CARIBBEAN EXAMINATIONS COUNCIL

Biology

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CSEC® Biology Past Papers

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TEST CODE **01207020**

FORM TP 2005002

JANUARY 2005

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

$1\frac{1}{2}$ hours

1. Candidates MUST attempt ALL the questions on this paper.

2. Candidates MUST use this answer booklet when responding to the questions. For EACH question, write your answer in the space indicated and return the answer booklet at the end of the examination.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

You should NOT spend more than 30 minutes on Question 1.

1. **Figures 1a** and **1b** below show how an experiment was set up to investigate how the rate of reaction of ONE of the enzymes of the human digestive system varies with temperature. Five different temperatures were investigated. Each tube contained 4 drops of the enzyme solution and 4 cm^3 of starch solution.

A white tile was prepared with drops of iodine as shown in **Figure 1b** below. One drop of the mixture from each tube was removed at intervals and added to a drop of iodine on the tile. This was done every minute for ten minutes. The results are shown in **Figure 1b** by the blackened and non-blackened circles.

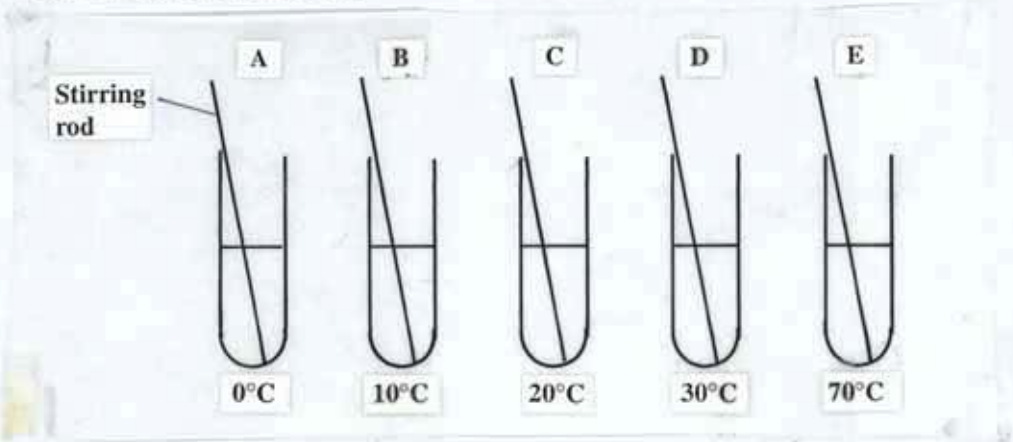


Figure 1a

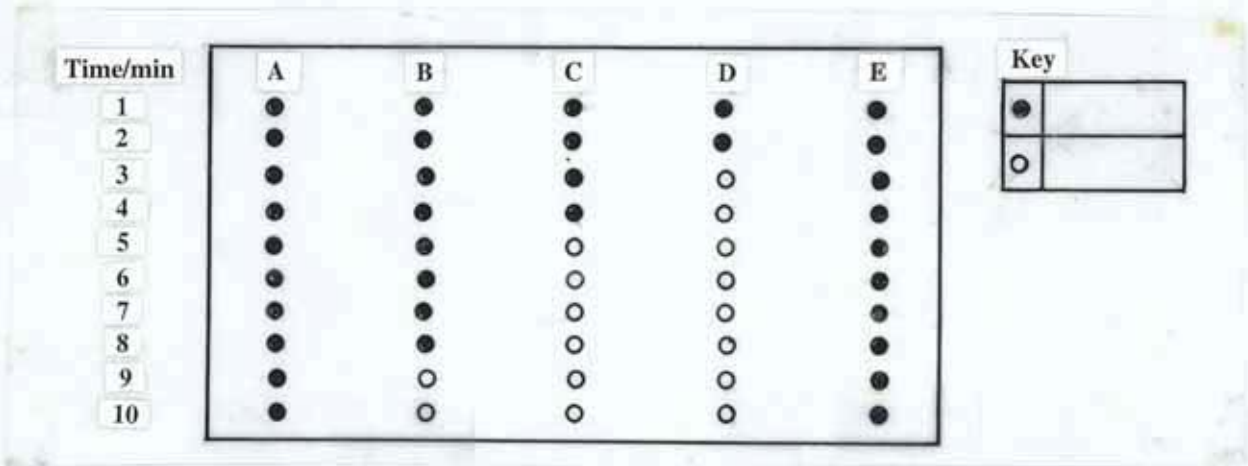


Figure 1b

(a) Complete the key beside **Figure 1b** to indicate the colours represented by the blackened and non-blackened circles. **(2 marks)**

GO ON TO THE NEXT PAGE

(b) (i) Explain why the colour of the drops remained the same for the 10 minutes in

row A .....

.....

row E .....

.....

(4 marks)

(ii) What substance would you expect to find in Tube D after 2 minutes?

.....

(1 mark)

(iii) Describe the test that could be carried out to find out if you were correct at (b) (ii) above.

.....

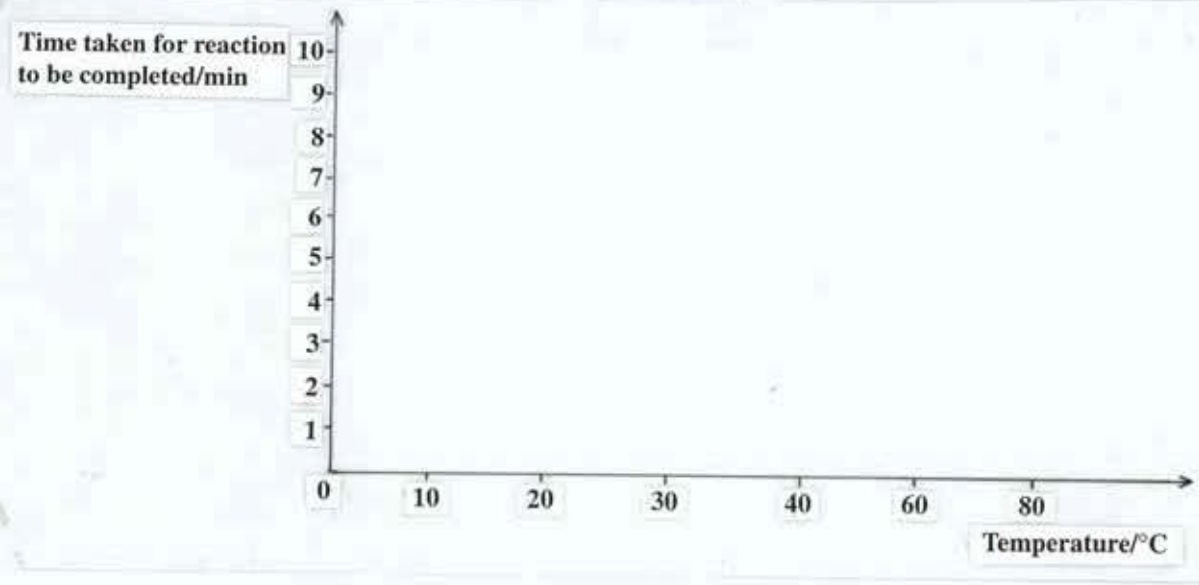
.....

.....

.....

(2 marks)

(c) (i) Using information from the experiment in **Figures 1a and 1b**, complete the graph below to show the effect of temperature on the time taken for the reaction between the starch and the enzyme to be completed.



(3 marks)

(ii) At what temperature did the reaction take place most rapidly?

.....

(1 mark)

(iii) What would you expect to happen if, at the end of the 10-minute period, the contents of Tubes A and E were brought to 30°C and then tested with iodine? Give ONE reason for your answer in EACH case.

Tube A:

.....

.....

Tube E:

.....

.....

(4 marks)

(d) (i) Use the information on page 2 to describe the procedure used to set up this investigation, by placing each step in the correct order in which it should be carried out to ensure accuracy. Include ONE precaution that you would take.

Step 1: .....

Step 2: .....

Step 3: .....

Step 4: .....

Precaution: .....

.....

(5 marks)

(ii) Explain the importance of stirring the mixture.

.....

.....

(1 mark)

(e) A similar investigation to that described on page 2 was carried out using red bean cotyledons.

(i) How should the cotyledons be prepared for testing?

.....

.....

(1 mark)

(ii) Explain what happens to the starch stored in the cotyledons when the seed germinates.

.....

.....

(3 marks)

(f) Some bean seeds were sown in a box and left inside a garden shed. **Figure 1c** shows their appearance after a few days.

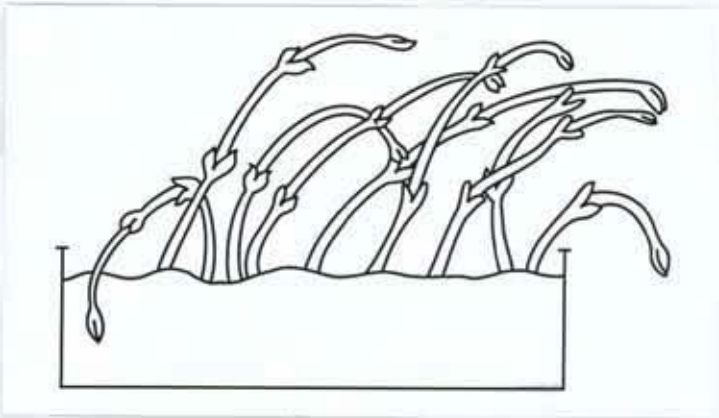


Figure 1c

(i) Explain the appearance of the seedlings in **Figure 1c**.

.....

.....

.....

(2 marks)

(ii) If you are asked to set up an investigation in a laboratory to show that your explanation in (f) (i) is correct and all you have is an old shoe box, how would you prepare the box for the investigation?

.....

.....

.....

(1 mark)

Total 30 marks

2.

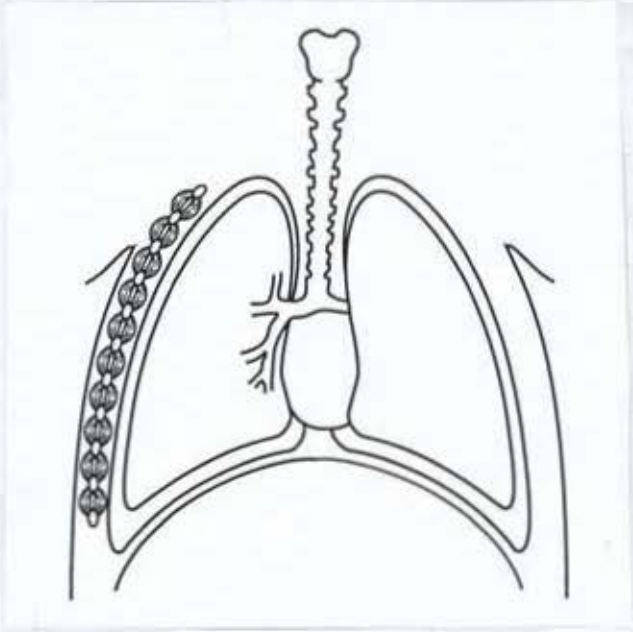


Figure 2a

Figure 2b

(a) (i) Label the structures involved in breathing in **Figure 2a** above. **(4 marks)**

(ii) Add a line to **Figure 2a** to show the position of the diaphragm when breathing in. **(1 mark)**

(iii) State what is happening to the rib cage at the same time that the diaphragm is moving to the position you have shown in (a) (ii).

.....

(1 mark)

(b) (i) Indicate with an 'X' on **Figure 2a,** where the structures shown in **Figure 2b** are found. **(1 mark)**

(ii) Name the TWO major blood vessels that branch to form the capillaries shown in **Figure 2b**.

.....

(2 marks)

(iii) Explain how oxygen from the air in the lungs moves to the rest of the body and into cells where it is needed.

.....

.....

.....

(3 marks)

(c) (i) Why are breathing and respiration BOTH important to mammals?

Breathing:

.....

.....

Respiration:

.....

.....

(3 marks)

(ii) Suggest ONE reason why plants do not need to breathe although respiration is important to them also.

.....

.....

(2 marks)

Total 17 marks

3. **Figure 3** shows a graph of carbon dioxide concentration in the air of a rain forest over a 24-hour period.

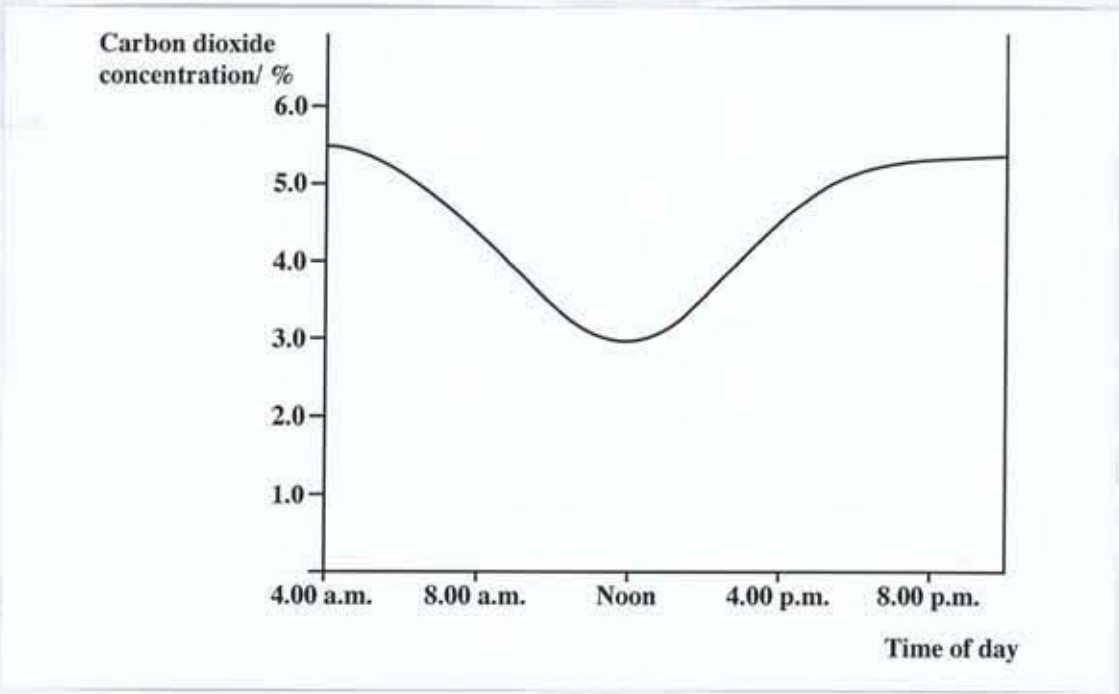


Figure 3

Data for the graph were obtained from an investigation of the atmosphere over a particular forest. The investigation was based on the fact that the carbon dioxide content of the atmosphere can be accurately measured. (The average carbon dioxide content of the atmosphere is normally about 0.03%.)

(a) Using ALL the available data, describe the changes in carbon dioxide concentration shown in **Figure 3**.

.....

.....

.....

(4 marks)

(b) (i) Identify the TWO plant processes that affect the amount of carbon dioxide in the atmosphere.

.....

(2 marks)

(ii) Explain the changes taking place in the carbon dioxide concentration over the forest between 4.00 a.m. and 4.00 p.m.

.....

.....

.....

(2 marks)

(c) (i) What environmental factor was MAINLY responsible for the changes which were seen in the graph in **Figure 3**?

.....

(1 mark)

(ii) Explain how the factor you named at (c)(i) was responsible for the changes observed over the 24-hour period.

.....

.....

.....

.....

(4 marks)

(d) Give THREE biological reasons why forests are important.

.....

.....

.....

.....

(3 marks)

Total 16 marks

4.

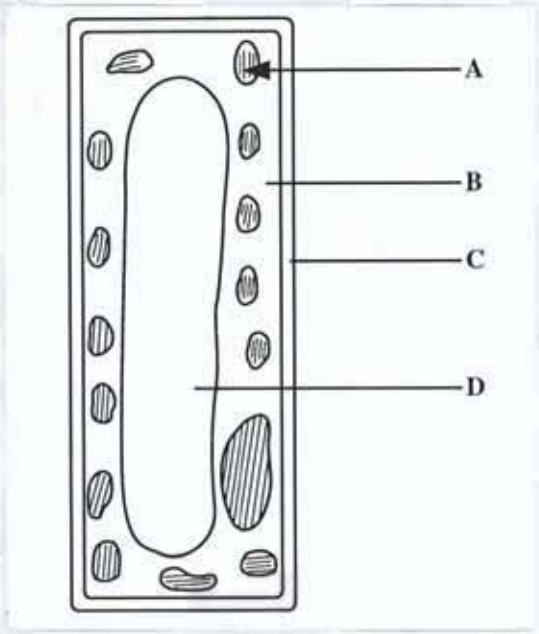


Figure 4. Diagram of a cell from the leaf of a green plant

(a) Identify the structures labelled A to D in **Figure 4**. **(4 marks)**

A .....

B .....

C .....

D .....

(b) State the functions of Structures A and D in **Figure 4**.

A

.....

.....

D

.....

.....

(3 marks)

(c) State TWO ways in which the cell shown in **Figure 4** is different from a human white blood cell.

.....

.....

(2 marks)

GO ON TO THE NEXT PAGE

(d) The number of chromosomes in the nucleus of the cell shown in **Figure 4** is 12. How many chromosomes would be present if the cell were part of a

(i) petal?

.....

(ii) pollen grain?

.....

(2 marks)

(e) The concentration of sugars in the cell sap has been calculated to be 10%. Describe what will happen to the cell if it is placed in a 50% sugar solution.

.....

.....

.....

(2 marks)

Total 13 marks

5. **Figure 5** shows in outline how a plant breeder developed a variety of a particular plant which had large leaves and large flowers. Both of the parent varieties (1 and 2) were true breeding (homozygous) for flower size.

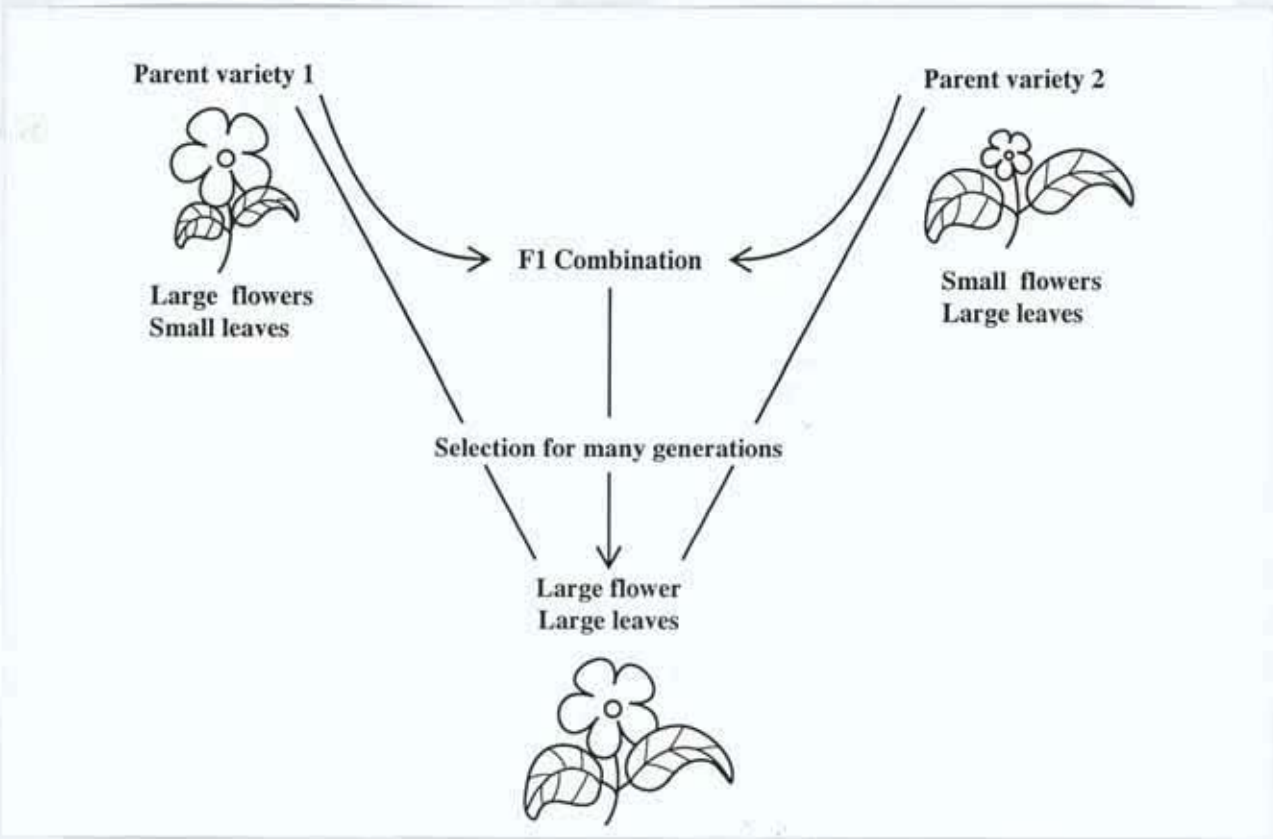


Figure 5

(a) (i) What does the term 'homozygous' mean?

.....

(2 marks)

(ii) Complete the genetic diagram below to show what happened the first time the two varieties were crossed, if small flowers are dominant to large flowers.

Parents'phenotype Large flowers Small flowers Key

Parents'genotype

Gametes

Fertilization

Offspring genotype

Offspring phenotype **(5 marks)**

(iii) Why would the breeding programme have to continue for many generations?

.....

.....

(1 mark)

(b) (i) What is the advantage to a plant of having large flowers and large leaves?

Large flowers:.....

.....

Large leaves:.....

.....

(2 marks)

(ii) What might be the advantage to the flower farmer of having a variety with BOTH large flowers and large leaves?

.....

.....

(2 marks)

(iii) Give ONE **other** characteristic of the new flower variety that the flower farmer would want and say why it would be important to the farmer.

Characteristic: .....

Importance: .....

.....

(2 marks)

Total 14 marks

END OF TEST

TEST CODE **01207030**

FORM TP 2005003

JANUARY 2005

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 03 – General Proficiency

1 hour

14 JANUARY 2005 (p.m.)

In addition to the 1 hour, candidates are allowed a reading time of 10 minutes. Writing may begin during the 10-minute period.

This paper is divided into THREE sections. Candidates MUST answer ONE question from EACH section. Where appropriate, answers should be illustrated by diagrams.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

SECTION A

Answer ONE question from this section.

1. (a) (i) Give TWO differences between osmosis and diffusion. **(2 marks)**

(ii) Describe how osmosis is used in transport by a plant. **(4 marks)**

(b) (i) Explain why controlling osmosis in cells is an important part of the control of diabetes. **(4 marks)**

(ii) Explain why diabetes is considered a physiological disorder and not a nutritional disease, although it can be controlled by changes in the diet. **(2 marks)**

(c) (i) Patients whose kidneys have stopped working efficiently are put on strict diets. They are allowed to have

(i) little salt

(ii) very small quantities of meat, beans and peas

(iii) a few ounces of water when they are thirsty.

Explain why EACH of these adjustments to the diet is necessary. **(4 marks)**

(ii) When using an artificial kidney, blood from the patient passes through tubes made of a selectively permeable membrane. The tubes are surrounded by a watery fluid containing carefully controlled amounts of certain solutes.

Suggest how a kidney machine is able to 'clean' the patient's blood. **(4 marks)**

Total 20 marks

2. (a) (i) Compare the structure of a red blood cell and a white blood cell. **(2 marks)**

(ii) Describe the role of white blood cells in humans. **(4 marks)**

(b) (i) Describe ONE way in which the skin of humans offers protection. **(2 marks)**

(ii) How do the skin and the blood work together in order to continue protecting the body when it is cut? **(4 marks)**

(c) (i) Identify TWO differences between the structure of the epidermal tissue of a leaf and the human skin. **(4 marks)**

(ii) Some plant diseases are caused by bacteria or viruses. These diseases spread rapidly through the plant, sometimes killing it. Explain how the transport system of the plant may be involved. **(4 marks)**

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION B

Answer ONE question from this section.

3. (a) (i) Using appropriate examples, distinguish between the physical and the biotic factors of a natural habitat. **(4 marks)**

(ii) How might a biotic factor affect ONE of the physical factors in the habitat? **(2 marks)**

(b) A fire in part of a forest killed most plants, except a few trees. After some weeks plants started to grow again but no animals were found. A year later the community was almost the same as before the fire.

(i) Give TWO methods of dispersal by which some of the new plants may have reached the area.

(ii) Explain why plants must return before the animals can come back. **(4 marks)**

(c) In another part of the same forest mentioned at (b) above, chemical waste was dumped from a nearby factory. All the plants and animals died. After a year nothing had returned.

(i) Suggest why the plants and animals did NOT return after this event. **(4 marks)**

(ii) Discuss TWO long-term effects that could be caused by the permanent loss of a large part of a forest AND suggest how this could be avoided. **(6 marks)**

Total 20 marks

4. (a) (i) Few people have hereditary diseases compared to pathogenic diseases. Give TWO characteristics of these two types of diseases that could account for this. **(2 marks)**

(ii) Using ONE named disease as an example, explain how a baby could have a hereditary disease which neither parent has. **(4 marks)**

(b) (i) What characteristics of AIDS cause it to be considered a deadly disease although people rarely die directly from it? **(4 marks)**

(ii) Do you think it is possible for humans to eventually become resistant to AIDS? Give ONE reason for your answer. **(2 marks)**

(c) Plants brought into a country without permission are taken away from passengers and, in most cases, destroyed. In some countries, persons with AIDS are permanently isolated from other citizens. Many people object to these two practices.

To what extent do you consider these TWO practices acceptable? Support your answer with reasons. **(8 marks)**

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION C

Answer ONE question from this section.

5. (a) Your breakfast consists of bread, eggs and butter.

(i) What are the end products of digestion of these foods?

(ii) Describe FULLY what happens in the body to EACH end product after it is digested.

(8 marks)

(b) A student attempted to investigate the actions of the enzyme lipase. He placed some pieces of fat in a test tube of water and added some lipase solution. He left the test tube in an air-conditioned laboratory overnight. The next day there was little change in the fat. Explain FULLY why he did NOT get the results he expected.

(6 marks)

(c) In recent times, people have been cautioned to reduce the amount of fat in their diets.

(i) Why is the reduction of the amount of fat in the diet recommended?

(4 marks)

(ii) Suggest TWO reasons why fat should NOT be completely eliminated from the diet. **(2 marks)**

Total 20 marks

6. (a) (i) Identify the TWO systems in the human body that are responsible for co-ordination.

(ii) Give THREE reasons why co-ordination is important for all living things. Explain your answer.

(8 marks)

(b) During a medical examination of a seven-year-old girl, it is determined that she will be unable to produce adequate quantities of oestrogen. Discuss how this condition may affect her future life. **(6 marks)**

(c) (i) Which hormone progesterone or oestrogen, is present in **greater** quantities in birth contol pills? Explain your answer. **(3 marks)**

(ii) It is possible to remove an ovum from one woman, fertilise it in a test tube and implant the embryo in the uterus of another woman. Suggest THREE problems which may be associated with this procedure. **(3 marks)**

Total 20 marks

END OF TEST

TEST CODE **01207042**

FORM TP 2005004

JANUARY 2005

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 04/2 – Alternative to SBA

General Proficiency

2 hours

In addition to the 2 hours, candidates are allowed 10 minutes in order to read through the entire paper. Writing may begin during the 10-minute period.

1. Candidates MUST attempt ALL the questions on this paper.

2. Candidates MUST use this answer booklet when responding to the questions. For EACH question, write your answer in the space indicated and return the answer booklet at the end of the examination.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

You should NOT spend more than 30 minutes on Question 1.

1. (a) Specimen A shows all the characteristics of a green plant.
Make a FULLY ***labelled*** drawing of the whole specimen in the space provided below.

(12 marks)

(b) Carefully cut off and remove the ***base*** of Specimen A. Select one leaf and carefully pull it apart from the rest of the specimen to fully expose a single leaf. Describe the structure of the leaf of Specimen A.

.....

.....

.....

.....

(3 marks)

(c) (i) You are provided with the following: water bath, boiling tube with alcohol, iodine solution, white tile or Petri dish, tweezers.

Use the apparatus provided to obtain information about the products of photosynthesis in this leaf. Write up your investigation using the outline below.

Aim:

.....

.....

Apparatus and Materials:

.....

.....

Method:

.....

.....

.....

.....

Results::

.....

.....

(11 marks)

(ii) When a decolourised leaf of Specimen A is treated with hydrochloric acid and sodium hydrogen carbonate solution, then boiled with Benedict's solution a red colour change is obtained.

Explain these results in comparison with the investigation in (c)(i).

.....

.....

.....

.....

(4 marks)

Total 30 marks

2. The following apparatus and materials were used to find out whether small organisms respond positively or negatively to light and damp conditions.

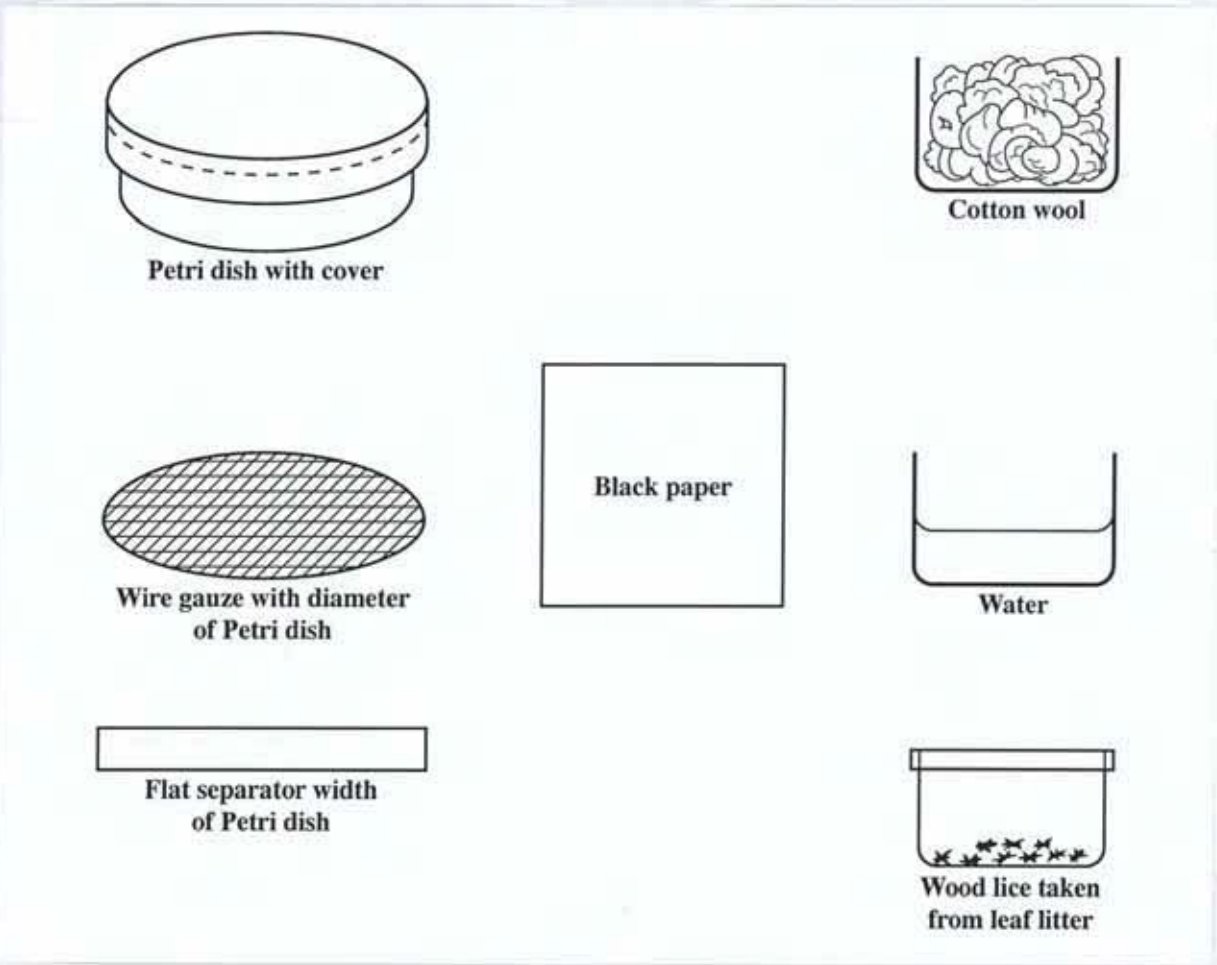


Figure 1

GO ON TO THE NEXT PAGE

(a) Draw TWO labelled diagrams in the boxes provided below to show HOW the apparatus and materials were arranged at the start of the investigation. Show precisely where you would place the organisms.

View from above	Side/lateral view

(8 marks)

(b) Most of the organisms were found to move towards the area of the Petri dish that was dark and damp and it was believed that they moved there because the conditions were like those of their habitat.

(i) Suggest why ALL the organisms did not go to the dark, damp area.

.....

.....

(2 marks)

(ii) What would be the risks to these organisms if they were unable to show the response of moving towards dark, damp areas?

.....

.....

(2 marks)

Total 12 marks

3. After making observations on the differences in the yield of bean crops on three adjacent plots of land, some biology students feel that the soils on which the crops grow are mainly responsible for their observations. They carry out investigations to determine if their hypotheses are correct.

In one investigation they attempt to discover the composition of soil from each plot using a simple technique. They separate the soil by shaking samples from each plot in equal volumes of water in a measuring cylinder. The results obtained are illustrated in the diagrams in **Figure 2a**.

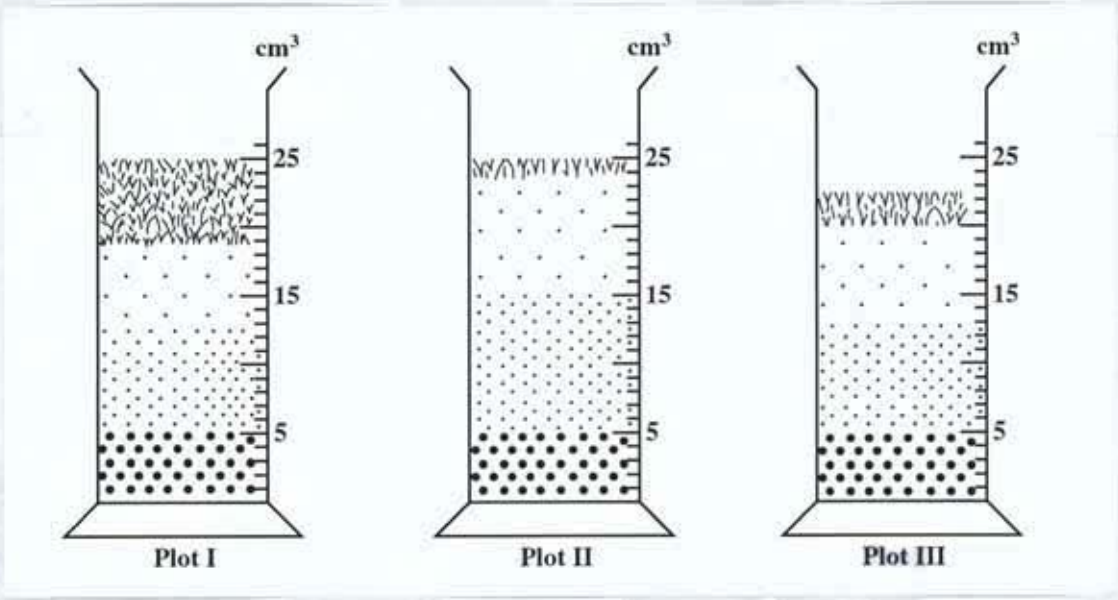


Figure 2a. Results of the experiment to investigate the soil composition

(a) (i) What is the volume of humus in EACH sample of soil in **Figure 2a**?

Plot I

.....

Plot II

.....

Plot III

.....

(3 marks)

GO ON TO THE NEXT PAGE

(ii) Calculate the relative proportion of soil particles in Plot I. Show your working.

(3 marks)

(iii) Identify THREE precautions to be taken in setting up the investigation shown in **Figure 2a** and in deriving the results.

.....

.....

.....

.....

(3 marks)

(iv) Suggest a hypothesis for the investigation.

.....

.....

(2 marks)

(b) The students set up another soil investigation as illustrated in **Figure 2b**.

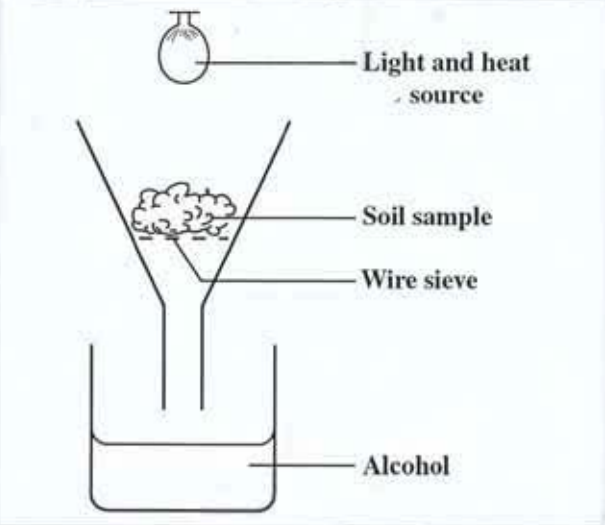


Figure 2b. Apparatus set up for a soil investigation

(i) What is the aim of the investigation in **Figure 2b**?

.....

.....

(2 marks)

(ii) Suggest an observation that the students made that caused them to undertake this investigation.

.....

.....

(2 marks)

(c) Describe a method to show that the amount of water the soil holds affects growth of the plant.

.....

.....

.....

.....

(3 marks)

Total 18 marks

END OF TEST

TEST CODE **01207020**

FORM TP 2005046

MAY/JUNE 2005

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

1 1/2 hours

1. Candidates MUST attempt ALL the questions on this paper.

2. Candidates MUST use this answer booklet when responding to the questions. For EACH question, write your answer in the space indicated and return the answer booklet at the end of the examination.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

You should NOT spend more than 30 minutes on Question 1.

1. In studying a particular habitat, a group of students finds the distribution of organisms shown in Table 1 below:

TABLE 1: ORGANISMS FOUND IN THE HABITAT UNDER STUDY

Organism	Number/10 quadrat throws
Mole crickets	18
Herbivorous bug	22
Butterfly	18
Grasses and herbs	230
Praying mantis	6
Lizard	1
Ants	65

(a) (i) In the space provided below, construct a pie chart to show the relative proportions of the organisms the students found occupying the habitat.

Figure 1. Relative proportions of organisms found in the habitat under study

(4 marks)

GO ON TO THE NEXT PAGE

(ii) What is the advantage of using a pie chart to represent the data in Table 1?

_____

_____

(2 marks)

(iii) Identify another means besides a table and pie chart to represent the data in Table 1.

_____

(1 mark)

(iv) Identify TWO carnivores from the data contained in Table 1 and the pie chart .

_____

(2 marks)

(b) (i) From the organisms the students find in the habitat, identify a food chain with at least FOUR organisms.

_____

_____

(2 marks)

(ii) Suggest TWO long-term effects on the habitat, if a pair of flycatchers (insect-eating birds) suddenly enter the habitat under study.

_____

_____

(2 marks)

(c) In another study undertaken by the same group of students, they find Specimens A to D represented in Figure 2 below. The students claim that the specimens belong to the same group.

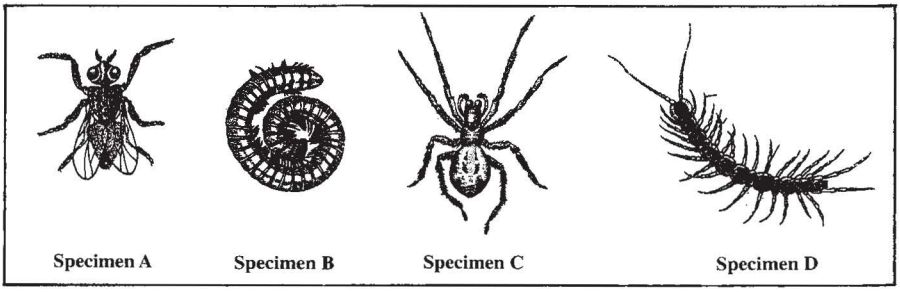


Figure 2. Specimens students find in the second study

(i) Identify TWO features shown in the drawings that can be used to classify the specimens.

_____

_____

(2 marks)

(ii) In the space provided below, accurately draw Specimen B twice the size shown in Figure 2. State the magnification of your drawing.

(4 marks)

(d) The students observe that a particular species of plant in the original study area occurs in two varieties, one with completely green leaves and the other with leaves that are mainly red. The students suggest that the green variety is a more efficient plant than the red variety and therefore wish to compare the rates at which they would photosynthesise. They propose a hypothesis and decide on an investigation to test that hypothesis.

(i) Based on the students' observation, suggest a hypothesis for the investigation.

_____

_____

(2 marks)

(ii) Describe the investigation you would undertake to test the hypothesis you suggested in (d) (i). Include in your description the apparatus, materials and method you would use.

Apparatus and Materials: _____

_____

_____

Method: _____

_____

_____

_____

_____

(4 marks)

(iii) State TWO environmental factors that affect the rate of photosynthesis.

_____

(2 marks)

(iv) Write an equation to adequately represent the processes involved in photosynthesis.

_____

_____

(3 marks)

Total 30 marks

2. (a) Figure 3 below shows the location of selected glands in the female human body.

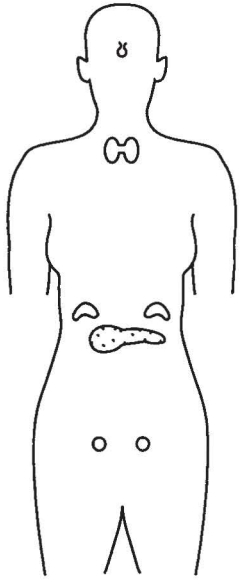


Figure 3. Selected glands of the female human body

(i) Label Figure 3 to show the **position** of THREE glands that produce hormones involved in growth and development in humans. **(3 marks)**

(ii) Complete the table below to identify and give the role of the hormones of growth and development produced by the glands you located in (a) (i).

Gland	**Growth & development hormone produced**	**Role of hormone**
1.		
2.		
3.		

(6 marks)

(b) The glands involved in growth and development are all examples of endocrine glands.

(i) a) Identify ONE **other** type of gland in the human body.

_____

(1 mark)

b) Give ONE **example** of the type of gland you identified in (b) (i) a) above.

_____

(1 mark)

(ii) Give ONE **similarity** and ONE **difference** between endocrine glands and the type of gland identified in (b) (i).

Similarity: _____

_____

Difference: _____

_____

(2 marks)

(c) If the gene for insulin production is transferred from a human pancreatic cell to a certain bacterium, it produces human insulin within the bacterium.

(i) Give the name of the process of transfer of the gene.

_____

(ii) State ONE advantage of the process you mentioned in (c) (i) above.

_____

(3 marks)

Total 16 marks

3. Figure 4 below shows the basic plan of two flowers, Flowers 1 and 2.

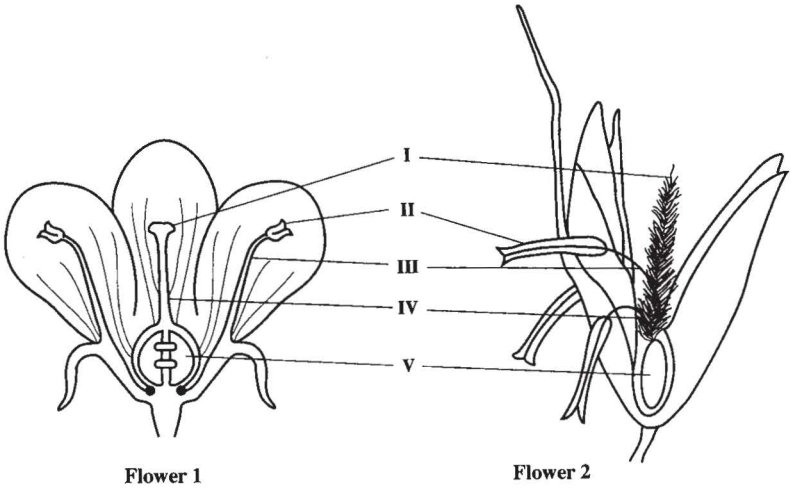


Figure 4. Two types of flowers

(a) (i) Name the parts of Flowers 1 and 2, labelled I to V, in Figure 4 above.

I _____ IV _____

II _____ V _____

III _____

(5 marks)

(ii) The flower structures labelled in Figure 4 are sometimes referred to as 'essential' structures.

Suggest ONE reason for the use of the term 'essential' to describe the labelled structures.

_____

_____

(2 marks)

(b) (i) Identify the pollinating agent for EACH flower in Figure 4.

Flower 1: _____

Flower 2: _____

(2 marks)

(ii) Identify TWO characteristics of EACH flower that are useful in pollination.

Characteristics in Flower 1: _____

_____

_____

Characteristics in Flower 2: _____

_____

_____

(4 marks)

(c) In the space provided below, draw in outline TWO simple diagrams to represent the shape of the fruit EACH flower is likely to produce.

Fruit of Flower 1 **Fruit of Flower 2**

(2 marks)

Total 15 marks

4. Some seedlings are transplanted onto garden beds and the changes in their mass are noted over a period of time. The changes are recorded in the graph below.

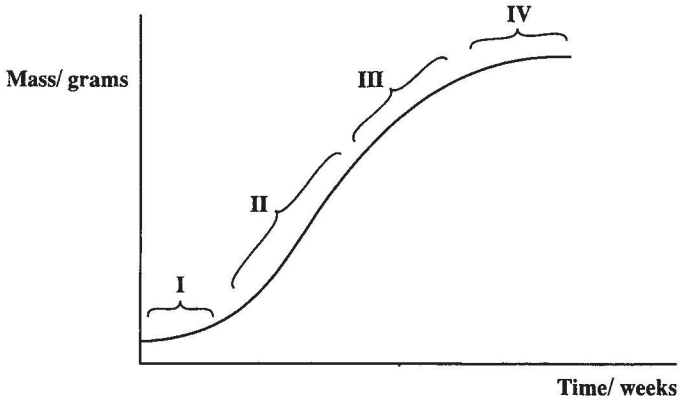


Figure 5. Change in mass of seedlings

(a) Describe the changes taking place at stages II and IV.

Stage II: _____

_____

_____

Stage IV: _____

_____

_____

(4 marks)

(b) Identify TWO mineral salts found in garden soil and explain the role of EACH salt.

Mineral salt 1: _____

Role: _____

Mineral salt 2: _____

Role: _____

(4 marks)

(c) During their life cycle plants may store large amounts of excess food.

(i) Explain TWO advantages to the plant of storing food in its seeds.

_____

_____

_____

(4 marks)

(ii) Describe TWO situations in the life cycle of a plant when stored food is used.

_____

_____

_____

_____

(4 marks)

Total 16 marks

5. Figure 6 below shows the inheritance of earlobe size in a human family.

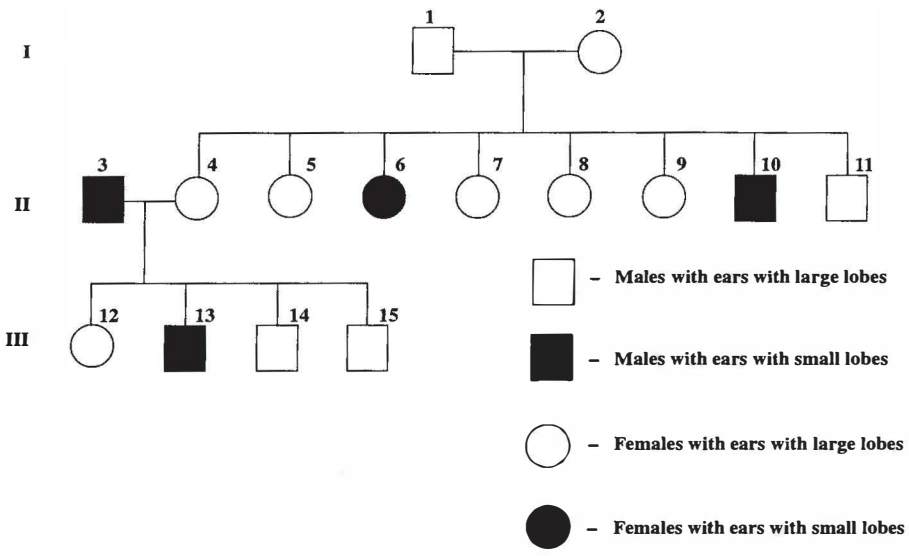


Figure 6. Pedigree chart for ear lobe size in a human family

(a) (i) Using the chart in Figure 6 above, state the genotypes of family members, 1, 2 and 6.

Family member 1: _____

Family member 2: _____

Family member 6: _____

(3 marks)

(ii) Identify the type of variation involved in the inheritance of earlobe size in humans shown in Figure 6 above.

_____

(1 mark)

(iii) Give ONE reason for the importance of variation among living things.

_____

(1 mark)

(b) There are various blood group systems, but the one most commonly used is the ABO system.

Account for the fact that in the ABO system, although there are FOUR different blood groups in existence, only THREE **alleles** determine these blood groups.

_____

_____

_____

_____

(3 marks)

(c) Name ONE inherited disease.

_____

(1 mark)

(d) How do the treatment **and** control of an inherited disease differ from the treatment **and** control of a deficiency disease?

Treatment: _____

_____

_____

Control: _____

_____

_____

(4 marks)

Total 13 marks

END OF TEST

TEST CODE **01207030**

FORM TP 2005047 MAY/JUNE 2005

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 03 – General Proficiency

1 hour

02 JUNE 2005 (a.m.)

In addition to the 1 hour, candidates are allowed a reading time of 10 minutes. Writing may begin during the 10-minute period.

This paper is divided into THREE sections. Candidates MUST answer ONE question from EACH section. Where appropriate, answers should be illustrated by diagrams.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

SECTION A

Answer ONE question from this section.

1. (a) With the aid of a diagram, describe the structure of the male reproductive system in humans and explain why this system is well-suited to its functions. **(8 marks)**

(b) (i) Explain the role of the male hormone (male gonadotropin) secreted by the gonads in controlling growth and development. **(2 marks)**

(ii) Give TWO reasons why a man who is undergoing a sex change operation is given a course of female gonadotropins. **(4 marks)**

(c) (i) Plant growth substances are often referred to as plant 'hormones'.

Do you consider this reference appropriate? Give TWO reasons for your answer. **(2 marks)**

(ii) Sometimes plant growth substances are sprayed onto plants to improve certain characteristics, for example, to hasten fruit ripening.

Suggest TWO **disadvantages** of this practice. **(4 marks)**

Total 20 marks

2. (a) With the aid of a diagram, describe the structure of a kidney tubule and explain why its structure makes it well-suited to its functions. **(8 marks)**

(b) Anti-diuretic hormone (ADH) causes changes in the functioning of the kidney tubule. Explain how these changes are brought about. **(4 marks)**

(c) (i) Suggest TWO reasons why osmo-regulation is important in plants. **(4 marks)**

(ii) A farmer selected crops which had deeply penetrating roots, and leaves with thick cuticles for a particular area of land he wished to cultivate.

Fully explain why a farmer would select these features for his crops. **(4 marks)**

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION B

Answer ONE question from this section.

3. (a) (i) Using an **annotated** diagram ONLY describe the structure of a dicotyledonous leaf as seen in cross section. **(4 marks)**

(ii) Describe TWO ways in which the leaf is well-suited for its functions. **(4 marks)**

(b) (i) The citrus swallowtail butterfly lays eggs on the leaves of citrus plants.

Fully explain what is the advantage to the butterfly of laying eggs on the leaves. **(4 marks)**

(ii) Although the citrus swallowtail larvae are parasitic on citrus plants, they do not necessarily kill the plants. Suggest why this is an **advantage to the butterfly**. **(2 marks)**

(c) (i) Crop yield may be affected by many factors including a covering of mould which forms a black layer on the upper surface of leaves.

Fully explain how a black layer covering the leaves might affect crop yield. **(4 marks)**

(ii) Suggest ONE reason why a lack of water may result in reduced crop yield. **(2 marks)**

Total 20 marks

4. (a) (i) Using an **annotated** diagram ONLY illustrate the sites where digestion occurs in humans. **(4 marks)**

(ii) Describe TWO features of the system which make it suitable for digestion. **(4 marks)**

(b) With reference to the products of digestion in humans, illustrate why the liver is sometimes referred to as the 'chemical laboratory' of the body. **(6 marks)**

(c) As producers, plants are very important in every ecosystem.

Apart from nutrition suggest THREE other ways in which plants add value to an ecosystem. **(6 marks)**

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION C

Answer ONE question from this section.

5. (a) Outline the main features of mitosis and meiosis. **(8 marks)**

(b) (i) The study of genetics is based on our knowledge of the role and behaviour of chromosomes.

Identify TWO features of the role and behaviour of chromosomes that are important in predicting the outcome of crosses between gametes. **(4 marks)**

(ii) Two grey mice when mated, produced a total of 8 white, 9 black and 17 grey offspring. Student A suggested that grey coat colour was dominant in the mice. Student B strongly disagreed.

Which student is right? Explain your answer using appropriate symbols. **(8 marks)**

Total 20 marks

6. (a) (i) Outline the factors involved in the transmission and control of AIDS **and** a **named** vector-borne disease.

(ii) Suggest TWO reasons why it is important to determine the causes of disease. **(12 marks)**

(b) In terms of the spread of disease in plants, a vegetable garden can be considered a 'risky' environment compared to a forest.

Do you agree with this view? Support your answer with reasons. **(4 marks)**

(c) Concerted efforts are currently made by certain Caribbean governments to preserve forested areas although there is the need to provide housing for people.

Suggest TWO long-term biological benefits of a government's investment in forest conservation. **(4 marks)**

Total 20 marks

END OF TEST

TEST CODE **01207020**

FORM TP 2006002

JANUARY 2006

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

$1\frac{1}{2}$ hours

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **There are FIVE questions in this booklet. Answer ALL questions.**
2. **You MUST use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

Answer ALL questions.

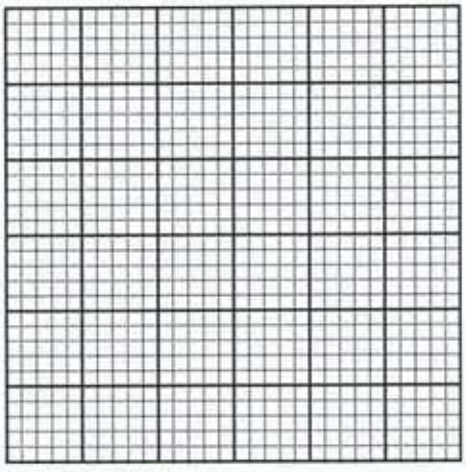
You should NOT spend more than 30 minutes on Question 1.

1. One activity of 'Green Minds', a school gardening club, is to find out the effect of temperature on the rate of decay of green leaves. Club members are divided into nine groups, each of which investigates the amount of decay that occurs at a particular temperature **over a period of two weeks**. The results from all groups are collated and presented in Table 1.

TABLE 1: DECAY OF FRESH LEAVES AT DIFFERENT TEMPERATURES

Group	Temperature (°C)	Fresh leaves decayed (%)
1	0	1
2	5	2
3	10	4
4	15	6
5	20	12.5
6	25	25
7	30	35
8	35	40
9	40	50

(a) (i) Use the data in Table 1 to construct a graph showing the percentage decay of fresh green leaves at the temperatures investigated.



(4 marks)

(ii) Identify TWO precautions each group should take in setting up their investigations.

.....

.....

.....

(2 marks)

(b) (i) Suggest ONE conclusion that may be drawn from the information presented in Table 1 and your graph.

.....

.....

(2 marks)

(ii) Give ONE explanation for the conclusion arrived at in (b)(i) above.

.....

.....

(2 marks)

(iii) One club member suggested that at a temperature of 80°C no decay would have occurred. Do you support this view? Explain your answer.

.....

.....

(2 marks)

(c) One of the goals of Green Minds is to promote the use of **natural** fertilizers by gardeners in the school's neighbourhood. Identify FOUR points about fertilisers that club members should provide to the neighbourhood gardeners to promote their cause.

.....

.....

.....

.....

(4 marks)

(d) Green Minds club members conduct experiments in several areas to provide data to support their work. In an investigation on the conditions that affect the rate of transpiration, they use the apparatus shown in **Figures 1.1** and **1.2** below.

(Potometer with bubble at the end of the tube)

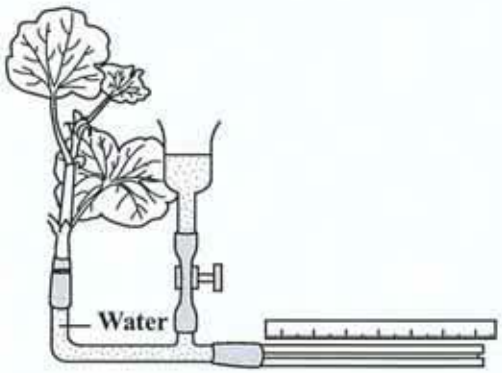


Figure 1.1

Apparatus at the start of the investigation

(Potometer with bubble a few cm along the tube)

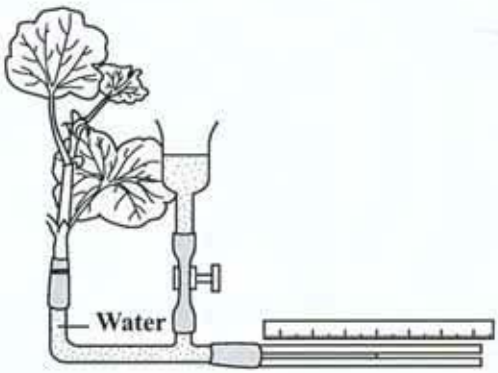


Figure 1.2

Apparatus after 20 minutes

(i) Describe how you would prepare the materials and apparatus for investigation illustrated in **Figures 1.1** and **1.2**.

.....

.....

.....

.....

(3 marks)

(ii) Suggest ONE limitation to the method you described in d (i).

.....

.....

(1 mark)

(iii) How far did the bubble move in 20 minutes?

.....

(1 mark)

(iv) Estimate the transpiration rate of the plant in the investigation.

.....

(2 marks)

(v) Suggest ONE reason why your estimated rate is not necessarily accurate.

.....

.....

(2 marks)

(vi) Identify ONE external factor that might affect the movement of the bubble.

.....

(1 mark)

(e) Green Minds club members sometimes perform food tests to determine the nutrient content of produce grown in their gardens. On one occasion they attempt to find out whether the fruit of the newly introduced crop called yam-bean really contains the major nutrients they are told it contains.

(i) Describe how the club members could determine the presence of TWO named nutrients in the yam-bean fruit.

.....

.....

.....

.....

(2 marks)

(ii) State the expected food test results if the nutrients you chose in (e) (i) are present in the fruit.

.....

.....

(2 marks)

Total 30 marks

2. (a) **Figure 2** below is a diagram of the longitudinal section through the heart. Study the diagram and answer the questions that follow.

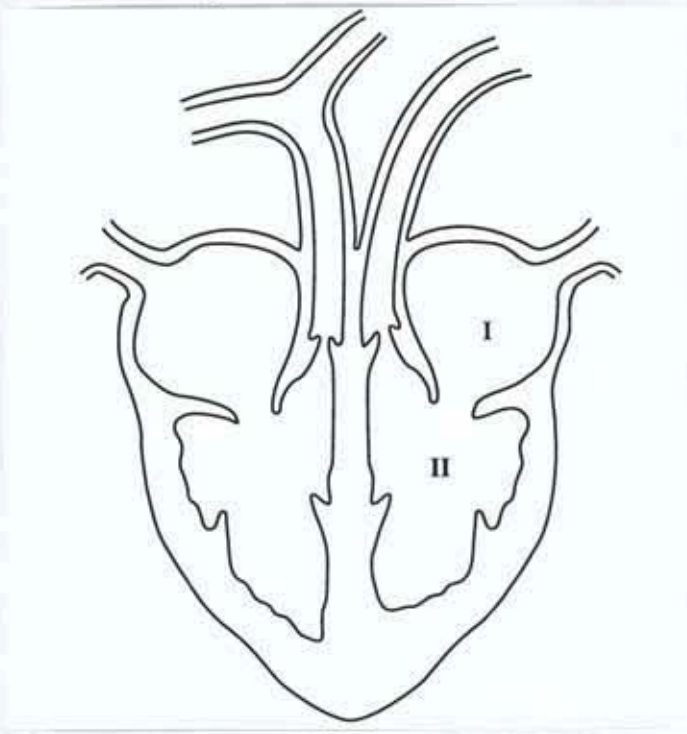


Figure 2. Longitudinal section through the heart

(i) Name the parts of the heart labelled I and II in Figure 2.

I: .....

II: .....

(2 marks)

(ii) Using FOUR arrows **only**, show on the diagram the direction of blood flow from the pulmonary artery to the aorta. **(4 marks)**

(iii) Name TWO structures shown in the diagram that ensure the blood flows in one direction only.

.....

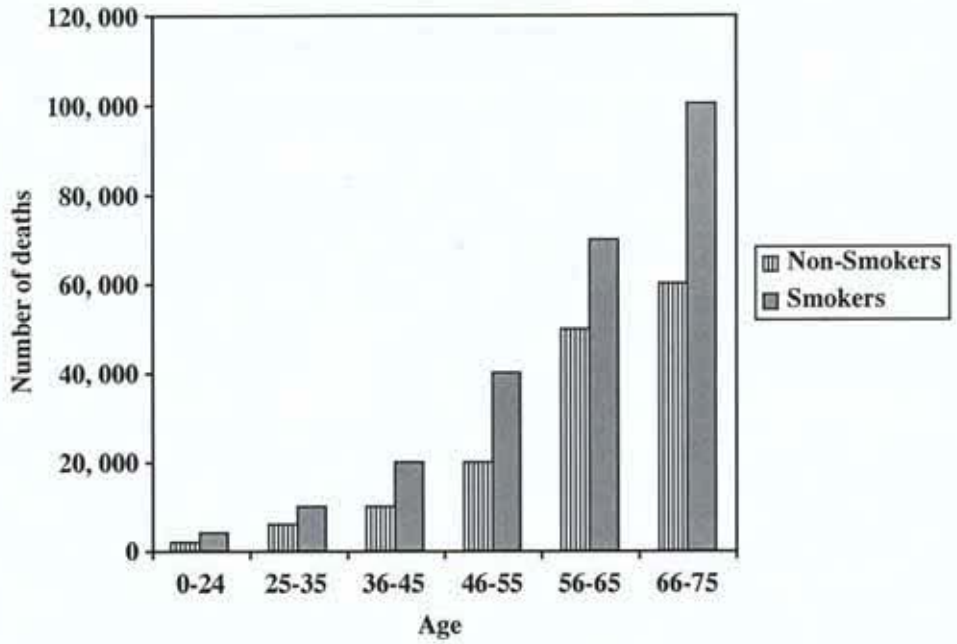
(2 marks)

(b) (i) The graph below shows the number of deaths due to heart disease among smokers and non-smokers.
Draw ONE conclusion based on the graph.

.....

.....

(2 marks)



(ii) Suggest TWO reasons why smoking may contribute to heart disease.

.....

.....

(2 marks)

(iii) Identify TWO factors besides smoking that could cause the heart to malfunction.

.....

.....

(2 marks)

Total 14 marks

3. The following are drawings of a red bean seed that has been soaked in water for twenty-four hours.

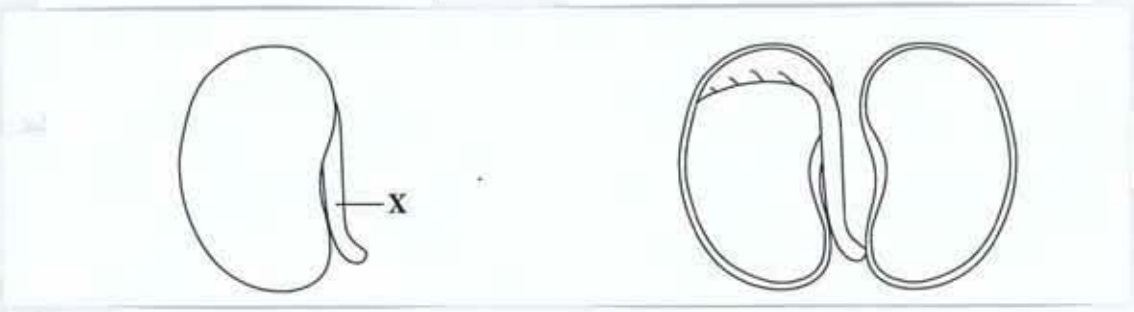


Figure 3.1 External view **Figure 3.2 Internal structure**

(a) Fully label the drawings to show the main parts of the seed. **(5 marks)**

(b) After soaking in water for twenty-four hours, the part labelled X elongated (grew). What changes took place in the seed to bring about growth in part X?

.....

.....

.....

(3 marks)

(c) Explain why it is important for plants to produce seeds with large amounts of stored food.

.....

.....

.....

(3 marks)

(d) Identify THREE environmental factors that affect the rate of growth of a seedling.

.....

(3 marks)

Total 14 marks

4. Figure 4 below shows diagrams of the human male and female genital organs.

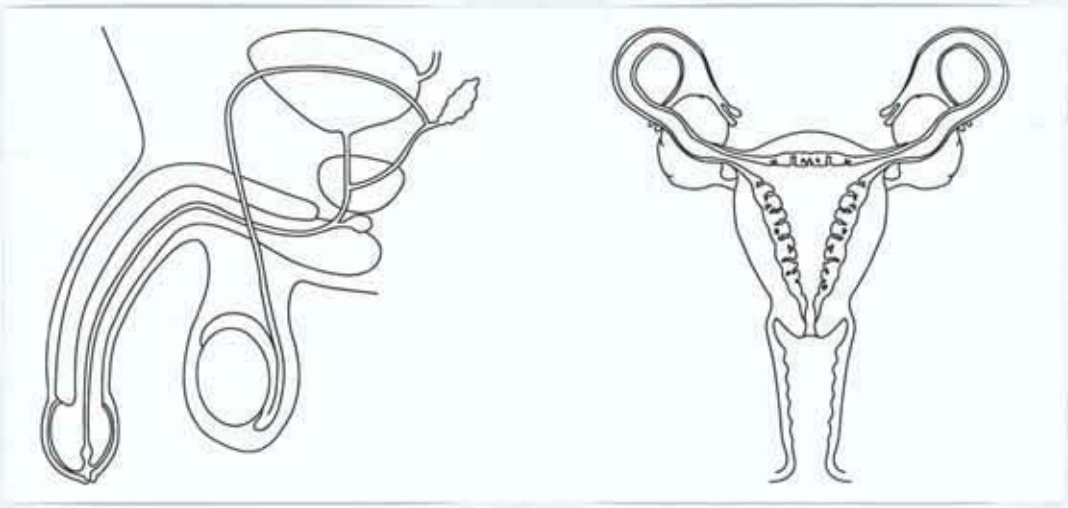


Figure 4. Male and female genital organs

(a) Label the diagrams to show FIVE structures involved in **gamete production** and **transfer**. **(5 marks)**

(b) (i) Place an X on the diagram to show where fertilization takes place. **(1 mark)**

(ii) Outline the route a spermatozoon (sperm) must travel from its origin in order to fertilize an egg.

.....

.....

(2 marks)

(iii) Explain how it is possible for an egg to be fertilized but fail to result in a successful pregnancy.

.....

.....

(2 marks)

(c) (i) Name TWO reproductive hormones produced by a woman.

.....

(2 marks)

(ii) Explain how the hormones named in (c)(i) on page 9 enable successful reproduction in humans.

.....

.....

.....

.....

(4 marks)

Total 16 marks

5. **Figure 5** below shows the profile of a freshwater pond and its immediate surroundings.

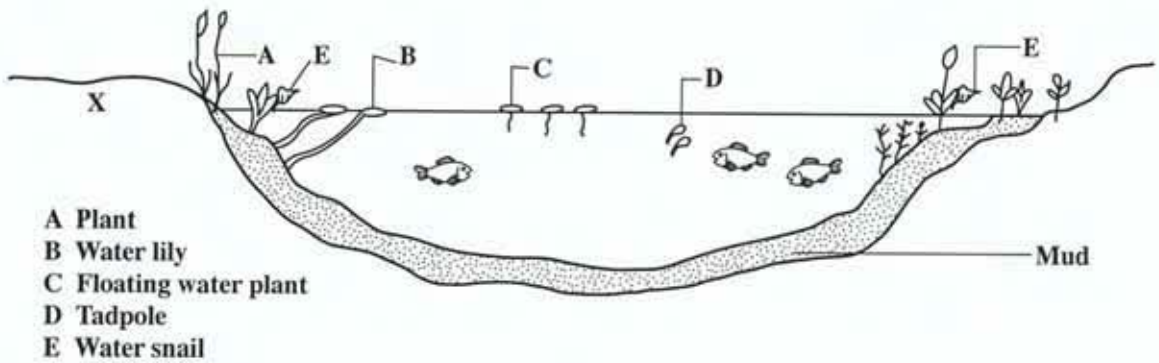


Figure 5. Profile of a freshwater pond

(a) (i) Identify TWO biotic and TWO abiotic factors illustrated in the diagram.

Biotic factors:

.....

(2 marks)

Abiotic factors:

.....

(2 marks)

(ii) Suggest TWO ways in which any of the biotic and abiotic factors interact.

.....

.....

.....

.....

(4 marks)

(b) (i) A new housing settlement is erected near the pond.

Suggest FOUR precautions residents must take to preserve the pond as a natural habitat.

.....

.....

.....

.....

(4 marks)

(ii) After a period of heavy showers an algal bloom appears in the pond.

Suggest a reason for this increase in the population of algae in the pond.

.....

.....

(2 marks)

(iii) Explain ONE possible consequence of the rapid increase in algae population.

.....

.....

(2 marks)

Total 16 marks

END OF TEST

TEST CODE **01207030**

FORM TP 2006003

JANUARY 2006

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 03 – General Proficiency

1 hour

16 JANUARY 2006 (p.m.)

In addition to the 1 hour, candidates are allowed a reading time of 10 minutes. Writing may begin during the 10-minute period.

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **This paper is divided into THREE sections. Answer THREE questions, ONE from Section A, ONE from Section B and ONE from Section C.**

2. **Where appropriate, answers should be illustrated by diagrams.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

SECTION A

Answer ONE question from this section.

1. (a) (i) Describe the processes involved in photosynthesis. **(6 marks)**

(ii) Identify TWO characteristics of the leaf that make it an effective photosynthetic organ **and** state how EACH characteristic mentioned facilitates photosynthesis. **(4 marks)**

(iii) How is it possible for a plant to survive after losing all of its leaves? **(2 marks)**

(b) The phenomenon of swarming occasionally occurs in some insect species, such as locusts. At such times locusts occur in very large numbers and they attack vegetation including crops.

(i) Explain TWO consequences to a farmer if his crop is attacked by a swarm of locusts. **(2 marks)**

(ii) Suggest why spraying with insecticide would be an **ineffective** method of controlling swarming locusts. **(2 marks)**

(iii) Explain TWO methods that could be used in controlling insect pests. **(4 marks)**

Total 20 marks

2. (a) (i) Describe mitosis **and** explain why this process is important in living organisms. **(6 marks)**

(ii) Identify TWO parts of a plant where mitosis takes place. **(2 marks)**

(b) Explain to a farmer TWO advantages of having a field of cloned sugarcane. **(4 marks)**

(c) (i) In the process of cloning in an animal, the nucleus from the egg is replaced by a nucleus from a body or somatic cell of the same organism. What is the significance of this process? **(4 marks)**

(ii) One of the goals of modern medicine is to replace the malfunctioning organ of a patient with an organ cloned from the patient's own tissues. Suggest TWO reasons why this might be better than using donor organs. **(4 marks)**

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION B

Answer ONE question from this section.

3. (a) Describe FOUR features of the human lungs which make them efficient gaseous exchange surfaces. **(8 marks)**

(b) (i) Show how TWO features of phloem enable it to function efficiently. **(2 marks)**

(ii) Suggest how the functioning of phloem might change during fruit formation and development. **(2 marks)**

(c) (i) Fruits are sometimes preserved by coating them with wax. Suggest why this practice might be necessary. **(2 marks)**

(ii) Describe the ways in which any THREE plant processes can affect fruit formation and development. **(6 marks)**

Total 20 marks

4. (a) (i) Describe TWO ways in which human activity can negatively impact on the environment. **(4 marks)**

(ii) A growing concern of many Caribbean governments is the growth of squatter communities since, among other issues, they can pollute water courses. Identify TWO reasons why the governments may be concerned. **(4 marks)**

(b) (i) Some communities dispose of their garbage by burning. Suggest TWO reasons why this practice might be harmful. **(4 marks)**

(ii) Give TWO alternative methods of garbage disposal the residents can use. **(2 marks)**

(c) (i) Name TWO pathogenic diseases. **(2 marks)**

(ii) Although AIDS is caused by a pathogen, its occurrence is rarely higher in a poor, crowded community than in a middle class neighbourhood. Explain why this may be so. **(4 marks)**

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION C

Answer ONE question from this section.

5. (a) (i) For a named habitat, construct a food chain with at least FOUR trophic levels. **(4 marks)**

(ii) Explain the importance of decreasing numbers of organisms at each successive trophic level. **(4 marks)**

(b) Provide explanations for the following occurrences in food chains and webs:

(i) Many of the largest animals in the world are herbivores. **(2 marks)**

(ii) Carnivores often have multiple sources of food. **(2 marks)**

(c) A habitat is described as being in 'equilibrium' when all species that inhabit it have a fair chance of continuing survival. Using at least FOUR examples, show that different types of organisms performing different functions is important for a habitat to be in equilibrium. **(8 marks)**

Total 20 marks

6. (a) Draw a diagram of the nitrogen cycle to show how the roles of FOUR types of bacteria contribute to the recycling of nitrogenous material. **(8 marks)**

(b) Explain how

(i) the human body deals with excess nitrogenous compounds found in blood **(4 marks)**

(ii) waste nitrogenous compounds given off by the human body are processed as part of the nitrogen cycle. **(2 marks)**

(c) Burning large tracts of forest is believed to affect natural cycles.

Suggest THREE ways in which this practice may affect the nitrogen cycle. **(6 marks)**

Total 20 marks

END OF TEST

TEST CODE **01207042**

FORM TP 2006004

JANUARY 2006

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 04/2 – Alternative to SBA

General Proficiency

2 hours

In addition to the 2 hours, candidates are allowed 10 minutes in order to read through the entire paper. Writing may begin during the 10-minute period.

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **Answer ALL questions.**
2. **Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

You should NOT spend more than 30 minutes on Question 1.

1. You have been provided with a flower of the hibiscus plant.

(i) Measure the length of the entire flower and record the length.

Flower length: _____ **(1 mark)**

(ii) Make a drawing of the hibiscus flower in the space provided below. (Do NOT label the drawing).

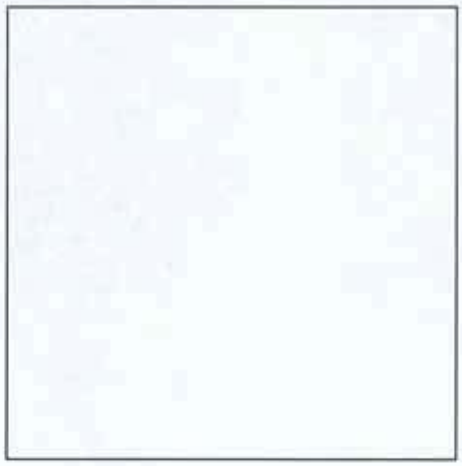
Title: _____

Magnification: _____

(7 marks)

(iii) Carefully remove all the petals, sepals and bracts to expose the essential parts of the flower. Use the dissecting needle to split the stamen tube to expose the ovary. Remove and cut across the ovary to show the arrangement of the ovules.

In the box below, make a drawing of a cross-section of the ovary as seen in the dissection. (You may use the hand lens. Labels, magnification and title are NOT required).



(3 marks)

(iv) Describe the fruit that would be produced from the ovary you dissected.

.....

.....

(2 marks)

(v) Describe a test to show that **leaves of the hibiscus** are organs of photosynthesis. Explain ONE precaution to be taken in conducting the test.

Test:

.....

.....

.....

.....

.....

(5 marks)

Precaution:

.....

.....

(2 marks)

Total 20 marks

2. The apparatus in **Figure 1** below is set up to investigate the role of an enzyme.

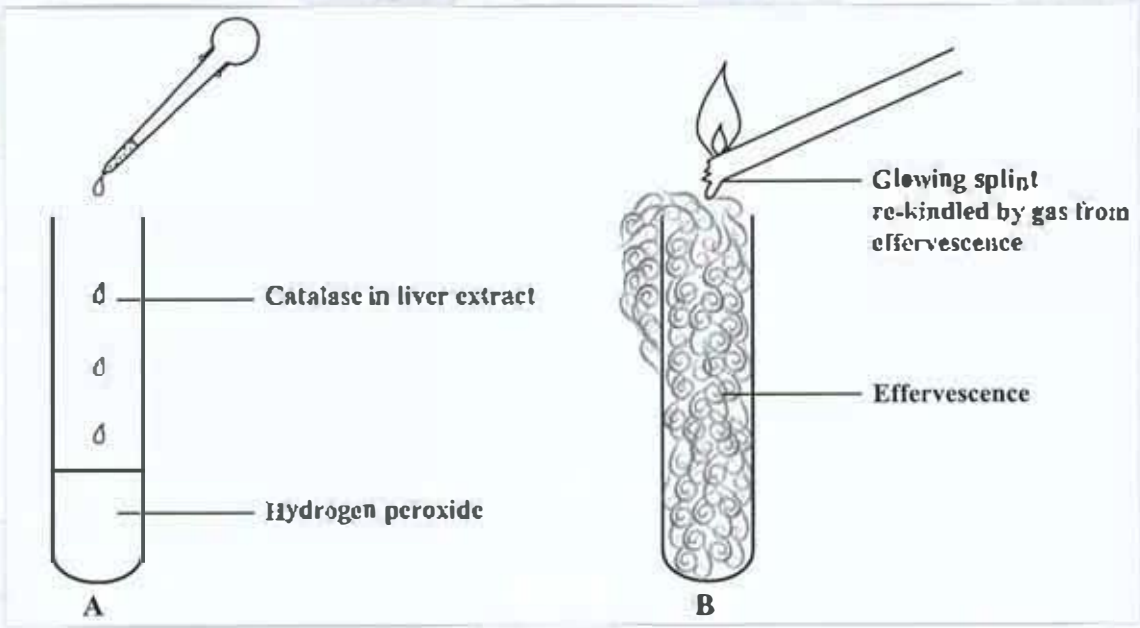


Figure 1. Apparatus to investigate the role of an enzyme

(a) (i) Suggest the specific aim for the investigation in **Figure 1** above.

.....

.....

(2 marks)

(ii) Catalase reacts with hydrogen peroxide to produce a gas which causes the effervescence shown in **Figure 1 B**.

(a) Identify the gas given off in **Figure 1 B**.

.....

(1 mark)

(b) Give ONE reason for the importance of the reaction illustrated in the investigation in **Figure 1**.

.....

(2 marks)

(iii) Catalase, the enzyme used in the investigation, was present in the extract obtained from the liver tissue of a mammal.

Suggest how the liver extract might have been prepared for use in the investigation.

.....

.....

.....

(2 marks)

(iv) Indicate ONE precaution that should be taken in obtaining pure, active liver extract.

.....

.....

(2 marks)

(b) Salivary amylase is a digestive enzyme that is found in the mouth. Pepsin is a digestive enzyme found in the stomach.

(i) What are the different conditions in the mouth and stomach, required for maximum activity of amylase and pepsin respectively?

Condition in mouth: .....

Condition in stomach: .....

(2 marks)

(ii) Identify ONE OTHER factor in the mouth and in the stomach that allows salivary amylase and pepsin to function optimally.

.....

(1 mark)

(iii) Design an experiment to show that different conditions are required by pepsin and amylase for optimal reaction rate. Indicate all materials and apparatus required and fully describe your method.

Apparatus and materials:.....

.....

.....

(2 marks)

Method:.....

.....

.....

.....

.....

(4 marks)

(c) In another investigation conducted to demonstrate that a gas is a product of respiration in small organisms, the following pieces of apparatus were used.

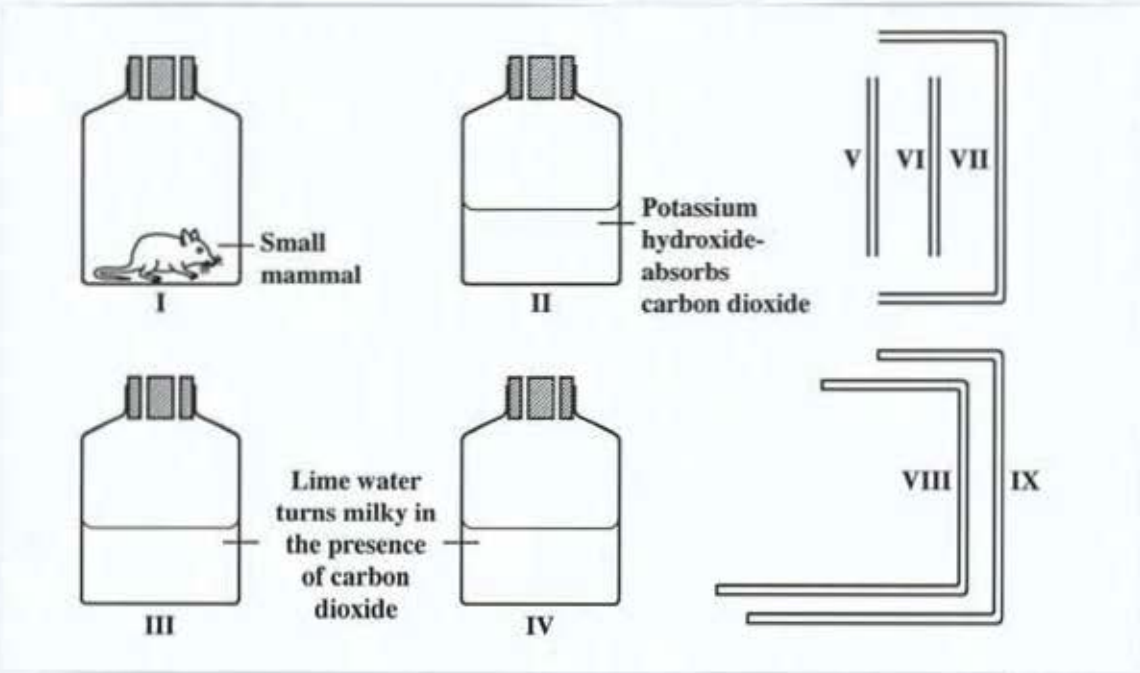


Figure 2. Apparatus and materials used to investigate respiration in a small mammal

(i) In the space provided below, draw a diagram to illustrate how the nine pieces of apparatus shown in Figure 2 were assembled for the investigation.

(4 marks)

(ii) Suggest an additional piece of apparatus required for the investigation.

.....

(1 mark)

(iii) Explain the purpose of including potassium hydroxide in the investigation.

.....

.....

(2 marks)

(iv) Write an aim for this investigation.

.....

.....

(2 marks)

Total 27 marks

3. Table 1 shows the heights (measured to the nearest cm) of 30 students in a form four (grade 10) class in a secondary school. (Columns 3 and 4 are a continuation of columns 1 and 2 respectively).

TABLE 1: HEIGHTS OF 30 STUDENTS IN FORM 4

Student	Height (cm)	Student	Height (cm)
1	129	16	138
2	136	17	142
3	134	18	131
4	132	19	135
5	141	20	122
6	127	21	126
7	136	22	137
8	133	23	134
9	140	24	131
10	133	25	143
11	125	26	128
12	135	27	130
13	137	28	135
14	139	29	144
15	145	30	148

(a) Complete Table 2 below to show the frequency distribution of height in the class. Write a suitable title for the table.

TABLE 2

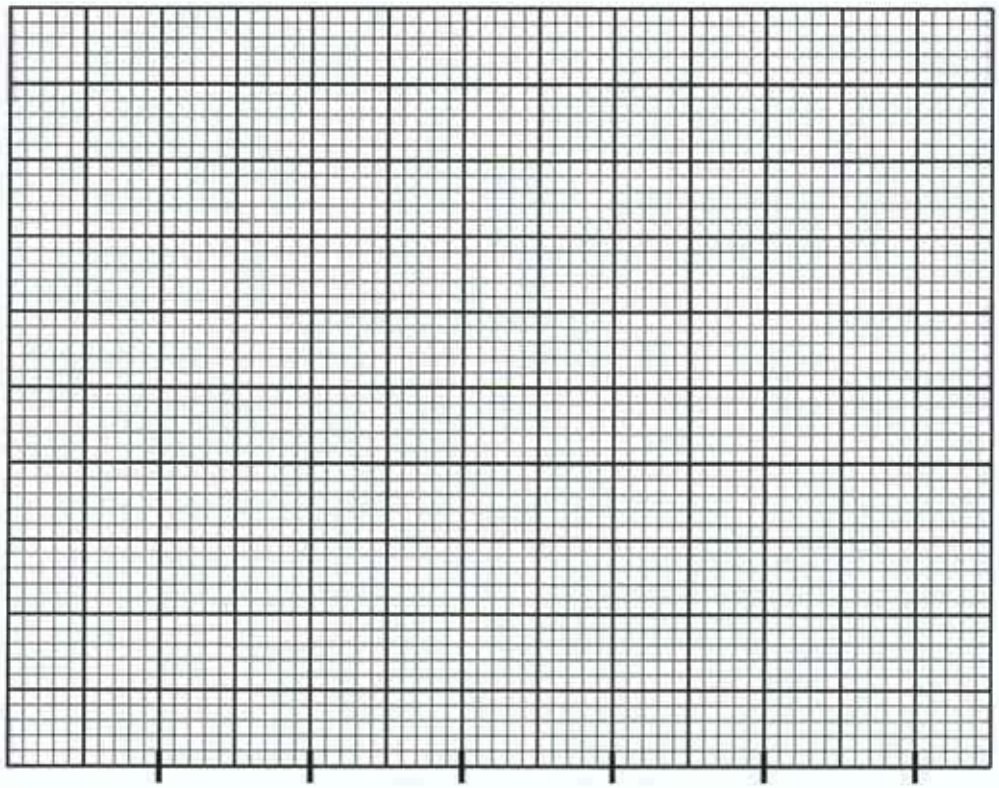
Title of table: _____

(1 mark)

Group ranges for height (cm)	Frequency (Number of heights in each group range)
120 – 124	1
125 – 129	
130 – 134	
135 – 139	
140 – 144	
145 – 149	

(1 mark)

(b) On the graph below, construct a histogram of the data you collated in Table 2.



(6 marks)

(c) Describe the nature and shape of the distribution of heights among the 30 students.

.....

.....

(2 marks)

(d) State THREE advantages of using the table and the histogram to show the distribution of height in the class.

.....

.....

.....

.....

(3 marks)

Total 13 marks

END OF TEST

TEST CODE **01207020**

FORM TP 2006048

MAY/JUNE 2006

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

1$\frac{1}{2}$ hours

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **There are FIVE questions in this booklet. Answer ALL questions.**
2. **You MUST use this answer booklet when responding to the questions. For each question, write your answer in the space provided and return the answer booklet at the end of the examination.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

Answer ALL questions.

Do NOT spend more than 30 minutes on Question 1.

1. Figure 1 below shows an aquatic and a terrestrial food web.

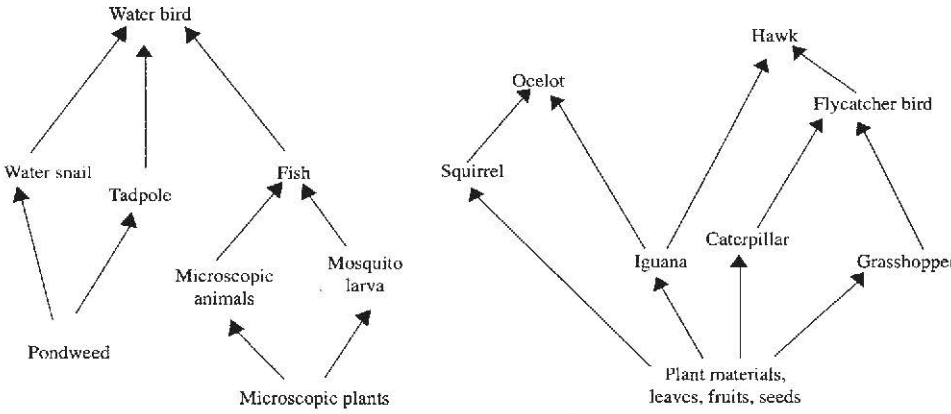


Figure 1: Diagrams of two food webs

(a) Table 1 below contains examples of organisms at different trophic levels.

Complete Table 1 using ONLY the organisms shown in the food webs in Figure 1.

TABLE 1: ORGANISMS AT DIFFERENT TROPHIC LEVELS IN FIGURE 1

Trophic levels	Aquatic food web	Terrestrial food web
	Pond weed	Plant materials, leaves, fruits, seeds
Primary consumer		
	Fish	Flycatcher
Tertiary Consumer		

(6 marks)

(b) Identify TWO similarities between the aquatic and terrestrial food webs.

_____

_____

(2 marks)

GO ON TO THE NEXT PAGE

(c) Describe how data may be collected to construct the **terrestrial** food web in Figure 1. Make a list of the materials and apparatus required and state ONE precaution to be taken in collecting the data.

Materials and apparatus: _____

_____

_____

(2 marks)

Method: _____

_____

_____

_____

(4 marks)

Precaution: _____

_____

(1 mark)

(d) In the space provided below, construct a table to present the data to be collected for constructing the terrestrial food web.

(4 marks)

(e) Suggest TWO ways in which the data to be collected may be summarized or represented, apart from food webs.

(2 marks)

(f) (i) How would the method differ from that described in (c), if you wished to gather data to construct the **aquatic** food web?

(2 marks)

(ii) Explain why the method would be different for collecting data for the aquatic food web.

(2 marks)

(g) Decomposers are important to food webs because they recycle nutrients.

(i) Name TWO types of decomposers that are usually found in food webs.

(2 marks)

(ii) Describe the role decomposers play in the recycling process.

(3 marks)

Total 30 marks

2. Closely examine Figure 2 which represents the major parts of the alimentary canal and associated organs.

(a) (i) Complete the labelling of the boxes in Figure 2. **(3 marks)**

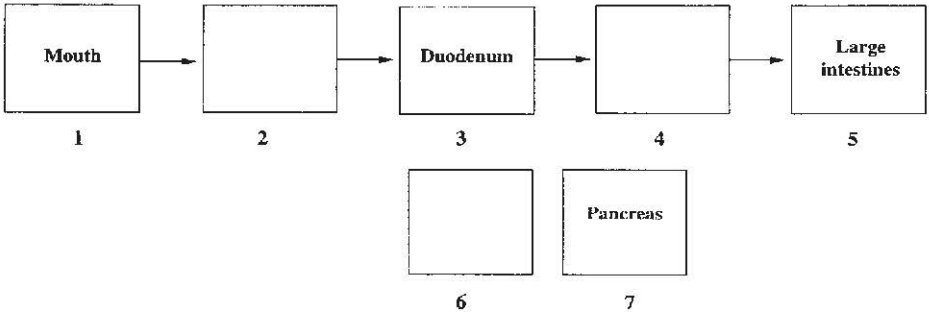


Figure 2. Major parts of the alimentary canal and associated organs

(ii) Place the symbols (P, R, S and T) in the boxes in Figure 2 where the respective activities described below take place:

P: Completion of digestive processes
R: Production of an acidic pH
S: Absorption of large quantities of water
T: Emulsification of fats **(4 marks)**

(iii) Draw ONE arrow on the diagram in Figure 2 to show where digested food is taken. **(1 mark)**

(b) Identify THREE products into which food is converted during the digestive process and give a function of EACH of the products identified.

Digestive product 1: _____

Function: _____

_____

Digestive product 2: _____

Function: _____

_____

Digestive product 3: _____

Function: _____

_____

(6 marks)

Total 14 marks

GO ON TO THE NEXT PAGE

3. Figure 3 is a diagram of a longitudinal section through phloem cells of the vascular bundle of a dicotyledonous plant.

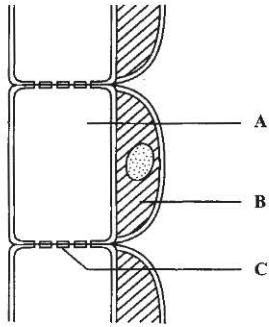


Figure 3. Longitudinal section through phloem cells

(a) (i) Identify the structures labelled A, B and C in Figure 3.

A: _____

B: _____

C: _____

(3 marks)

(ii) State the function of the structure labelled C in Figure 3.

_____

(1 mark)

(iii) State TWO structural differences between xylem and phloem.

_____

_____

_____

(2 marks)

(b) (i) Sometimes roots develop as storage organs. Suggest TWO reasons why a plant may need to store food.

_____

_____

_____

(2 marks)

GO ON TO THE NEXT PAGE

(ii) Figure 4 represents the cross-section of a dicotyledonous root.

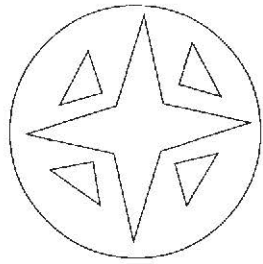


Figure 4. Cross-section of a dicotyledonous root

a) Place an **X** on Figure 4, in the area where food material is likely to be stored. **(1 mark)**

b) Label any THREE structures in Figure 4. **(3 marks)**

(c) Plants manufacture the food they store by the process of photosynthesis.

(i) State TWO environmental factors that are necessary for photosynthesis to occur.

_____

_____

_____

(2 marks)

(ii) How does food manufactured in photosynthesis reach storage areas in the root?

_____

_____

(2 marks)

Total 16 marks

4. Figure 5 shows diagrams of the male and female reproductive organs of humans.

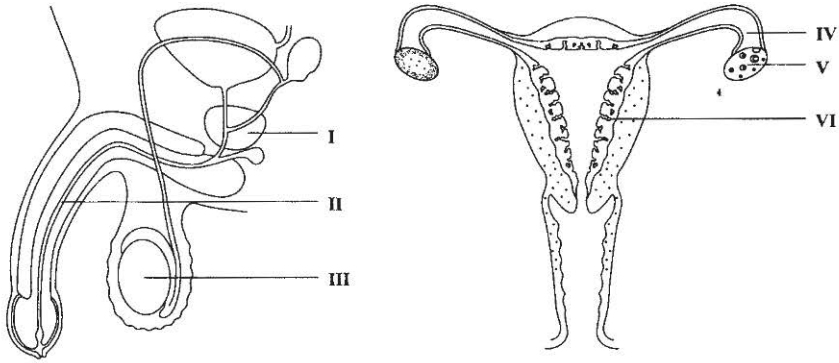


Figure 5. Male and female reproductive organs

(a) (i) Complete Table 2 below by writing the name and function of EACH of the structures labelled I, II, IV and VI.

TABLE 2: NAME AND FUNCTION OF STRUCTURE

	Name of Structure	Function
I		
II		
IV		
VI		

(8 marks)

(ii) Explain why III and V, shown in Figure 5, may be described as having similar functions.

_____

_____

(2 marks)

GO ON TO THE NEXT PAGE

(b) (i) Name the product of fertilization.

_____

(1 mark)

(ii) What becomes of the product of fertilization in

a) humans

_____

_____

b) flowering plants?

_____

_____

(2 marks)

(c) Identify TWO ways in which the male and female reproductive organs illustrated in Figure 5 **function** differently from each other.

_____

_____

_____

(2 marks)

Total 15 marks

5. Figure 6 below represents the offspring produced when two pure-breeding dogs are crossed and their offspring are interbred (offspring from the same litter are bred).

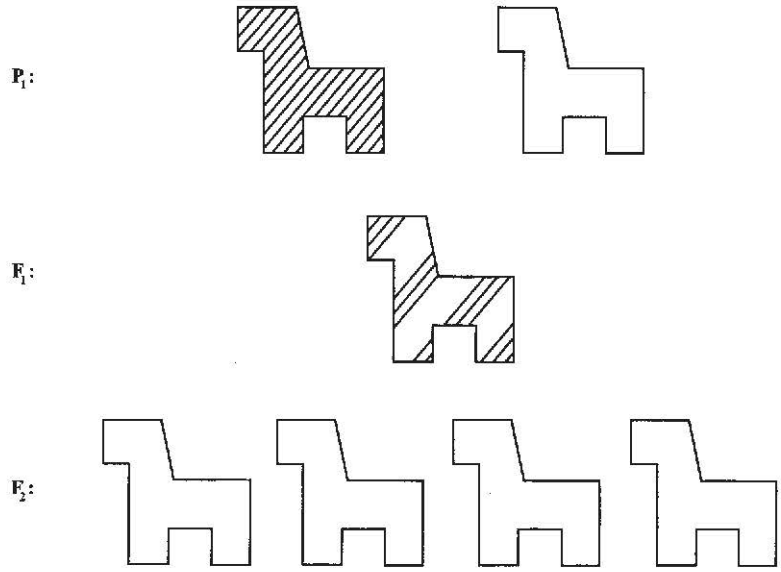


Figure 6. Offspring from two pure-breeding parents

*Note: the diagrams showing coat colour in the F_2 generation are **not** complete.*

(a) (i) Parents (P_1) represent pure-breeding dogs for coat colour. In the space provided below, use appropriate symbols to represent the coat colour for both parents and the F_1 generation.

(3 marks)

(ii) Using appropriate stripes, complete the diagrams of the F_2 generation in Figure 6, to show the coat colours of the offspring when the F_1 generation interbreed.

(4 marks)

(b) Coat colour is an example of phenotype.

(i) Explain the meaning of the term 'phenotype'.

(2 marks)

(ii) How is the phenotype of an organism determined?

(2 marks)

(c) (i) Why is genetic variation important?

(2 marks)

(ii) 'Monocropping' – planting of the same type of plants over an extensive area – is sometimes considered risky because of the lack of genetic variation.

Explain why this practice may be considered risky.

(2 marks)

Total 15 marks

END OF TEST

TEST CODE **01207030**

FORM TP 2006049

MAY/JUNE 2006

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 03 – General Proficiency

1 hour

08 JUNE 2006 (a.m.)

READ THE FOLLOWING DIRECTIONS CAREFULLY

In addition to the 1 hour, candidates are allowed a reading time of 10 minutes. Writing may begin during the 10-minute period.

This paper is divided into THREE sections. Answer ONE question from EACH section. Where appropriate, answers should be illustrated by diagrams.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

SECTION A

Answer ONE question from this section.

1. (a) With the aid of a diagram, show how the nephron (uriniferous tubule) is suited to its functions. **(8 marks)**

(b) An individual with malfunctioning kidneys is often required to undergo dialysis. In this process the blood is made to flow alongside a dialysis solution, which sets up a gradient with the blood to filter its impurities.

(i) What substances should be present in the dialysis solution? **(2 marks)**

(ii) In what ways would the dialysis process be **different** from the process that takes place in a properly functioning uriniferous tubule? **(6 marks)**

(c) (i) Give TWO ways in which plants eliminate waste products from their systems. **(2 marks)**

(ii) Suggest why the mechanisms plants use to eliminate waste products are not as complex as those of animals. **(2 marks)**

Total 20 marks

2. (a) With the aid of a labelled diagram, explain how the human eye is well suited to its functions. **(8 marks)**

(b) Eyeglasses (spectacles) are used to replace or supplement the functioning of the lens.

(i) Explain how eyeglasses are able to correct for images falling behind and images falling in front of the retina. **(4 marks)**

(ii) How do the lenses of eyeglasses function differently from properly functioning lenses of the eyes? **(4 marks)**

(c) Contact lenses function similarly to eyeglasses but are worn directly on the surface of the eye.

Suggest ONE advantage and ONE disadvantage of using contact lenses. **(4 marks)**

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION B

Answer ONE question from this section.

3. (a) Living organisms experience a life cycle even though each organism lives for a consecutive number of years.

(i) Using a named example, explain why the stages in the life of an organism are described as a cycle. **(4 marks)**

(ii) Draw a labelled representation of the stages in the life of the organism you named at (a) (i). **(4 marks)**

(b) (i) With the aid of diagrams, describe the process of mitosis. **(8 marks)**

(ii) Explain the importance of mitosis in the life of a named organism. **(4 marks)**

Total 20 marks

4. (a) (i) Explain why it is important for an animal to have organs of sensitivity. **(2 marks)**

(ii) Describe how the skin is equipped to carry out its **sensory** function. **(2 marks)**

(iii) Draw a simple representation of the path impulses would follow if the sense organ referred to in (a) (ii) were part of a reflex arc. **(4 marks)**

(b) Plants do not usually possess elaborate sense organs, yet there is often the need for them to perform special functions. Two such special functions are pollination and fertilization.

(i) Explain why plants depend on external factors or conditions to help in the pollination process. **(2 marks)**

(ii) Suggest FOUR ways in which a plant may be adapted for a named method of pollination. (Indicate the method of pollination for suggested adaptation). **(4 marks)**

(iii) With the aid of a diagram, describe how pollination leads to fertilization. **(6 marks)**

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION C

Answer ONE question from this section.

5. (a) (i) For a named insect vector, state the habitat of EACH stage in its life cycle. **(4 marks)**

(ii) Name TWO diseases spread by the activity of a vector **and** for any ONE disease explain the role of the vector. **(4 marks)**

(b) A particular Caribbean village is plagued by an insect vector. Some villagers suggest spraying to control the insects while others do not agree with that method.

(i) Why do some of the villagers choose NOT to support the use of sprays to control the insects? **(4 marks)**

(ii) Identify TWO methods OTHER THAN spraying that could be used to eradicate the insect vector you named at (a) (i) above **and** explain why these methods would be preferred by some villagers. **(8 marks)**

Total 20 marks

6. (a) Using examples, distinguish between physical and biotic factors in the environment. **(4 marks)**

(b) In one Caribbean territory a family imports and privately keeps a few deer. The deer escape into nearby forests during a hurricane and their population quickly increases to a few hundreds. Deer are herbivores and are not part of the natural fauna (animal life) of that territory.

(i) Identify TWO biotic factors that could have helped the deer population to increase, and explain how EACH would have contributed to the increase. **(4 marks)**

(ii) How would the increase in the deer population affect the environment? **(4 marks)**

(c) Besides introducing new species, human activities also affect the natural environment in other ways. For example, many Caribbean coral reefs have been damaged by human activities.

(i) Describe TWO ways in which human activity destroys coral reefs. **(2 marks)**

(ii) Suggest the implications of the coral reef destruction described in (c) (i). **(6 marks)**

Total 20 marks

END OF TEST

TEST CODE **01207020**

FORM TP 2007002

JANUARY 2007

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

$1\frac{1}{2}$ hours

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **There are FIVE questions in this booklet. Answer ALL questions.**
2. **You MUST use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

Answer ALL questions.

DO NOT spend more than 30 minutes on Question 1.

1. The table below shows the changes in height of a corn plant over a 36-day period.

TABLE 1: CHANGES IN HEIGHT OF A PLANT OVER A 36-DAY PERIOD

Time/days	0	6	12	18	24	30	36
Height/cm	0	10	90	215	245	250	250

(a) (i) On the grid provided in Figure 1, draw a graph of the results shown in Table 1.

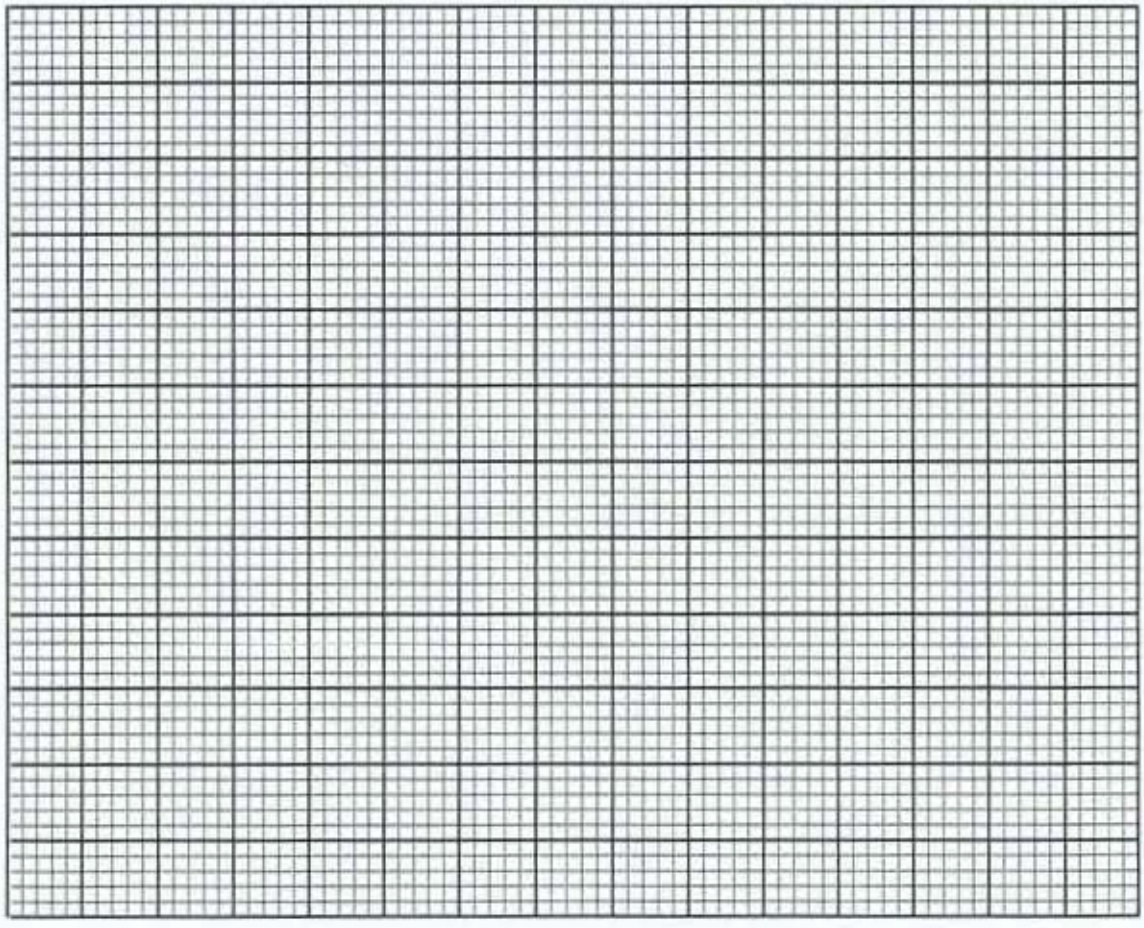


Figure 1. Grid for graph of results shown in Table 1

(7 marks)

(ii) Using information from the graph you constructed on page 2, estimate the height of the corn plant on Days 5 and 13.

Day 5: _____

Day 13: _____

(2 marks)

(b) Describe the pattern of growth shown by the plant over the 36-day period.

_____

_____

(3 marks)

(c) (i) What is the likely source of food for the corn plant during the first 6 days?

_____

(1 mark)

(ii) Give TWO uses of the food obtained by the corn plant during the first 6 days.

_____

_____

(2 marks)

(d) Another method of determining growth of the plant is using the dry mass (weight).

(i) Describe the method for obtaining dry mass, including the materials and apparatus necessary.

Materials and apparatus:

_____

_____

(2 marks)

Method:

_____

_____

_____

_____

(2 marks)

(ii) State ONE step to be taken to ensure the accuracy of the results when using this method.

_____

_____

(1 mark)

(iii) Give ONE disadvantage of using dry mass to determine growth.

_____

_____

(1 mark)

(e) (i) Suggest TWO ways in which the growth of the corn plant would be different over the 36 days, if the soil in which it grew were deficient in nitrogen and magnesium.

_____

_____

_____

(2 marks)

(ii) Explain how a lack of EACH of the following elements may result in the differences suggested in (e)(i) above.

Nitrogen: _____

_____

Magnesium: _____

_____

(2 marks)

GO ON TO THE NEXT PAGE

(f) (i) The corn seed germinated after a heavy shower of rain, although it had been in the soil for a long period of time. What changes occurred in the seed for germination to take place?

_____

_____

_____

(3 marks)

(ii) Apart from water, state TWO conditions necessary for germination.

_____

_____

(2 marks)

Total 30 marks

2. Figure 2 shows the incidence of osteoporosis, a bone disease in humans.

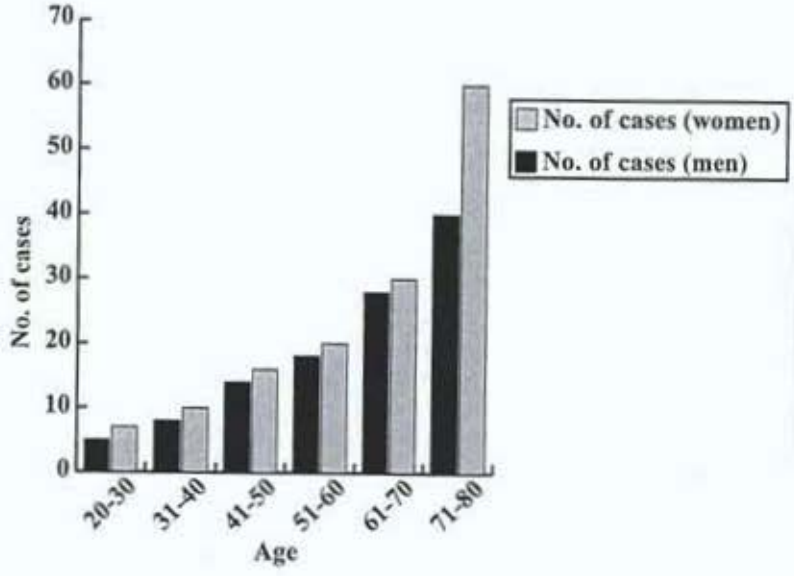


Figure 2. Incidence of osteoporosis in males and females.

(a) Using the information in Figure 2, draw TWO conclusions about the incidence of the disease.

_____

_____

(2 marks)

(b) Osteoporosis refers to a decrease in bone density, the bones become brittle, weakened and easily fractured.

(i) Give TWO reasons that may account for the development of osteoporosis with age.

_____

_____

(2 marks)

(ii) It has been suggested that osteoporosis is associated with oestrogen levels in women.

State TWO functions of oestrogen.

_____

_____

(2 marks)

(c) (i) If children were to be affected by osteoporosis, suggest TWO likely effects of the disease on their bodies.

_____

_____

(2 marks)

(ii) Suggest a mineral supplement that is likely to be recommended for people suffering from osteoporosis.

_____

(1 mark)

(d) (i) Healthy bone is living tissue. Give TWO advantages of bone being a living tissue.

_____

_____

(2 marks)

(ii) Apart from support, identify TWO functions of bone.

_____

_____

(2 marks)

Total 13 marks

GO ON TO THE NEXT PAGE

3. Figure 3 shows the menstrual cycle in a human female.

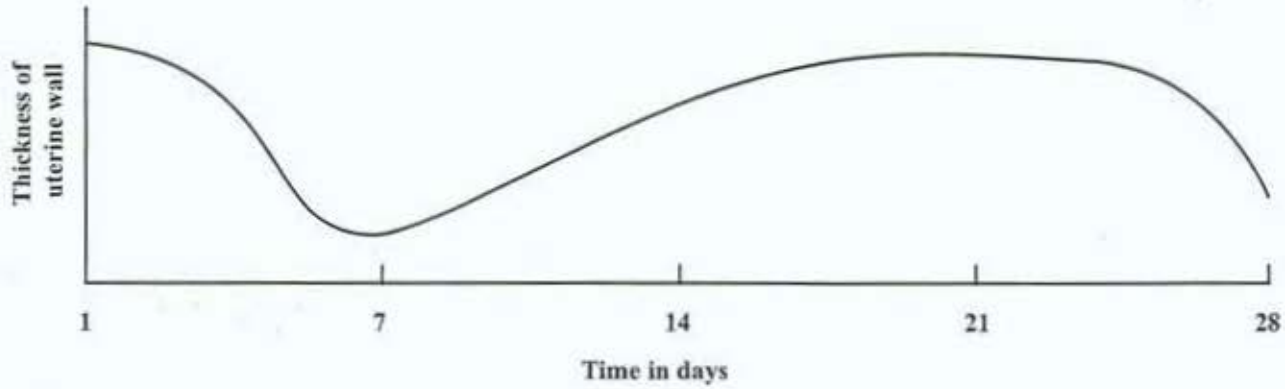


Figure 3. Menstrual cycle of the human female

(a) (i) Using the numbers I - IV, label Figure 3 to indicate where in the menstrual cycle EACH of the following events occur:

a) Uterus wall builds up as oestrogen level rises (I)

b) Many blood vessels develop (II)

c) Shedding of the uterine wall (III)

d) Uterine wall prepared for implantation (IV) **(4 marks)**

(ii) Identify TWO hormones involved in the menstrual cycle and give the function of any ONE.

_____

_____

_____

(3 marks)

(b) State THREE functions of the placenta during development of the foetus.

_____

_____

_____

(3 marks)

(c) (i) State THREE birth control methods practised by human beings.

_____

_____

_____

(3 marks)

(ii) Suggest why birth control seems more important in humans than in other populations of mammals.

_____

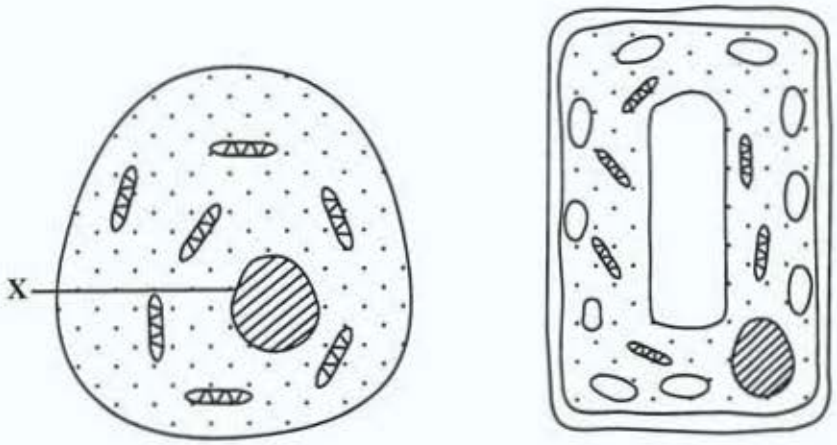
_____

_____

(2 marks)

Total 15 marks

4. Figure 4 below represents one cell from a plant and one from an animal.



Cell 1 **Cell 2**

Figure 4. Plant and animal cells as seen under a microscope

(a) (i) Using only the letters P, Q and R label the structures on <u>both</u> cells that perform EACH of the following:

a) Produce ATP (P)
b) Synthesise protein (Q)
c) Allow substances to enter and leave the cell (R) **(3 marks)**

(ii) Using the letters S and T, label the structure on Cell 2 ONLY that performs EACH of the following functions:

a) Converts light into chemical energy (S)
b) Allows a wide range of substances to pass through (T) **(2 marks)**

(b) (i) Name structure X shown in Cell 1.

_____

(1 mark)

(ii) Structure X is absent from mature red blood cells and sieve tubes.
Suggest one process which these cells will not be able to perform. Give a reason for your answer.

Process:

_____

Reason:

_____

(2 marks)

(c) (i) What is likely to occur in Cells 1 and 2 of Figure 4 if they were placed in distilled water for over half-an-hour?

Cell 1:

_____

_____

Cell 2:

_____

_____

(4 marks)

(ii) Explain why the changes in Cell 1 might be different from the changes in Cell 2 after half-an-hour in distilled water.

_____

_____

(2 marks)

(d) Although blood cells are in a watery medium (plasma) they do not absorb excessive amounts of water. Explain why this is so.

_____

_____

(2 marks)

(e) Persons living at very high altitudes where the air is rare (low oxygen concentration) have a larger number of red blood cells per unit volume of blood than those living at sea level.

Suggest why a person living at high altitudes requires a relatively large number of red blood cells.

_____

_____

(2 marks)

Total 18 marks

5. Figure 5 is a labelled diagram of part of the breathing apparatus of fish.

Figure 5. Fish gill

(a) (i) Water passes over the gill rakers before passing over the filaments. Suggest the function of the gill rakers.

_____

(1 mark)

(ii) Identify ONE feature observed in Figure 5 that allows the filaments to function efficiently.

_____

(1 mark)

(iii) State ONE OTHER characteristic of the filaments that helps in their function.

_____

_____

(1 mark)

(b) (i) Identify TWO structures in the breathing apparatus of humans that have similar functions to the parts of the gills illustrated in Figure 5

Gill structure	Structure in the human breathing apparatus

(4 marks)

(c) State THREE ways in which the lungs of a smoker may be affected by the smoking habit.

_____

_____

_____

(3 marks)

(d) (i) Smoking is one human activity that pollutes the environment. Identify TWO OTHER human activities that result in pollution.

_____

_____

(2 marks)

(ii) Identify TWO effects of polluted waterways on aquatic life.

_____

_____

(2 marks)

Total 14 marks

END OF TEST

TEST CODE **01207030**

FORM TP 2007003

JANUARY 2007

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 03 – General Proficiency

1 hour

15 JANUARY 2007 (p.m.)

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **In addition to the 1 hour, candidates are allowed a reading time of 10 minutes. Writing may begin during the 10-minute period.**
2. **This paper is divided into THREE sections. Answer THREE questions, ONE from Section A, ONE from Section B and ONE from Section C.**
3. **Where appropriate, answers should be illustrated by diagrams.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

SECTION A

Answer ONE question from this section.

1. (a) (i) Briefly explain how different pH levels are produced along the length of the alimentary canal in humans.

(ii) Give TWO reasons why the elongated tubular shape of the alimentary canal is suited to its digestive function. **(8 marks)**

(b) Following a healthy lifestyle with a balanced diet is considered important in weight control in humans.

(i) Identify FOUR constituents of a balanced diet.

(ii) What are the likely effects of age and lifestyle on the constituents of a balanced diet of an individual? **(8 marks)**

(c) In certain cases, an obese individual undergoes stomach stapling surgery in which the volume of the stomach is reduced.

(i) Explain why this is an option to control the diet.

(ii) Give TWO disadvantages of this process for the individual. **(4 marks)**

Total 20 marks

2. (a) (i) Briefly explain how nitrogen from the air is cycled through living systems.

(ii) Suggest TWO reasons why the cycling process in (a)(i) is important. **(8 marks)**

(b) Human activities sometimes disrupt natural cycles that are important to living organisms.

(i) Identify TWO human activities that disrupt natural cycles or processes.

(ii) For EACH activity identified at (b)(i), describe the precautions that may be taken to reduce disruption of the natural cycles. **(6 marks)**

(c) The spread of many diseases can be reduced by human activity such as hygienic (sanitary) and lifestyle practices.

(i) Identify TWO diseases that occur because of poor hygiene and inappropriate lifestyle practices.

(ii) Explain how proper hygiene and sound lifestyle practices can help reduce the occurrence of the diseases you identified at (c)(i). **(6 marks)**

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION B

Answer ONE question from this section.

3. (a) (i) What are the differences in structure between a mature red blood cell and a white blood cell?

(ii) Explain TWO likely effects of a relatively small number of red blood cells on the body. **(6 marks)**

(b) (i) Trevor cuts his finger and his mother wraps it with a piece of cloth to stop the flow of blood.

Suggest TWO advantages and TWO disadvantages of his mother's action.

(ii) Often our immediate response to symptoms of the common cold is to reach for an antibiotic. What may be the disadvantages of this response? **(8 marks)**

(c) (i) Identify TWO types of immunity and explain how they provide protection for the body.

(ii) Despite extensive medical research, viral diseases such as AIDS have been particularly difficult to cure.

What may be the benefits of encouraging pregnant women to be tested for the AIDS virus? **(6 marks)**

Total 20 marks

4. (a) Using examples, distinguish between receptors and effectors. **(4 marks)**

(b) While walking to school one day, Vinita sees a ferocious dog about to attack. She turns and runs.

(i) Explain how the eye and the central nervous system function to cause Vinita to see and respond to the dog.

(ii) The hormone adrenalin is produced immediately. Explain the changes that take place in Vinita's body as a result of the production of adrenalin. **(8 marks)**

(c) (i) Describe how the movement of muscles and bones in the leg occurs for Vinita to raise her knee and run.

(ii) After a while Vinita's legs become tired and she is forced to rest.

Explain why her leg muscles become tired and what happens to them when she rests. **(8 marks)**

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION C

Answer ONE question from this section.

5. (a) With the aid of a diagram, describe THREE ways in which the xylem is suited to its function. **(8 marks)**

(b) (i) One agricultural practice is that of watering plants.

Explain why too much water is dangerous to plants.

(ii) Another agricultural practice observed in the Caribbean is that of covering newly transplanted seedlings with coconut branches.

Suggest why a farmer may adopt this practice.

(iii) A few weeks after transplanting, it is the practice to remove some healthy seedlings while allowing others to grow.

Explain why this process becomes necessary. **(12 marks)**

Total 20 marks

6. (a) Using a diagram of a biomass pyramid, describe the relationships between the trophic levels in a named habitat. **(8 marks)**

(b) (i) Suggest TWO advantages and TWO disadvantages of rearing fish in an aquarium.

(ii) In some countries, aquaculture (breeding fish in freshwater ponds) is being promoted as a means of increasing fish production.

Explain why a fish species whose natural habitat is the sea should NOT be bred in freshwater ponds. **(8 marks)**

(c) Sometimes waterways become polluted by oil spills. Suggest how this may affect marine organisms. **(4 marks)**

Total 20 marks

END OF TEST

TEST CODE **01207042**

FORM TP 2007004

JANUARY 2007

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 04/2 – Alternative to SBA

General Proficiency

2 hours

In addition to the 2 hours, candidates are allowed 10 minutes in order to read through the entire paper. Writing may begin during the 10-minute period.

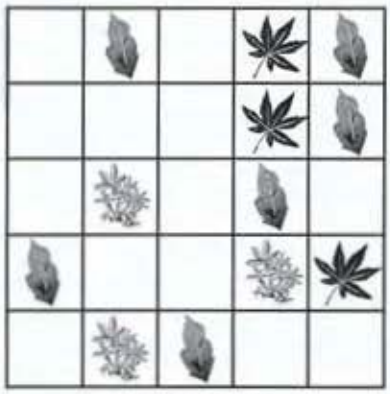
READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **Answer ALL questions.**
2. **Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.**

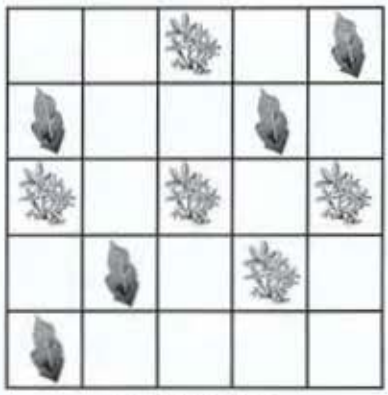
DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

You should NOT spend more than 30 minutes on Question 1.

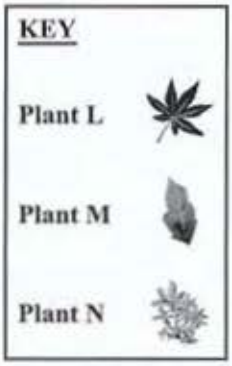
1. Figure 1 below represents 5 quadrats of the result of an ecological study conducted by students in an ecology club. Only $1m^2$ quadrats were used in the study.

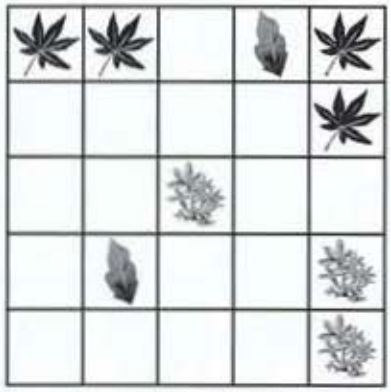


QUADRAT 1

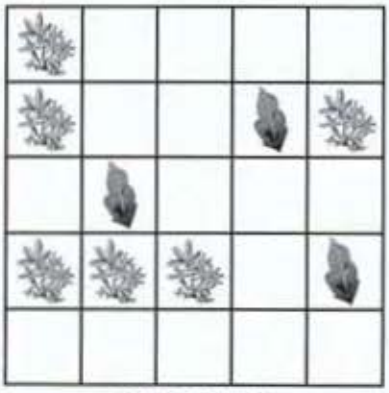


QUADRAT 2

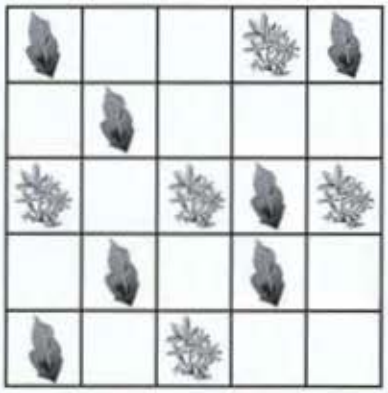




QUADRAT 3



QUADRAT 4



QUADRAT 5

Figure 1. Results of an ecological study

(a) Using information from the quadrats, make a table to show the results for the three plants.

(7 marks)

(b) Calculate the density for plant M. Show your working.

(2 marks)

(c) Describe in detail how the quadrat was used to obtain the data displayed in Figure 1.

(4 marks)

(d) Explain how the data collected using the quadrats could be used to determine the distribution of the three plants on the entire lawn.

(2 marks)

(e) Could the same method be used to study the distribution of animals? Explain your answer.

_____

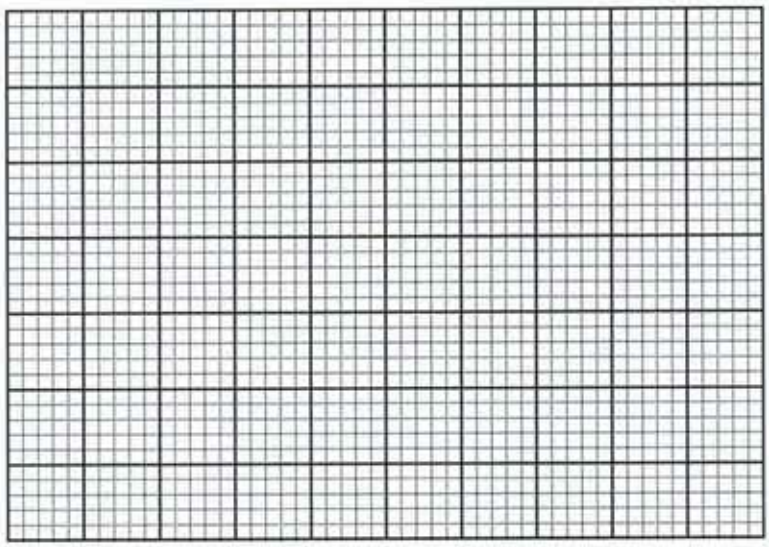
_____

_____

_____

(2 marks)

(f) In another field study the students counted 5 earthworms, 8 beetles, 35 ants, 3 lizards and 23 woodlice.
Represent these findings as a bar graph on the grid below.



(2 marks)

(g) Name TWO OTHER ways of representing the number of animals found.

_____

_____

(2 marks)

Total 21 marks

2. (a) (i) Carry out the following instructions and then answer the questions below.

- Use a piece of tissue to clean off the mirror carefully.
- Take a deep breath and breathe out slowly, through your mouth, on to the surface of the mirror.
- Record your observations.

Observations:

_____

_____

(1 mark)

(ii) Describe a test to identify the substance on the mirror.

_____

(2 marks)

(iii) Based on your observations, what conclusion can be made about the difference between inhaled and exhaled air?

_____

_____

(1 mark)

(iv) Does the investigation have a control? Give a reason for your answer.

_____

_____

(2 marks)

(b) Figure 2 below shows a student carrying out an investigation into another difference between inhaled and exhaled air.

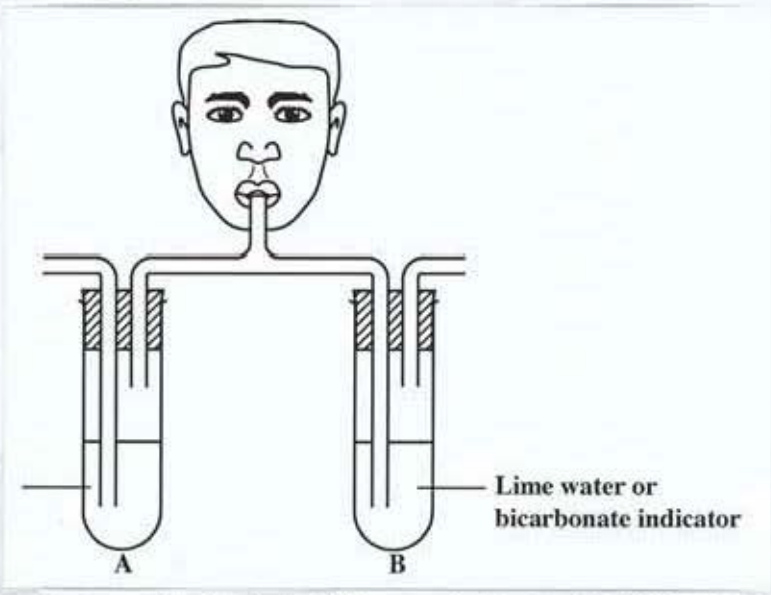


Figure 2. Investigation into difference between inhaled and exhaled air

(i) Label the contents of flask A. **(1 mark)**

(ii) Use arrows on Figure 2 to show the direction of the flow of air when the student inhales. **(2 marks)**

(iii) What is the aim of this experiment?

_____

_____

(2 marks)

(iv) State TWO precautions that the student should take in setting up this apparatus.

_____

_____

(2 marks)

(v) What changes would be seen in Flask B after the student exhales for the first

2 seconds? _____

(1 mark)

30 seconds? _____

(1 mark)

(vi) If you held your breath for a minute before breathing out into the apparatus, how might this affect the results? Give ONE reason for your answer.

_____

_____

_____

(2 marks)

(vii) Your teacher has asked you to describe to a student who was absent, how to use the apparatus and materials shown in Figure 2 to carry out the investigation. Write down the instructions you would give to her.

_____

_____

_____

(3 marks)

Total 20 marks

3. (i) Using the mirror with which you are provided, draw a diagram of your incisors (front teeth) in the space below.

(8 marks)

(ii) What are the features of the incisor you observed in the mirror?

_____

_____

_____

(3 marks)

(iii) State TWO differences you observed between your incisor and any other two types of teeth which you can see in your mouth.

_____

_____

_____

(4 marks)

(iv) Explain how the differences you observed about your teeth can help you to choose your diet.

_____

_____

_____

_____

(4 marks)

Total 19 marks

END OF TEST

TEST CODE **01207020**

FORM TP 2007048

MAY/JUNE 2007

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

1 1/2 hours

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **There are FIVE questions in this booklet. Answer ALL questions.**
2. **You MUST use this answer booklet when responding to the questions. For each question, write your answer in the space provided and return the answer booklet at the end of the examination.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

NOTHING HAS BEEN OMITTED

GO ON TO THE NEXT PAGE

Answer ALL questions.

You should NOT spend more than 30 minutes on Question 1.

1. Students in a Biology class wish to test the hypothesis that all leaves on a tree photosynthesize at the same rate. They select leaves from a tree similar to that illustrated in Figure 1.

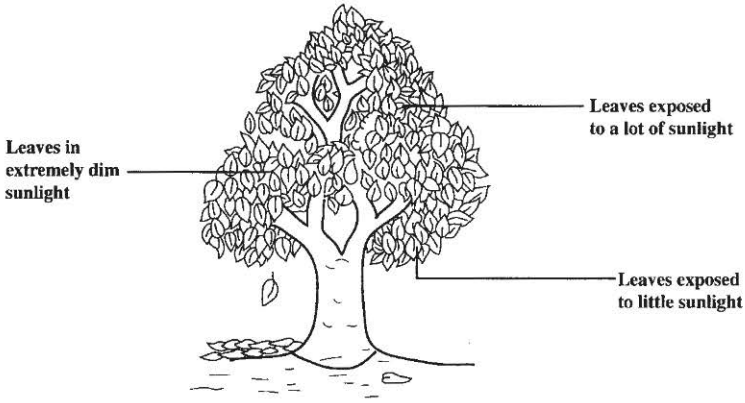


Figure 1. Diagram of a tree displaying its canopy

(a) (i) Describe how the students may investigate the hypothesis. Include in your description any apparatus/materials required.

Apparatus/materials:

_____

_____

Method:

_____

_____

_____

_____

_____

(6 marks)

GO ON TO THE NEXT PAGE

(ii) Write an aim for the investigation.

_____

_____

(2 marks)

(iii) Suggest ONE precaution the students should take in their investigation.

_____

(1 mark)

(b) Table 1 below shows the effect of carbon dioxide concentration on the rate of photosynthesis at two different light intensities.

TABLE 1: EFFECT OF CARBON DIOXIDE ON PHOTOSYNTHESIS

CO_2 concentration (%)	Rate of photosynthesis	
	Low light intensity	High light intensity
0.00	0	0
0.02	15	30
0.04	24	50
0.06	31	64
0.08	36	70
0.10	38	74
0.12	40	75
0.14	40	75
0.20	40	75

(i) On the graph paper on page 5, construct a line graph to show the effect of carbon dioxide concentration on the rate of photosynthesis. **(6 marks)**

(ii) Using Table 1 and the graph you constructed, determine the concentration at which carbon dioxide is a limiting factor at high and low light intensities respectively.

At low intensity:

_____

At high intensity:

_____

(2 marks)

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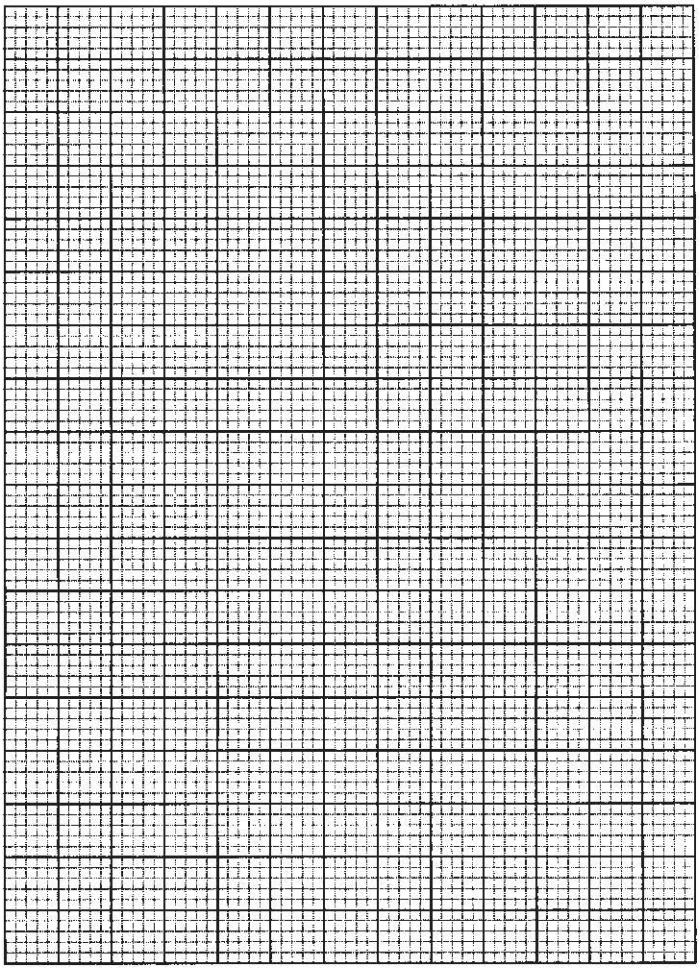


GO ON TO THE NEXT PAGE

(iii) Apart from carbon dioxide and sunlight, identify ONE OTHER environmental factor that is required for photosynthesis.

_____

(1 mark)

(c) (i) Using arrows only, illustrate on Figure 2 the pathway by which the products of photosynthesis arrive at storage cells or organs. **(2 marks)**

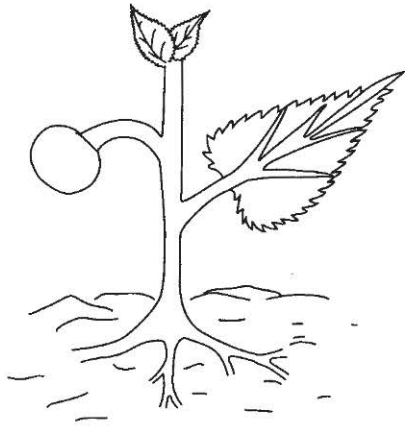


Figure 2. Stylised diagram of the components of a plant

(ii) What is the name of the transporting tissue?

_____

(1 mark)

(d) Table 2 below shows the composition of human breast milk, UHT cow's milk and infant formula.

TABLE 2: COMPOSITION OF THREE TYPES OF MILK

Constituent	Amount / 100g milk		
	Breast milk	**UHT cow's milk**	**Infant formula**
Energy (kcal)	77.0	65.0	100
Water (g)	85.2	87.4	0.0
Protein (g)	1.1	3.5	1.5
Fat (g)	4.0	3.5	4.3
Lactose (milk sugar) (g)	9.5	4.9	9.2
Vitamin C (mg)	5.0	1.0	5.0
Calcium (mg)	33.0	118.0	7.0

(i) Breast milk is described as best for babies. Using the information in Table 2, give TWO reasons why this description is appropriate.

_____

_____

_____

_____

(4 marks)

(ii) Apart from nutrients, suggest ONE OTHER value of breast milk.

_____

(1 mark)

(e) Minerals are required for good nutrition in plants. Name TWO minerals used by plants and state the function of EACH mineral named.

Mineral 1:

_____

Function:

_____

Mineral 2:

_____

Function:

_____

(4 marks)

Total 30 marks

GO ON TO THE NEXT PAGE

2. (a) Figure 3 is a diagram of the elbow joint.

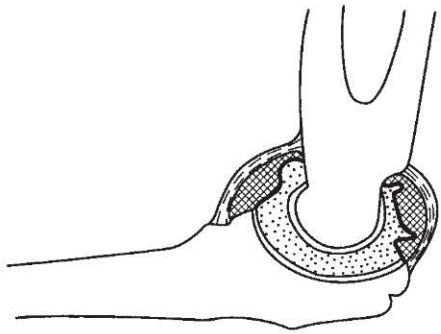


Figure 3. Diagram showing the elbow joint

(i) Name the type of joint illustrated in Figure 3.

_____

(1 mark)

(ii) Label the diagram to illustrate the MAIN features of a joint. **(4 marks)**

(iii) In the diagram at Figure 3, a pad of fat is shown. Suggest ONE function of this feature in the elbow joint.

_____

(1 mark)

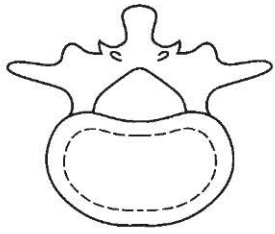
(iv) People who suffer from arthritis experience pain because certain parts of the joint are worn away. Identify TWO parts of the joint that are likely to be worn away.

_____

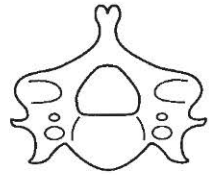
_____

(2 marks)

(b) Figure 4 illustrates two mammalian vertebrae.



Vertebra I



Vertebra II

Figure 4. Diagram of two mammalian vertebrae

(i) Name EACH vertebra shown in Figure 4.

Vertebra I:

_____

Vertebra II:

_____

(2 marks)

(ii) Name THREE features that have similar functions in the two vertebrae shown in Figure 4.

_____

_____

_____

(3 marks)

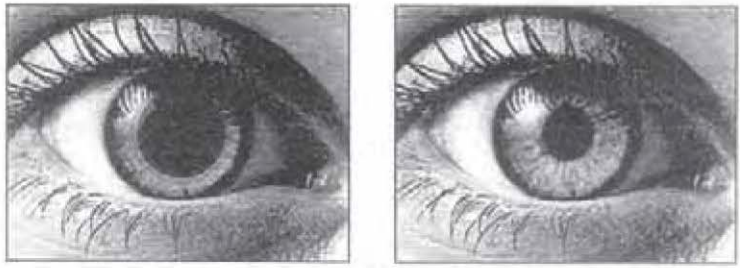
(iii) Identify ONE feature that distinguishes between the two vertebrae.

_____

(1 mark)

Total 14 marks

3. (a) The pupils of the human eye illustrated in Figure 5 show different responses to external stimuli.



Pupil I **Pupil II**

Figure 5. Pupils of the human eye responding to stimuli

(i) Identify the stimulus for EACH pupil in Figure 5.

Stimulus for Pupil I:

_____

Stimulus for Pupil II:

_____

(2 marks)

(ii) For Pupil II in Figure 5, describe how the response came about.

_____

_____

_____

(3 marks)

(iii) How are the responses illustrated by the pupils in Figure 5 important to humans?

_____

_____

(2 marks)

(b) The diagram of the eye at Figure 6 shows how the lens appears in a *short-sighted* person.

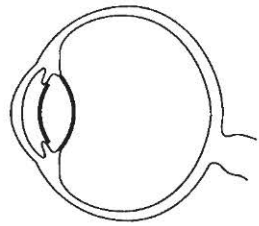
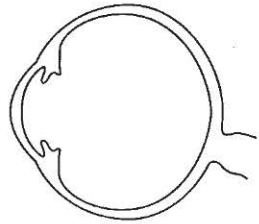


Figure 6. Diagram of the eye of a short-sighted person

(i) Using arrows, show on Figure 6 where an image that is viewed by this person would normally fall in relation to the retina. **(2 marks)**

(ii) Innovations in treating eye defects include lens replacement. On the diagram below, draw the lens that is likely to correct the defect shown in Figure 6, if lens replacement is done. **(2 marks)**



(c) Although plants have no specialized organs of sensitivity such as the eye, they also respond to external stimuli. Explain TWO ways in which the response in plants is different from the response to external stimuli by humans.

_____

_____

_____

_____

(4 marks)

Total 15 marks

4. (a) Figure 7 below shows the longitudinal section of a tomato fruit.

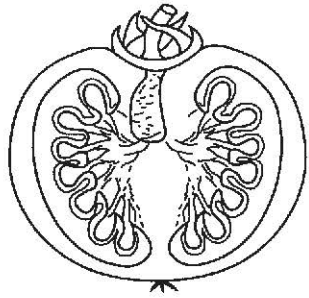


Figure 7. Longitudinal section of a tomato fruit

(i) Complete Figure 7 by labelling SIX parts of the fruit. **(6 marks)**

(ii) The seeds of the fruit shown in Figure 7 are dispersed by animals. Identify TWO ways in which these seeds are adapted for this process.

_____

_____

(2 marks)

(b) Figure 8 below shows the green and dry stages of a legume.

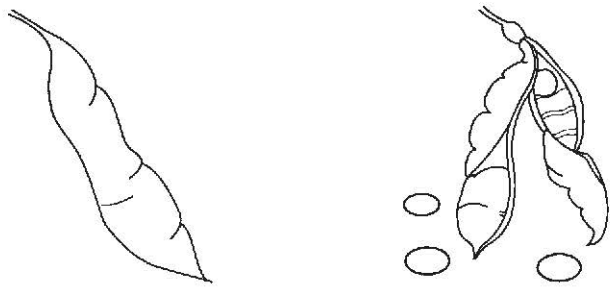


Figure 8. Green and dry stages of the same fruit of a legume

(i) What type of dispersal is shown by the fruit illustrated in Figure 8?

_____

(1 mark)

GO ON TO THE NEXT PAGE

(ii) Give TWO reasons why the plant parts illustrated in Figures 7 and 8 are classified by biologists as fruits.

_____

_____

_____

_____

(4 marks)

(c) Suggest ONE similarity and TWO differences in the ways in which the ovary in humans and in plants functions.

Similarity:

_____

(1 mark)

Differences:

_____

_____

(2 marks)

Total 16 marks

5. (a) Complete Table 3 below by writing an example and the cause of EACH type of disease listed.

TABLE 3: TYPES OF DISEASES

Type of disease	Example	Cause
Pathogenic		
Deficiency		
Hereditary		
Physiological		

(8 marks)

(b) Figure 9 below gives some data on factors affecting the transmission of HIV and AIDS in the Caribbean.

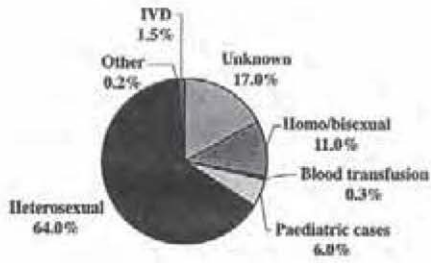


Figure 9. Factors affecting the transmission of HIV and AIDS in the Caribbean

(i) Using information from the pie chart, give the THREE most common ways in which HIV and AIDS are spread in the Caribbean.

_____

_____

_____

(3 marks)

(ii) Suggest TWO ways in which people in the Caribbean can reduce the spread of HIV and AIDS.

_____

_____

(2 marks)

(iii) Identify TWO symptoms of AIDS.

_____

_____

(2 marks)

Total 15 marks

END OF TEST

TEST CODE **01207030**

FORM TP 2007049

MAY/JUNE 2007

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 03 – General Proficiency

1 hour

04 JUNE 2007 (a.m.)

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **In addition to the 1 hour, candidates are allowed a reading time of 10 minutes. Writing may begin during the 10-minute period.**

2. **This paper is divided into THREE sections. Candidates MUST answer ONE question from EACH section. Where appropriate, answers should be illustrated by diagrams.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

SECTION A

Answer ONE question from this section.

1. (a) With the aid of a diagram, describe how the rib cage **and** lung function during the breathing process. **(8 marks)**

(b) (i) Well-trained athletes recover more quickly after completing a race than untrained athletes. Give TWO reasons why this is so.

(ii) Athletes are usually advised against smoking cigarettes. Suggest TWO reasons for such advice. **(8 marks)**

(c) Although iron is a requirement for all mature females, it is recommended that female athletes consume more iron than females who are not athletes. Suggest TWO reasons for this recommendation. **(4 marks)**

Total 20 marks

2. (a) (i) With the aid of a diagram, describe how the process of meiosis occurs.

(ii) Give TWO important differences between meiosis and mitosis. **(8 marks)**

(b) Scientists establish relationships among individuals using their knowledge of genetics. Construct a sequence of genetic diagrams to illustrate how scientists can use knowledge of genetics to show how a couple with blood types A and B respectively can produce a baby with blood type O. **(8 marks)**

(c) Sugarcane farmers usually grow a single variety of the plant and spend a lot of time, money and effort on protection from insect infestation.

(i) Suggest TWO reasons why sugarcane farmers tend to choose a single variety for their crops.

(ii) What are the implications to the sugarcane farmers of insect infestation of their crop? **(4 marks)**

Total 20 marks

SECTION B

Answer ONE question from this section.

3. (a) (i) Using ONLY a fully annotated diagram of the internal structure of a leaf, explain the role of the parts involved in photosynthesis. Include in EACH annotation the name of the structure and its function.

(ii) Write a balanced equation that effectively summarises photosynthesis.
(14 marks)

(b) (i) One effect of hurricanes is the complete removal of foliage (leaves) from trees. Many trees seem to readily survive the loss of all their leaves, even though they are the main photosynthesising organs. Explain how this is possible.

(ii) Gardeners sometimes remove leaves and branches from trees with the expectation of improving their yield. Suggest why this is a good practice.
(6 marks)

Total 20 marks

4. (a) (i) Using ONLY a fully annotated diagram show how the human digestive system is able to effectively perform its function.

(ii) Suggest ONE way in which the digestive system protects itself from disease-causing organisms in food. **(10 marks)**

(b) Identify TWO ways in which the body defends itself against disease organisms **and** explain the importance of the body having different ways of defending itself from disease. **(4 marks)**

(c) Most countries are concerned about an outbreak of a communicable disease, even though the disease, for example, 'bird flu', occurs in a distant country and in a species that is not human.

(i) What is a communicable disease?

(ii) Explain why countries should be concerned about <u>any</u> outbreak of a communicable disease. **(6 marks)**

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION C

Answer ONE question from this section.

5. (a) (i) What are decomposers?

(ii) Explain the role of decomposers in the carbon cycle.

(iii) Identify TWO types of decomposers **and** describe the characteristics they possess that make them suited to their role as decomposers. **(12 marks)**

(b) Excessive amounts of gases such as carbon dioxide in the atmosphere have resulted in increased trapping of heat energy around the earth, causing higher global temperatures (global warming) similar to that which occurs under greenhouse conditions.

(i) What are the benefits of growing plants under greenhouse conditions?

(ii) Suggest TWO reasons why global warming is NOT generally desirable.

(iii) Suggest ONE way in which global warming may be advantageous.

(8 marks)

Total 20 marks

6. (a) Using an example in EACH case, distinguish between the following pairs of terms used in the study of ecology.

- Biotic and physical
- Food chain and food web
- Community and population
- Habitat and environment

(8 marks)

(b) Wildlife reserves have become popular tourist destinations in several Caribbean territories. Wildlife authorities must protect plants and animals while providing opportunity for people to benefit from the natural beauty of the reserves.

Suggest THREE biological factors that wildlife authorities should consider before giving the public access to a wetland (swamp) reserve. For EACH factor you identify suggest what precautions the authorities may take in allowing public access.

(9 marks)

(c) In one Caribbean territory, visitors to the coral reef were allowed to experience its beauty by snorkeling, swimming and walking on the reef with plastic shoes. Within two decades, the reef deteriorated drastically and visitors were no longer allowed to walk on the reef.

What are the MAIN lessons to be learnt from this example? **(3 marks)**

Total 20 marks

END OF TEST

TEST CODE **01207020**

FORM TP 2008002

JANUARY 2008

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

1 $\frac{1}{2}$ hours

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **Answer ALL questions on this paper.**

2. **Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

Answer ALL questions.

DO NOT spend more than 30 minutes on Question 1.

1. A student plotted the graph shown in Figure 1 after carrying out an investigation on the effect of temperature on the rate of enzyme reaction.

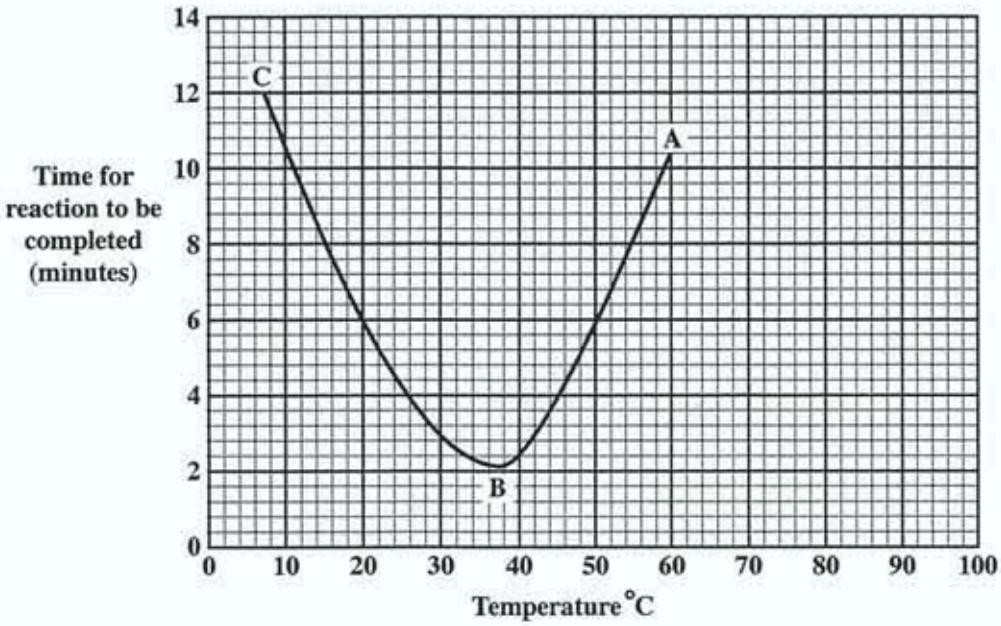


Figure 1. Graph showing the effect of temperature on the rate of enzyme activity

(a) (i) Describe the reaction rate between points A and B, and between points B and C in Figure 1.

Between A and B

_____

_____

Between B and C

_____

_____

(2 marks)

(ii) What is the optimum temperature for the enzyme in this reaction?

_____

(1 mark)

GO ON TO THE NEXT PAGE

(b) Using information in Figure 1, construct in the space provided below, a table to show the data obtained by the student in investigating the rate of enzyme reaction. Your table should contain six rows of data/information.

(8 marks)

(c) (i) If the enzyme used in this investigation were amylase, describe fully the method you would use to obtain the data for the graph. Identify the materials and apparatus.

Materials and apparatus

_____

_____

Method

_____

_____

_____

_____

(ii) Identify ONE source of error in the investigation.

_____

(7 marks)

(d) Green papaya (paw paw) fruits may be used as a means of softening meat. The green papaya is crushed and rubbed on the meat and then left for a few hours before cooking.

(i) What process might be taking place to soften the meat?

_____

(1 mark)

If the crushed papaya is added to the meat while cooking has started, the cooking time for the meat is not significantly shorter.

(ii) Suggest why this may be so.

_____

_____

(2 marks)

(e) In order to germinate, seeds also require a softening agent. In this case they are softened by water.

(i) Suggest TWO ways in which water helps the process of germination.

_____

_____

(2 marks)

(ii) Apart from water, state TWO environmental conditions needed for germination.

_____

_____

(2 marks)

(f) Environmental conditions impact not only on germination of seeds but also on the functioning of soil inhabitants, including microorganisms.

(i) Name TWO important groups of microorganisms whose activities are influenced by environmental conditions.

_____

(2 marks)

(ii) Identify ONE cycle which depends on the activities of microorganisms.

_____

(1 mark)

(iii) Explain the importance of the microorganisms named in (f)(i) in natural cycles.

_____

_____

(2 marks)

Total 30 marks

GO ON TO THE NEXT PAGE

2. In conducting an ecology study, a group of Biology students investigates gaseous exchange in pond snails and in a waterweed species. The students set up five test tubes as shown in Figure 2. All tubes are filled with an indicator solution, stoppered with rubber bungs and exposed to light for one hour.

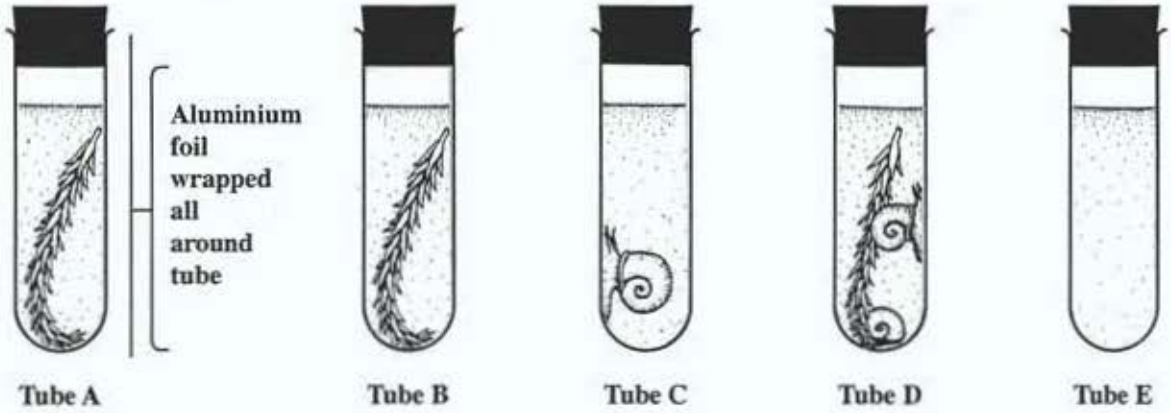


Figure 2. Set up of test tubes for investigating gaseous exchange in two species

The students use the colour changes in hydrogen carbonate indicator solution as shown in Table 1 to determine the carbon dioxide concentration in each tube.

TABLE 1

CARBON DIOXIDE CONCENTRATION AND BICARBONATE INDICATOR

Carbon dioxide concentration	Colour of bicarbonate indicator solution
Same as in the air	Reddish brown
Less than that in the air	Purple
More than that in the air	Yellow

(a) Identify ONE tube in which, after one hour, the colour of the hydrogen carbonate indicator becomes **yellow** and ONE in which the solution becomes **purple**. In each case explain your answer.

Tube with **yellow** indicator:

_____

Explanation:

_____

_____

3. Figure 3 shows a longitudinal section through the human heart.

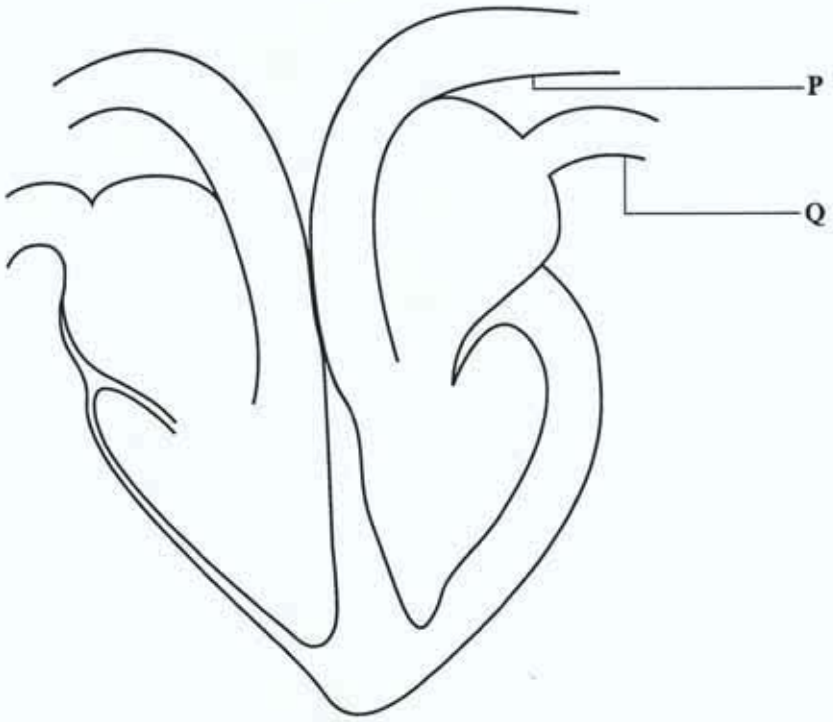


Figure 3. Diagram of a longitudinal section through the human heart

(a) (i) Using FOUR arrows ONLY show the direction of flow of blood into and out of the human heart illustrated in Figure 3. **(4 marks)**

(ii) Name the blood vessels labelled P and Q respectively.

Blood vessel P:_____

Blood vessel Q:_____

(2 marks)

(iii) Some babies are born with a small opening in the wall/septum between the two upper chambers of the heart. Suggest how this condition would affect the functioning of the heart when the atria contract.

_____

_____

(2 marks)

(b) Heart muscle cells obtain their requirements from blood transported in the coronary arteries.

(i) Name TWO substances that the heart muscle cells will receive in this blood supply.

_____

_____

(2 marks)

(ii) Identify ONE substance found in the blood supply that can cause the walls of the coronary artery to thicken.

_____

(1 mark)

(iii) How does the thickening of the coronary arterial wall affect the heart?

_____

_____

(2 marks)

(c) Plant cells obtain their requirements from transport vessels with which they are associated. Identify TWO types of transport vessels in plants and for EACH identify ONE substance which it transports.

Transport vessel 1:_____

Substance transported:_____

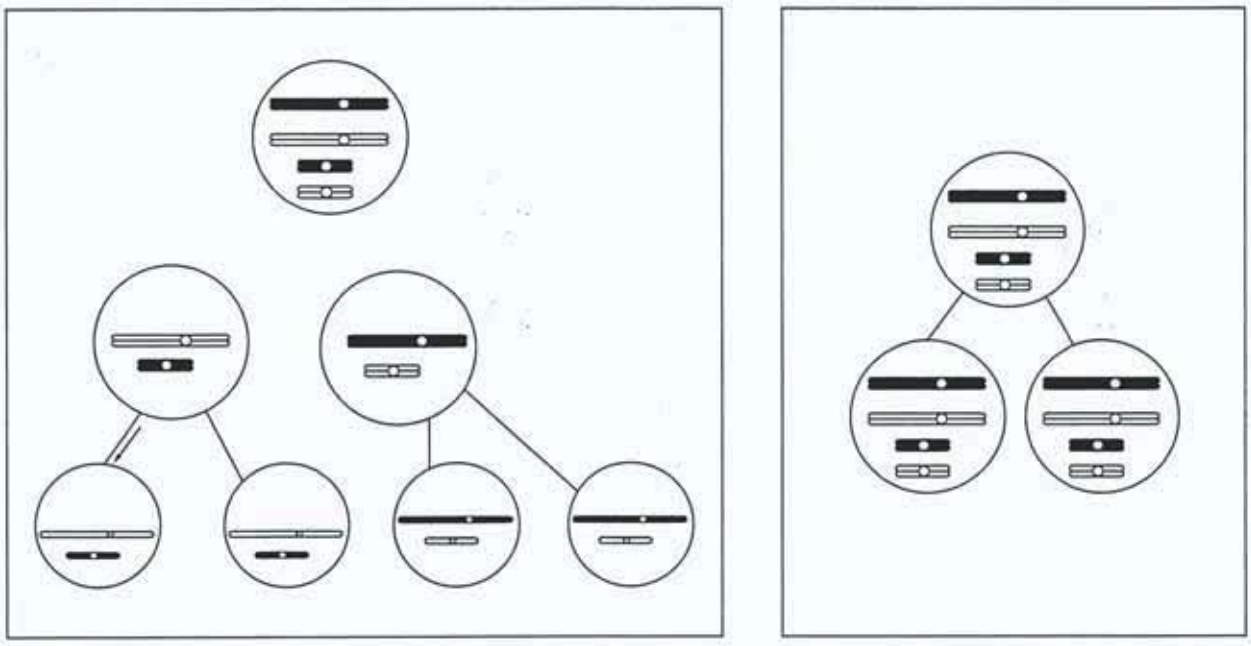
Transport vessel 2:_____

Substance transported:_____

(4 marks)

Total 17 marks

4. Figure 4 below shows two cells undergoing cell division.



Cell division I **Cell division II**

Figure 4. Cell division in two cells

(a) (i) Name EACH type of cell division illustrated in Figure 4.

Cell division I: _____

Cell division II: _____

(2 marks)

(ii) Identify TWO differences between the processes observed in the illustrations in Figure 4.

_____

_____

(2 marks)

(iii) Name TWO specific locations in a plant where EACH type of cell division illustrated in Figure 4 occurs.

Cell division I: _____

Cell division II: _____

(2 marks)

(iv) Give TWO reasons why BOTH types of cell division are important in the life cycle of a plant.

Cell division I:

_____

_____

Cell division II:

_____

_____

(4 marks)

(b) After egg cells from a female rabbit had undergone one form of cell division their nuclei were replaced with nuclei from somatic (body cells) of the rabbit. These cells produced offspring that were identical to the female rabbit.

(i) What is the name given to this process?

_____

(1 mark)

(ii) Suggest ONE advantage and ONE disadvantage of this process.

Advantage:

_____

Disadvantage:

_____

(2 marks)

(c) Egg cells are found in both plants and animals. Egg cells in plants are protected within an ovule.

(i) Into what structure will the ovule develop?

_____

(1 mark)

(ii) Name TWO features which will show that the structure you identified at (c)(i) developed from an ovule.

_____

_____

(2 marks)

Total 16 marks

5. Figure 5 below shows the nitrogen cycle.

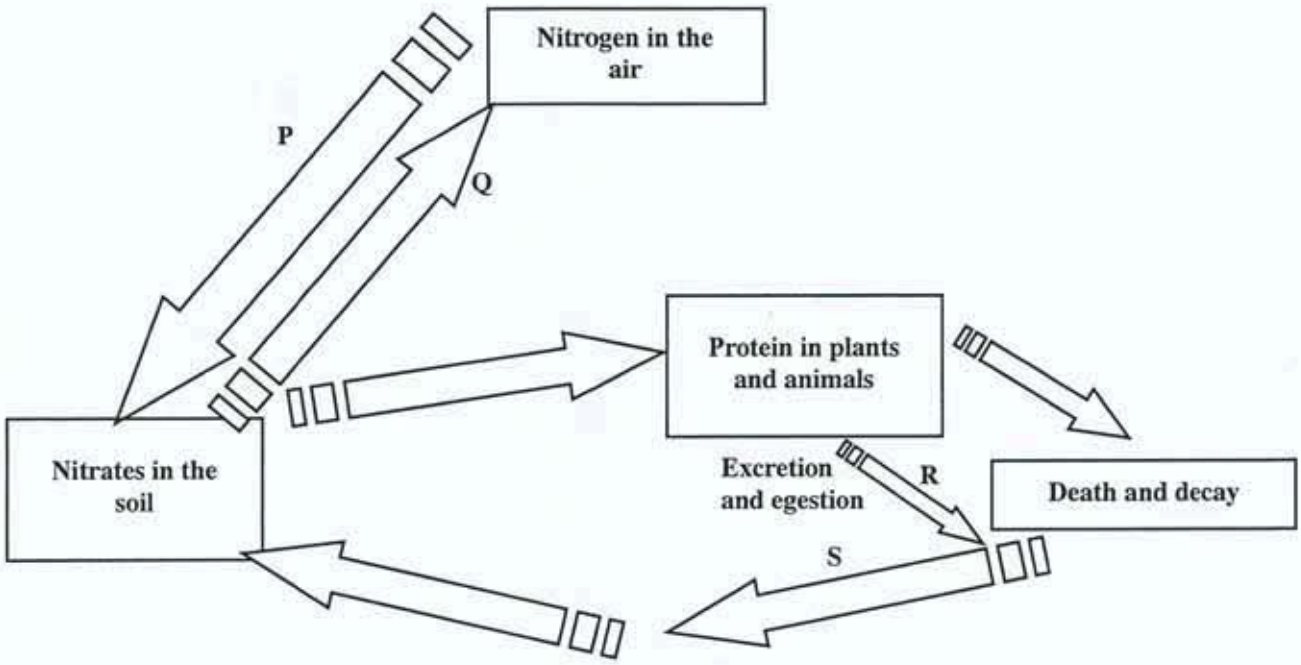


Figure 5. An incompletely labelled nitrogen cycle

(a) (i) Name the process carried out by bacteria at EACH of the stages indicated by P, Q, R and S.

P: _____

Q: _____

R: _____

S: _____

(4 marks)

(ii) Explain how nitrates from the soil become protein in plants and animals.

_____

_____

_____

(3 marks)

GO ON TO THE NEXT PAGE

(iii) Leguminous plants have bacteria in their root nodules, which are involved in the nitrogen cycle. The relationship between the legumes and the bacteria is described as mutualistic. Explain why this description is appropriate.

_____

_____

_____

(2 marks)

(b) Apart from mutualism, identify TWO OTHER types of relationships that occur among living organisms. Give ONE example of each relationship you identify.

Relationship: _____

Example: _____

Relationship: _____

Example: _____

(4 marks)

Total 13 marks

END OF TEST

TEST CODE **01207030**

FORM TP 2008003

JANUARY 2008

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 03 – General Proficiency

1 hour

21 JANUARY 2008 (p.m.)

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **In addition to the 1 hour, candidates are allowed a reading time of 10 minutes. Writing may begin during the 10-minute period.**
2. **This paper is divided into THREE sections. Answer THREE questions, ONE from Section A, ONE from Section B and ONE from Section C.**
3. **Where appropriate, answers should be illustrated by diagrams.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

SECTION A

Answer ONE question from this section.

1. (a) The human body produces and therefore must eliminate substances that can become toxic or excessive.

(i) Identify TWO substances that the body produces which can become toxic or excessive.

(ii) With the aid of a diagram, describe how a kidney tubule is able to reduce a toxic substance in the body to harmless levels. **(8 marks)**

(b) After years of alcohol abuse, one individual is found to be unable to reduce the levels of toxic substances in his body and a liver transplant is recommended. With reference to the functions of the liver explain why such a step (replacement of the liver) is recommended. **(6 marks)**

(c) A growing problem in modern society is the abuse of drugs, including those prescribed by physicians.

(i) Suggest TWO reasons why drug abuse is on the rise.

(ii) Identify TWO ways in which prescription drugs, such as antibiotics, might be abused, and in EACH case suggest a long-term effect of this abuse. **(6 marks)**

Total 20 marks

2. (a) (i) With the aid of a diagram, describe the stages in the life history of a named insect vector of disease.

(ii) Although the life cycle of many vectors is well known, the diseases they cause may still occur, for example, repeated outbreaks of malaria, dengue fever or cholera. Suggest TWO reasons for the repeated outbreaks of vector-borne diseases. **(12 marks)**

(b) Protection from certain infectious diseases is gained by injecting small amounts of dead or weakened antigens in a process called vaccination. For some diseases lifetime protection is obtained by taking a course (more than one dose over time) of vaccines.

(i) Explain the principles involved in taking a course of vaccines.

(ii) For some diseases, for example influenza, vaccines must be taken annually to gain protection. Explain why the principles you outlined at (b)(i) do not seem to work for all infectious diseases. **(8 marks)**

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION B

Answer ONE question from this section.

3. (a) (i) With the aid of a diagram, describe the structure of the human female reproductive system.

(ii) Explain how the reproductive system is suited for its function in reproduction. **(8 marks)**

(b) A woman who had her tubes tied (tubal ligation) thought that she would no longer have her monthly period.

(i) Explain how tubal ligation could prevent pregnancy without stopping the monthly period.

(ii) Indicate THREE OTHER examples of birth control that the woman could have chosen. **(6 marks)**

(c) Birth control is an attempt by humans to control the size of the human population. In some countries the number of children a couple is allowed to have is determined by the government.

(i) Suggest TWO reasons why control of the human population is necessary.

(ii) Should a government determine the number of children a couple may have? Explain your answer.

(6 marks)

Total 20 marks

4. (a) (i) With the aid of a diagram, describe the internal structure of a dicotyledonous seed.

(ii) Explain the role of the components (parts) of the dicotyledonous seed in growth and development. **(6 marks)**

(b) (i) Identify TWO hormones in humans that are involved in growth and development.

(ii) Animals are treated with hormones to improve their yield and commercial value. There is a growing concern about the diet of young children consisting of excessive amounts of foods from these animals. Suggest TWO reasons for such concern. **(6 marks)**

(c) A goat breeder in deciding against the use of hormones on his animals chose to cross his largest ram (male) with his highest reproducing female in the hope of obtaining many large offspring.

(i) With the use of a genetic diagram, explain how it is possible for the goat breeder to obtain the desired results.

(8 marks)

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION C

Answer ONE question from this section.

5. (a) (i) What are decomposers?

(ii) Explain the role of decomposers in the carbon cycle.

(iii) Identify TWO types of decomposers AND describe the characteristics they possess that make them suited to their role as decomposers. **(12 marks)**

(b) The release into the atmosphere of excessive amounts of gases such as carbon dioxide, has resulted in increased trapping of heat energy around the earth. The trapped heat energy causes higher global temperatures (global warming), similar to that which occurs under greenhouse conditions.

(i) What are the benefits of greenhouse conditions to plants?

(ii) Suggest TWO reasons why global warming is NOT generally desirable for animals.

(iii) Suggest ONE way in which global warming might be advantageous. **(8 marks)**

Total 20 marks

6. (a) In many Caribean countries, wetland ecosystems (swamps) are classified as nature reserves and are protected by special laws that restrict human activities in these areas.

(i) State FOUR reasons why wetlands are considered to be of great importance.

(ii) Suggest FOUR ways in which human activity could affect a wetland ecosystem. **(8 marks)**

(b) The negative effects of human activity can also be observed in urban areas. For example, although "No Dumping" signs are placed at strategic locations throughout most cities, indiscriminate garbage disposal is still a universal problem.

(i) Suggest FOUR reasons why indiscriminate garbage disposal should be discouraged.

(ii) Apart from posting signs, suggest TWO OTHER ways to encourage proper garbage disposal. **(6 marks)**

(c) Environmentalists argue against the use of inorganic fertilizers, while farmers argue in favour of it. Present an argument in support of the environmentalists, giving THREE clear points. **(6 marks)**

Total 20 marks

END OF TEST

TEST CODE **01207042**

FORM TP 2008004

JANUARY 2008

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 04/2 – Alternative to SBA

General Proficiency

2 hours

In addition to the 2 hours, candidates are allowed 10 minutes in order to read through the entire paper. Writing may begin during the 10-minute period.

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **Answer ALL questions.**
2. **Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

You should NOT spend more than 30 minutes on Question 1.

1. The drawings in Figure 1 represent five of the organisms found in a sample of the leaf litter in a forested area.

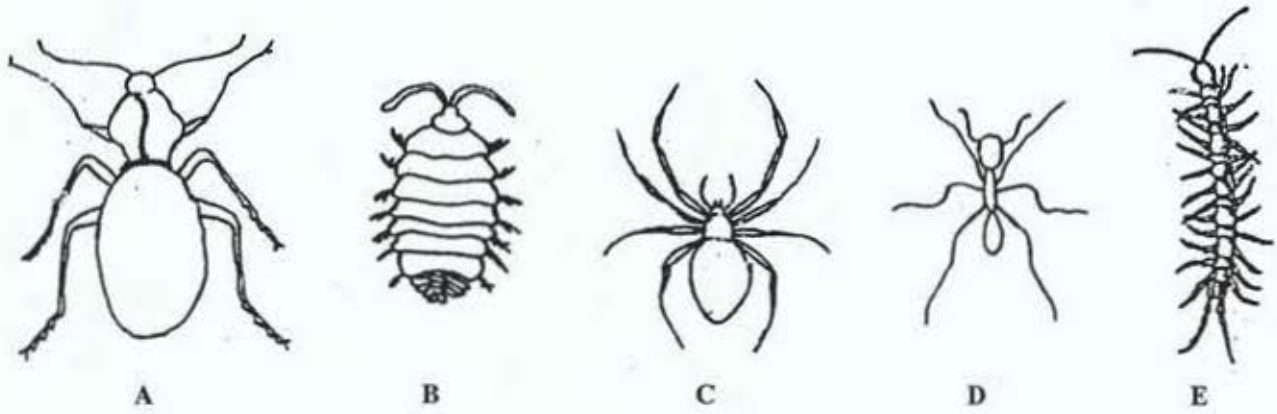


Figure 1. Drawings of five organisms found in a sample of leaf litter

(a) (i) Identify THREE characteristics observed in the drawings that can be used to classify the organisms.

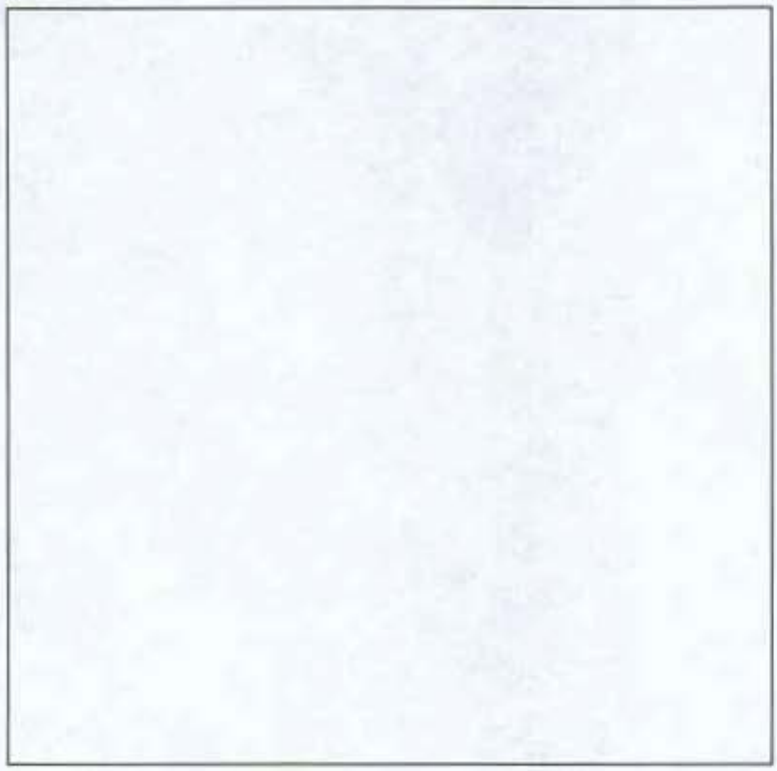
_____

_____

_____

(3 marks)

(ii) Using the characteristics you identified at (a)(i) on page 2, construct a key, table or chart in the space below to show how you would distinguish among the organisms shown in Figure 1.



(2 marks)

(iii) Describe how you would investigate the number and types of organisms that have their habitat in leaf litter.

(4 marks)

(iv) State TWO precautions to be taken in carrying out the investigation you described at (a)(iii) above.

(2 marks)

(v) In the space provided below, construct a table to show how you would record the data from the investigation you described at (a)(iii) on page 3.

(4 marks)

(vi) Suggest TWO reasons why leaf litter might be considered a good habitat for the organisms illustrated in Figure 1. Explain your answer.

(4 marks)

(b) Figure 2 shows a dissected fish head.

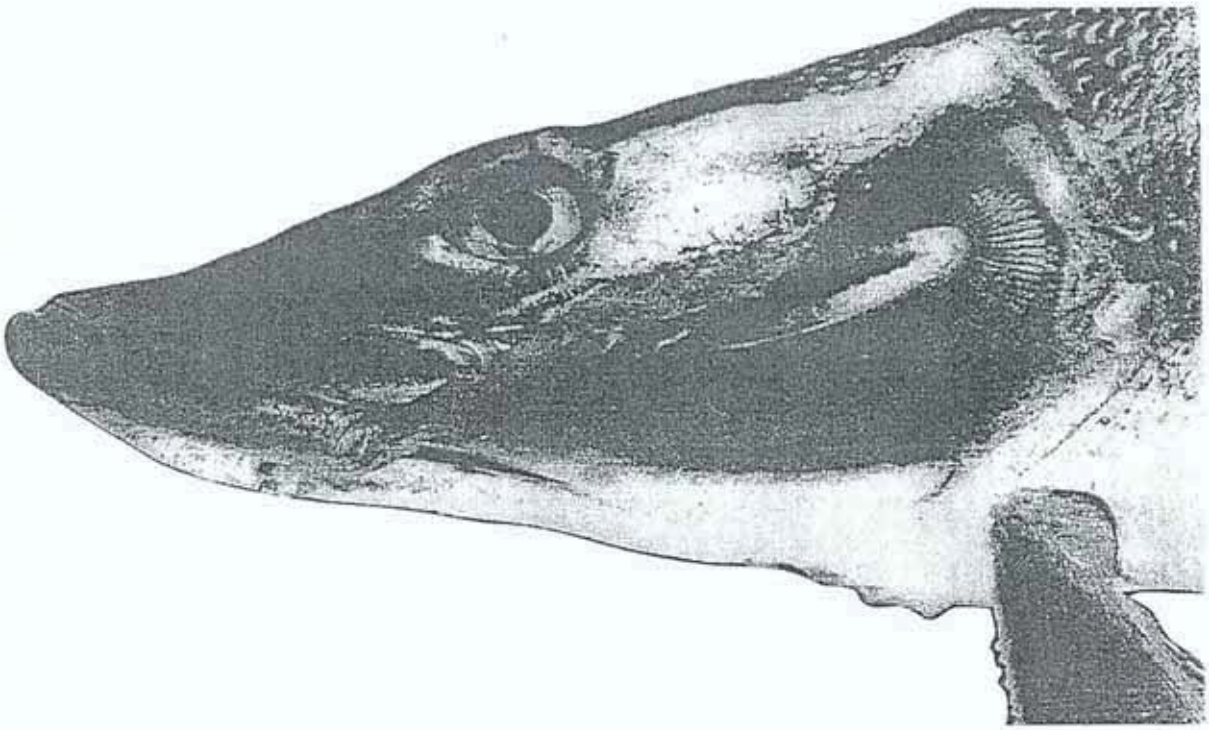
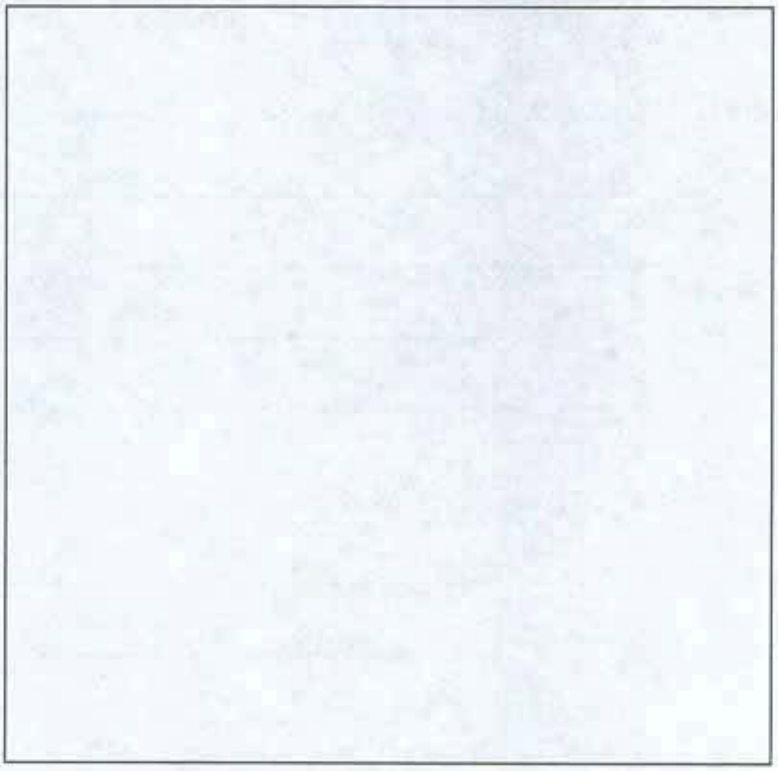


Figure 2. Photograph of a dissected fish head to show its gaseous exchange surface

(i) In the space provided below make a drawing of the side/lateral view of one of the gills shown in the photograph. **No labels are required.**



(4 marks)

(ii) Give the magnification of your drawing.

_____

(1 mark)

(iii) Explain how the structure of the gill is suited to its function.

_____

_____

_____

_____

(3 marks)

Total 27 marks

2. You are provided with leaves from two different types of plants identified as Specimen A and Specimen B respectively.

(a) On the graph paper provided on page 9 draw each leaf to clearly illustrate its special features. **No labels are required**. Indicate Specimen A and Specimen B on your drawing and include the magnification of each leaf. **(8 marks)**

(b) Identify THREE differences you observe between Specimens A and B.

_____

_____

_____

_____

(3 marks)

(c) Calculate the leaf area of each specimen.

Leaf area of Specimen A: _____

Leaf area of Specimen B: _____

(2 marks)

(d) (i) Explain the importance of leaf area to the plant.

_____

_____

_____

(2 marks)

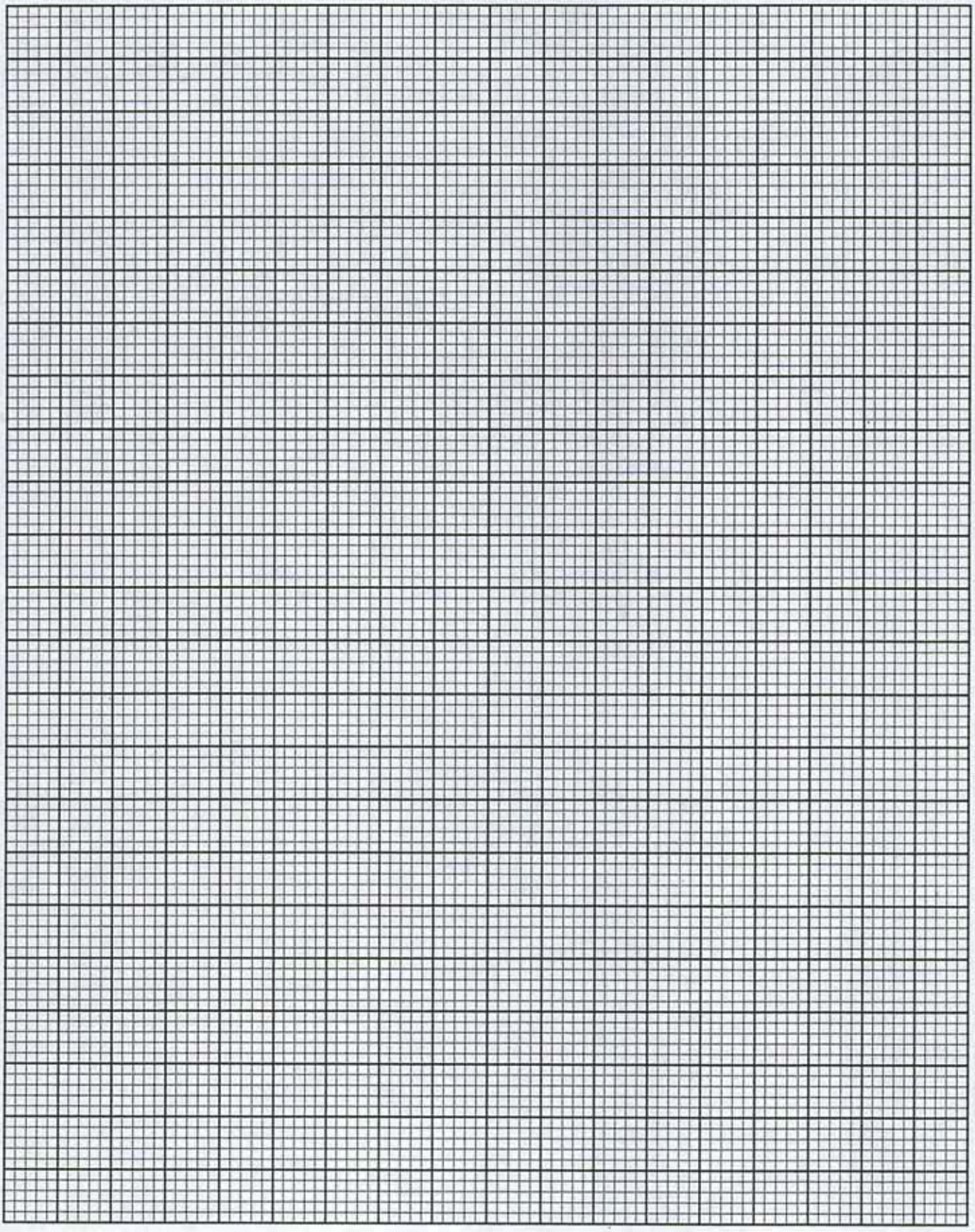
(ii) How might a plant compensate for having leaves with small leaf areas?

_____

_____

(2 marks)

Total 17 marks



3. A Biology class carried out an investigation of the amount of water-loss from two plant species over a 10-hour period. The two potted plants were kept in the laboratory under very dim light and were weighed at hourly intervals after the initial weights were obtained. The change in mass of each plant was calculated and recorded as shown in Table 1.

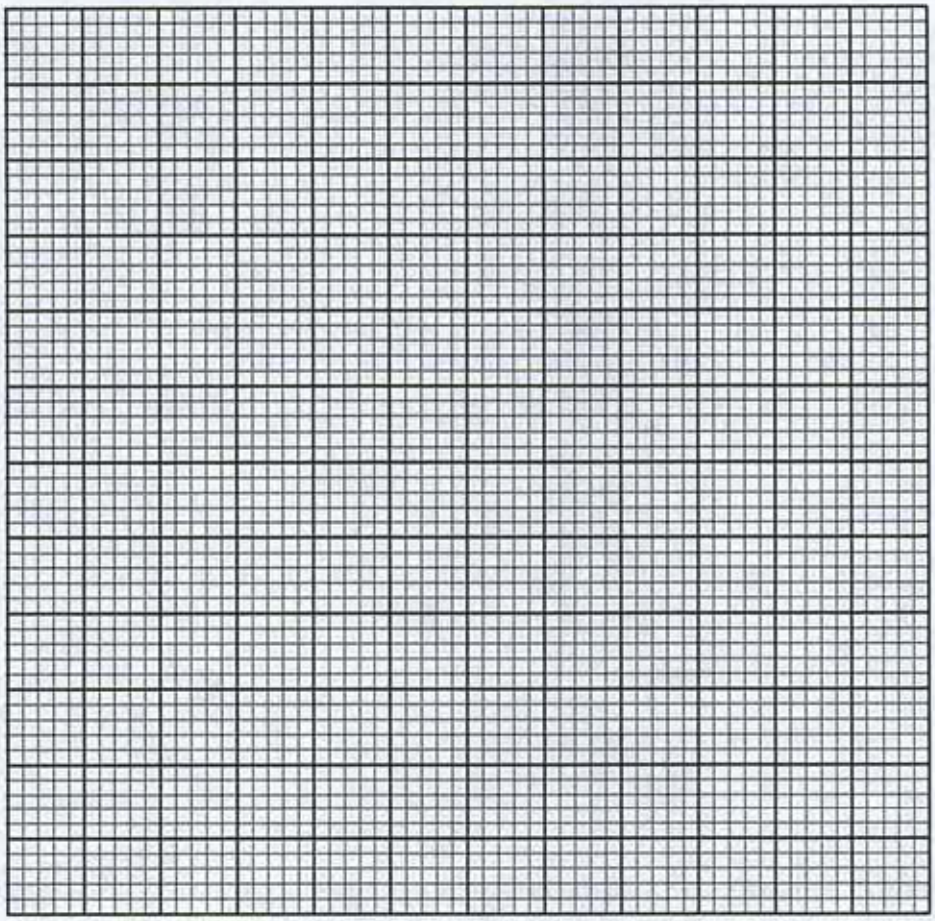
TABLE 1

PERCENTAGE WATER-LOSS PER UNIT AREA IN TWO PLANT SPECIES OVER A 10-HOUR PERIOD

Time/hour	Loss of % mass/dm^{-2}	
	Species P	Species Q
0	0.0	0.0
1	5.0	9.0
2	8.5	11.0
3	11.0	12.5
4	12.0	14.0
5	13.5	15.0
6	13.5	16.5
7	14.0	17.0
8	14.5	18.5
9	14.5	20.0
10	15.0	22.0

GO ON TO THE NEXT PAGE

(a) Using the graph paper provided below, accurately represent the data collected on the two plant species.



(8 marks)

(b) Suggest TWO sources of error in the investigation outlined at Question 3 on page 10.

_____

_____

_____

_____

(2 marks)

(c) Explain the differences observed in the percentage water-loss of the two plant species over the 10-hour period.

_____

_____

_____

_____

(2 marks)

The apparatus shown in Figure 3 were used to collect the data for the investigation of water-loss in the two plant species.

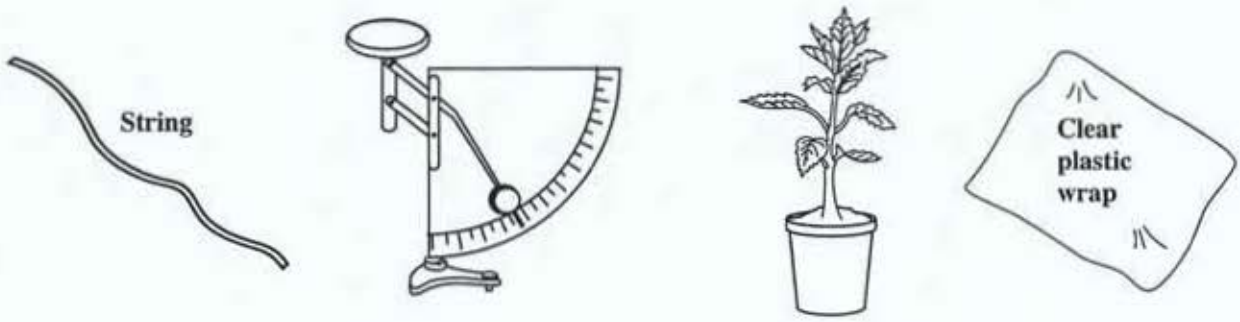


Figure 3. Apparatus and materials used to determine water-loss in two plant species

(d) In the space provided below draw a diagram to illustrate how the apparatus shown in Figure 3 were arranged to collect the data shown in Table 1 on page 10.

(4 marks)

Total 16 marks

END OF TEST

TEST CODE **01207020**

FORM TP 2008043 MAY/JUNE 2008

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **This paper consists of SIX questions in two sections. Answer ALL questions.**
2. **For Section A, write your answers in the spaces provided in this booklet.**
3. **For Section B, write your answers in the answer booklet provided.**
4. **Where appropriate, answers should be illustrated by diagrams.**
5. **At the end of the examination, attach your question booklet to your answer booklet and return them to the Supervisor.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

SECTION A

Answer ALL questions in this section.

Do NOT spend more than 30 minutes on Question 1.

1. (a) The pie charts in Figure 1 show the results of an investigation by a student on equal volumes of two samples of soil.

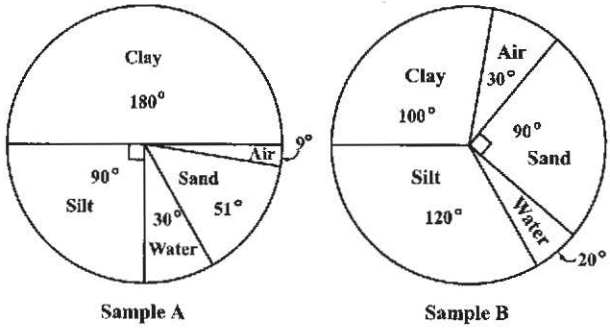


Figure 1. Constituents in two samples of soil

(i) Calculate the percentage of air in Sample A. Show your working.

(2 marks)

(ii) How do you account for the difference in the proportion of air in Samples A and B?

_____

_____

_____

(2 marks)

(b) The student carried out a further investigation on the soil in which 100 cm^3 of water was poured on each of the soil samples, A and B. The water which drained from each soil sample was collected in measuring cylinders. Figure 2 shows diagrams of the two cylinders in which the water that drained through each soil sample was collected.

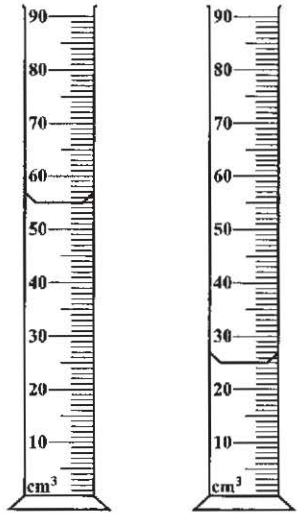


Figure 2. Cylinders showing volume of water from soil samples

(i) What is the volume of water in EACH cylinder as shown in Figure 2?

Cylinder 1: _____

Cylinder 2: _____

(2 marks)

(ii) Which measuring cylinder represents drainage from Sample B? Give a reason for your answer.

_____

_____

(2 marks)

GO ON TO THE NEXT PAGE

(iii) Calculate the volume of water retained by EACH sample of soil.

(2 marks)

(iv) Identify ONE source of error in the investigation of soil drainage.

_____

_____

(1 mark)

(v) Explain why it is important to investigate water retention properties of soils.

_____

_____

_____

(2 marks)

(c) Apart from the components shown in the pie chart in Figure 1, soil also contains living organisms. Six soil organisms are shown in Figure 3.

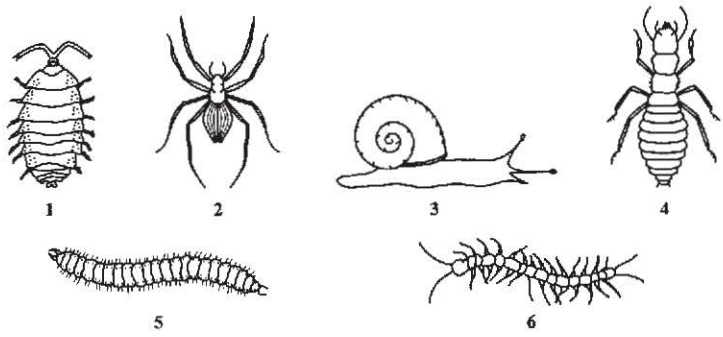


Figure 3. Some organisms found in or on the soil

(i) Identify TWO features of the organisms observed in Figure 3 which could be used to classify them.

_____

_____

(2 marks)

(ii) Name ONE group of soil organisms that is important in the recycling of soil nutrients.

_____

(1 mark)

(iii) Organisms 1 and 3 in Figure 3 are usually found under stones or leaf litter. Suggest TWO reasons why these organisms are found in this type of habitat.

_____

_____

(2 marks)

(iv) To investigate the number in the population of Organism 5 that occurs in its habitat:

a) List the apparatus you would need.

_____

b) Describe the method you would use.

_____

_____

_____

(4 marks)

(v) Organism 5 feeds on leaf litter, while Organism 6 is thought to be a carnivore.

a) Define the term 'carnivore'.

_____

_____

b) Give TWO adaptations that Organism 6 should possess as a carnivore.

_____

_____

(3 marks)

Total 25 marks

2. (a) Figure 4 shows a diagram of a mammalian joint.

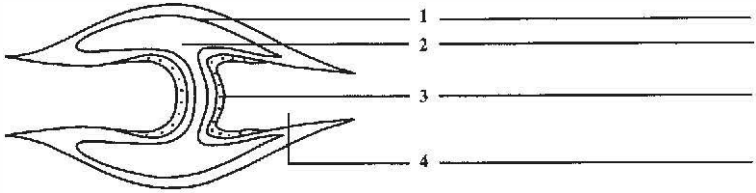


Figure 4. Diagram of a mammalian joint

(i) On the diagram in Figure 4, label EACH of the parts numbered 1, 2, 3 and 4. **(4 marks)**

(ii) State ONE function of EACH of the parts labelled 2 and 4.

Part 2: _____

Part 4: _____

(2 marks)

(b) (i) Name a partially movable joint.

_____

(ii) How does movement at a partially movable joint differ from movement at the elbow joint?

_____

_____

(3 marks)

(c) Figure 5 shows a diagram of the bones of the human fore limb.

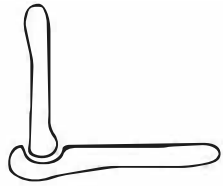


Figure 5. Stylised diagram of a human fore limb

On the stylised diagram in Figure 5, draw a representation of a pair of antagonistic muscles for flexing and extending the arm. **(2 marks)**

(d) Many older persons replace their hip bone to retain their ability to walk. Suggest TWO reasons why the hip bone can lose its locomotory function.

_____

_____

_____

(4 marks)

Total 15 marks

GO ON TO THE NEXT PAGE

3. (a) Figure 6 is a diagram of a dividing cell of an organism which has a diploid chromosome number of 4.

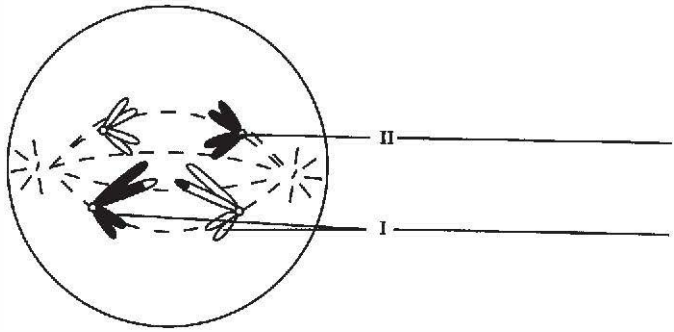


Figure 6. Dividing cell showing chromosomes

(i) On the diagram in Figure 6, write the name of the structures labelled **I** and **II**.
(2 marks)

(ii) What type of cell division is illustrated in Figure 6?

_____

(1 mark)

(iii) Give TWO reasons for your response in (a) (ii) above.

_____

_____

(2 marks)

(iv) How many chromosomes would there be in the daughter cells produced in the cell division illustrated in Figure 6?

_____

(1 mark)

(v) Give TWO advantages to an organism of this type of cell division.

_____

_____

(2 marks)

(b) (i) What is 'genetic engineering'?

(2 marks)

(ii) Give ONE advantage of genetic engineering.

(1 mark)

(iii) Suggest ONE problem that could arise from genetically modifying an organism.

(2 marks)

(c) Suggest ONE reason why it is possible to successfully transfer genes from one species to another, yet species under normal conditions do not generally interbreed.

(2 marks)

Total 15 marks

SECTION B

Answer ALL questions in this section.

Write your answers in the answer booklet provided.

4. (a) (i) Explain why food chains usually begin with a plant species.

(ii) Using an appropriate diagram, show how a plant or animal may belong to more than one food chain.

(iii) Explain why the number of organisms decreases at the successive trophic levels. **(8 marks)**

(b) Biological control usually involves the introduction of new species to an ecosystem to reduce or control the population of organisms considered to be pests.

(i) Identify ONE relationship that is important in biological control and explain how this relationship functions in biological control.

(ii) Suggest TWO reasons why biological control is a preferred method of reducing pest populations compared to the use of pesticides. **(7 marks)**

Total 15 marks

5. (a) (i) With the aid of a fully annotated diagram, explain how air reaches the lungs and oxygen is absorbed into the blood stream.

(ii) Suggest why it is important for human blood to have a specialised type of cell for oxygen absorption. **(9 marks)**

(b) The effect of smoke emission from factories on plant leaves is sometimes compared to the effect of cigarette smoke on human lungs. Suggest TWO reasons why this comparison is appropriate. **(4 marks)**

(c) Many governments have passed legislation to reduce the amount of cigarette smoking in public. Explain why governments should consider it their responsibility to reduce smoking in public. **(2 marks)**

Total 15 marks

GO ON TO THE NEXT PAGE

6. (a) (i) How does the human body defend itself against disease?

(ii) Identify TWO diseases from which the body CANNOT effectively defend itself.

(iii) For any ONE disease you identified at (a) (ii), explain why it is difficult for the body to defend itself from that disease. **(8 marks)**

(b) Antibiotics are a group of drugs that is used to help the body fight diseases caused by certain organisms. Doctors advise their patients to take an entire course of antibiotics only when and as prescribed. However, many people do not follow the doctor's advice and some of these drugs have been found to be no longer effective.

Suggest TWO biological and TWO social implications of the improper use of antibiotics. **(4 marks)**

(c) Alcohol is sometimes considered an abused drug. Explain why this may be an appropriate description. **(3 marks)**

Total 15 marks

END OF TEST

TEST CODE **01207020**

FORM TP 2009002

JANUARY 2009

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING DIRECTIONS CAREFULLY.

1. **This paper consists of SIX questions in two sections. Answer ALL questions.**
2. **Write your answers in the spaces provided in this booklet.**
3. **Where appropriate, answers should be illustrated by diagrams.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

SECTION A

Answer ALL questions in this section.

You should NOT spend more than 30 minutes on Question 1.

1. A group of students was asked to investigate the effect of pH on the activity of two digestive enzymes, **X** and **Y**. The enzymes were taken from different parts of the same human digestive tract. The results of the experiment are presented in Table 1.

TABLE 1: COMPARISON OF THE RATE OF REACTION OF ENZYMES X AND Y AT DIFFERENT pH

pH	Rate of reaction (mg products per unit time)	
	X	Y
2.0	0	0
2.5	0	0
4.0	0	0
5.0	1.0	0
5.5	3.0	0
6.0	4.5	3.0
6.5	8.5	9.0
7.0	12.0	10.0
7.5	10.0	12.0
8.0	2.0	14.0
8.5	0	12.5
9.0	0	5.0
10.0	0	0

(a) (i) Using the data in Table 1, complete the graph on page 3 to show the rate of reaction of Enzymes X and Y at the different pH levels. **(4 marks)**

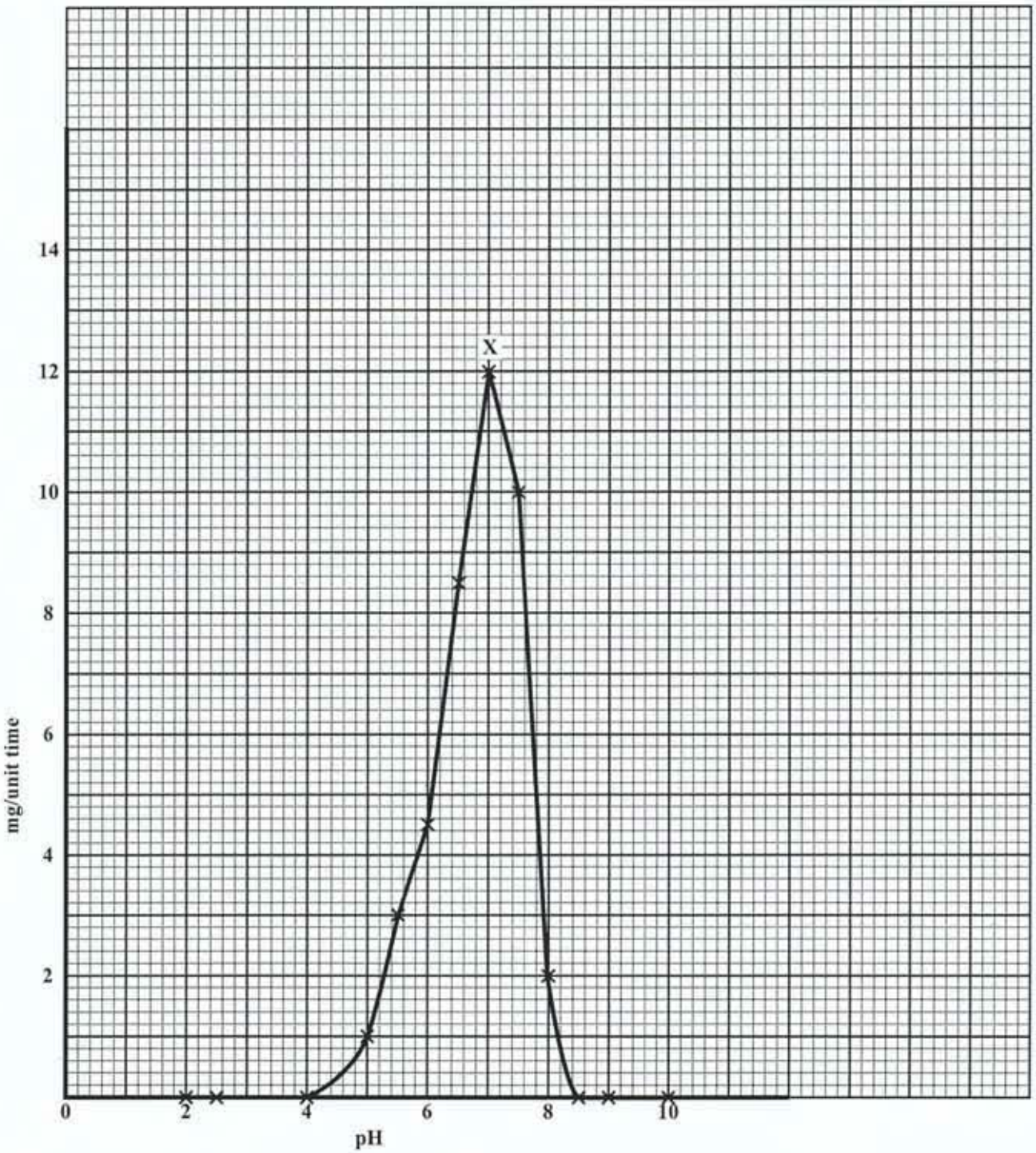
(ii) Give ONE reason why the rate of reaction for both enzymes was sometimes zero.

_____

(1 mark)

GO ON TO THE NEXT PAGE

Title:



(iii) Use the information from the graph to answer questions a) to d):

a) What is the optimum pH for

Enzyme X?: _____

Enzyme Y?: _____

b) Which enzyme functions at a lower pH range?

_____

c) Which enzyme produces **more** products at its optimum pH?

_____

d) Is it likely that Enzyme X and Enzyme Y are similar? Give ONE reason for your answer.

_____

_____

(6 marks)

(b) The product of reactions catalyzed by Enzymes X and Y is a reducing sugar. Describe a test the students could use to confirm the presence of the reducing sugar. Give the apparatus and materials to be used and describe the method and expected results.

Apparatus and materials

_____

_____

Method

_____

_____

_____

Expected results

_____

_____

(5 marks)

(c) Although they are produced by different organs in the human digestive system, Enzymes X and Y break down the same nutrient in the body. Identify Enzymes X and Y.

(i) X: _____

Y: _____

(2 marks)

(ii) Label the diagram in Figure 1 to show where Enzymes X and Y are found.

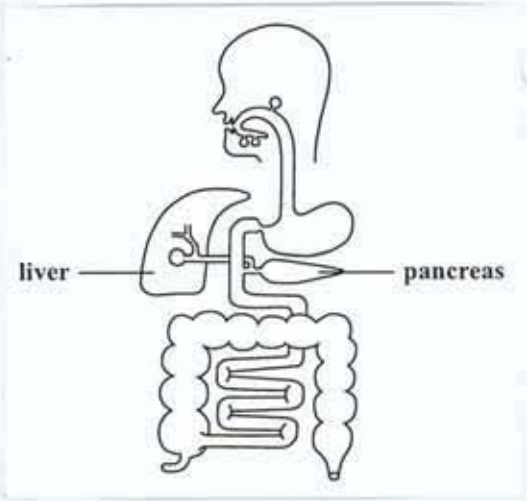


Figure 1. Outline of the alimentary canal

(2 marks)

(iii) Suggest TWO advantages to humans of having two forms of the same enzyme.

_____

_____

(2 marks)

(d) Enzyme activity is important in plants for the digestion of stored food.

(i) Identify ONE condition or circumstance when digestion of food takes place in a plant.

_____

(1 mark)

(ii) Name TWO inorganic substances (mineral elements) required by plants to make their food.

_____

_____

(2 marks)

Total 25 marks

2. Figure 2 shows a section through human skin.

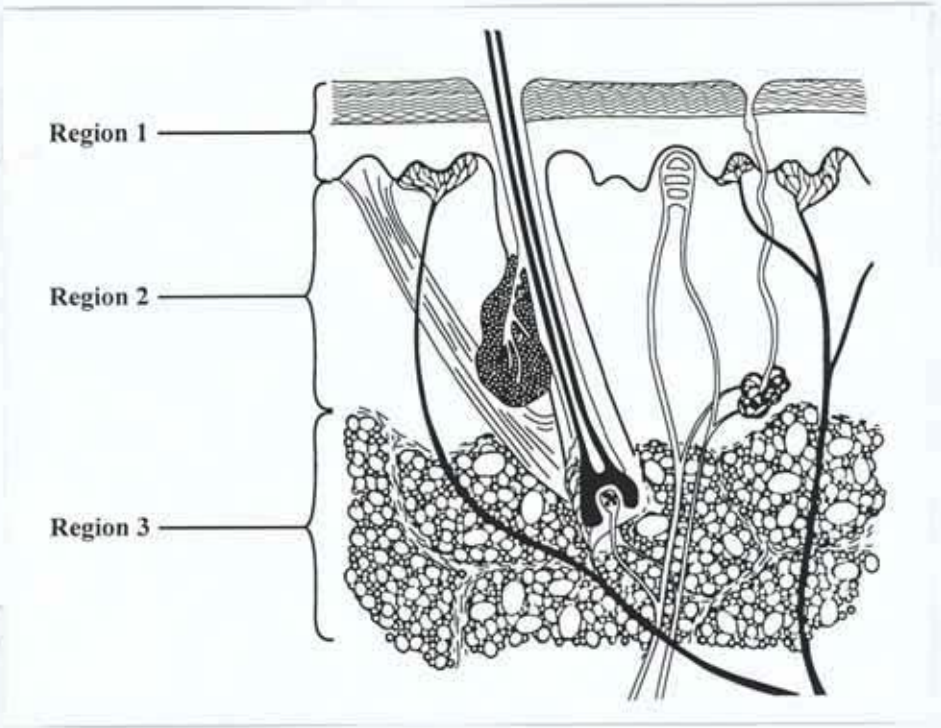


Figure 2. Longitudinal section through human skin

(a) (i) Identify the regions indicated by the lines numbered 1 - 3.

Region 1: _____

Region 2: _____

Region 3: _____

(3 marks)

(ii) Identify from the diagram TWO structures which aid in temperature regulation in humans.

_____

_____

(2 marks)

(iii) State TWO functions of the skin other than temperature regulation.

_____

_____

(2 marks)

GO ON TO THE NEXT PAGE

(b) (i) Mr Firebon was badly burnt and lost all of Region 1 shown in Figure 2 on page 6. Suggest TWO ways in which the functioning of the skin would be affected.

_____

_____

_____

_____

(4 marks)

(ii) Sometimes burns are treated by grafting onto the burnt area skin taken from another part of a person's own body. Outline ONE advantage of this procedure.

_____

_____

_____

(2 marks)

(c) Suggest ONE reason why a plant may also need to regulate its temperature.

_____

_____

_____

(2 marks)

Total 15 marks

3. (a) (i) Complete the chart in Figure 3, using **letters** and **words** as appropriate, to show the inheritance of flower colour when two pure-breeding varieties of *Impatiens* are crossed. The heterozygous phenotype is pink.

Parental phenotype and genotype	 **Red RR** **White WW**
Gametes	
F_1 genotype	
F_1 phenotype	

(3 marks)

Figure 3. Illustration of incomplete dominance in flower colour in the plant species, *Impatiens*

(ii) If F_1 *Impatiens* plants were crossed, what would be the phenotypic ratio for flower colour in the offspring?

_____

(2 marks)

(iii) What type of genetic variation is shown by the flower colour in *Impatiens*? Explain your answer.

_____

_____

_____

(3 marks)

GO ON TO THE NEXT PAGE

(b) (i) The alleles of the ABO blood group in humans show co-dominance. How does this co-dominance differ from incomplete dominance shown in the inheritance of flower colour in *Impatiens* illustrated in Figure 3?

_____

_____

_____

(2 marks)

(ii) If the *Impatiens* flowers in Figure 3 showed co-dominance, what would be the phenotype of the F_1 generation?

_____

(1 mark)

(iii) In the space provided below, show, by using a genetic diagram, how a child may inherit blood type O from parents who belong to blood groups A and B respectively.

Parental genotype:

Gametes:

F_1 genotype:

F_1 phenotype:

(4 marks)

Total 15 marks

SECTION B

Answer ALL questions in this section.

Write your answers in the space provided after EACH question in this answer booklet.

4. (a) With the aid of a balanced equation, describe the process by which green plants make their food. **(6 marks)**

(b) Sometimes plants are found in conditions where they are unable to make enough food. For EACH situation identified below, explain why the plants are unable to make enough food.

(i) Tomato plants infested with a population of caterpillars

(ii) Water plants rooted to the bottom of a pond in which there is a proliferation (sudden large population) of algae **(4 marks)**

(c) (i) Farmers use fertilisers to increase crop yield.
How does the use of fertilisers increase crop yield?

(ii) Some farmers choose to use chemical fertilisers, while others use natural fertilisers. Suggest TWO disadvantages of the use of **chemical** fertilisers.

(iii) Suggest ONE beneficial effect of organic fertilisers on soil. **(5 marks)**

Total 15 marks

Write your answers to Question 4 here.

GO ON TO THE NEXT PAGE

5. (a) (i) Describe the process of respiration in living cells.

(ii) How do the cells in the human body obtain the raw materials for respiration?
(6 marks)

(b) Persons suffering from sickle-cell anaemia and iron-deficiency anaemia display similar symptoms because the oxygen-carrying capacity of the blood is reduced.

(i) Identify TWO likely symptoms of persons suffering from anaemia.

(ii) How is the oxygen-carrying capacity of the blood reduced by

a) sickle-cell anaemia?

b) iron-deficiency anaemia?

(iii) Suggest TWO ways of treating persons suffering from iron-deficiency anaemia.
(7 marks)

(c) Suggest ONE reason why some persons with diseases have higher than normal numbers of white blood cells. **(2 marks)**

Total 15 marks

Write your answers to Question 5 here.

6. (a) Using annotated diagrams, compare the structure of a wind-pollinated flower with that of an insect-pollinated flower. **(6 marks)**

(b) Asexual reproduction is common in many flowering plants.

(i) Explain TWO ways in which humans make use of the plants' ability to reproduce asexually.

(ii) Give TWO advantages to humans of asexual reproduction in plants. **(6 marks)**

(c) (i) Although many of the same plant species grow in different Caribbean territories, a CARICOM citizen is not allowed to transport living plant material between islands without permission.

Suggest TWO likely risks involved in transporting living plant material from one territory to another.

(ii) Agricultural produce is imported from one territory to another. Suggest ONE way in which the risks in this activity can be reduced. **(3 marks)**

Total 15 marks

Write your answer to Question 6 here.

END OF TEST

TEST CODE **01207032**

FORM TP 2009003

JANUARY 2009

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 03/2 – Alternative to SBA

General Proficiency

2 hours

In addition to the 2 hours, candidates are allowed 10 minutes in order to read through the entire paper. Writing may begin during the 10-minute period.

READ THE FOLLOWING DIRECTIONS CAREFULLY.

1. **Answer ALL questions.**
2. **Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. Figure 1 shows red bean seedlings at various stages of germination. Examine the drawings carefully and answer the questions which follow.

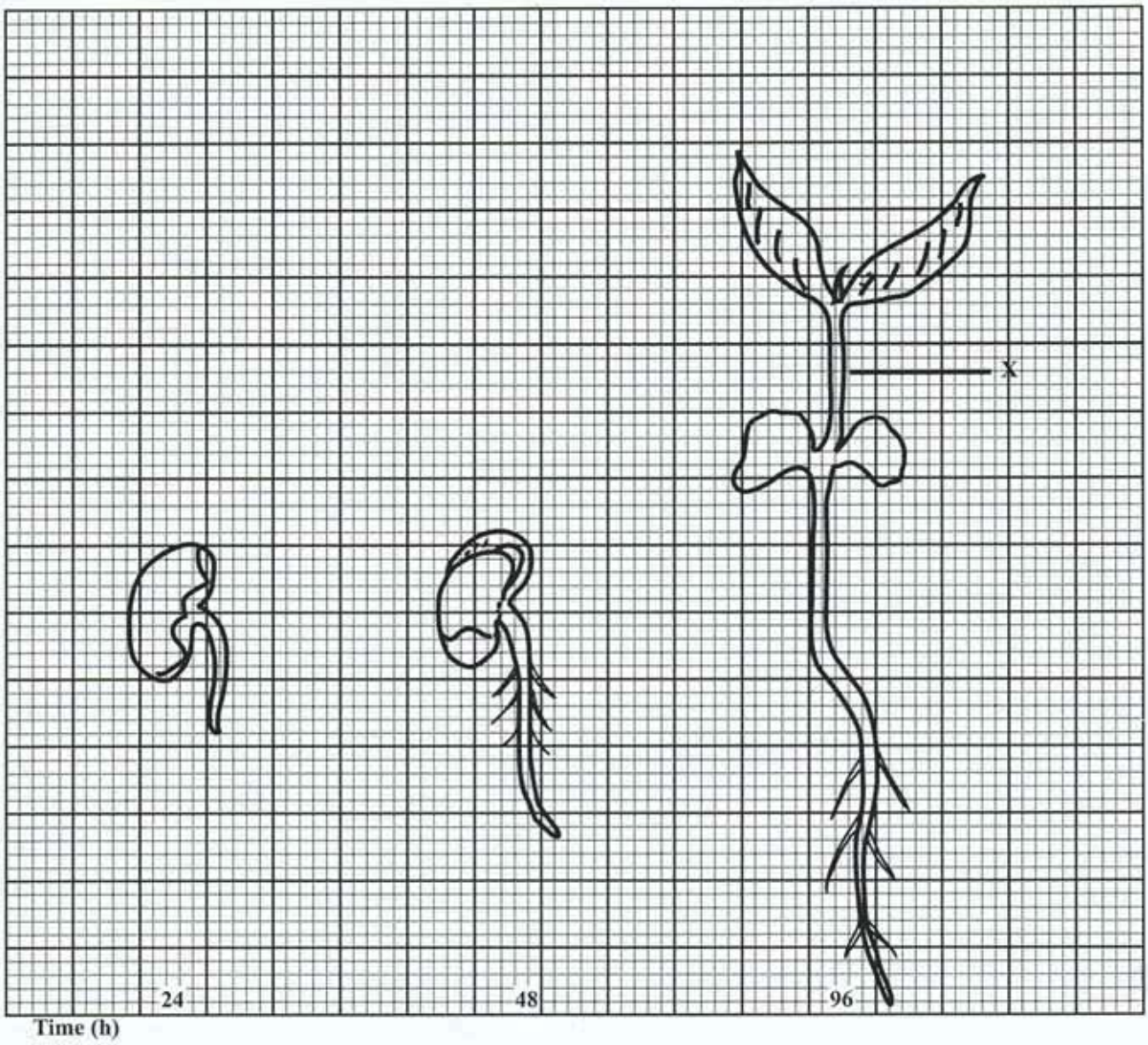


Figure 1. Stages in germination of red bean seedlings

(a) Using only your observations of the drawings in Figure 1, identify THREE plant features that have developed by 96 hours.

_____

_____

(3 marks)

GO ON TO THE NEXT PAGE

(b) What is the length of the structure identified as X?

_____

(2 marks)

(c) Describe a test to show whether the seed stores proteins for germination. Identify the apparatus and method.

Apparatus: _____

Method: _____

_____

_____

_____

_____

(4 marks)

(d) (i) Describe TWO changes that take place **within** the seed, between 24 hours and 96 hours.

_____

_____

(2 marks)

(ii) Why are the changes you described at (d) (i) important to the seedling?

_____

_____

(2 marks)

(iii) Identify TWO environmental conditions that are important to the seedlings at 96 hours.

_____

_____

(2 marks)

(e) After 96 hours as illustrated in Figure 1, some seedlings are placed in pots with soil and further investigated. One set of potted plants is placed in an intact black cardboard box, while another set is placed in a black cardboard box with a hole in one side. Both sets are left in a well-lit laboratory for one week.

(i) Suggest a hypothesis for this investigation.

_____

_____

(2 marks)

(ii) Identify ONE way in which this investigation could be improved.

_____

_____

(2 marks)

(f) Data shown in Table 1 were collected from investigation into the growth and development of the seedlings grown in strong sunlight.

TABLE 1: STEM LENGTH (CM) OF FOUR SEEDLINGS OVER A TEN-DAY PERIOD

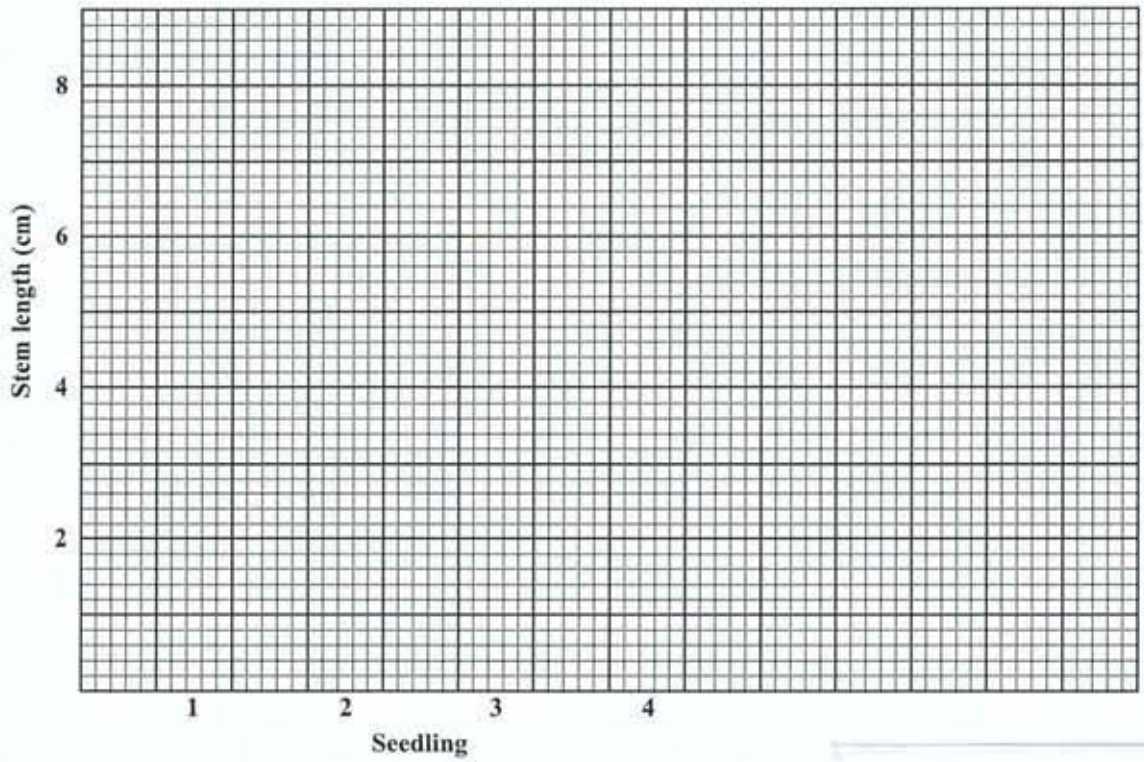
Seedling	Day 4	Day 6	Day 8	Day 10
1	3.0	3.9	4.7	5.8
2	1.5	2.0	2.9	3.3
3	2.8	3.3	4.5	5.6
4	3.1	4.0	5.1	6.0

(i) Complete the table below to show the average stem length of the four seedlings over the ten-day period.

Day	Average stem length of the four seedlings (cm)
4	
6	
8	
10	

(4 marks)

(ii) On the grid below, construct a bar graph to show the stem lengths of the four seedlings over the ten-day period.



(4 marks)

Total 27 marks

2. Figure 2 is a drawing of a vertebra of a small mammal. Observe the drawing closely and answer the questions which follow.

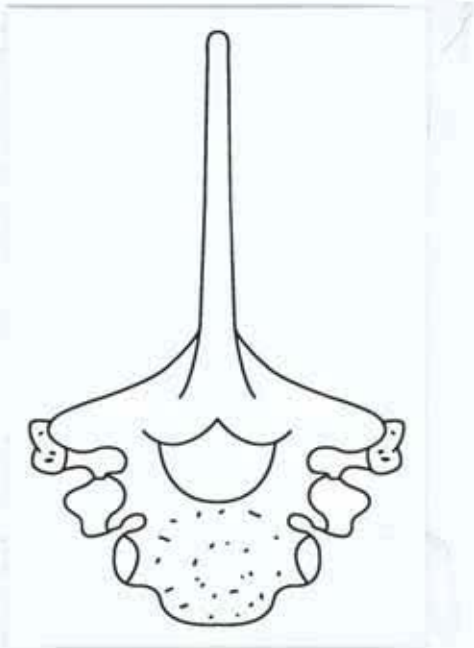


Figure 2. Drawing of a composite view of a mammalian vertebra

(a) In the space provided below draw a fully labelled diagram of the lateral view of the vertebra shown in Figure 2.

Title: _____

Magnification: _____

(8 marks)

(b) (i) Where in the spinal column can the vertebra illustrated in Figure 2 be found?

_____

(1 mark)

(ii) Identify ONE feature shown in your diagram which makes the vertebra suited to one of its functions. Name the function.

Feature: _____

Function: _____

_____

(1 mark)

(c) Figure 3 is a drawing of a mammalian humerus. Identify THREE features you observe in the drawing of the bone shown in Figure 3 that are important for its functions. Explain how EACH feature you identify serves its purpose.

Feature 1: _____

Function:

_____

_____

Feature 2: _____

Function:

_____

_____

Feature 3: _____

Function:

_____

_____

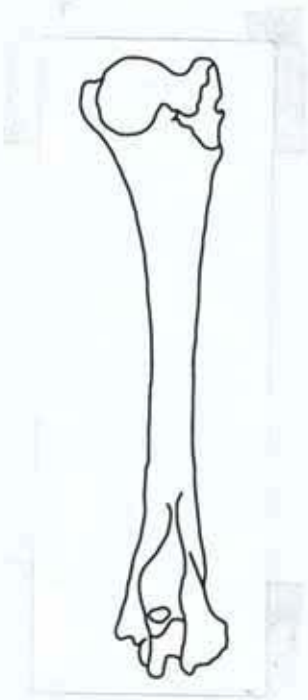


Figure 3. Posterior view of a mammalian humerus

(6 marks)

Total 16 marks

3. The apparatus shown in Figure 4 is used to investigate aspects of photosynthesis in plants.

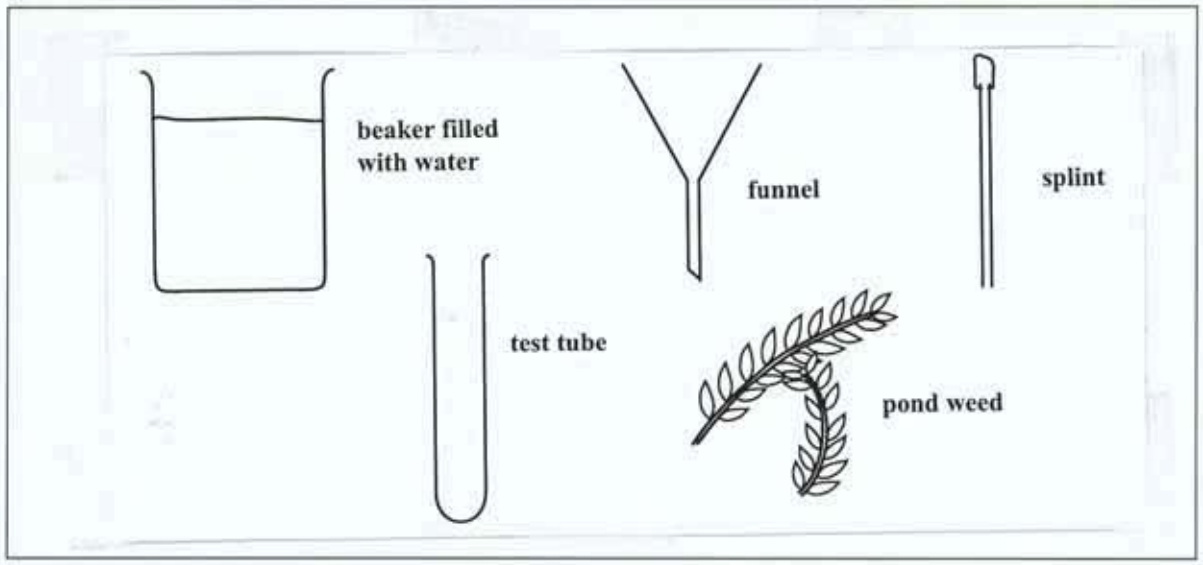


Figure 4. Apparatus to investigate photosynthesis

(a) In the space provided below, draw a diagram to show how the apparatus should be assembled to demonstrate that photosynthesis is taking place.

(4 marks)

(b) Write an aim for the investigation.

_____

_____

(2 marks)

(c) (i) What would you observe in the test tube after a few hours?

_____

_____

(2 marks)

(ii) How will the data in (c) (i) above be used to show that the aim stated at (b) on page 9 has been achieved?

_____

_____

(2 marks)

(d) A farmer claimed that his crops near the spreading immortelle tree produced fewer and smaller fruits than crops growing in the open areas, even though he watered all the plants to the same extent. His daughter, a Form 5 biology student, suggested that the difference might be due to different rates of photosynthesis.

Using the following guidelines, design an investigation to show that the student's suggestion may be right.

(i) Identify the factor likely to be affecting the rate of photosynthesis.

_____

(1 mark)

(ii) Identify the apparatus required and the method you would use in the investigation.

Apparatus: _____

_____

Method: _____

_____

_____

(4 marks)

(iii) What inference would you make from the results obtained from the investigation?

_____

_____

(2 marks)

Total 17 marks

END OF TEST

TEST CODE **01207020**

FORM TP 2009040

MAY/JUNE 2009

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **This paper consists of SIX questions in two sections. Answer ALL questions.**
2. **Write your answers in the spaces provided in this booklet.**
3. **Where appropriate, answers should be illustrated by diagrams.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

NOTHING HAS BEEN OMITTED

GO ON TO THE NEXT PAGE

SECTION A

Answer ALL questions.

DO NOT spend more than 30 minutes on Question 1.

1. A biology class goes on a field trip to study a small coastal ecosystem along a busy highway. A student's sketch of the area investigated is shown in Figure 1 below.

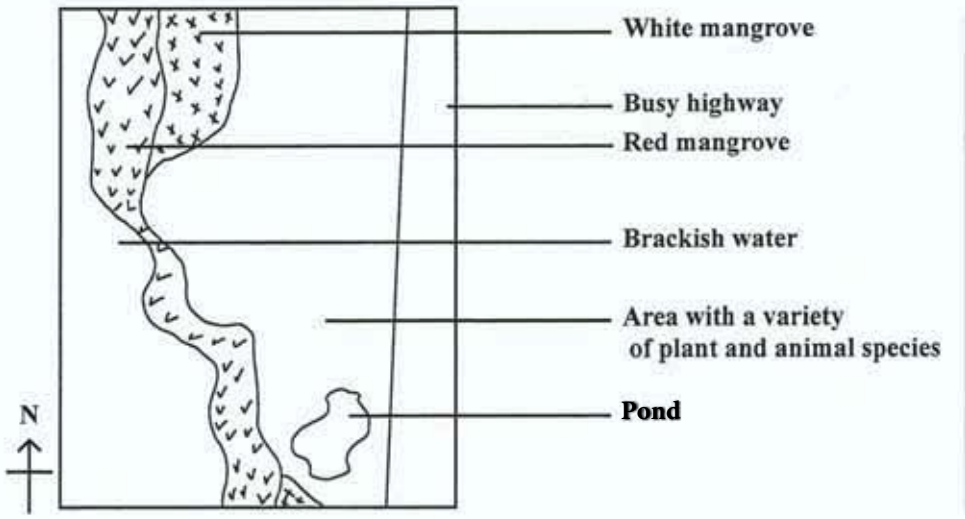


Figure 1. Map of the area studied

(a) One group of students is given a 1 m^2 quadrat to study the area shown in Figure 1.

(i) The distribution of the different plant and animal species changes from the water's edge to the highway. Name TWO <u>additional</u> pieces of apparatus the students will need to investigate the changing distribution of plant and animal species.

_____

_____

(2 marks)

(ii) Describe how EACH piece of apparatus you named in (a) (i) can be used to study the distribution of plant species in this area.

_____

_____

_____

(2 marks)

(b) One group of students uses a 1 m^2 quadrat to determine the distribution of three plant species in the area behind the mangroves. The results are shown in Table 1.

TABLE 1: RESULTS FROM QUADRAT THROWS

Plant organisms	Quadrat number									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Small flowering shrub	5	2	3	2	2	1	2	1	3	1
Grass growing in clumps	4	2	3	2	0	1	2	4	0	0
Succulent plants	10	10	12	15	20	25	15	22	5	18

(i) State ONE precaution that should be taken when using the quadrat to determine the distribution of the plant species.

_____

(1 mark)

(ii) Calculate the species density of the small flowering shrub in the area. **(Show your working.)**

(2 marks)

(iii) Suggest a reason for such a large number of succulent plants in the area.

_____

_____

_____

(2 marks)

(c) Another group of students observes the feeding relationship among the organisms found in and around the pond. The data recorded is shown in Table 2.

TABLE 2: FEEDING RELATIONSHIPS OF ORGANISMS IN THE POND

Organism	Food eaten
Crab	Decaying plant matter
Guppy (fish)	Mosquito larvae, tadpoles
Waterbird	Guppy, frog, crab
Water snail	Algae, water weed
Mosquito larvae	Moss, decaying plant matter
Water weed	Makes own food
Frog	Dragonfly, mosquito larvae
Tadpoles	Water weed

(i) Using the information in Table 2 construct a food web with TEN organisms.

(3 marks)

(ii) Explain why there are usually no more than four trophic levels in a food web.

_____

_____

(2 marks)

(iii) State TWO physical factors that could affect the population of the organisms that live in the pond.

_____

(2 marks)

GO ON TO THE NEXT PAGE

(d) Different groups of students collected data on the frog population from 1997 to 2004. Table 3 shows this data.

TABLE 3: FROG POPULATION OBSERVED FROM OCTOBER 1997 TO OCTOBER 2004

Year	Population size of frogs (number of individuals)
2004	5
2003	5
2002	35
2001	80
2000	110
1999	No data (No field trip due to hurricane)
1998	75
1997	125

(i) Plot a graph to represent the data shown in Table 3, using the grid provided on page 7. **(4 marks)**

(ii) Account for the trend in the frog population before and after the hurricane.

_____

_____

_____

(3 marks)

(iii) Suggest ONE reason why it is useful to study the distribution of frogs.

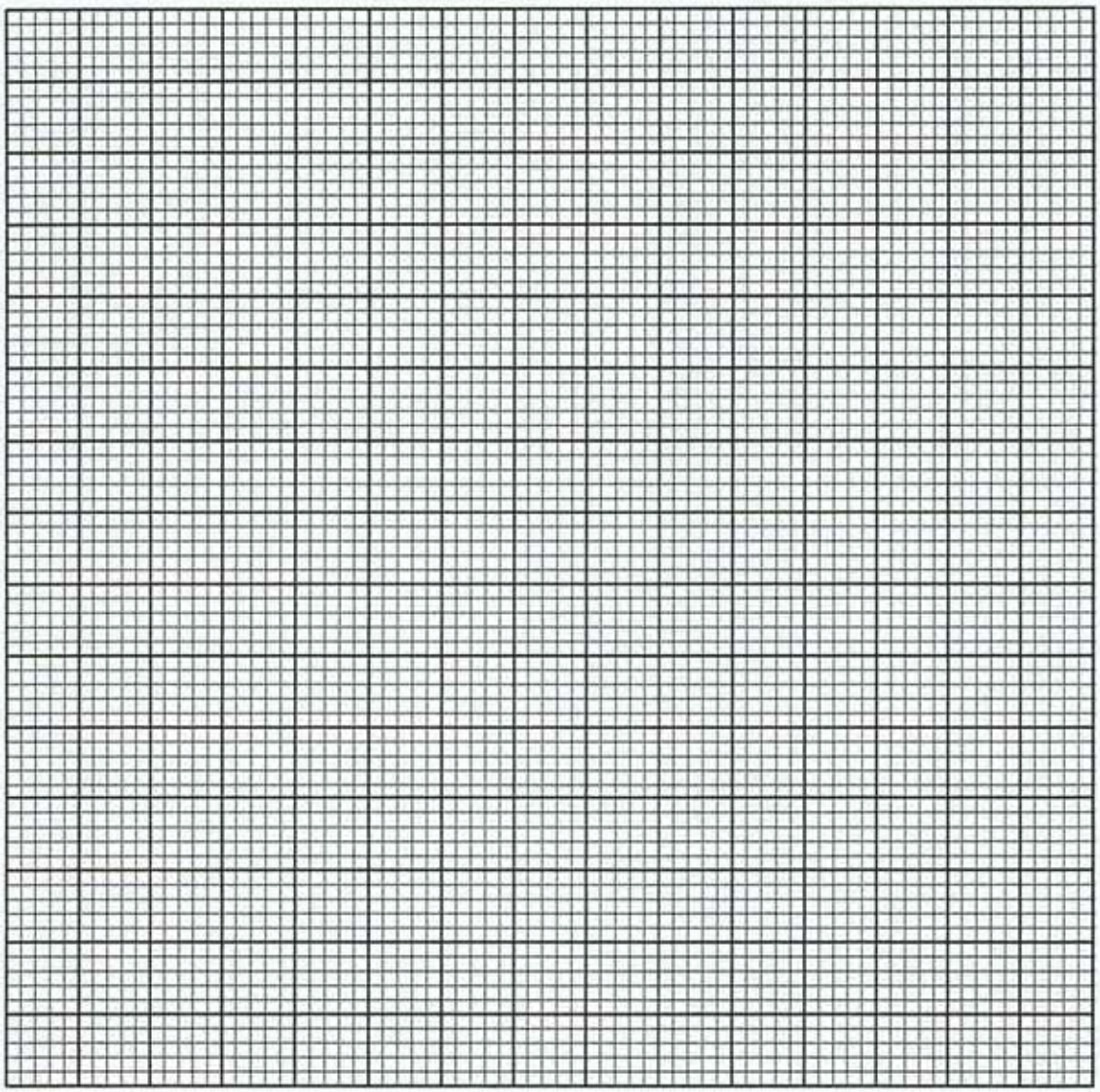
_____

_____

(2 marks)

Total 25 marks

Grid for Question 1. (d) (i)



2. (a) Figure 2 shows the structure of the human eye.

Label the parts numbered 1 to 6 on the diagram in Figure 2. **(6 marks)**

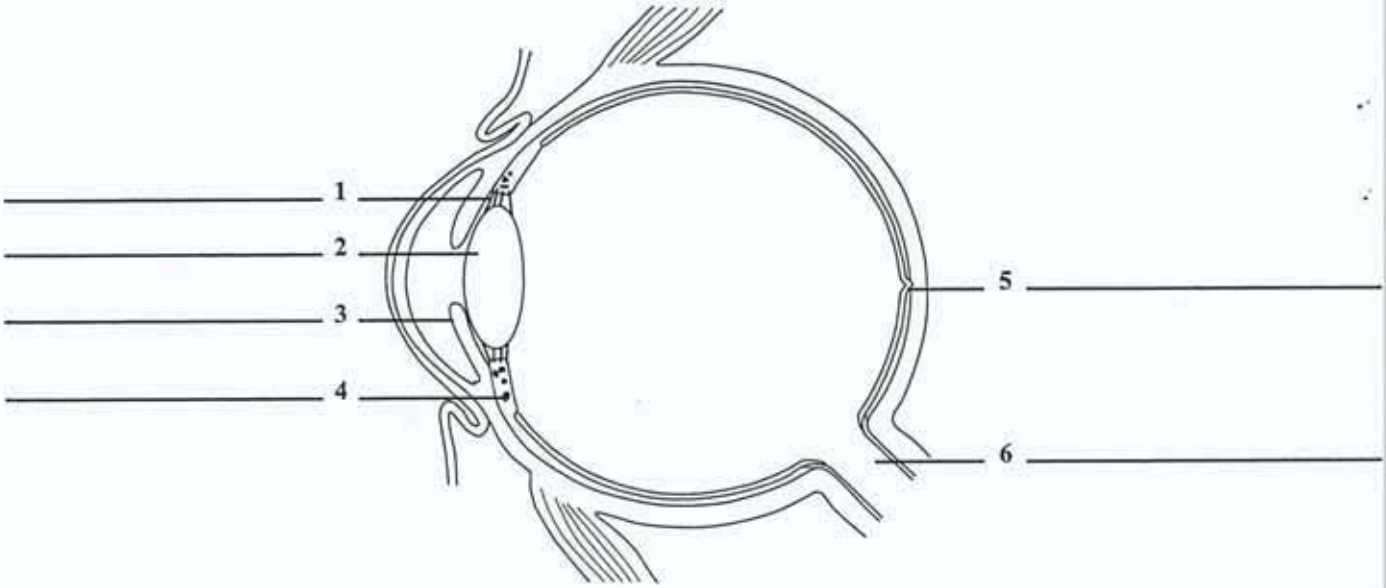


Figure 2. A section through the human eye

(b) The rods and cones are specialised cells of the retina which are stimulated by light. What biological term describes such cells?

_____

(1 mark)

(c) Severe lack of Vitamin A can result in the cornea of the eye becoming dry and thickened. Explain how this condition would affect a person's ability to see.

_____

_____

(2 marks)

(d) (i) Diagrams C and D in Figure 3 show two common eye defects, while Diagrams 7, 8 and 9 show three types of lenses that can be used to correct eye defects.

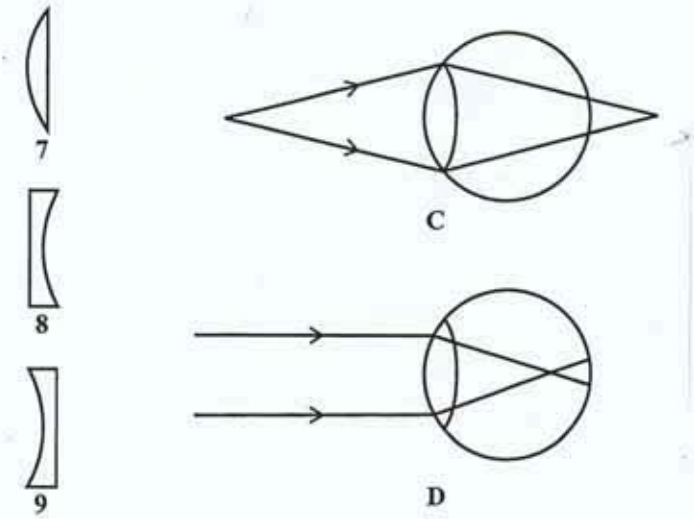


Figure 3. Common eye defects and corrective lenses

Identify the eye defects and the lenses in Figure 3 that can be used to correct the defects.

Diagram C Eye defect:

_____

Corrective lens:

_____

Diagram D Eye defect:

_____

Corrective lens:

_____

(4 marks)

(ii) Sometimes contact lenses are used to correct eye defects. Suggest TWO precautions one should take when using contact lenses.

_____

_____

(2 marks)

Total 15 marks

GO ON TO THE NEXT PAGE

3. Figure 4 shows the internal structure of a dicotyledonous leaf.

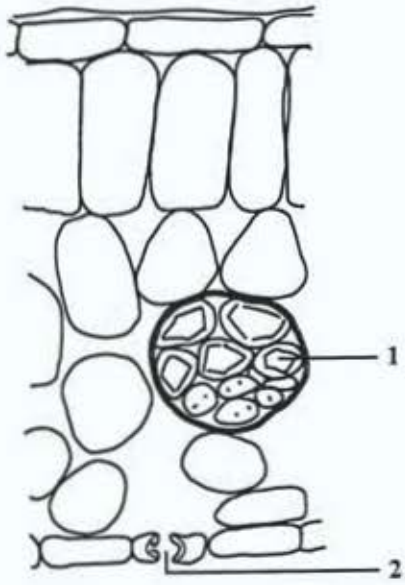


Figure 4. Internal structure of a dicotyledonous leaf

(a) Name ONE function for which the leaf in Figure 4 is suited and suggest how it is BEST suited for that function.

_____

_____

_____

(2 marks)

(b) (i) Using THREE arrows only, show on Figure 4 the path of water diffusing from the leaf. **(3 marks)**

(ii) Identify the structures labelled 1 and 2.

Structure 1: _____

Structure 2: _____

(2 marks)

(iii) Name ONE consequence to a herbaceous plant if there is temporary unavailability of water to replace the water lost from the leaves.

_____

(1 mark)

GO ON TO THE NEXT PAGE

(c) (i) Explain how water from the soil gets to the leaf in a plant.

(3 marks)

(ii) Explain how any ONE structural feature of plant cells helps in transport in plants.

(2 marks)

(d) Explain why all the water taken up by the roots of a plant is NOT lost by evaporation from the leaves.

(2 marks)

Total 15 marks

SECTION B

Answer ALL questions in this section.

Write your answer in the spaces provided at the end of EACH question in this booklet.

4. (a) (i) With the aid of a fully annotated diagram of the kidney (uriniferous) tubule, explain how urine is produced and gets to the bladder.

(ii) Suggest why urine production is important in humans. **(8 marks)**

(b) Members of a Boy Scouts troop were advised by their leader to take water with them on their hike into the mountains. One boy decided to drink a large quantity of water before leaving on the hike. Explain how his body functions to deal with the excess water. **(3 marks)**

(c) One lesson taught to the Boy Scouts troop on their hike was that the plants along the trail were adapted to conserve water. Suggest TWO reasons why the plants observed growing along the trail had mechanisms to reduce water loss. **(4 marks)**

GO ON TO THE NEXT PAGE

GO ON TO THE NEXT PAGE

Total 15 marks

5. (a) Using a diagram, illustrate how any THREE named processes are involved in the recycling of carbon in nature. **(6 marks)**

(b) (i) Sometimes human activity abnormally affects natural cycles. Suggest TWO ways in which human activity contributes to an abnormal rise in levels of atmospheric carbon dioxide.

(ii) Suggest ONE likely consequence of abnormally high carbon dioxide levels on ecosystems.

(iii) Suggest TWO ways in which carbon dioxide levels can be controlled. **(9 marks)**

GO ON TO THE NEXT PAGE

Total 15 marks

6. (a) (i) Draw a diagram to show the relative positions of the ovaries, uterus, oviduct and cervix of the human female reproductive system.

(ii) Annotate the diagram to identify the functions of the labelled parts.

(6 marks)

(b) (i) Two hormones associated with the reproductive cycle of the female are oestrogen and progesterone. What are TWO likely consequences of limited production of these hormones?

(ii) Women of reproductive age are generally advised not to smoke cigarettes. Identify TWO ways in which smoking is likely to harm the developing foetus.

(6 marks)

(c) Education on reproductive health in some schools now includes condom education.

(i) State ONE disadvantage of using condoms.

(ii) Suggest TWO reasons why choosing a birth control method can be a more difficult issue for the female partner in a marriage than the male. **(3 marks)**

GO ON TO THE NEXT PAGE

GO ON TO THE NEXT PAGE

Total 15 marks

END OF TEST

TEST CODE **01207020**

FORM TP 2010002

JANUARY 2010

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **This paper consists of SIX questions in two sections. Answer ALL questions.**
2. **For Section A, write your answers in the spaces provided in this booklet.**
3. **For Section B, write your answers in the space provided at the end of each question, in this booklet.**
4. **Where appropriate, answers should be illustrated by diagrams.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

SECTION A

Answer ALL questions.

Write your answers in the spaces provided.

DO NOT spend more than 30 minutes on Question 1.

1. A student wanted to test the following hypothesis: 'Housefly larvae (maggots) respond negatively to light'.

He used the apparatus shown in Figure 1 for his investigation.

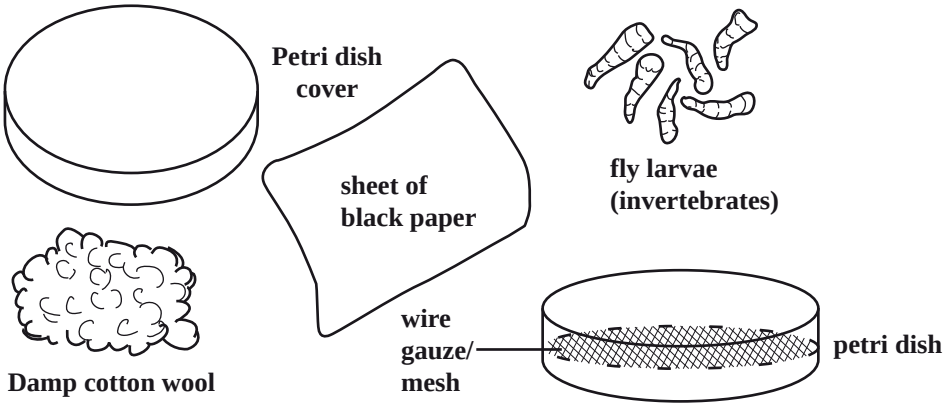


Figure 1. Apparatus to test hypothesis

(a) In the space provided, produce a diagram to show how the apparatus in Figure 1 could have been set up for this investigation.

(4 marks)

(b) The student recorded his results in Table 1.

TABLE 1. RESULTS OF CHOICE CHAMBER INVESTIGATION

Trial	Location of the 20 larvae	
	Dark side	Light side
1 2 3	11 15 14	9 5 6
Total		
Percentage		

(i) Complete Table 1 by calculating the total and percentage of larvae on the dark side and the light side of the petri dish. Write your answer in Table 1.

(2 marks)

(ii) Do the results of this investigation support the student's hypothesis? Give a reason for your answer.

_____

_____

_____

(2 marks)

(iii) Name TWO factors OTHER THAN light that could have influenced the larvae's response.

_____

_____

(2 marks)

(iv) Describe how the apparatus shown in (a) could be modified to investigate ONE of the factors named in (b) (iii).

_____

_____

_____

(2 marks)

(v) Explain how the response shown by the larvae in this experiment could help them to survive in their natural environment.

_____

_____

(2 marks)

(c) Plants also have mechanisms for responding to the environment.

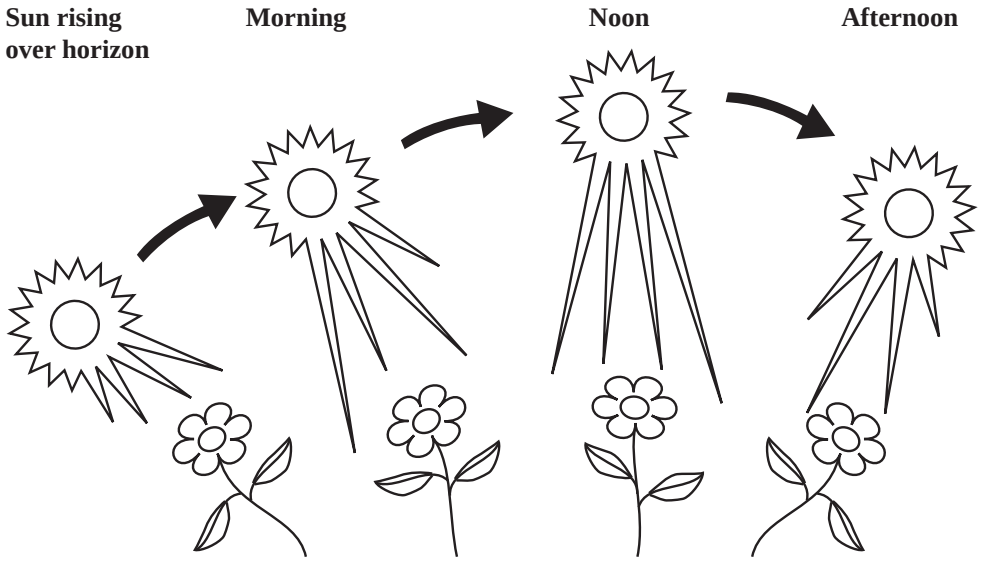


Figure 2. A plant's response to sunlight

(i) How does the response shown in Figure 2 benefit the plant?

_____

_____

(2 marks)

(ii) Describe an experiment to determine whether a leaf on a potted plant has been photosynthesizing.

_____

_____

_____

_____

(3 marks)

(iii) Name TWO conditions OTHER THAN light, that are necessary for photosynthesis.

_____

(2 marks)

GO ON TO THE NEXT PAGE

(d) The response to gravity shown by seedlings is due to uneven distribution of auxins. In experiments to demonstrate this response, the seedlings in the control are constantly rotated.

(i) Why is this an important step in the investigation?

_____

_____

(2 marks)

(ii) Explain why the response to gravity is essential for plant survival.

_____

_____

_____

(2 marks)

Total 25 marks

2. Figure 3 shows a cross-section through an alveolus.

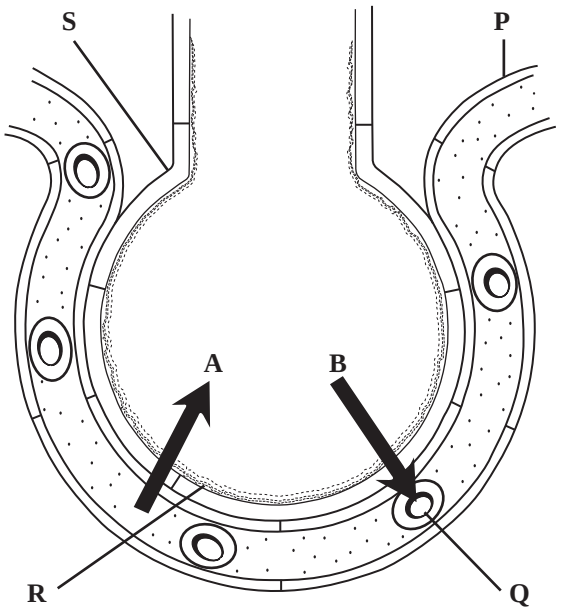


Figure 3. Cross-section through an alveolus

(a) (i) Name the structures labelled P, Q, R and S in Figure 3.

P: _____
_

Q: _____
_

R: _____
_

S: _____

(4 marks)

(ii) Identify the gases indicated by the arrows, A and B, in Figure 3.

A: _____

B: _____

(2 marks)

(b) (i) Name the process by which gases move in the directions shown by the arrows.

_____

(1 mark)

(ii) Identify ONE feature illustrated in the diagram which shows that the alveolus is suitable for gaseous exchange.

_____

(1 mark)

(c) What is the role of breathing in the movement of the gases illustrated in Figure 3?

_____

_____

_____

(2 marks)

(d) A person who is exercising vigorously breathes more deeply and rapidly than someone who is resting. Give TWO reasons why this is necessary.

_____

_____

_____

(2 marks)

(e) Explain how cigarette smoking can reduce the efficiency of the lungs.

_____

_____

_____

(3 marks)

Total 15 marks

3. Figure 4 shows the longitudinal sections through a seed and a fruit.

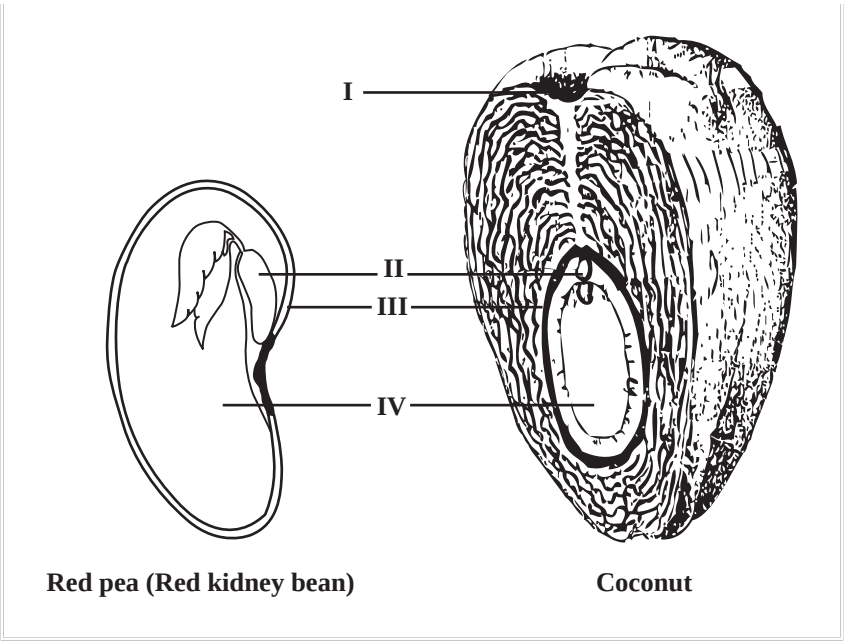


Figure 4. Longitudinal sections through a seed and a fruit

(a) (i) Identify the structures labelled I to IV in Figure 4.

I: _____

II: _____

III: _____

IV : _____

(4 marks)

(ii) What is the function of the structure labelled IV?

_____

(1 mark)

(b) (i) Name ONE method of dispersal for EACH of the following:

Red pea (Red kidney bean) _____

Coconut _____

(2 marks)

(ii) Suggest TWO features of the coconut shown in Figure 4 that are important in its dispersal.

_____

_____

(2 marks)

(iii) Suggest why coconut trees are usually found along the coastlines of islands while red pea plants are found inland.

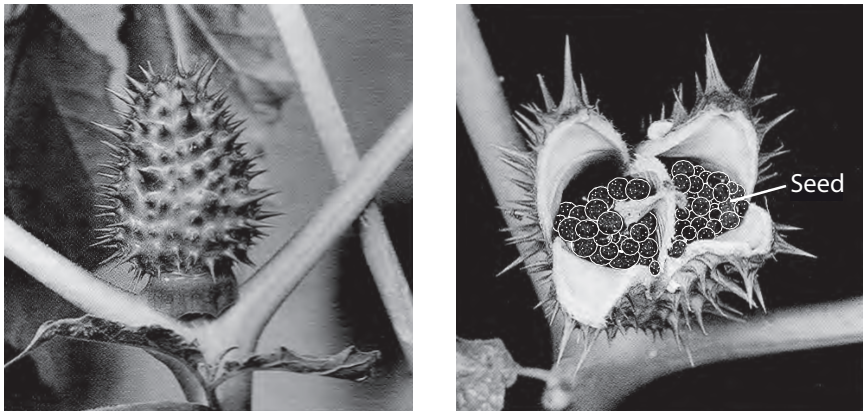
_____

_____

_____

(3 marks)

(c) Figure 5 shows the thorn apple fruit in two stages, green and dry.



Green thorn apple fruit **Dried thorn apple fruit**

Figure 5. Illustrations of thorn apple fruit

(i) Identify the method of dispersal of the thorn apple fruit shown in Figure 5.

_____

(1 mark)

(ii) Suggest why thorn apple plants are usually found growing in clusters around the parent plant.

_____

_____

(2 marks)

Total 15 marks

GO ON TO THE NEXT PAGE

SECTION B

Answer ALL questions in this section.

Write your answers in the spaces provided at the end of each question.

4. (a) Describe the process by which carbon dioxide and water are made into carbohydrates by green plants. **(4 marks)**

(b) In a large tree most structures are NOT green. Explain how such structures get the food materials they need to survive. **(2 marks)**

(c) Suggest THREE factors or conditions which determine whether plants store either very little or very much of the food they make. **(3 marks)**

(d) Outline THREE reasons for leaving 'green spaces', such as parks and woodlands, within crowded cities, even when there may be a shortage of land for housing and industrial development. **(6 marks)**

Total 15 marks

5. (a) (i) Draw a simple diagram in the box below to show the relative positions of the following organs of the human digestive system:

- Mouth/oesophagus
- Stomach
- Liver
- Pancreas
- Small intestine

(ii) Annotate the diagram to show the functions of any FOUR of the organs.

(iii) The alimentary canal in humans is designed for a varied diet, yet some people choose to become vegetarians. Suggest how vegetarians can make up for any limitations associated with their diet. **(9 marks)**

(b) Certain organs associated with digestion, for example, the pancreas, also have endocrine functions. How would removal of the pancreas affect its endocrine function? **(4 marks)**

(c) Although plants make their own food, they may suffer from deficiency diseases. Explain how deficiency diseases are likely to arise in plants. **(2 marks)**

Total 15 marks

6. (a) Using annotated diagrams, compare the structure of an unspecialized plant cell with that of an unspecialized animal cell. **(6 marks)**

(b) Nerve cells become specialized to carry out their function. Suggest THREE features of a nerve cell which enable it to carry out its function effectively. **(3 marks)**

(c) Cell specialization is one mechanism that allows an organism to carry out its functions efficiently. Another mechanism that allows an organism to function effectively is the adaptation to its habitat.

(i) Identify TWO physical factors which animals encounter (face) in an aquatic habitat, such as a freshwater pond.

(ii) Suggest TWO adaptations that animals in a freshwater pond might have. Explain how EACH adaptation is useful to the animal. **(6 marks)**

Total 15 marks

Space for diagrams

END OF TEST

TEST CODE **01207032**

FORM TP 2010003

JANUARY 2010

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 03/2 – Alternative to SBA

General Proficiency

2 hours

In addition to the 2 hours, candidates are allowed 10 minutes in order to read through the entire paper. Writing may begin during the 10-minute period.

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. **Answer ALL questions.**

2. **Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

1. In an investigation carried out by a group of Biology students on the school's playing field, the estimated numbers of various organisms were determined as shown in Table 1.

TABLE 1: ESTIMATES OF NUMBER OF ORGANISMS FOUND IN THE SCHOOL'S PLAYING FIELD

Organism	**Number**	**Organism**	**Number**
Earthworm	300	Grass	(Numerous)
Snail	90	Unknown flowering shrub	16
Slug	105	Iguana	7
Millipede	120	Grasshopper	90
Lizard	10	Mango tree	1
Butterfly	24	Kiskeedee (bird)	10
Ant	500	Toad	15
Humming bird	20	Leaf litter	(large amounts)

(a) Identify the THREE methods that were most likely used in the investigation to collect the data shown in Table 1.

_____

_____

(3 marks)

(b) Explain how any TWO methods you identified at (a) were likely used in collecting the information.

_____

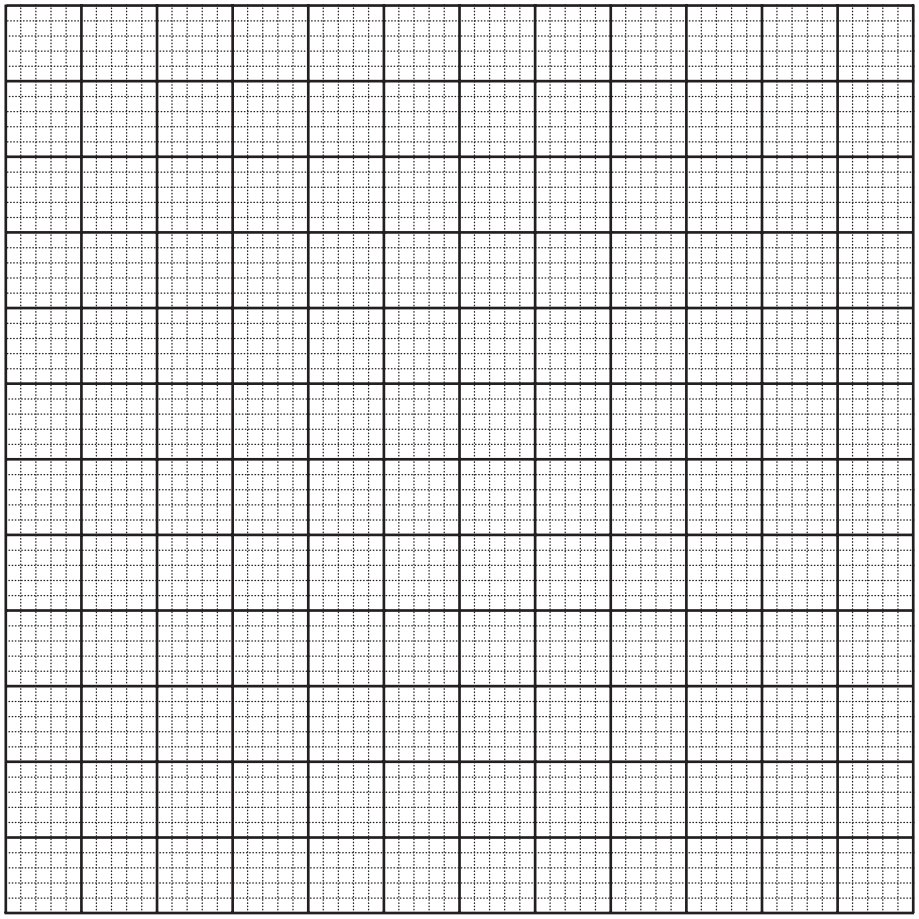
_____

_____

_____

(4 marks)

(c) On the grid on page 3, construct a bar chart to show the relative population sizes of the following organisms found in the playing field: earthworm, snail, slug, millipede, iguana, kiskeedee. **(6 marks)**



(d) Which of the organisms listed at (c) are likely to be at the same trophic level? Explain your answer.

_____

_____

(3 marks)

(e) Explain why a pyramid of numbers may NOT be adequate to show the feeding relationships between the tree and the organisms it supports.

_____

_____

(2 marks)

Total 18 marks

2. A student set up the experiment as shown in Figure 1 to investigate movement of water in plant tissue.

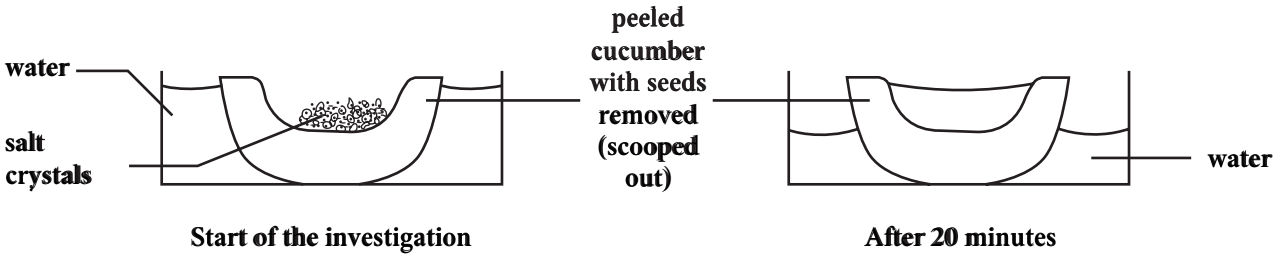


Figure 1. Apparatus set up for an investigation

(a) (i) State an aim for the investigation illustrated in Figure 1.

_____

_____

(2 marks)

(ii) Explain the results of the investigation after 20 minutes, as shown in Figure 1.

_____

_____

_____

_____

(3 marks)

(iii) Identify TWO precautions that should be taken in carrying out the investigation.

_____

_____

(2 marks)

(iv) Describe how you would set up a control for the investigation.

_____

_____

_____

(2 marks)

(v) How would the control confirm the results of the investigation?

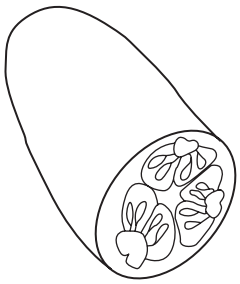
_____

_____

_____

(2 marks)

(b) You are provided with a diagram of half a cucumber similar to that used in the investigation in (a) of this question.



In the space provided below make a drawing of the cucumber as it would be seen in cross section.

(6 marks)

(c) In an investigation to show the amount of water taken up by a plant the following apparatus and materials were used, as illustrated in Figure 2.

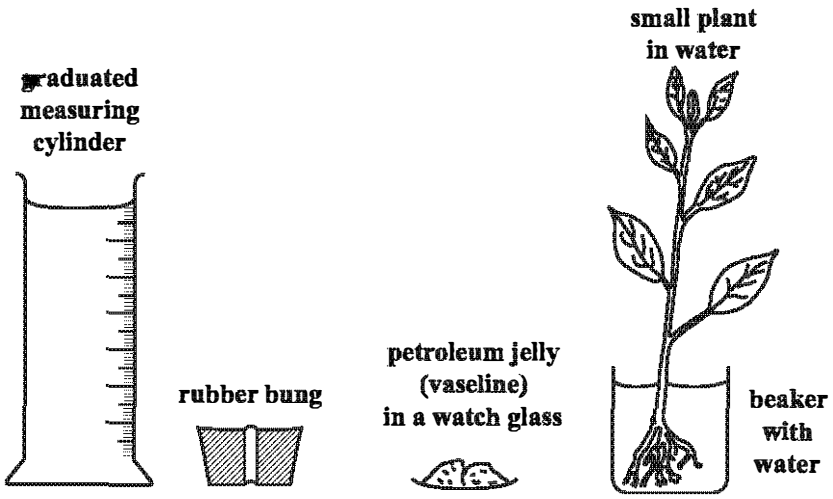


Figure 2. Apparatus and materials used to show water uptake in a plant

(i) In the space provided below assemble the apparatus and materials to show how the investigation was set up.

(4 marks)

(ii) During the investigation, changes in the water level in the graduated measuring cylinder were recorded at 2-hour intervals over a 24-hour period. Construct a table that can be used to record this information.

(4 marks)

Total 25 marks

3. Table 2 shows some data for the incidence of AIDS in the Caribbean.

TABLE 2: NUMBER OF REPORTED AIDS CASES IN CERTAIN CARIBBEAN COUNTRIES BETWEEN 1982 AND 2000

Year	Number of females	Number of males	Total number of cases reported
1982	0	0	0
1984	0	5	5
1986	0	200	200
1988	26	494	520
1990	75	675	750
1992	150	850	1000
1994	260	1040	1300
1996	425	1275	1700
1998	660	1540	2200
2000	890	1810	2700

(a) (i) On the grid below, plot a graph of the data given in Table 2. **(6 marks)**

(ii) From the information provided in the table and graph draw ONE conclusion about the incidence of AIDS in Caribbean populations during the period 1982 to 2000.

_____

_____

_____

(3 marks)

(b) Table 3 gives the methods of transmission in reported AIDS cases in Caribbean countries during the 1982 to 2000 period.

TABLE 3: METHODS OF TRANSMISSION IN REPORTED AIDS CASES DURING THE PERIOD 1982 TO 2000

Transmission Methods	Percentage Population (%)
Birth	6
Blood transfusion	0.3
Intravenous devices	1.5
Unknown	17
Sexual intercourse (homosexual)	11
Sexual intercourse (heterosexual)	64
Other	0.2

(i) In the space provided below, construct a pie chart to illustrate the data in Table 3. **(6 marks)**

(ii) Suggest ONE social implication of the data presented in Table 3 and the pie chart.

_____

_____

(2 marks)

Total 17 marks

END OF TEST

TEST CODE **01207020**

FORM TP 2010040

MAY/JUNE 2010

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 1/2 hours

READ THE FOLLOWING DIRECTIONS CAREFULLY.

1. **This paper consists of SIX questions in two sections. Answer ALL questions.**
2. **For Section A, write your answers in the spaces provided in this booklet.**
3. **For Section B, write your answers in the spaces provided at the end of each question, in this booklet.**
4. **Where appropriate, answers should be illustrated by diagrams.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Answer ALL questions.

Do NOT spend more than 30 minutes on Question 1.

1. In an experiment on the plant species illustrated in Figure 1, the part identified as X was tested in several plants after they had grown in three different light intensities.

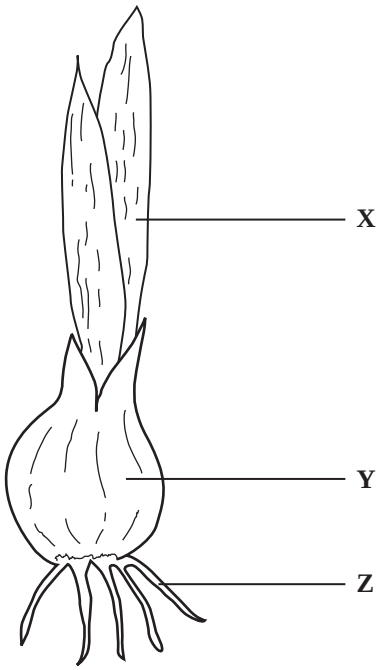


Figure 1. A plant species

(a) Sets of three plants for each light intensity were tested for the following: starch, reducing sugar, protein, oil.

(i) In the space provided below construct a table to show how the data from the experiment might be collected.

(5 marks)

(ii) Explain why a sample of three plants was used for each test.

_____

_____

_____

(2 marks)

(b) In the space provided below, draw a labelled diagram of the apparatus that can be used in an experiment to illustrate that Part Z will take in water for use by Part Y (in Figure 1 on page 2).

(4 marks)

(c) One function of the plant part shown at Y is storage. Identify ONE organ in the human body that serves the same function.

_____

_____

(1 mark)

(d) Humans also carry out other functions similar to that shown by the plant species represented at Figure 1, for example, respiration. In investigating respiration in a human being and a plant, explain how you would demonstrate that the process carried out by both organisms is the same.

_____

_____

_____

(3 marks)

(e) Figure 2 represents the flower of the plant species shown in Figure 1.

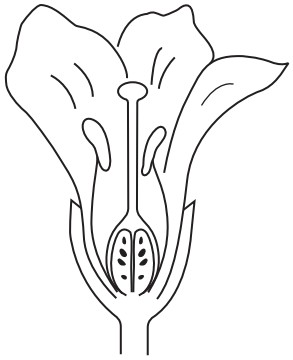


Figure 2. Longitudinal section through the flower of the plant species

(i) On the diagram in Figure 2, label the following parts using the symbols indicated:

- **P** for the place where pollen is produced
- **O** for the place that houses the ovum
- **S** where pollen is deposited **(3 marks)**

(ii) Suggest how this flower might be pollinated. Explain your answer.

_____

_____

(3 marks)

(f) Some plant storage organs give rise to offspring. Suggest TWO advantages to the plant of having both flowers, and a storage organ that gives rise to offspring.

_____

_____

_____

_____

(4 marks)

Total 25 marks

2. In an experiment on germinating seedlings, a group of Biology students made the drawings shown in Figure 3 to illustrate the changes over a five-day period.

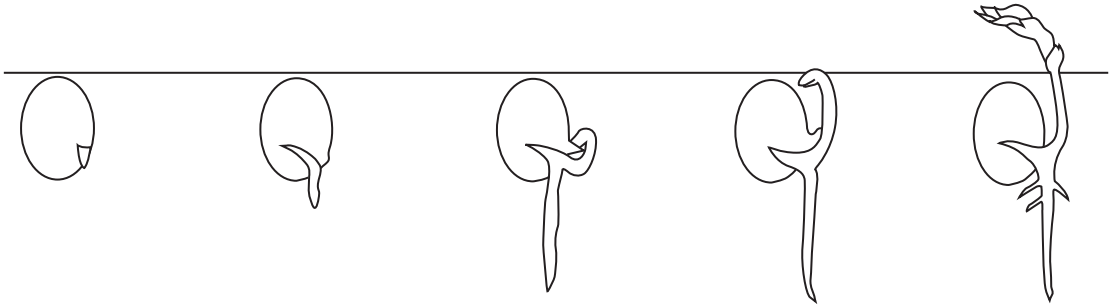


Figure 3. Stages in a germinating seedling

(a) Label on the drawing in Figure 3, THREE parts of the seedling shown on Day 5.

(3 marks)

(b) Outline the changes that took place in the seed to allow the development shown in Figure 3.

_____

_____

_____

_____

(3 marks)

(c) (i) The development shown by the seedling is a type of 'movement'. What is the name given to this type of movement?

_____

(1 mark)

(ii) State TWO ways in which the movement shown by the seedling differs from that of an earthworm moving through its burrow.

_____

_____

_____

_____

(4 marks)

(d) (i) Identify TWO physical factors that can cause an earthworm to move deeper into its burrow.

_____

_____

(2 marks)

(ii) Explain why moving deeper into its burrow is important to the earthworm.

_____

_____

(2 marks)

Total 15 marks

3. Figure 4 shows a terrestrial food web.

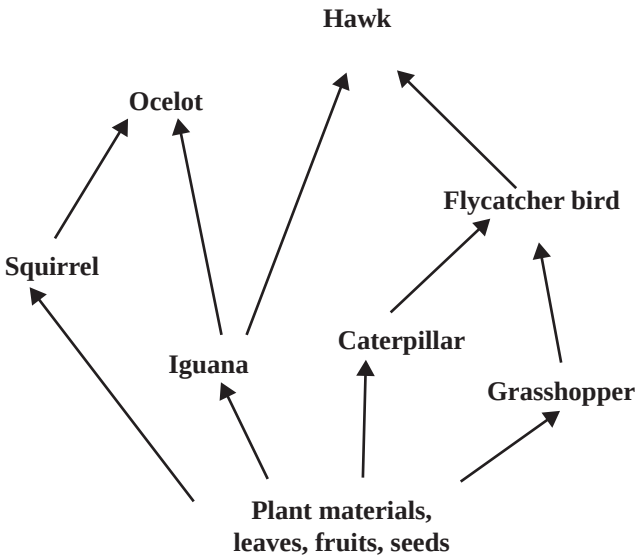


Figure 4. Terrestrial food web

(a) Identify, from the food web shown in Figure 4, a food chain with FOUR trophic levels. Draw the food chain in the space provided below.

(5 marks)

(b) (i) Identify, from the food web in Figure 4, ONE predator and ONE organism which is likely to be its prey.

_____

(2 marks)

(ii) Identify TWO characteristics that will differentiate the predator population from that of the prey.

_____

_____

(4 marks)

(c) (i) Apart from predator/prey, identify ONE other relationship that may exist in a food web, and provide an example.

_____

_____

(2 marks)

(ii) Give ONE advantage of having special relationships among organisms in a food web.

_____

_____

(2 marks)

Total 15 marks

SECTION B

Answer ALL questions.

Write your answers in the spaces provided at the end of each question.

4. (a) (i) Identify, with the aid of diagrams, the main stages in the life history of a **named** insect vector of disease.

(ii) Explain how EACH stage in the life history of the insect you identified at (a)(i) might be controlled to keep the vector population in check. **(9 marks)**

(b) (i) Some sexually transmitted infections are caused by viruses and have been found to be without cure. Explain why viral infections are usually very difficult, if not impossible, to cure.

(ii) Apart from the nature of the AIDS virus, what OTHER factors make the control of this disease very difficult? **(6 marks)**

Total 15 marks

Space for diagrams

5. (a) (i) How is it possible for plants that have identical genetic make-up to show differences?

(ii) Suggest why it is sometimes necessary to breed plants with the same genetic make-up.

(iii) Give ONE disadvantage of breeding an identical population of organisms.
(5 marks)

(b) When breeding programmes are deliberately used to control the characteristics of a population of organisms, the process is called artificial selection.

Explain how this process is different from natural selection. **(4 marks)**

(c) (i) Genetic engineering is a modern biological technology that has been used to change the characteristics of certain organisms.
How does genetic engineering differ from artificial selection?

(ii) Suggest TWO concerns people might have about using genetic engineering to alter characteristics of organisms. **(6 marks)**

Total 15 marks

6. (a) (i) With the aid of a diagram, explain how the hind limb in humans allows for movement from one place to another.

(ii) Give THREE advantages to humans of their ability to move from one place to another. **(9 marks)**

(b) Flowering plants are usually anchored to one spot but both their gametes and seeds need to be distributed or dispersed from one place to another.

(i) Identify TWO means by which seeds are dispersed.

(ii) Explain how any TWO characteristics of a seed may be adapted for dispersal. **(6 marks)**

Total 15 marks

Space for diagram

END OF TEST

TEST CODE **01207032**

FORM TP 2010041

MAY/JUNE 2010

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 03/2 – Alternative to SBA

General Proficiency

2 hours

In addition to the 2 hours, candidates are allowed 10 minutes in order to read through the entire paper. Writing may begin during the 10-minute period.

READ THE FOLLOWING DIRECTIONS CAREFULLY.

1. **Answer ALL questions.**
2. **Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Answer ALL questions.

1. The apparatus shown in Figure 1 is used to demonstrate that carbon dioxide is given off during aerobic respiration.

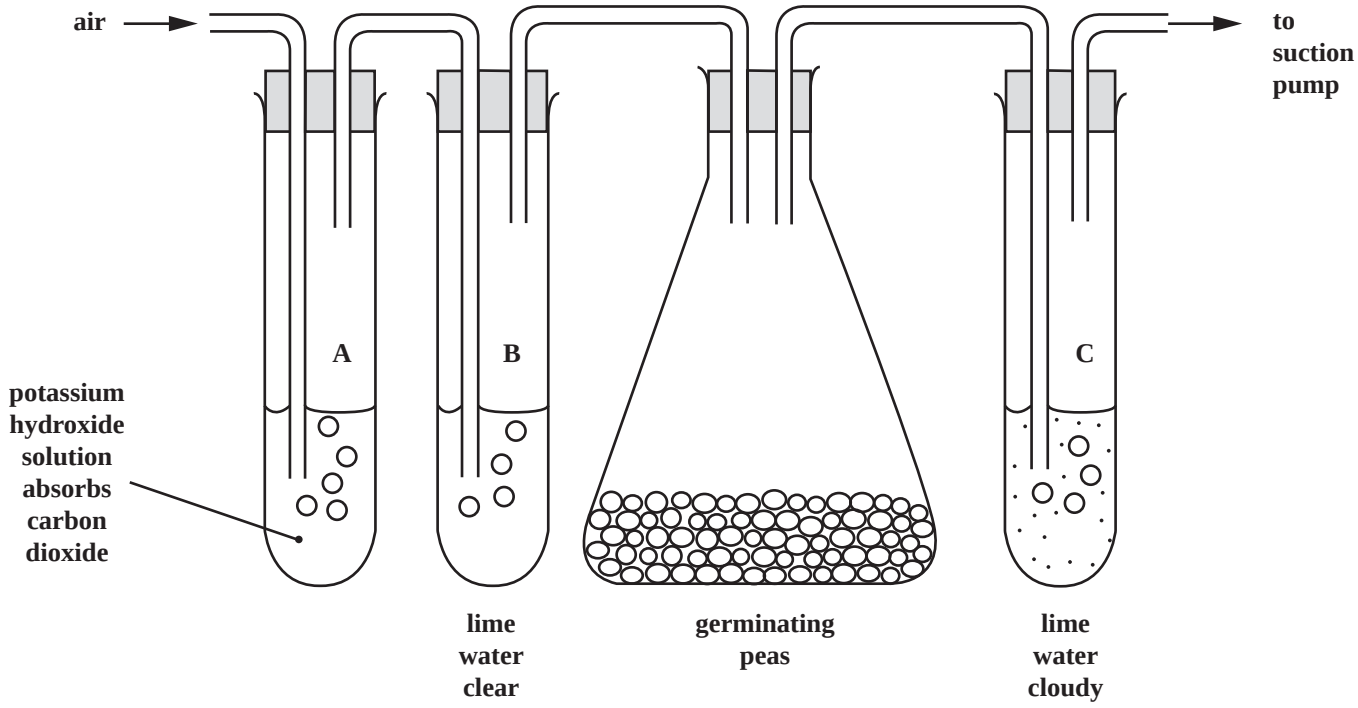


Figure 1. Apparatus used to show that germinating seeds release carbon dioxide during respiration

(a) What is the function of the air in Figure 1?

_____

(1 mark)

(b) Why is air first passed through a solution which absorbs carbon dioxide?

_____

(1 mark)

(c) (i) What causes the lime water in C to become cloudy?

_____

(1 mark)

(ii) Why does the change in lime water occur only in C?

_____

_____

(2marks)

(d) Carbon dioxide is not the only product of aerobic respiration. Heat is also given off. Design an experiment to show that heat is given off by germinating seeds. Write the apparatus and method for the experiment.

Apparatus:

_____

_____

Method:

_____

_____

_____

_____

(6 marks)

(e) The data presented in Table 1 shows the breathing rate of athletes after heavy and light exercise.

TABLE 1: RATE OF BREATHING AFTER EXERCISE

Number of minutes after exercise	Breaths per minute	
	After heavy exercise	After light exercise
1	30	12
2	20	10
3	15	8
4	10	8
5	8	8

(i) On the grid provided on page 4, draw graphs of the data shown in Table 1.

(8 marks)

(ii) Explain the difference in shape of the graphs that you have drawn on page 4.

_____

_____

_____

_____

(2 marks)

Total 21 marks

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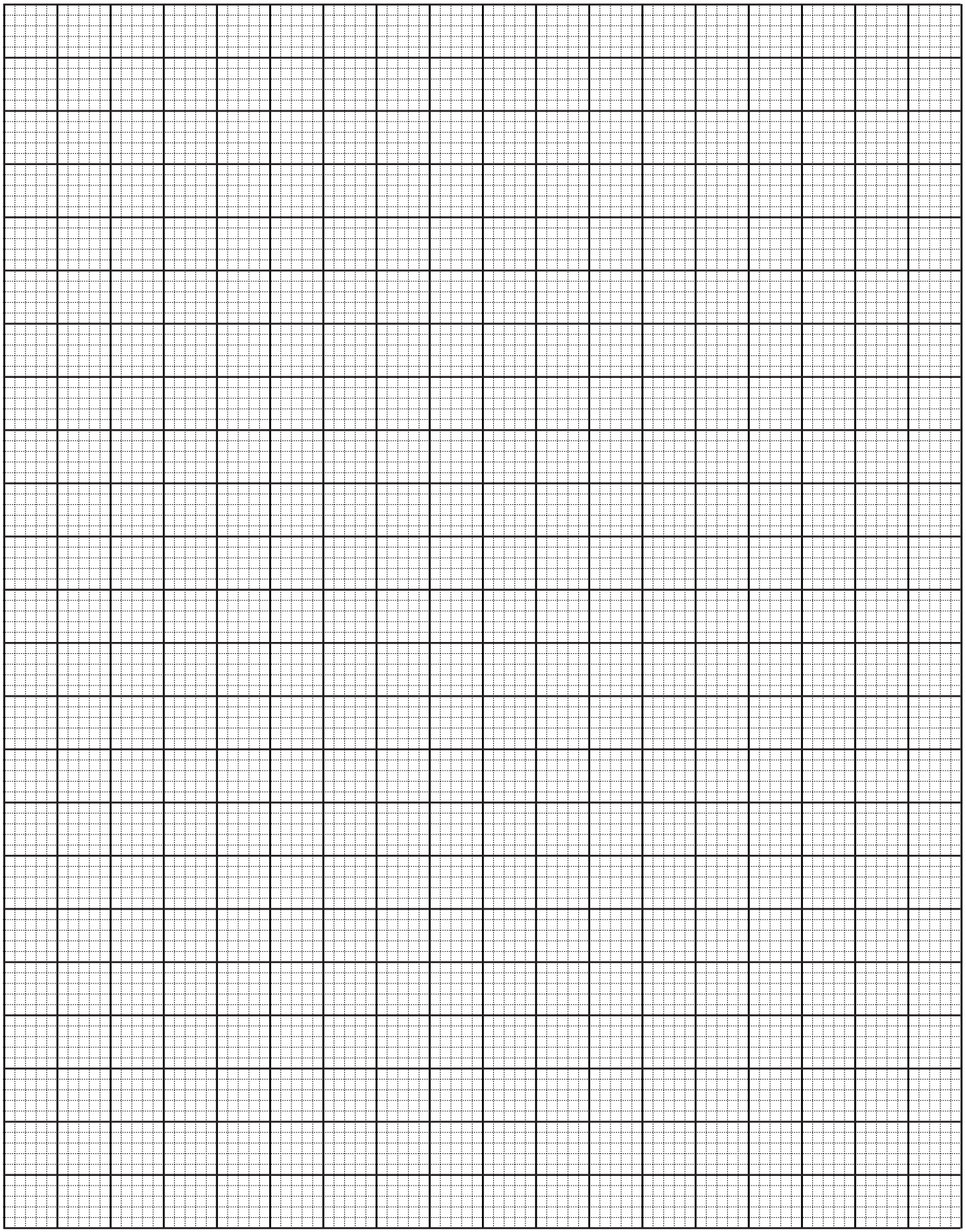


2. Students investigated transpiration in a well-watered plant. Their hypothesis was that the amount of water lost from a plant changes during the day.

(a) Suggest a suitable aim for the experiment carried out by the students.

_____

_____

(2 marks)

(b) The experiment was conducted in an enclosed room. They weighed the plant at two-hour intervals and the results they obtained were plotted on the graph represented in Figure 2 below. They forgot to weigh the plant at 12 noon.

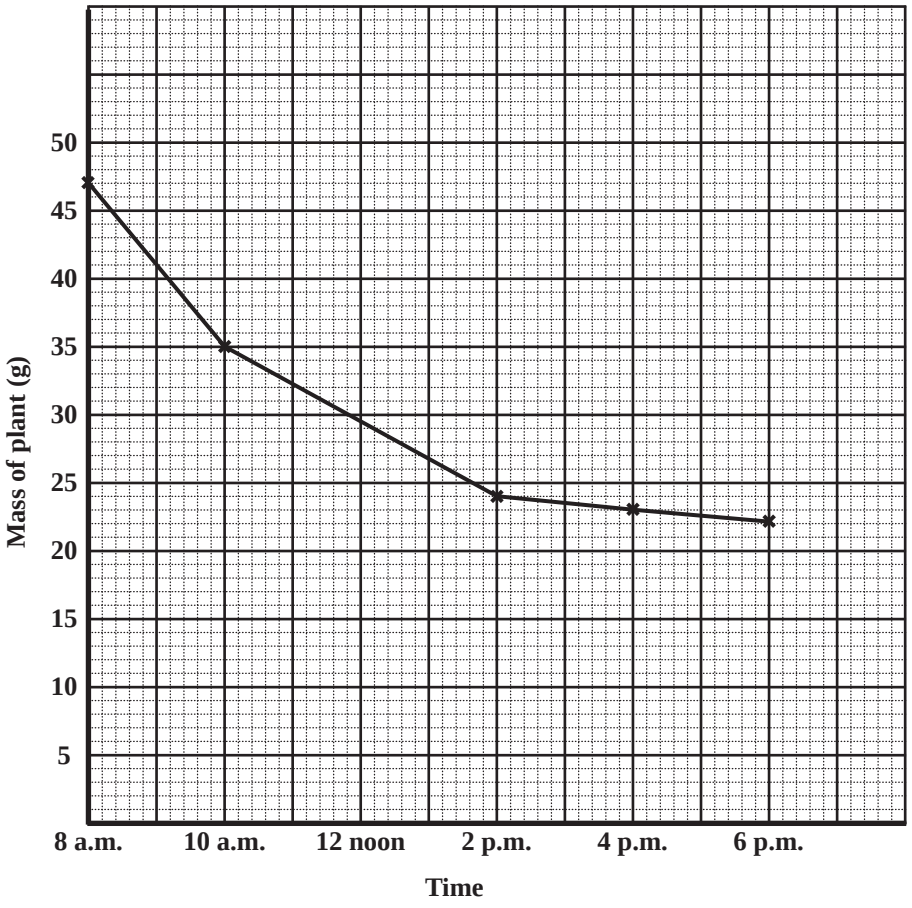


Figure 2. Graph showing mass of a plant between 8:00 a.m. and 6:00 p.m.

(i) Give an explanation for the shape of the graph in Figure 2 between

8:00 a.m. and 10:00 a.m.

_____

_____

2:00 p.m. and 4:00 p.m.

_____

_____

(4 marks)

(ii) From the graph in Figure 2 on page 5, estimate the weight of the plant at 12 noon.

_____

(1 mark)

(c) Construct a table in the space provided to represent the results shown in Figure 2.

(6 marks)

(d) Describe how the apparatus and materials are likely to be set up and used to obtain the results shown in Figure 2 on page 5.

Apparatus and Materials:

_____

Method:

_____

_____

_____

_____

(5 marks)

Total 18 marks

3. Figure 3 shows how a specimen of a fruit was cut in order to examine its internal structure.

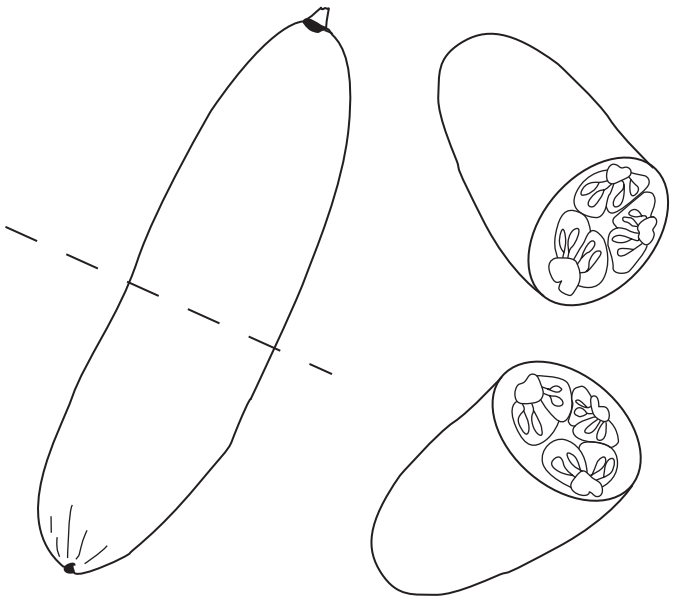


Figure 3. Drawings of a fruit specimen showing preparation for internal examination

(a) Give TWO characteristics of the drawings in Figure 3 that indicate the specimen is a fruit.

_____

_____

(2 marks)

(b) In the space provided below make a labelled drawing of a cross-section of the fruit to show its internal structure.

(7 marks)

(c) The fruit was seen to be eaten by a kiskedee bird, and one biology student made the observation that the seeds of this fruit were dispersed by animals.

(i) State ONE hypothesis that can be made from that observation.

_____

_____

(2 marks)

(ii) State ONE aim for an investigation that can be conducted to test the hypothesis in (i) above.

_____

_____

(2 marks)

(iii) Describe a suitable method to investigate the aim you stated in (ii) on page 8.

Method:

_____

_____

_____

_____

(4 marks)

(d) (i) Apart from eating fruits the kiskedee bird is sometimes seen to catch insects. Give ONE biological term to describe the kiskedee bird based on its feeding habits.

_____

(1 mark)

(ii) Explain why feeding on both plant and animal material is advantageous to the bird.

_____

_____

(3 marks)

Total 21 marks

END OF TEST

FORM TP 2011002

TEST CODE **01207020**

JANUARY 2011

C A R I B B E A N E X A M I N A T I O N S C O U N C I L

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING DIRECTIONS CAREFULLY.

1. **This paper consists of SIX questions in two sections. Answer ALL questions.**
2. **Write your answers in the spaces provided in this booklet.**
3. **Where appropriate, answers should be illustrated by diagrams.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

SECTION A

Answer ALL questions.

Do NOT spend more than 30 minutes on Question 1.

1. Many plants store excess food.

(a) (i) Identify TWO parts of a flowering plant where food is stored.

_____

(2 marks)

(ii) Name TWO food nutrients in plant storage organs that humans use as food.

_____

_____

(2 marks)

(b) Some biology students carried out a series of food tests on a plant storage organ, and recorded their observations in a table similar to that shown in Table 1.

(i) Complete Table 1 by describing the method and conclusion for EACH food test the students carried out.

TABLE 1: FOOD TESTS ON A PLANT STORAGE ORGAN

Food Test	Observation	Conclusion
1.	Blue - Green - Yellow - Red	
2.	Blue to lilac/purple	
3.	Yellow brown - dark blue - black	

(9 marks)

GO ON TO THE NEXT PAGE

(ii) Explain why the storage organ tested in (b) (i) should be included in the diet of a teenage boy.

_____

_____

_____

_____

_____

_____

(4 marks)

(iii) A boy fed ONLY on the storage organ tested in (b) (i) was found to be malnourished. Explain how this is possible.

_____

_____

_____

_____

(3 marks)

(c) No test for fats was conducted on the storage organ in (b) (i). Describe TWO tests for fats.

_____

_____

_____

_____

_____

_____

(3 marks)

(d) Food is also stored in animals. Identify TWO areas in the human body where food is stored.

_____

_____

(2 marks)

Total 25 marks

GO ON TO THE NEXT PAGE

2. (a) (i) Complete Table 2 to show the differences between plant and animal cells.

TABLE 2: COMPONENTS OF PLANT AND ANIMAL CELLS

Cell Component	Plant cell	Animal cell
Cell membranes	Present	Present
Cell walls		
Nuclei	Present	Present
Mitochondria		
Chloroplasts		Absent

(5 marks)

(ii) State ONE function of EACH of the following organelles:

Mitochondrion

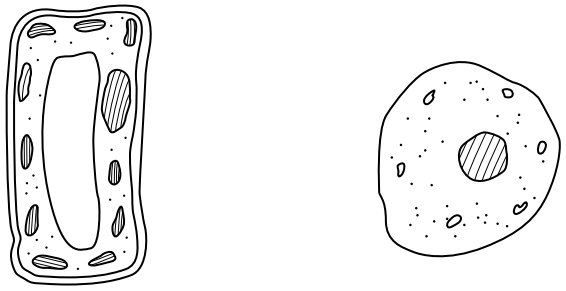
_____

Chloroplast

_____

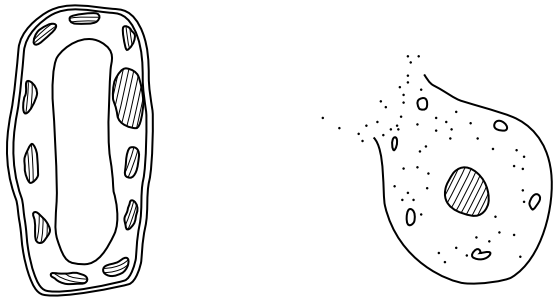
(2 marks)

(b) In an investigation on plant cells and animal cells the changes shown in Figure 1 are observed.



Plant cell **Animal cell**

Cells at the start of the investigation



Plant cell **Animal cell**

Cells after one hour

Figure 1. Cells in the investigation

(i) Name the process that causes the change in the appearance of both cells.

_____

(1 mark)

(ii) Explain why the process named in (b) (i) above is important to **plant cells**.

_____

_____

_____

(2 marks)

GO ON TO THE NEXT PAGE

(iii) The plant cell becomes turgid after one hour. Suggest why cell turgidity is useful to the plant.

_____

(1 mark)

(iv) Why does the animal cell burst but the plant cell does not?

_____

_____

_____

_____

(4 marks)

Total 15 marks

3. Some ecology students sampled the organisms found on one Poui tree at the edge of a rainforest. Table 3 gives information on these organisms.

TABLE 3: ORGANISMS FOUND ON A POUI TREE

Organism	Total Number	Food/Prey
Ant	200	Leaves
Spider	30	Termites, caterpillars, butterflies
Bluejay (bird)	15	Caterpillars, spiders
Termite	150	Tree bark
Caterpillar	125	Tree leaves
Hawk	2	Bluejay/(bird), woodpecker
Butterfly	150	Tree flowers
Woodpecker	13	Butterflies, caterpillars

(a) From Table 3, identify organisms at EACH trophic level shown in Table 4. Write your answer in the spaces provided in Table 4.

TABLE 4: TROPHIC LEVEL OF ORGANISMS ON POUI TREE

Trophic Levels	Examples of Organisms
Tertiary Consumer	1. _____
Secondary Consumers	1. _____ 2. _____
Primary Consumers	1. _____ 2. _____
Producers	Poui Tree

(5 marks)

GO ON TO THE NEXT PAGE

(b) One group of organisms not accounted for in the students' data was the decomposers.

(i) Give TWO examples of decomposers.

_____

(2 marks)

(ii) Why are decomposers important to organisms in a food web?

_____

_____

_____

(3 marks)

(c) Identify TWO factors or activities, OTHER THAN feeding, that are necessary for the survival of organisms in an ecosystem.

_____

_____

(2 marks)

(d) The size of a population of organisms may change from time to time. Name THREE physical factors that affect the size of populations in an ecosystem.

_____

_____

_____

(3 marks)

Total 15 marks

SECTION B

Answer ALL questions in this section.

Write your answers in the spaces provided at the end of EACH question in this booklet.

4. (a) (i) Using a diagram to illustrate the circulatory system, describe how oxygenated blood from the lungs is distributed to organs and tissues.

(ii) Explain how oxygen becomes available to a muscle tissue for respiration. **(7 marks)**

(b) During intense exercise, there is an insufficient supply of oxygen to muscles for aerobic respiration.

(i) Give TWO characteristics of aerobic respiration.

(ii) In the absence of sufficient oxygen, anaerobic respiration occurs. Suggest ONE disadvantage of **anaerobic** respiration. **(4 marks)**

(c) Transport vessels in plants have features that are similar to transport vessels in animals. Describe TWO ways in which xylem tissues are similar to blood vessels. **(4 marks)**

Total 15 marks

Space for diagram.

GO ON TO THE NEXT PAGE

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5. (a) Identify ONE communicable disease and the pathogen that causes the disease.
(2 marks)

(b) The spread of communicable diseases that affect humans declined significantly when artificial immunization through the use of vaccines was introduced.

(i) Describe how a vaccine works in building immunity.

(ii) Suggest why vaccines may NOT always have the desired effect in treating persons infected with disease. **(6 marks)**

(c) One way of controlling the spread of disease among crop plant, is to destroy the entire field, not just the few plants that are infected.

(i) Suggest why this method of control is sometimes used.

(ii) Give TWO **economic** and TWO **social** consequences of widespread disease among crop plants. **(7 marks)**

Total 15 marks

GO ON TO THE NEXT PAGE

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6. (a) Differentiate between an 'allele' and a 'gene'. **(4 marks)**

(b) A tropical plant species produces flowers that are either purple or white. The purple colour is found to be dominant to the white.

(i) Using **P** as the symbol, state the possible genotypes of the purple flowers.

(ii) A plant breeder obtained flowers that were purple in successive crops of the same plant species. However, in one crop he obtained a few white flowers. Using a genetic diagram, illustrate how he got white flowers in a crop of the same plant species. **(8 marks)**

(c) Genetically identical offspring sometimes show differences in phenotype. Suggest why such differences may occur. **(3 marks)**

Total 15 marks

Answer Part (b) (ii) here.

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END OF TEST

FORM TP 2011003

TEST CODE **01207032**

JANUARY 2011

C A R I B B E A N E X A M I N A T I O N S C O U N C I L

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 03/2 – Alternative to SBA

General Proficiency

2 hours

In addition to the 2 hours, candidates are allowed 10 minutes in order to read through the entire paper. Writing may begin during the 10-minute period.

READ THE FOLLOWING DIRECTIONS CAREFULLY.

1. **Answer ALL questions.**
2. **Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. In a study of their environment undertaken by the school's ecology club, *Ecominds*, members conducted a survey of the flora and fauna in a grassy field. They recorded the numbers of organisms that they found, as shown in Table 1.

TABLE 1: ESTIMATE OF NUMBERS OF ORGANISMS IN A GRASSY FIELD

Organisms	Estimated number
Plants	
• Sensitive plant	1 per m^2
• Rabbit bush	5 per m^2
• Savannah grass	75 per m^2
Animals	
• Lizards	10
• Bees and wasps	120
• Toads and frogs	85
• Woodlice	400
• Butterflies	150
• Ants	1100
• Grasshoppers	300

(a) (i) **On the graph paper provided on Page 3**, construct a bar graph to show the relative size of the animal populations in the grassy field. **(8 marks)**

(ii) Identify ONE organism that is likely to be preyed upon. Give a reason for your answer.

_____

_____

_____

(2 marks)

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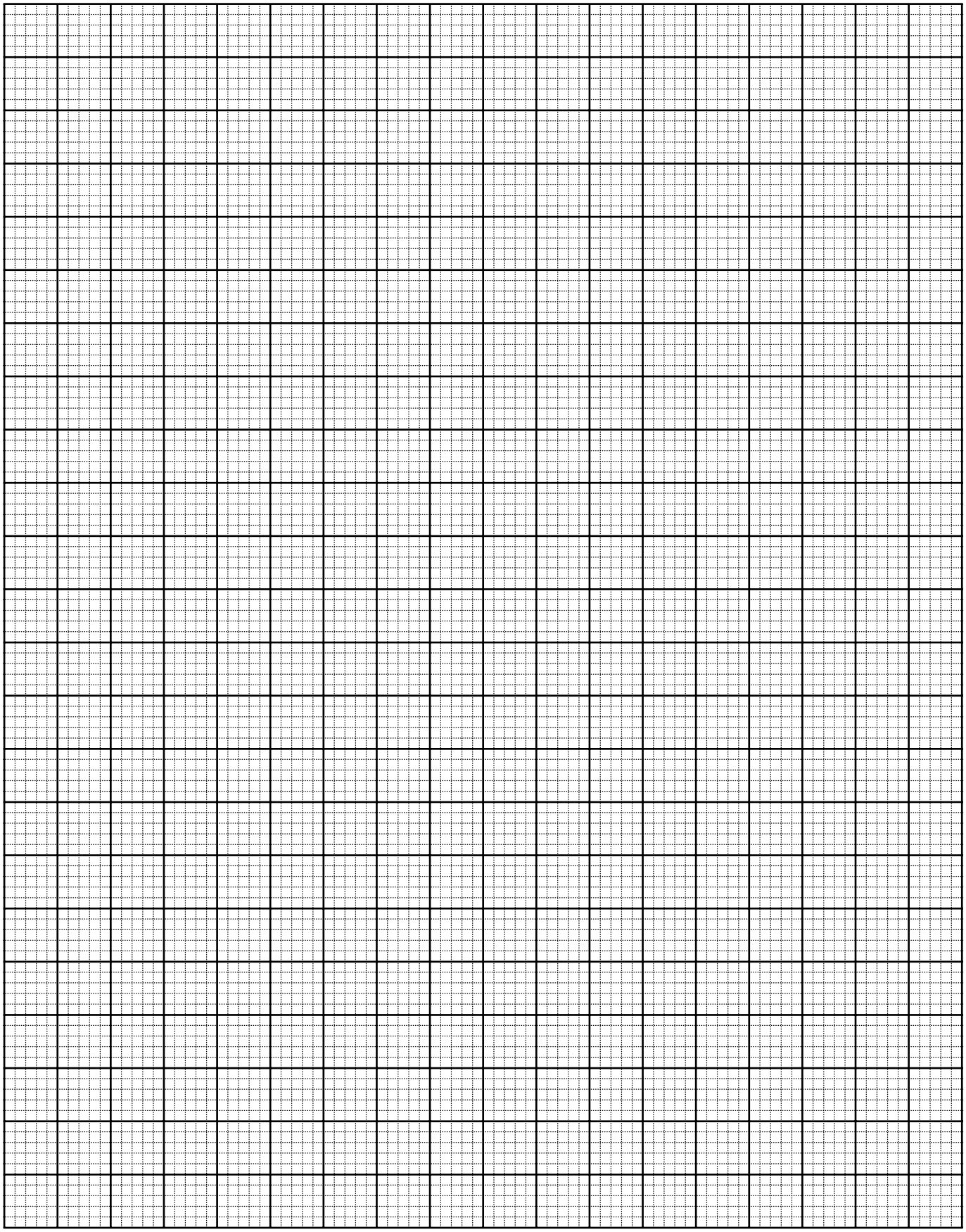

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(b) (i) Members of *Ecominds* used a quadrat to estimate the number of plants in the grassy field. Explain how they would have used the quadrat to arrive at the estimated number of plants.

_____

_____

_____

_____

(4 marks)

(ii) Suggest TWO other methods that would have been used by members of *Ecominds* to collect their data. Explain your suggestions.

_____

_____

_____

_____

(4 marks)

(c) In the leaf litter under a tree at the edge of the grassy field, the *Ecominds* team found organisms represented by Specimen A to Specimen D in Figure 1 below. The *Ecominds* team thought that they belonged to the same group, since they were all found in the leaf litter.

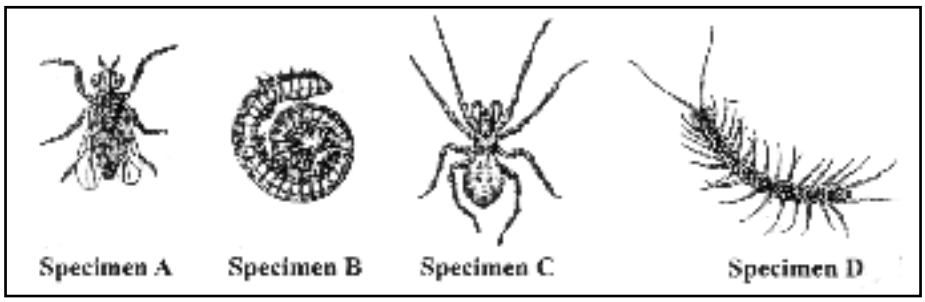


Figure 1. Drawings of specimens found in leaf litter

(i) Identify TWO features shown in the drawings in Figure 1 that can be used to classify the organisms.

_____

_____

(2 marks)

GO ON TO THE NEXT PAGE

(ii) In the space provided below, make a drawing of Specimen C twice the size shown in Figure 1. State your magnification.

(6 marks)

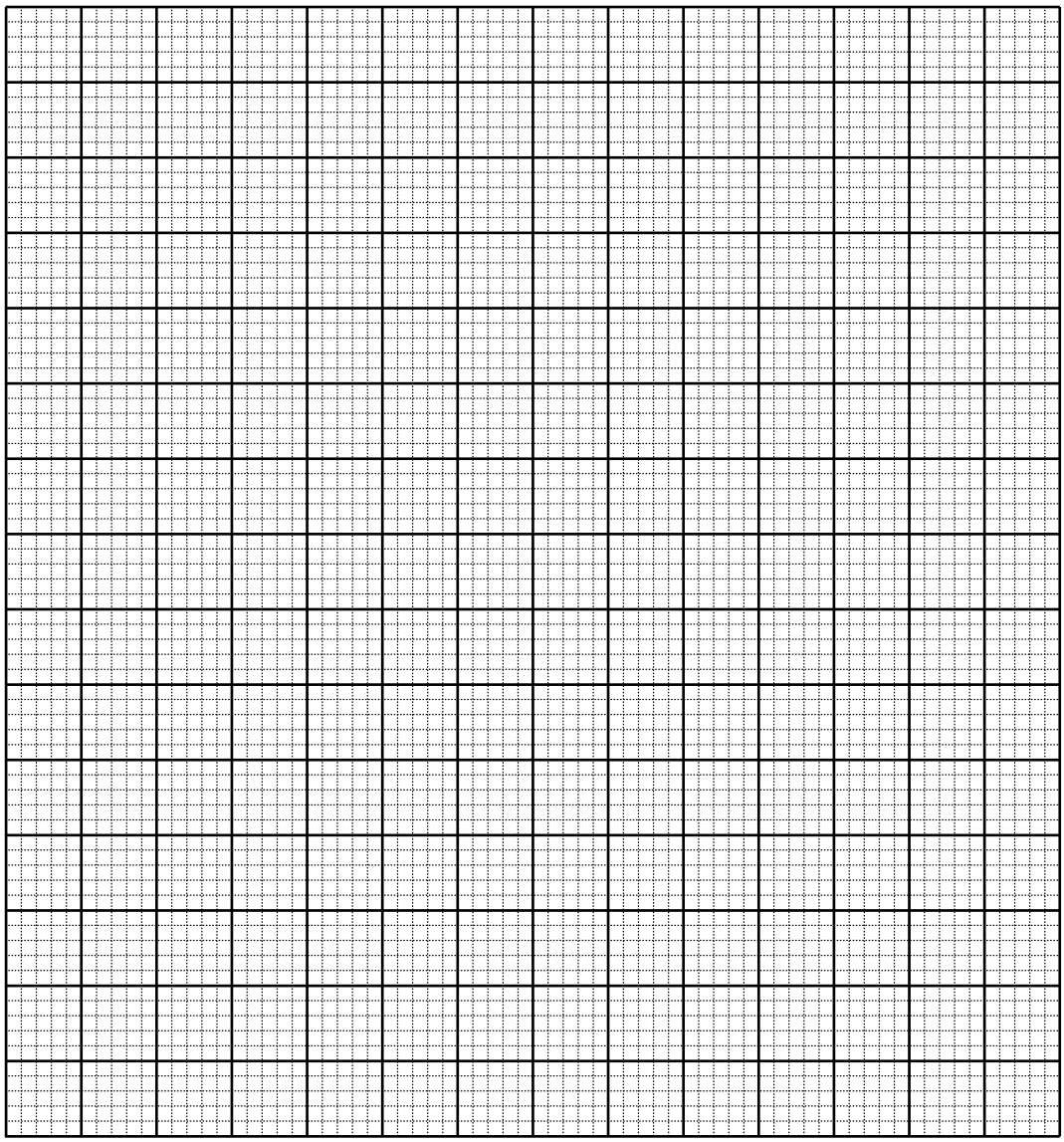
Total 26 marks

2. Table 2 shows the height of a pigeon pea (*Gungo*) plant over a period of seven weeks.

TABLE 2: CHANGES IN HEIGHT OF A PLANT OVER A SEVEN-WEEK PERIOD

Time/days	0	7	14	21	28	35	42	49
Height/cm	0	10	90	215	245	255	260	260

(a) (i) On the grid provided below draw a histogram of the data shown in Table 2.



(6 marks)

(ii) Using information from the graph you constructed on Page 6, estimate the height of the pigeon pea (*Gungo)* plant on Day 18 and Day 31.

Day 18: _____

Day 31: _____

(2 marks)

(b) The data shown in Table 2 and the graph in (a) (i) on Page 6 are used to illustrate the pattern of growth in the plant species. Another method of determining growth of a plant species is by using dry mass (weight).

(i) Describe the method for obtaining dry mass, including the materials and apparatus.

Materials and apparatus:

_____

_____

Method:

_____

_____

_____

(4 marks)

(ii) State ONE precaution that should be taken to ensure accurate results when using the dry mass method.

_____

(1 mark)

(iii) Give ONE disadvantage of using dry mass to determine growth.

_____

(1 mark)

(c) The pigeon pea (*Gungo*) is a leguminous plant and thus plays an important role in the recycling of nutrients.

(i) Identify ONE nutrient element that the pigeon pea plant helps to recycle.

_____

(1 mark)

GO ON TO THE NEXT PAGE

(ii) Briefly outline the role that the pigeon pea plant plays as a leguminous plant in recycling nutrients.

_____

_____

_____

_____

_____

_____

(3 marks)

Total 18 marks

NOTHING HAS BEEN OMITTED.

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3. Examine the pie chart in Figure 2, which shows the components in a balanced diet.

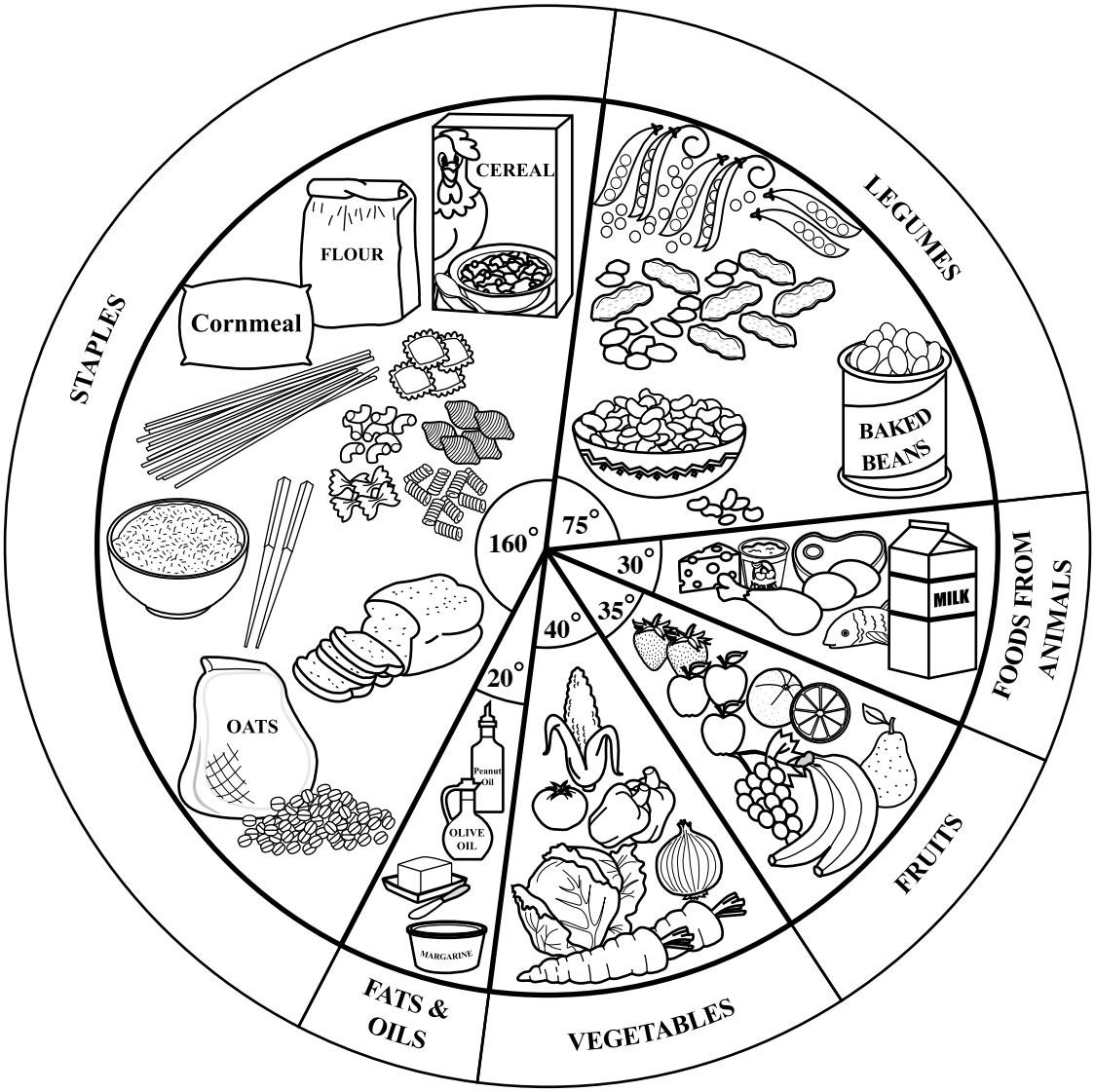


Figure 2. Components in a balanced diet

Prepared by the Caribbean Food and Nutrition Institute (CFNI)

GO ON TO THE NEXT PAGE

(a) Convert the information in the pie chart in Figure 2 into percentages, for the construction of a bar graph. Show your working in Table 3.

TABLE 3: CONVERSION OF PIE CHART INFORMATION TO PERCENTAGES

	Staples	**Legumes**	**Foods from animals**	**Fruits**	**Vegetables**	**Fats and oils**
Calculations						
Percentages						

(6 marks)

(b) Construct a bar graph in the space provided below using data from Table 3.

(6 marks)

(c) Which of the two methods of displaying the components of a balanced diet, pie chart or bar graph, may be considered MORE appropriate? Explain your answer.

_____

_____

_____

(2 marks)

(d) Suggest why staples form the LARGEST part of a balanced human diet.

_____

_____

(2 marks)

Total 16 marks

END OF TEST

FORM TP 2011045

TEST CODE **01207020**

MAY/JUNE 2011

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours

READ THE FOLLOWING DIRECTIONS CAREFULLY.

1. **This paper consists of SIX questions in two sections. Answer ALL questions.**
2. **For Section A, write your answers in the spaces provided in this booklet.**
3. **For Section B, write your answers in the spaces provided at the end of each question, in this booklet.**
4. **Where appropriate, answers should be illustrated by diagrams.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

SECTION A

Answer ALL questions. Write your answers in the spaces provided.

1. A student investigating transpiration carried out the following procedure. He obtained two celery stalks and cut the bottom end of each while they were submerged in water. The cut ends of both stalks were then quickly placed into two flasks of dye, Flask A and Flask B. Flask A was placed on a laboratory bench in normal room conditions, while flask B was put in the same room but warm air from a blow-dryer was directed onto it. The time was noted and the celery stalks were allowed to stand for 30 minutes. The student measured and recorded the distance the dye had travelled up each stalk at five-minute intervals during the 30-minute period. The results are shown in Table 1.

TABLE 1: DISTANCE DYE TRAVELLED UP THE CELERY STALKS

Time (minutes)	Stalk A (distance in cm)	Stalk B (distance in cm)
	1	2
10	3	
1		
20	7	12
2	9	1
30	10	17

(a) (i) **On the grid provided on page 3**, draw a line graph to represent the data shown in Table 1. **(4 marks)**

(ii) Account for the differences in the shape of the line graphs for Stalks A and B.

_____

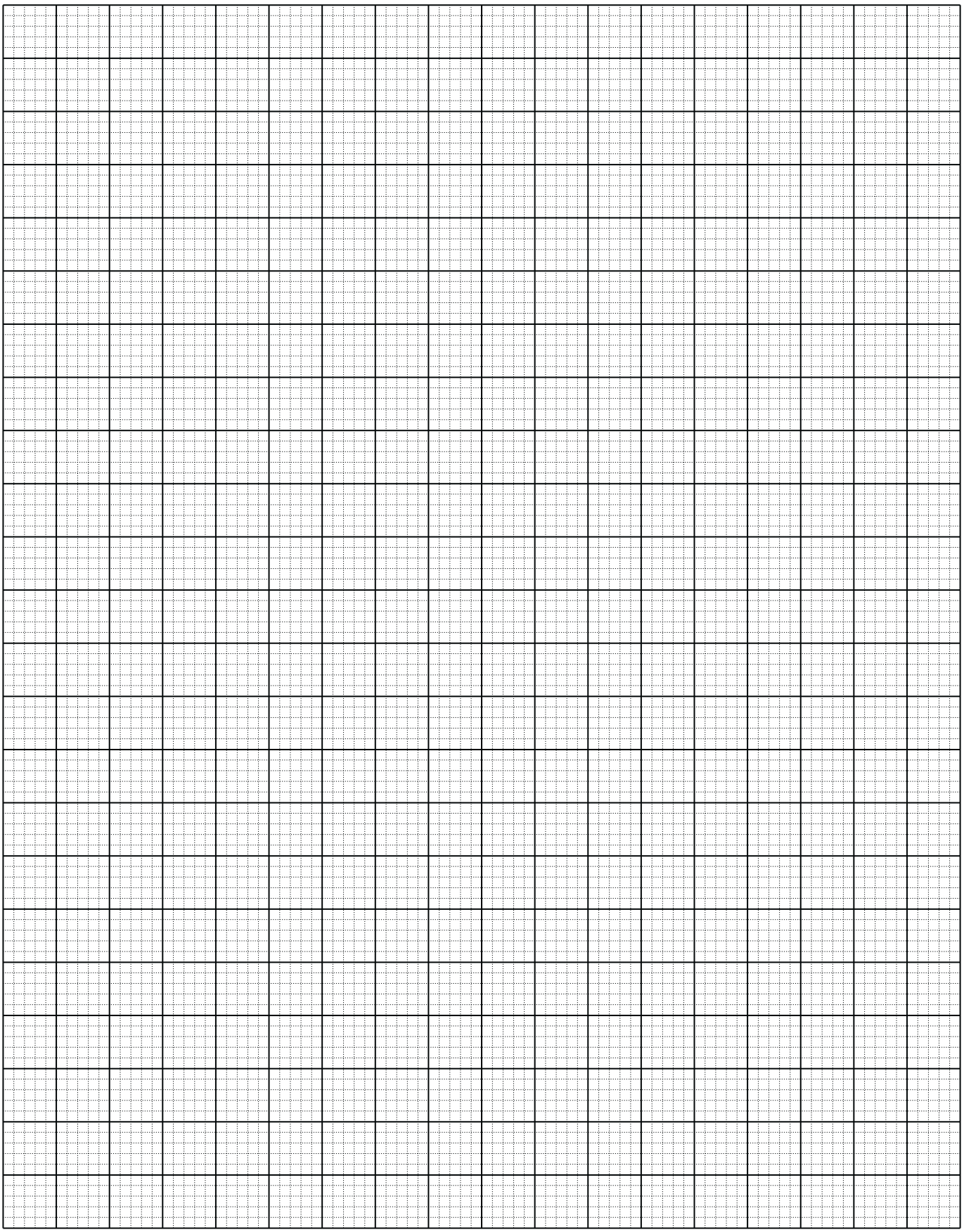
_____

_____

_____

_____

(2 marks)



(b) rite a suitable aim for this experiment.

_____

_____

(2 marks)

(c) Which flask represents the control in this investigation?

_____

(1 mark)

(d) What conclusion can be drawn from this data?

_____

_____

_____

(2 marks)

(e) Describe the physical processes involved in the movement of water from the soil into the plant roots, up the stem and out through the leaves.

_____

_____

_____

_____

_____

_____

_____

(4 marks)

(f) Describe TWO ways in which the xylem is adapted for transporting water within a flowering plant.

_____

_____

_____

(2 marks)

(g) Suggest THREE ways in which transpiration benefits plants.

_____

_____

_____

_____

(3 marks)

(h) Name a type of transport tissue, OTHER THAN xylem, found in flowering plants and state the composition of the fluid transported in this tissue.

_____

_____

(2 marks)

(i) Outline ONE difference and TWO similarities between the transport system of flowering plants and that of mammals.

Difference _____

Similarities _____

_____

_____

(3 marks)

Total 25 marks

2. If a human gets trapped in a room with limited oxygen he/she will not survive for very long.

(a) (i) Suggest ONE reason why humans need oxygen to stay alive.

_____

(1 mark)

(ii) rite a chemical equation which summari es the process for which oxygen is required in living cells.

_____

_____

(2 marks)

(iii) Name the process at (a) (ii) above.

_____

(1 mark)

(iv) In which cell organelle does the process at (a) (iii) take place?

_____

(1 mark)

(b) (i) During his spectacular sprint, Usain Bolt's muscle cells became starved of oxygen. Explain why this happens in exercising muscles.

_____

_____

(3 marks)

(ii) What substance is produced in Bolt's muscles which were starved of oxygen?

_____

(1 mark)

(iii) Explain how the substance in (b) (ii) above could affect Bolt's performance if he continued running for another 10 minutes.

_____

_____

(2 marks)

(c) (i) Some plant species are able to survive in conditions where oxygen is lacking. Name the process by which these plants get their energy.

_____

(1 mark)

(ii) Describe the process named in (c) (i) above and state T O substances produced by this process.

_____

_____

_____

(3 marks)

Total 15 marks

3. Figure 1 represents a concept map of the energy flow in an ecosystem.

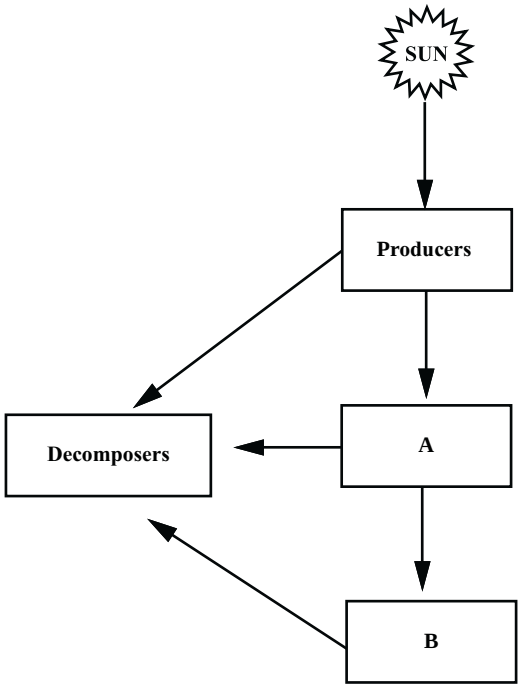


Figure 1. Concept map of energy flow in an ecosystem

(a) Explain the unique role of producers in the ecosystem.

_____

_____

(1 mark)

(b) (i) Identify A and B.

A _____

B _____

(2 marks)

(ii) Using a named example, explain the role of B in the ecosystem.

Example _____

Role _____

_____

(2 marks)

(iii) Give ONE example of a decomposer and explain how a decomposer releases carbon dioxide to the atmosphere.

Example _____

Carbon dioxide _____

_____

(3 marks)

(iv) Suggest why energy from the sun flows in one direction while materials are cycled within the ecosystem.

_____

_____

(2 marks)

(c) In addition to energy, materials are also cycled through various trophic levels and the abiotic environment. Using a diagram of the nitrogen cycle, show FOUR **named** processes which assist in recycling nitrogen in the ecosystem.

(4 marks)

(d) State the name of the organism responsible for ONE of the processes named in (c) above.

_____

(1 mark)

Total 15 marks

SECTION B

Answer ALL questions. Write your answers in the spaces provided at the end of each question.

4. (a) Describe T O ways in which a leaf is adapted for the process of photosynthesis. **(2 marks)**

(b) Some students carried out an investigation to find out whether chlorophyll is needed for photosynthesis. They took a de-starched, potted plant with variegated (green and white) leaves and left it in sunlight for a few hours. A student then removed one leaf from the plant and tested it for starch. The student drew the leaf before the starch test.

(i) Make a large, clearly labelled drawing to show the distribution of green and non-green areas of one leaf that the student may have used.

(ii) Indicate, on the same drawing, the part expected to change colour if the leaf had photosynthesi ed.

(iii) Describe the colour change expected if the leaf tested positive for starch. **(7 marks)**

(c) Explain how this investigation could indicate that chlorophyll is needed for photosynthesis. Include the role of chlorophyll in your explanation. **(4 marks)**

(d) Give an explanation for the presence of starch in the parts of a plant that do NOT contain chlorophyll. **(2 marks)**

Total 15 marks

Space for drawing

5. The kidney is an important excretory organ in mammals.

(a) Name T O substances excreted by the kidney. **(2 marks)**

(b) With the aid of an annotated diagram, explain how urine is formed in the human kidney. **(9 marks)**

(c) An analysis of a sample of urine shows the presence of blood cells and glucose. Account for the presence of these substances in the urine. **(4 marks)**

Total 15 marks

_____

_____

Space for drawing

6. (a) (i) Complete the following table by giving ONE example of EACH of the following categories of disease

Category of Disease	**Example of Disease**
Pathogenic	
Nutritional deficiency	
Hereditary	
Physiological	

(ii) Compare the methods used in treating and controlling the pathogenic and physiological diseases named in (a) (i). **(8 marks)**

(b) Plants can be genetically engineered to make them resistant to diseases.

(i) State what is meant by 'genetic engineering'.

(ii) Discuss the possible social, ethical and ecological implications of genetic engineering. **(7 marks)**

Total 15 marks

END OF TEST

FORM TP 2011046

TEST CODE **01207032**

MAY/JUNE 2011

C A R I B B E A N E X A M I N A T I O N S C O U N C I L

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 03/2 – General Proficiency

2 hours

In addition to the 2 hours, candidates are allowed 10 minutes in order to read through the entire paper. Writing may begin during the 10-minute period.

READ THE FOLLOWING DIRECTIONS CAREFULLY.

1. **Answer ALL the questions.**

2. **Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Answer ALL questions.

Write your answers in the spaces provided.

1. (a) An orange (fruit) was cut with a knife as shown in Figure 1.

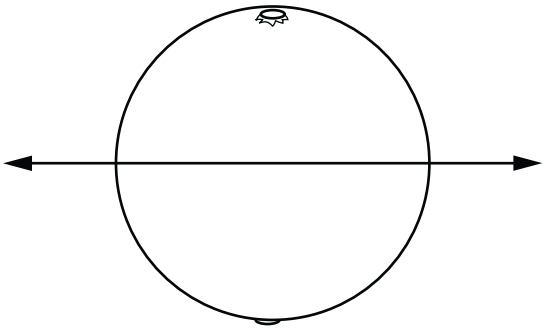


Figure 1. Diagrammatic representation of an orange

(i) Make a drawing of a section of the orange in Figure 1, after the cut is made and one half is removed. abel the following parts

- Epicarp (rind)
- Mesocarp
- Endocarp (pulp)
- Seed

Space for drawing

(8 marks)

(ii) The orange that was cut measured 8 cm in diameter. Calculate the magnification of your drawing. **Show your working.**

_____

_____

_____

(3 marks)

(b) Some food tests were conducted on the orange.

(i) Complete Table 1 by writing the relevant reagents for the following food tests and the expected colour change for EACH of the substances in the table.

TABLE 1: FOOD TESTS

Food Substance	**Reagent**	**Colour of Reagent**	
		Before Test	**After Test**
Reducing sugar			
Protein			
Starch			

(9 marks)

(ii) Table 2 gives information on tissues in the orange and the food substances they contain.

TABLE 2: RESULTS OF FOOD TESTS ON ORANGE

Tissue	Food Substance			
	Starch	**Reducing Sugar**	**Protein**	**Fat**
Rind				
Pulp				
Cotyledon of seed				

r s
s

Suggest a reason for the presence of the food substances seen in the pulp, rind and seed of the orange.

Pulp

_____

Rind

_____

Seed cotyledon

_____

(3 marks)

Total 23 marks

NOTHING HAS BEEN OMITTED.

2. (a) Fifty cubic centimetres (0 cm^3) of water were placed in each of two cylinders labelled A and B. Twenty-five cubic centimetres (25 cm^3) of Soil X and 2 cm^3 of Soil Y were then added to each of the cylinders labelled A and respectively. The contents of each cylinder were briskly stirred, then left standing for 1 minutes. Figure 2 shows the new volumes in the measuring cylinders.

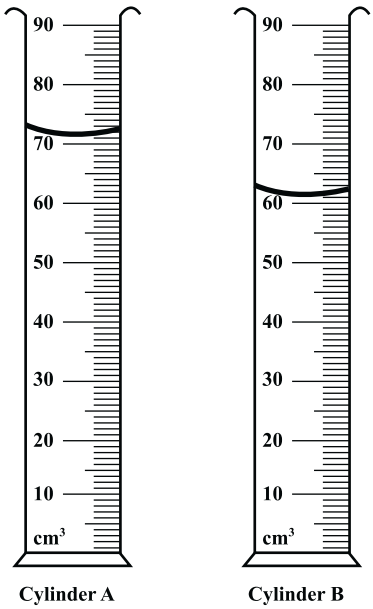


Figure 2. Measuring cylinders with water and soil samples after 15 minutes

(i) Read the volumes in Figure 2 and complete Table 3.

TABLE 3: DATA ON SOIL EXPERIMENT

	Total volume of water (cm^3) (V1)	**Total volume of soil (cm^3) (V2)**	**Volume after 15 mins (cm^3) (V3)**	**Change in volume (cm^3)**
Cylinder A	0	2		
Cylinder	0	2		

(4 marks)

(ii) Suggest a suitable aim for this experiment.

_____

_____

(2 marks)

(iii) Give T O precautions to be taken when carrying out the procedure used in this experiment and explain why EACH is necessary.

Precaution 1 _____

Reason _____

Precaution 2 _____

Reason _____

(4 marks)

(iv) Account for the change in volume seen in EACH cylinder.

Cylinder A _____

_____

_____

_____

Cylinder _____

_____

_____

_____

(6 marks)

(b) A farmer planted crops in Soil Y and complained that he had to water them frequently.

(i) Explain why Soil Y required frequent watering.

_____

_____

(1 mark)

(ii) Suggest T O ways in which Soil Y can be improved to make it more suitable to support plant growth.

_____

_____

_____

(2 marks)

Total 19 marks

GO ON TO THE NEXT PAGE

3. Table shows the diameter of an individual's pupil when light is placed at seven different positions along **A** to **B** as seen in Figure 3.

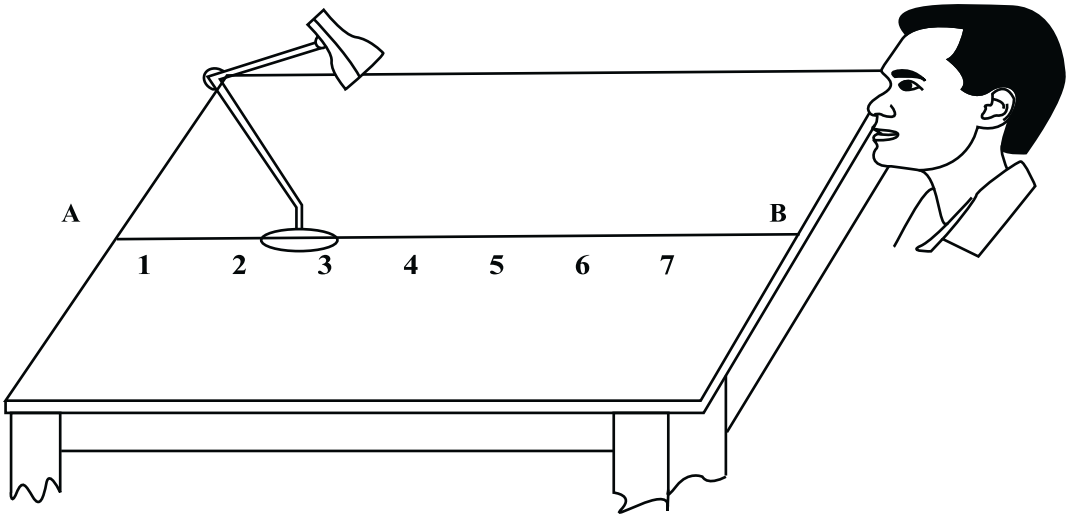
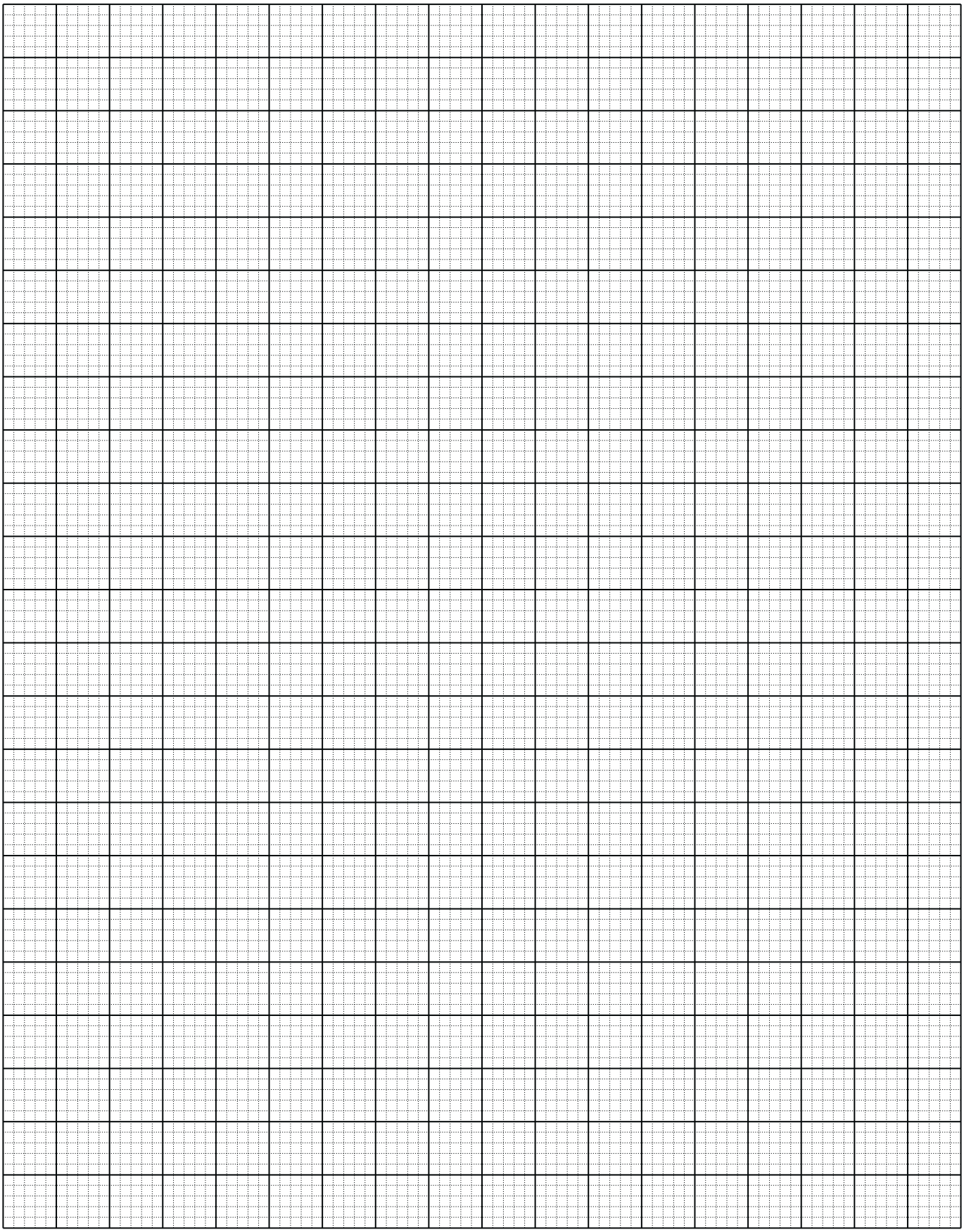


Figure 3. Effects of light on the pupil of the eye

TABLE 4: RELATIONSHIP BETWEEN POSITION OF LAMP AND DIAMETER OF THE PUPIL

Position of Lamp	Diameter of Pupil (mm)
1	3.0
2	2.9
3	2.7
	2.1
	1.
6	1.6
7	1.

(a) (i) On the grid provided on page 9, plot a graph of the results presented in Table .
(5 marks)



GO ON TO THE NEXT PAGE

(ii) Suggest a suitable hypothesis for this investigation.

_____

_____

(2 marks)

(iii) hat conclusion can be drawn from this experiment?

_____

_____

(2 marks)

(iv) State T O limitations of this experiment.

_____

_____

(2 marks)

(v) hy should this experiment be repeated several times using other persons?

_____

(1 mark)

(b) Explain how the muscle of the iris controls the si e of the pupil in different intensities of light.

_____

_____

_____

_____

_____

(4 marks)

(c) Suggest T O ways by which the vision of an individual with short-sightedness can be corrected.

_____

_____

_____

(2 marks)

Total 18 marks

END OF TEST

FORM TP 2012002

TEST CODE **01207020**

JANUARY 2012

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in two sections. Answer ALL questions.
2. For Section A, write your answers in the spaces provided in this booklet.
3. For Section B, write your answers in the space provided at the end of each question, in this booklet.
4. Where appropriate, answers should be illustrated by diagrams.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

SECTION A

Answer ALL questions. Write your answers in the spaces provided.

1. A potato was cut into 20 strips **(each weighing approximately 2.0 g)** and used to carry out an experiment designed to investigate the effect of different concentrations of sugar solution on the weight of the potato tissue.

The investigators recorded the weight of the strips **after** immersion in pure water, as well as in four different concentrations of sugar solution **(0.5, 1.0, 1.5 and 2.0 M)** and plotted the results on the graph shown in Figure 1 on page 3.

(a) List the apparatus and materials and describe the method of this investigation.

Apparatus and materials:

_____

_____

Method:

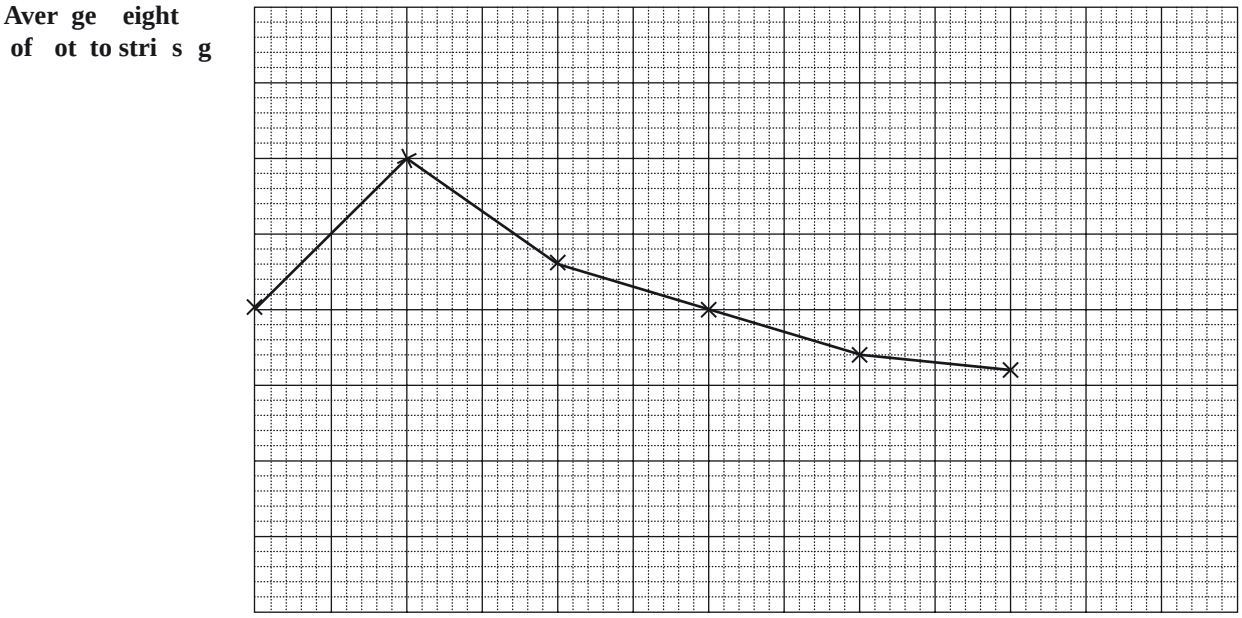
_____

_____

_____

_____

(4 marks)



ure ter on entr tion of sug r so ution M

igure r h sho ing ver ge eight of ot to stri s fter i ersion in ifferent on entr tions of sug r so utions

(b) Construct a table to represent the data shown in Figure 1.

TABLE 1:

(4 marks)

(c) Explain the results obtained when the potato strips were placed in

(i) pure water

_____

_____

(2 marks)

(ii) sugar solution less than 1.0 M and greater than 1.0 M.

Less than 1.0 M: _____

_____

More than 1.0 M: _____

_____

(4 marks)

(iii) Name the process responsible for the results obtained in this experiment.

_____

(1 mark)

(iv) Suggest ONE possible source of error in this experiment.

_____

(1 mark)

(d) Explain why the appearance of an animal cell would be different from that of a plant cell after immersion in

(i) pure water for 30 minutes

_____

_____

_____

(3 marks)

(ii) concentrated sugar solution for 30 minutes.

_____

_____

(3 marks)

(e) Name another process by which substances can move in and out of cells.

_____

(1 mark)

(f) Give TWO reasons why living organisms need to move substances in and out of their cells.

_____

_____

(2 marks)

Total 25 marks

2. Figure 2 shows the human digestive system.

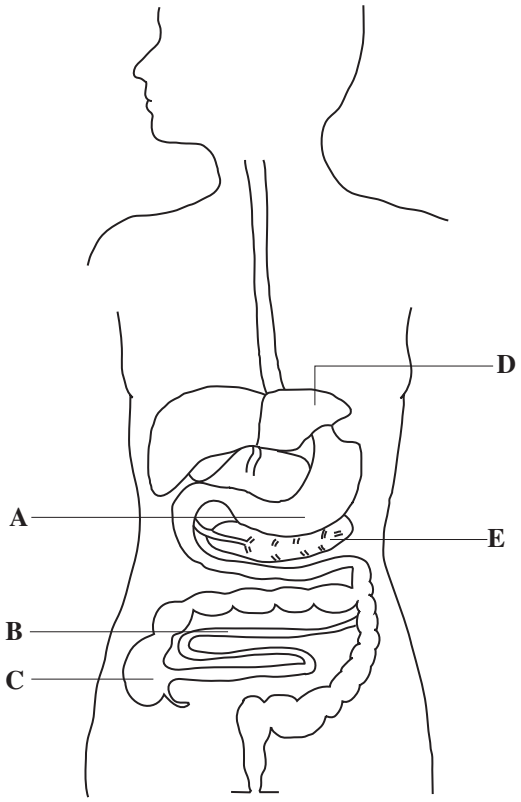


Figure 2. The human digestive system

(a) Name the parts labelled A, B, C, D and E in Figure 2.

A: _____

B: _____

C: _____

D: _____

E: _____

(5 marks)

(b) Suggest THREE ways in which Part B in Figure 2 is adapted for its functions.

_____

_____

_____

(3 marks)

(c) Humans have an omnivorous diet. Suggest how the human digestive system is adapted to break down the different types of food that humans eat.

_____

_____

_____

(3 marks)

(d) (i) State the digestive functions of the liver and the pancreas in a human.

Liver: _____

Pancreas: _____

(2 marks)

(ii) Suggest TWO consequences of the malfunctioning of the pancreas.

_____

_____

_____

(2 marks)

Total 15 marks

3. (a) Table 2 is an incomplete table illustrating inheritance of sex in humans.

Complete Table 2 to show how sex is inherited in humans.

TABLE 2: INHERITANCE OF SEX IN HUMANS

Parental phenotypes	**Male**	**Female**
Parental genotypes	(i) _____	XX
Gametes genotypes	(ii) _____	(iii) _____
Offspring genotypes	(iv) _____	
Offspring phenotypes	Male and female	

(3 marks)

(b) Figure 3 is a diagram of a flower.

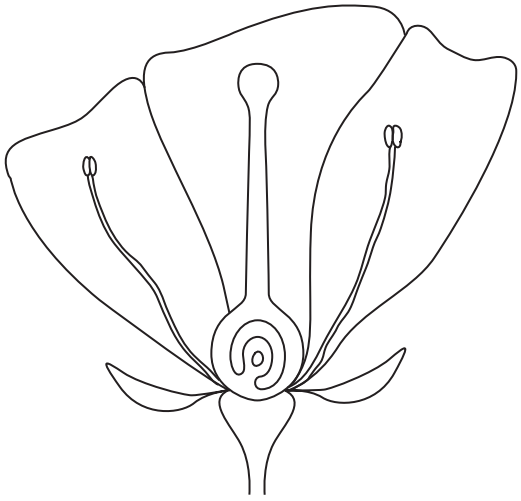


Figure 3. Diagram of a flower

(i) Label the parts in Figure 3 where sex cells/gametes are found. **(2 marks)**

(ii) Outline the process by which gametes are formed.

_____

_____

_____

_____

(2 marks)

(iii) If a plant has a diploid chromosome number of 8, how many chromosomes would be found in its gametes?

_____

(1 mark)

(c) Suggest TWO ways in which the process of meiosis may be useful to plants.

_____

_____

(2 marks)

(d) A horticulturalist has a crop of plants that produces both red and white flowers. However, more red flowers are produced than white. A red-flowered plant is crossed with a white-flowered plant and the offspring produced are in the ratio 1 red to 1 white. Using the symbols **R** for red and **r** for white, draw a genetic diagram to illustrate this ratio.

(3 marks)

(e) John and Jake grew plants with the same genotype. Jake's plants produced smaller flowers than John's plants. Account for the difference in size of these flowers.

_____

_____

(2 marks)

Total 15 marks

SECTION B

Answer ALL questions.

Write your answer in the space provided at the end of each question.

4. (a) Describe photosynthesis in green plants. **(5 marks)**

(b) With the aid of a fully annotated diagram, explain how the visible external features of a green dicotyledonous leaf aid the process of photosynthesis. **(3 marks)**

(c) When leaves fall from plants, microorganisms feed on them.

(i) What is the name given to these microorganisms?

(ii) Explain how this type of nutrition differs from photosynthesis. **(3 marks)**

(d) There are advantages and disadvantages when leaves fall from plants.
Suggest TWO advantages and TWO disadvantages to a plant, when leaves fall from it.
(4 marks)

Total 15 marks

Space for diagram (b)

5. (a) With the aid of a fully labelled diagram of the heart, explain how blood is pumped to the rest of the body. **(8 marks)**

(b) (i) Suggest why vaccination is NOT effective in the prevention, treatment or control of most diseases of the heart and blood vessels.

(ii) Explain why there is an increase in the number of white blood cells in a patient following heart surgery. **(7 marks)**

Total 15 marks

Space for diagram (a)

6. (a) (i) Distinguish between a community and a habitat.

(ii) Some students want to investigate the distribution of species found in a forest while another group wants to investigate the distribution of species in a pond. Describe the sampling technique that the students could use for EACH distribution of species. **(6 marks)**

(b) (i) Describe TWO types of feeding relationships that exist in an ecosystem and give an example of EACH type.

(ii) Construct a food web which describes the trophic relationship among four organisms in a community.

(iii) State which organism(s) in your web would have the **least** amount of energy available.

(iv) Describe TWO ways in which the natural balance in a community may be disrupted. **(9 marks)**

Total 15 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2012003

TEST CODE **01207032**

JANUARY 2012

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 032 – Alternative to SBA

General Proficiency

2 hours 10 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. Answer ALL questions.
2. You are advised to use the first 10 minutes to read through the entire paper.
3. Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Answer ALL questions.

Write your answers in the spaces provided.

1. A scientist used the apparatus in Figure 1 to investigate respiration in woodlice. The flasks, A and B, were kept at constant temperature.

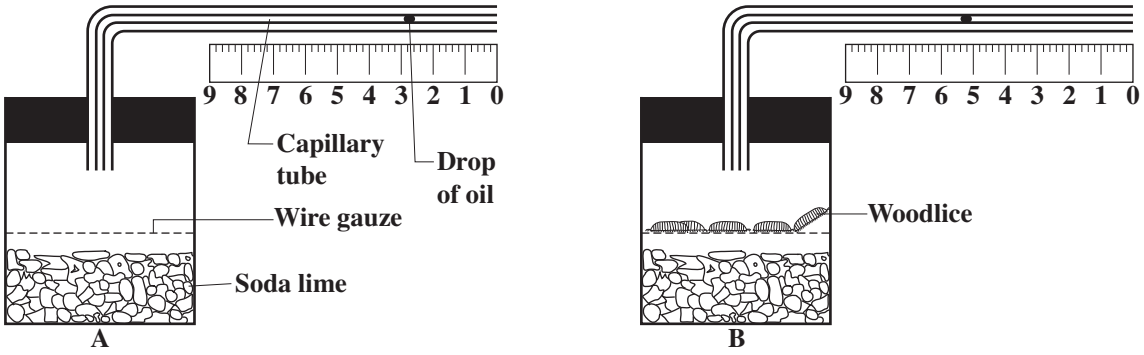


Figure 1. Apparatus used to investigate respiration in woodlice

The position of the drop of oil was measured at one-minute intervals and the data tabulated in Table 1.

TABLE 1: DISTANCE MOVED BY OIL IN B DURING EACH MINUTE FOR SIX MINUTES

Time (mins)	Distance (mm)
1	3
2	6
3	9
4	11
5	13
6	16

(a) Use the data in Table 1 to calculate the total distance travelled by the drop of oil.

_____

(1 mark)

(b) What is the average distance travelled by the drop of oil in one minute?

_____

(1 mark)

GO ON TO THE NEXT PAGE

(c) The area of a cross-section of the glass tubing is 0.5 mm^2. Calculate the volume of oxygen used by the woodlice in one minute. Use the equation,
Volume = Distance x Area of cross-section.
Show your working.

(2 marks)

(d) (i) Predict the outcome if the experiment were carried out at a higher temperature.

_____

(1 mark)

(ii) Suggest another variable that could influence the results of this experiment.

_____

(1 mark)

(e) Substrates for respiration are obtained from ingestion of food substances. You have been given the contents of the stomach of a small mammal and asked to determine the main food components of its diet.

(i) Describe THREE tests that could be used to identify the components of the mammal's diet.

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6 marks)

(ii) Using the key provided, complete the table to show the expected amounts of food substances in the diet if the mammal is either a carnivore or a herbivore.

Key

+++ = large amounts present;
++ = medium amounts present;
+ = small amounts present;
- = none present

The first cell is filled in for you as an example.

	Relative Amounts		
Type of Diet	Protein	Carbohydrates	Fat
Carnivore	+++		
Herbivore			

(5 marks)

Total 17 marks

2. (a) Some students conducted the following experiment.

Three potted green plants were kept in the dark for 48 hours. They were then each covered with a bell jar, labelled A, B and C respectively. A beaker with soda lime was put with the plant under Jar A. Jar B was covered with a black bag and Jar C was left untreated. All three jars were exposed to light and given adequate water for six hours. At the end of this time a leaf from each plant was tested for starch.

(i) Explain why the plants were kept in the dark for 48 hours.

_____

_____

(2 marks)

(ii) What is the function of the soda lime in Jar A?

_____

(1 mark)

(iii) Outline the procedure for testing a leaf for starch.

_____

_____

_____

_____

_____

_____

(4 marks)

(iv) Which leaf would MOST likely test positive for starch? Explain your answer.

_____

_____

_____

_____

_____

(3 marks)

(v) Suggest a hypothesis for this experiment.

_____

_____

(2 marks)

(b) The apparatus in Figure 2 can be used to collect data on the effect of light intensity on the rate of photosynthesis.

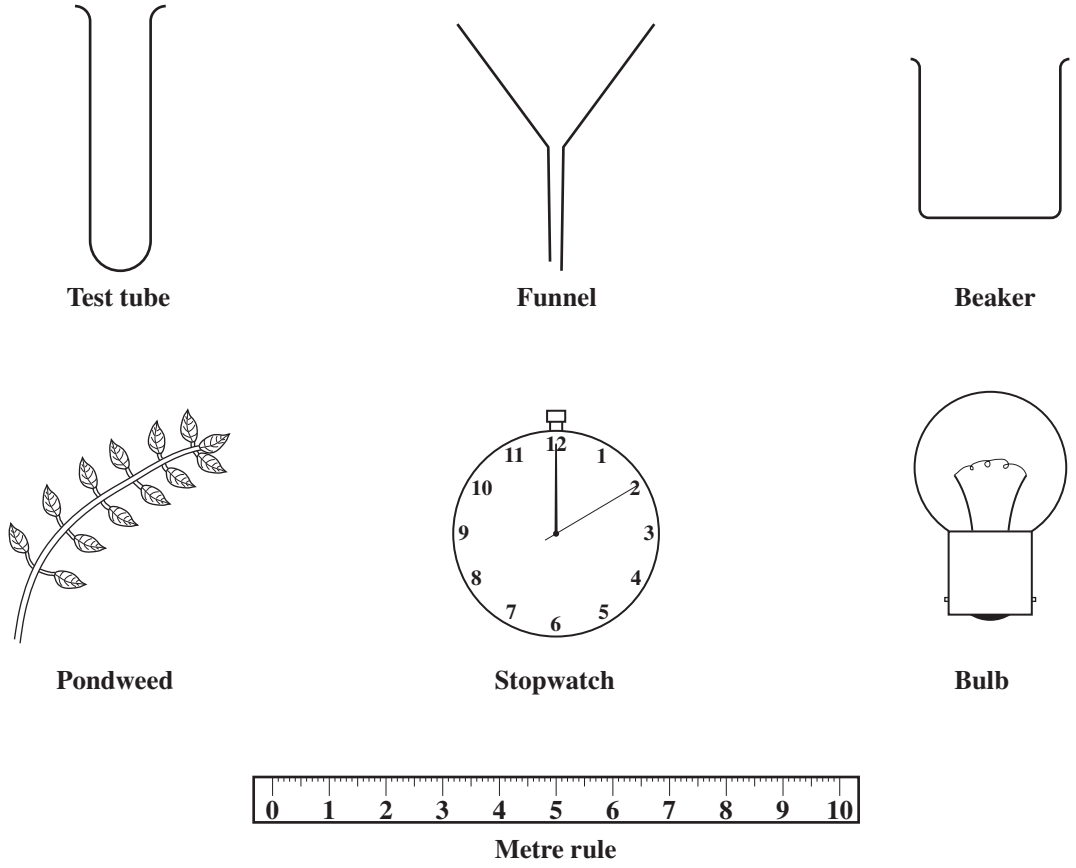


Figure 2. Apparatus and materials used to measure rate of photosynthesis

(i) Make a drawing to show how the apparatus in Figure 2 may be assembled to carry out the investigation.

(4 marks)

(ii) Describe how the assembled apparatus may be used to investigate the rate of photosynthesis.

_____

_____

_____

_____

(4 marks)

(iii) Construct a table to show how the data may be recorded.

(3 marks)

(iv) State TWO variables that may affect the results.

_____

_____

(2 marks)

(v) State TWO limitations of this experiment.

_____

_____

(2 marks)

(vi) Describe a suitable control for this experiment.

_____

_____

_____

(2 marks)

Total 29 marks

3. (a) The bones shown in Figure 3 were taken from the upper limb of a small mammal.

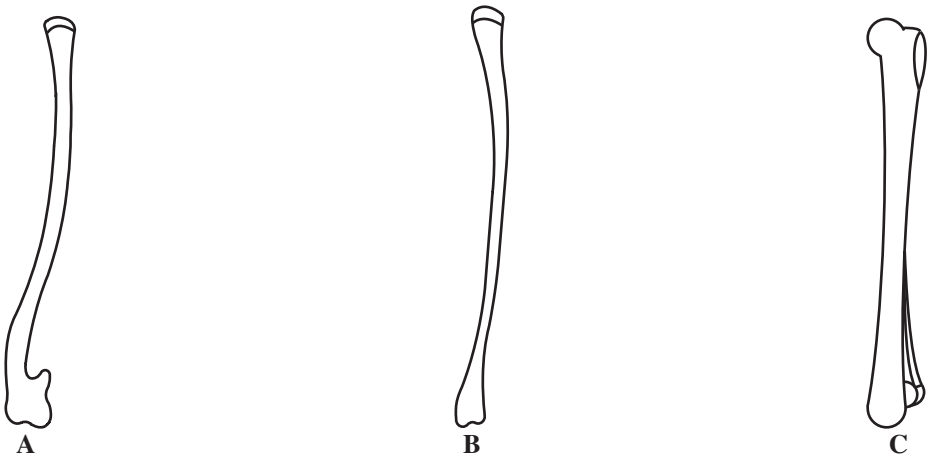
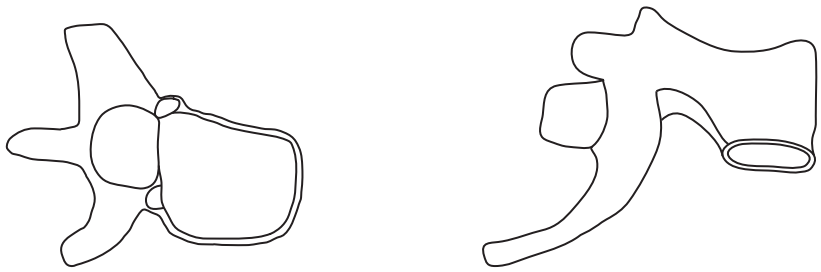


Figure 3. Bones from a small mammal

In the space provided below, make a large labelled drawing of these bones as they would appear joined together in the mammal.

(7 marks)

(b) Figure 4 represents drawings of the two mammalian vertebrae, D and E.



D **E**

Figure 4. Two mammalian vertebrae

(i) Measure the length of the neural spine of EACH vertebra.

Length of neural spine of D _____

Length of neural spine of E _____

(2 marks)

(ii) Suggest a reason for the difference in the lengths of the neural spines of D and E.

_____

(1 mark)

(iii) Measure the diameter of the centrum in D.

Diameter of centrum in D _____

(1 mark)

(iv) What is the importance of the large centrum in vertebra D?

_____

(1 mark)

(v) Identify the two vertebrae, D and E.

Vertebra D is _____

Vertebra E is _____

(2 marks)

Total 14 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2012045

TEST CODE **01207020**

MAY/JUNE 2012

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in two sections. Answer ALL questions.
2. For Section A, write your answers in the spaces provided in this booklet.
3. For Section B, write your answers in the spaces provided at the end of each question, in this booklet.
4. Where appropriate, answers should be illustrated by diagrams.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

SECTION A

Answer ALL questions. Write your answers in the spaces provided in this booklet.

1. Figure 1 shows the effect of temperature on the rate at which starch is broken down by the enzyme, amylase.

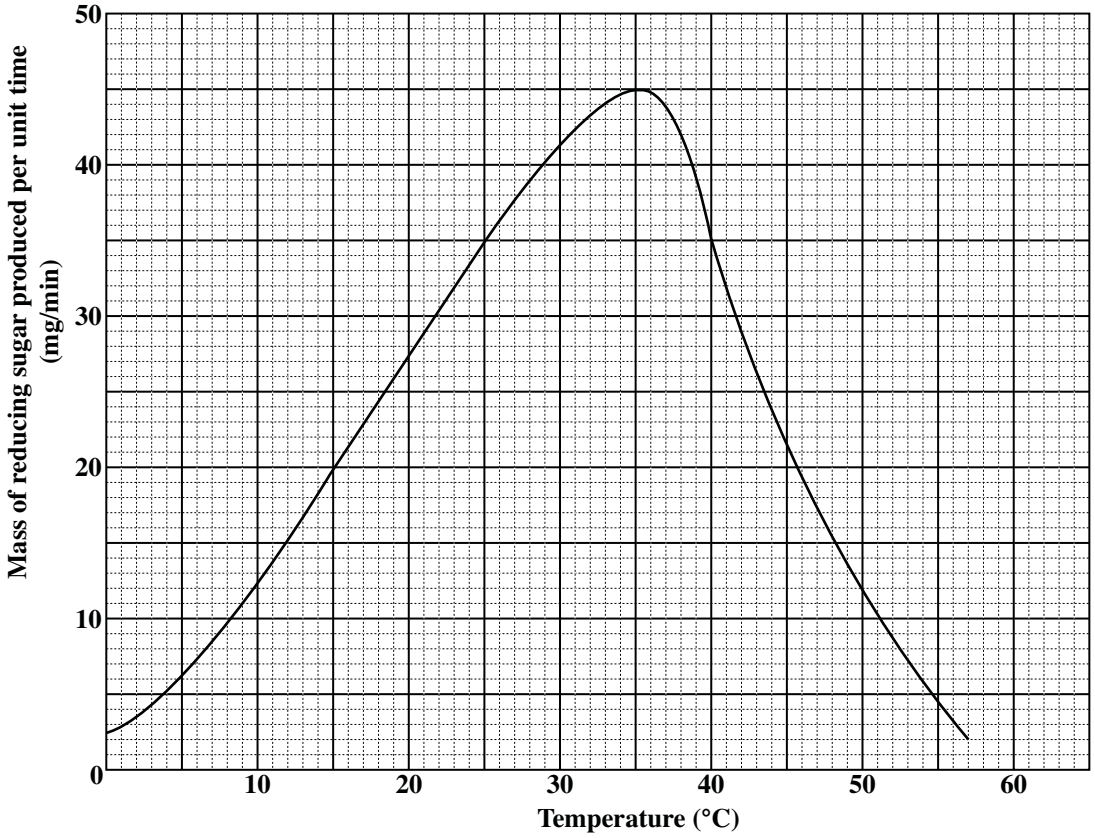


Figure 1. Effect of temperature on rate of amylase activity

(a) (i) Construct a table to represent the data shown on the graph in Figure 1, using FOUR temperature values from the graph.

(4 marks)

(ii) Describe the trend in enzyme activity as shown by the graph in Figure 1.

_____

_____

_____

_____

(3 marks)

(iii) Explain what happens to the enzyme at temperatures above 37 ^{o}C.

_____

_____

(2 marks)

(b) Design an experiment to determine the rate at which starch is broken down under different pH conditions.

_____

_____

_____

_____

_____

_____

(5 marks)

(c) (i) Name TWO parts of the human digestive system where amylase may be found.

_____

(2 marks)

(ii) Explain why the digestion of starch stops when food reaches the stomach.

_____

_____

(2 marks)

(iii) Name an enzyme which works best in the stomach.

_____

(1 mark)

(d) (i) Amylase is also found in plants. Suggest THREE plant structures in which amylase may be found.

_____

(3 marks)

(ii) How is the starch produced in leaves converted to a substance which can be transported to other parts of the plant?

_____

_____

(2 marks)

(iii) Give ONE benefit of the storage of starch in plants.

_____

(1 mark)

Total 25 marks

2. Figure 2 is a diagram of a hinge joint found at the elbow in a human body.

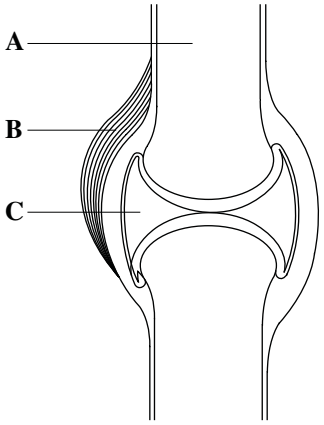


Figure 2. Diagram of a hinge joint

(a) (i) State the name of the structures labelled A, B and C in Figure 2, and give ONE function of EACH structure.

Name of A: _____

Function: _____

Name of B: _____

Function: _____

Name of C: _____

Function: _____

(6 marks)

(ii) Use a line and the letter D to show the cartilage in the joint in Figure 2.

(1 mark)

(b) Arthritis, a degenerative disease, may cause the wearing away of the cartilage of joints. Explain how this will affect joints.

_____

_____

_____

(2 marks)

(c) Explain how the muscles of the upper arm bring about the raising and lowering of the lower arm.

_____

_____

_____

_____

(4 marks)

(d) Suggest why the treatment of some blood diseases may involve a bone marrow transplant.

_____

_____

(2 marks)

Total 15 marks

3. (a) The diagram shown in Figure 3 represents a typical plant cell.

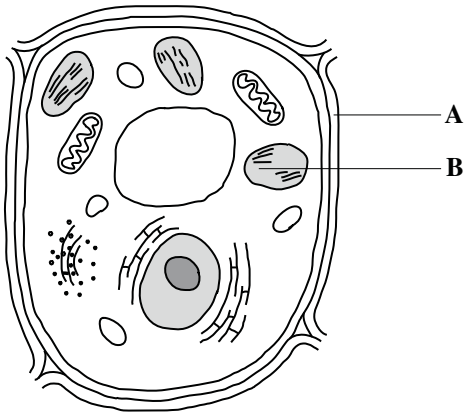


Figure 3. Diagram of a typical plant cell

Identify the parts labelled A and B and state the function of EACH part.

A: _____

Function of A: _____

B: _____

Function of B: _____

(4 marks)

(b) The cell in Figure 3 was left in a concentrated salt solution for one hour.
In the space below, draw an **annotated** diagram to show the appearance of this plant cell after one hour.

(6 marks)

(c) If all the cells in a plant appear like the one drawn in (b) on page 7, the plant's ability to photosynthesize will be reduced. Explain why photosynthesis will be reduced.

_____

_____

(2 marks)

(d) Complete the table below to show THREE differences between plant and animal cells.

	Feature	**Plant Cell**	**Animal Cell**
(i)	Vacuole		
(ii)	Chloroplast		
(iii)	Cell wall		

(3 marks)

Total 15 marks

SECTION B

Answer ALL questions.

Write your answers in the spaces provided at the end of each question.

4. (a) Distinguish between the following pairs of terms:

(i) Allele and gene

(ii) Phenotype and genotype

(iii) Dominant and recessive **(6 marks)**

(b) Black fur colour is controlled by a dominant allele, **B**, and brown fur colour by its recessive allele, **b**. This characteristic is NOT sex-linked. Give the genotypes of the parents and offspring of a cross between a black male and a brown female that produces ½ black offspring and ½ brown offspring. Show all the steps in the working of this problem. **(5 marks)**

(c) Haemophilia is caused by an X-linked recessive gene. Two parents with the normal phenotype have a haemophiliac child. Use a genetic diagram to show how this is possible. **(X^H = normal; X^h = gene for haemophilia)** **(4 marks)**

Total 15 marks

5. Insect vectors are involved in the spread of some pathogenic diseases.

(a) Describe the life cycle of a **named** insect vector. **(4 marks)**

(b) Distinguish between the transmission of a **named** pathogenic disease and a **named** physiological (lifestyle) disease. **(4 marks)**

(c) Explain how the <u>treatment</u> and <u>control</u> measures for a **named** pathogenic disease will differ from those of a **named** physiological disease. **(4 marks)**

(d) Evaluate the socio-economic impact of AIDS on the Caribbean population. **(3 marks)**

Total 15 marks

6. (a) With the aid of a **labelled** diagram, describe the structure of the human male reproductive system. Indicate on the diagram the structure that produces gametes, and the structures that transport the gametes to allow reproduction to take place. **(6 marks)**

(b) Name ONE method of contraception that works by preventing

(i) fertilization

(ii) ovulation.

Explain how EACH of the methods named above functions to prevent pregnancy. **(4 marks)**

(c) Compare the means by which the gametes are brought together in flowering plants with the means by which the gametes are brought together in humans. **(5 marks)**

Total 15 marks

Space for diagram

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2012046

TEST CODE **01207032**

MAY/JUNE 2012

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

BIOLOGY

Paper 032 – Alternative to SBA

General Proficiency

2 hours 10 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. Answer ALL questions.
2. Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.
3. You are advised to take some time to read through the paper and plan your answers.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Answer ALL questions.

Write your answers in the spaces provided.

1. Leaves are collected from two species of plants growing in a rainforest. One species is found in the undergrowth (shaded area) while the other species is found in an open area where the tall trees have been cut down. A leaf from each area is shown in Figure 1.

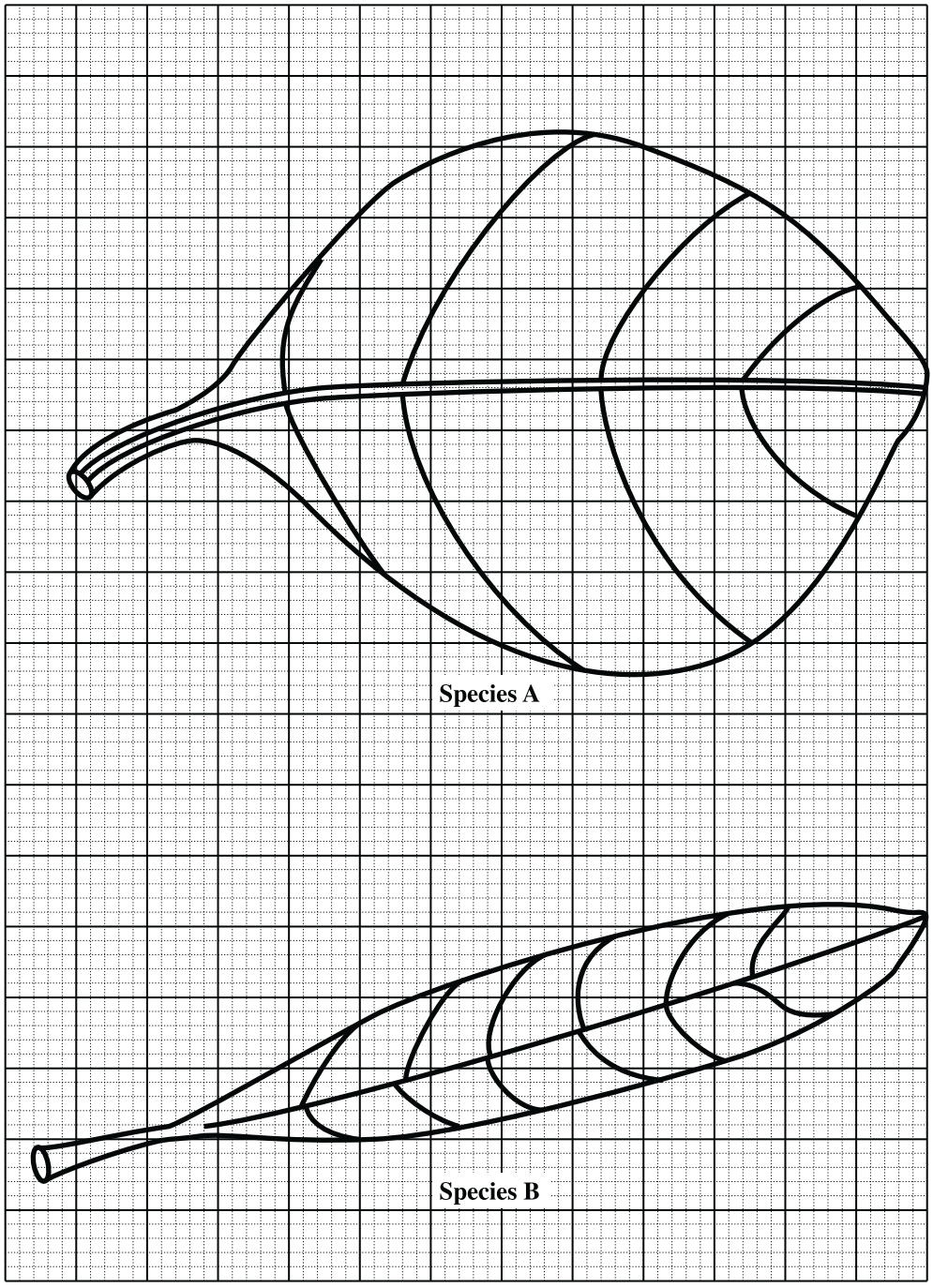


Figure 1. Leaves found in a rainforest

(a) Calculate the surface area of EACH leaf.

Species A: _____

_____

Species B: _____

_____

(3 marks)

(b) Suggest which leaf is found in the open area. Give a reason for your answer.

Species: _____

Reason: _____

(2 marks)

(c) Outline how the apparatus and materials shown in Figure 2 could be used to compare the chlorophyll content of each leaf.

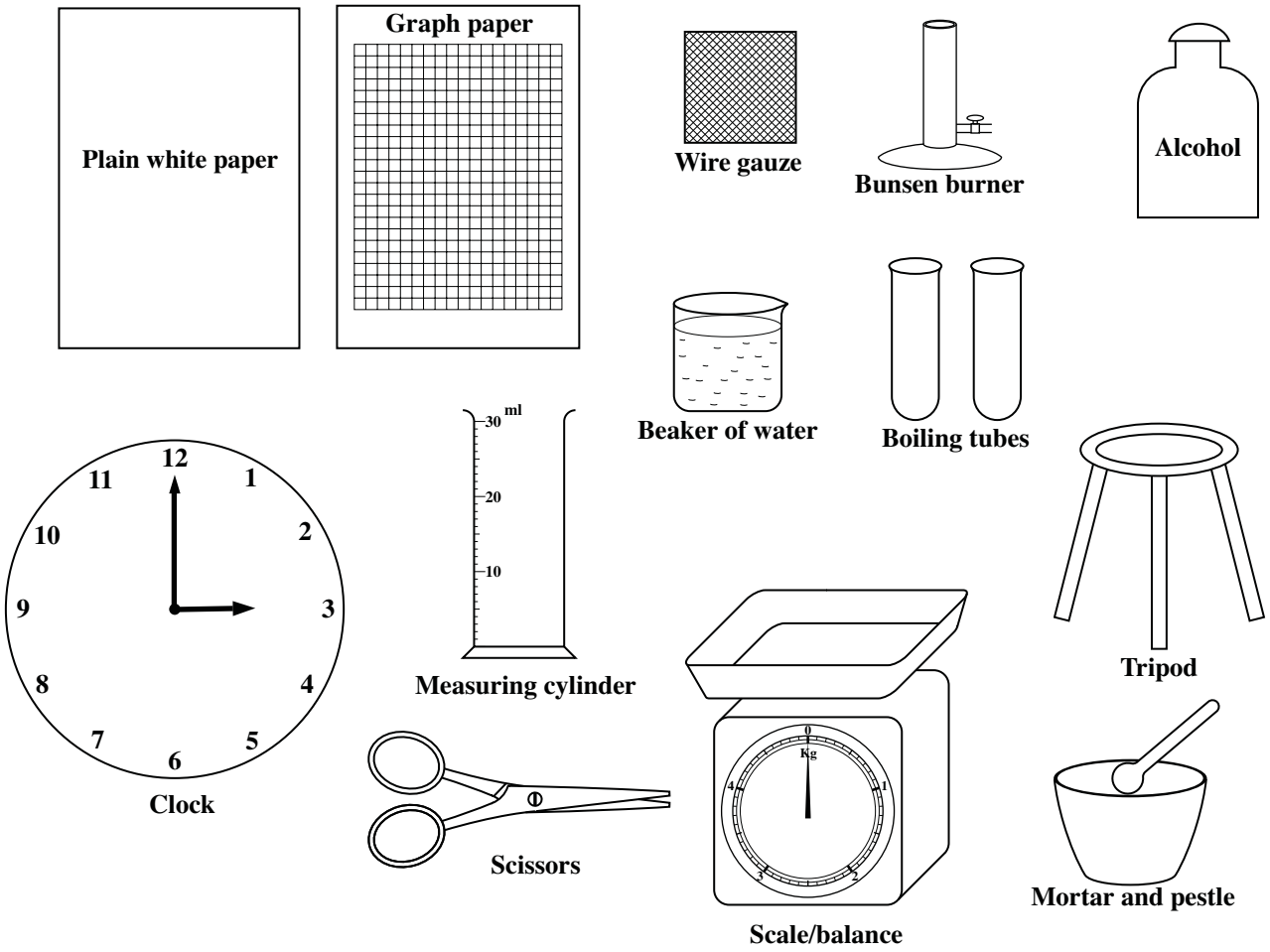


Figure 2. Apparatus and materials for testing for chlorophyll

(6 marks)

GO ON TO THE NEXT PAGE

(d) Construct a table which could be used to display the data to be collected from (c) on page 4.

(3 marks)

(e) Suggest TWO possible limitations of the method outlined in (c) on page 4.

_____

_____

(2 marks)

(f) Write a suitable hypothesis for this experiment.

_____

_____

(2 marks)

(g) Suggest TWO adaptations for photosynthesis that the plants growing in shaded areas of the forest have.

_____

_____

(2 marks)

(h) Seedlings of the two species, labelled A and B, were carefully removed from the forest and each put into a pot containing soil from the same area. The plants were watered equally and exposed to the same light intensity. The length of the stem of each seedling was measured daily for two weeks and the results recorded in Table 1.

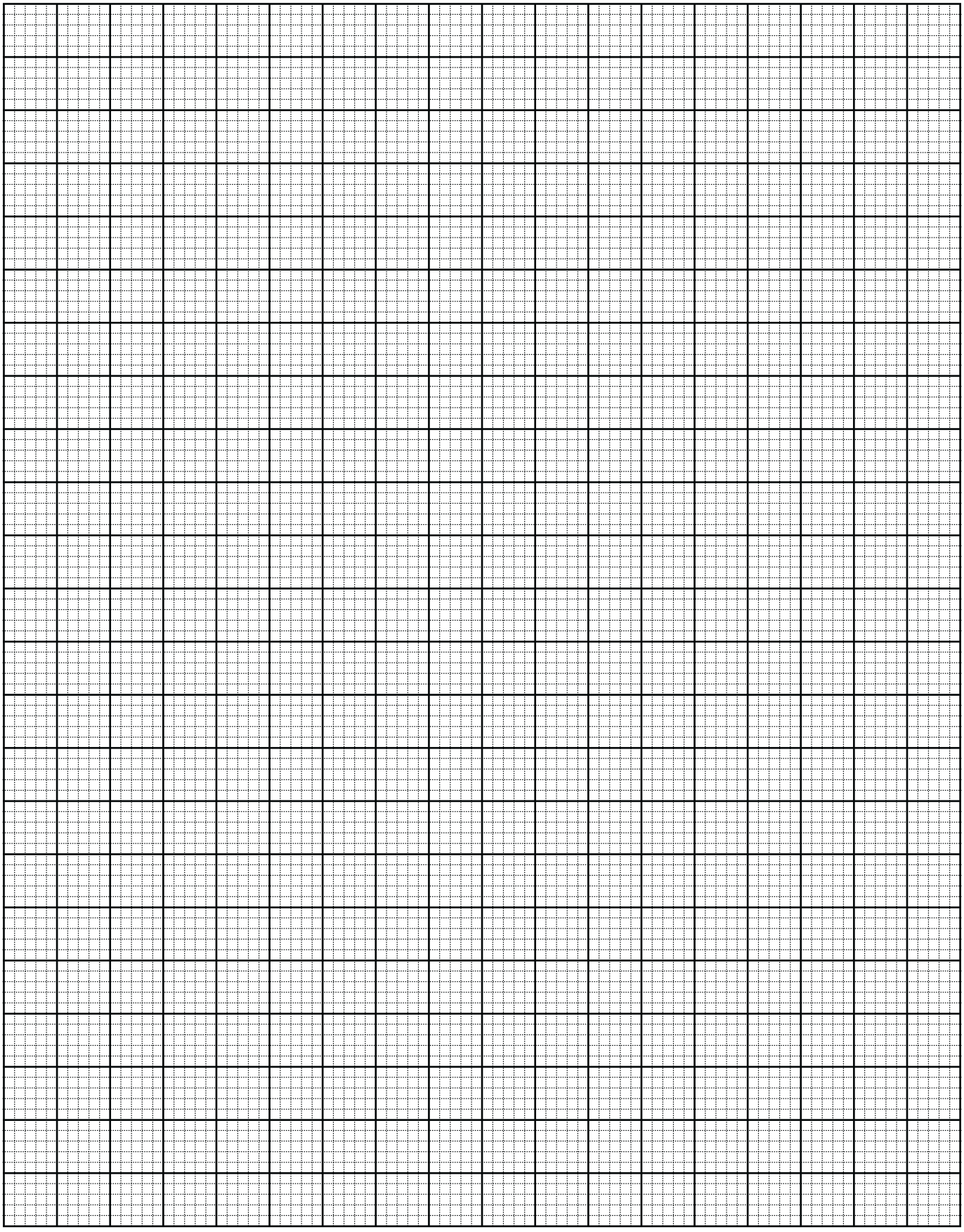
Plot the data in Table 1 on the grid provided on page 7.

TABLE 1: LENGTH OF STEM OF SEEDLINGS

Time (day)	Length of Stem (cm)	
	Species A	**Species B**
1	3.0	3.0
2	3.4	3.2
4	4.3	3.8
8	11.0	9.8
10	13.5	10.6
12	15.6	12.0
13	16.0	12.2
14	15.8	12.0

(5 marks)

Total 25 marks



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2. Some students in a biology class worked in pairs to investigate the reflex action shown in Figure 3.

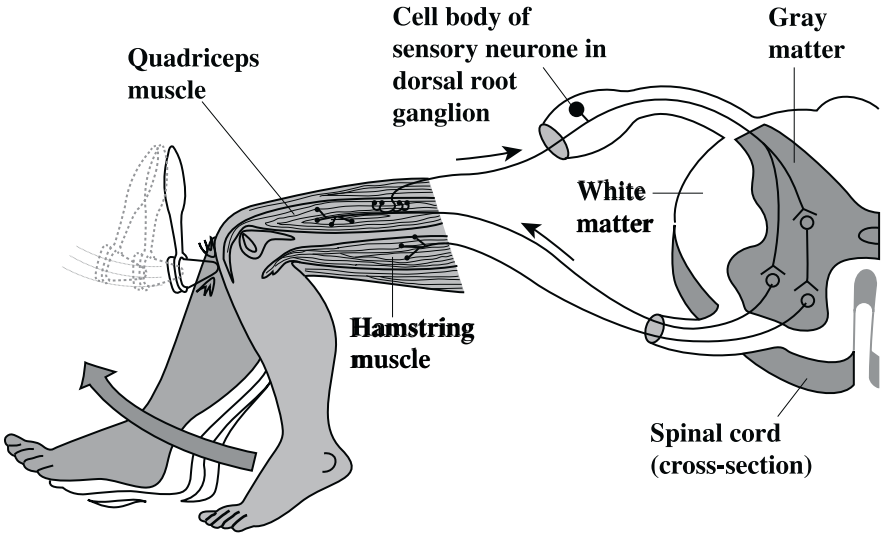


Figure 3. Diagrammatic representation of a reflex action

(a) Explain the usefulness of the reflex action shown in Figure 3.

_____

_____

(2 marks)

(b) A footballer's kneecap (patella) is injured during a match. Explain how this injury may affect his knee jerk reflex.

_____

_____

(2 marks)

(c) A researcher conducts an investigation to test the following hypothesis: "Alcohol consumption interferes with the transmission of nerve impulses in a reflex arc."

Describe how the procedure in Figure 3 could be used to test the hypothesis.

_____

_____

_____

_____

_____

_____

_____

_____

(4 marks)

(d) Light of different intensities is shone into the eyes of a person and the changes in diameter of the pupil are illustrated in Figure 4.

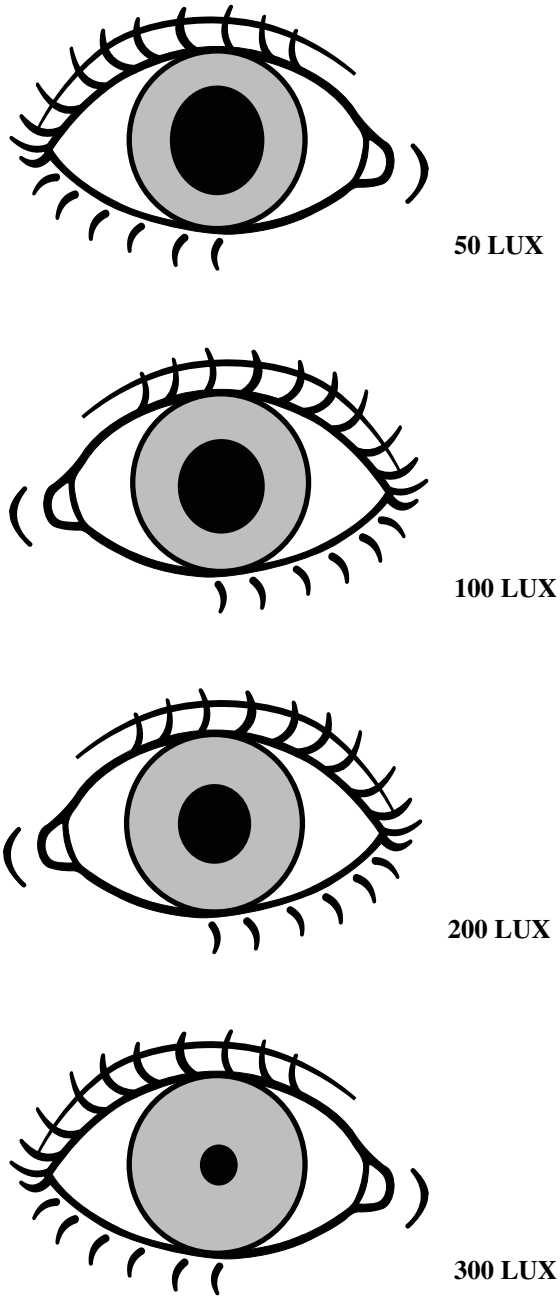


Figure 4. Effect of different light intensities on the pupil of the eye

(i) Measure the diameter of the pupil of the eye shown in Figure 4 and record your results in Table 2.

TABLE 2: EFFECT OF LIGHT INTENSITY ON THE PUPIL OF THE EYE

Light Intensity (lux)	Diameter of the Pupil (mm)
50	
100	
200	
300	

(3 marks)

(ii) Write a suitable aim for this investigation.

_____

_____

(2 marks)

(iii) Describe ONE limitation of this investigation.

_____

_____

(1 mark)

(iv) Use the data in Table 2 to write a suitable conclusion for this experiment.

_____

_____

(2 marks)

(e) Identify the part of the eye responsible for controlling pupil size and explain how it works.

_____

_____

_____

(3 marks)

Total 19 marks

3. The effect of exercise on breathing rate in a group of 100 healthy male athletes was measured by researchers at a sport facility.

The data collected is shown in Table 3.

TABLE 3: EFFECT OF EXERCISE ON BREATHING RATE

Time After Exercise (minutes)	Average Number of Breaths per 15 seconds
1	6
3	5
5	4
7	3
9	2
11	2

(a) Calculate the average number of breaths **per minute** in the first minute after exercise.

_____

(1 mark)

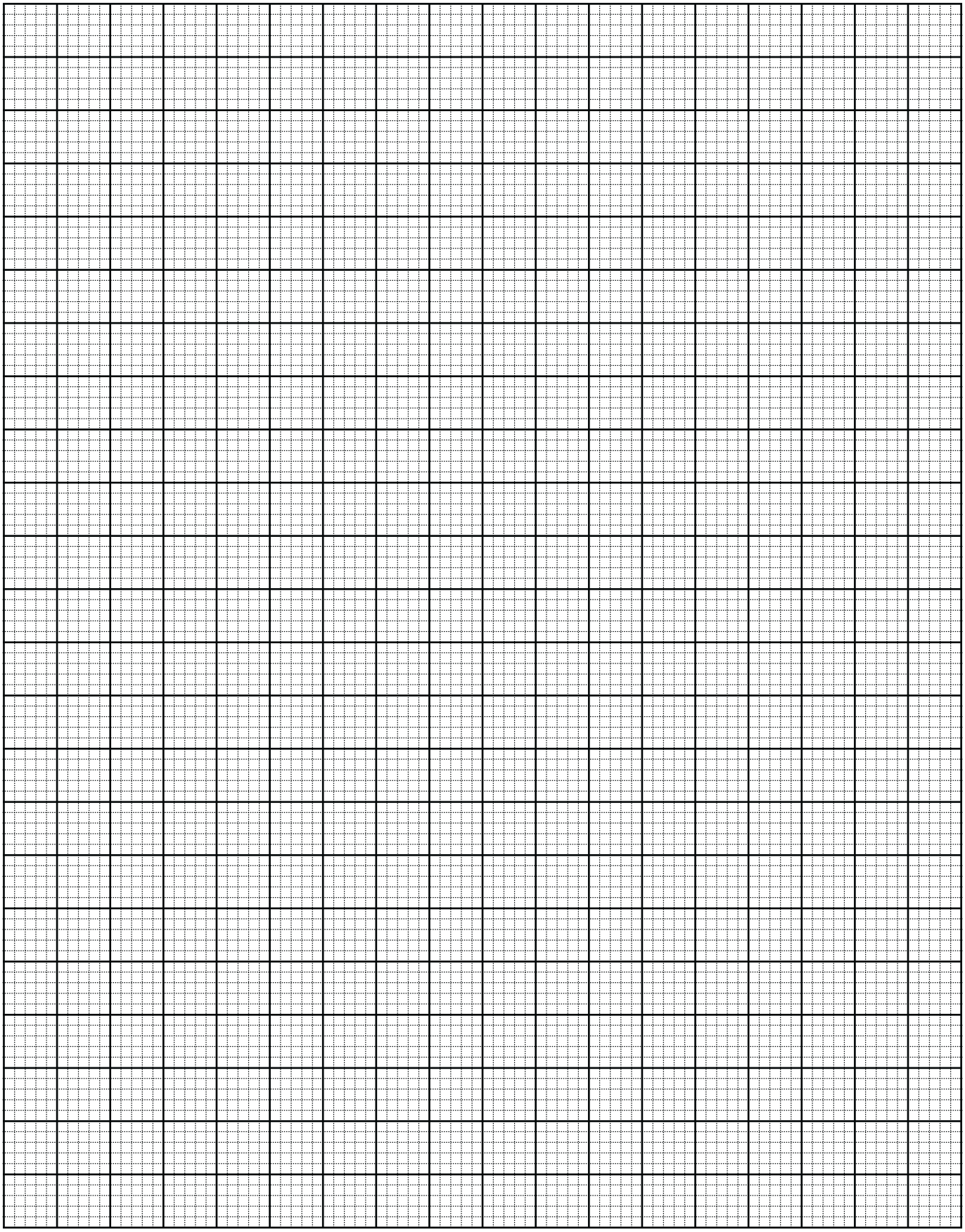
(b) On the grid provided on page 13, draw a graph to show the relationship between time and the average number of breaths **per minute**. **(5 marks)**

(c) Explain the shape of the graph.

_____

_____

(2 marks)



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(d) Table 4 gives data on a survey done on smoking.

TABLE 4: DATA ON SURVEY DONE ON SMOKING

Smoking Category	Number of Persons
Non-smoker	50
Ex-smoker	15
Pipe smoker	5
Cigarette smoker	30

Present the data shown in Table 4 as a pie chart. Show your calculations.

(6 marks)

(e) Emphysema is a lung disease that frequently develops from smoking. With this disease, the walls of some alveoli break down and become surrounded by harder fibrous tissue. Explain why smokers with this disease will have a higher than normal breathing rate after exercise.

_____

_____

(2 marks)

Total 16 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2013002

TEST CODE **01207020**

JANUARY 2013

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®

EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in two sections. Answer ALL questions.
2. For Section A, write your answers in the spaces provided in this booklet.
3. For Section B, write your answers in the spaces provided at the end of each question, in this booklet.
4. Where appropriate, answers should be illustrated by diagrams.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

SECTION A

Answer ALL questions.

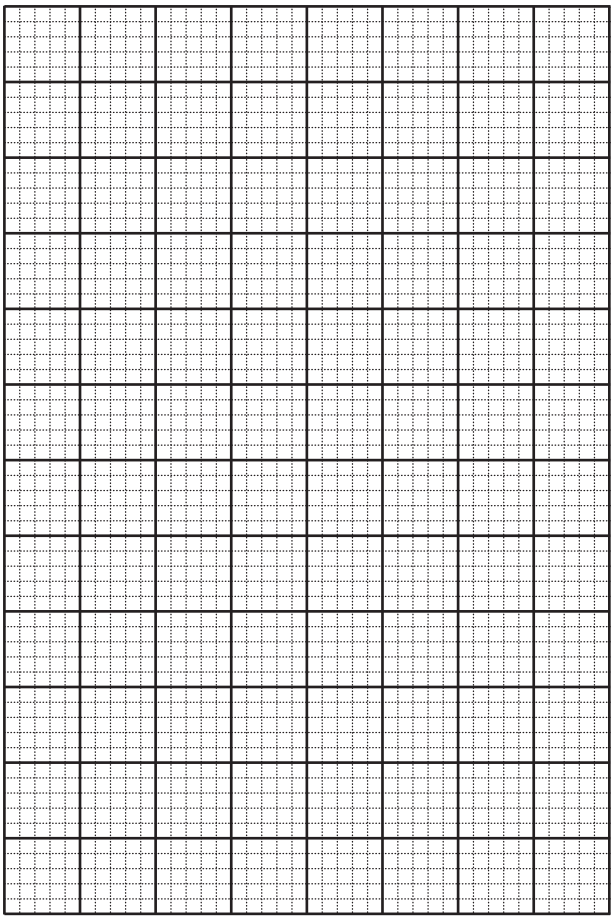
Write your answers in the spaces provided in this booklet.

1. An athlete who normally lives and trains at sea level has maintained a red blood cell count of 4.2 million per unit of blood. In preparation for an athletic event scheduled to take place 2,500 m above sea level, he began training at this altitude six months prior to the event. His number of red blood cells was counted at monthly intervals. Table 1 shows the values of the red blood cell count for the six-month period.

TABLE 1: ATHLETE'S RED BLOOD CELL COUNT DURING SIX MONTHS OF TRAINING AT 2,500 m ABOVE SEA LEVEL

Month	Number of Red Blood Cells (millions/unit of blood)
1	4.4
2	4.7
3	5.1
4	5.2
5	5.3
6	5.3

(a) (i) **On the grid provided below**, draw a graph to represent the data in Table 1.



(5 marks)

(ii) Describe the shape of the graph between Months 1 and 3 and between Months 4 and 6.

Months 1–3 _____

_____

Months 4–6 _____

_____

(2 marks)

(iii) Taking into account the concentration of oxygen at higher altitudes, give an explanation for the change in the red blood cell count at higher altitudes.

_____

_____

(2 marks)

(iv) Suggest a suitable hypothesis for the results shown in Table 1.

_____

_____

(2 marks)

(v) What would be a suitable control in an experiment being conducted to test the hypothesis suggested in (iv) above?

_____

_____

_____

(2 marks)

(b) Katz is suffering from sickle-cell anaemia.

(i) How do the red blood cells of Katz differ from normal red blood cells?

_____

_____

(2 marks)

(ii) Explain why sickle-cell anaemia makes Katz feel tired easily.

_____

_____

_____

(2 marks)

(c) (i) Suggest ONE condition under which the number of **white** blood cells in the human body will be increased.

_____

(1 mark)

(ii) State the function of TWO different types of white blood cells.

_____

_____

(2 marks)

(iii) Suggest why red blood cells have a shorter life span than that of white blood cells.

_____

_____

(1 mark)

(d) Plants differ from animals in the way that they protect themselves and in their mode of nutrition.

(i) Describe TWO ways by which plants protect themselves from excess water loss.

_____

_____

_____

_____

(2 marks)

(ii) State the name used to describe the mode of nutrition in plants.

_____

(1 mark)

(iii) Name the organelle found in the cells of green plants that is responsible for the type of nutrition stated in (ii) above.

_____

(1 mark)

Total 25 marks

2. Figure 1 is a diagram of a tomato plant.

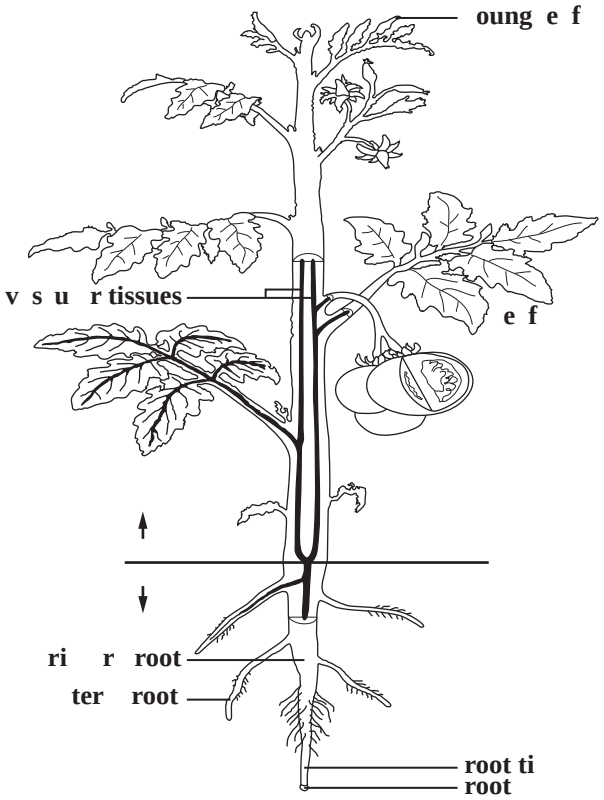


Figure 1. Diagram of a tomato plant

(a) Name the part of the plant in Figure 1 that is responsible for EACH of the following functions:

(i) Support of the stem _____
(1 mark)

(ii) Sexual reproduction _____
(1 mark)

(iii) Development of the embryo _____
(1 mark)

(iv) Obtaining water and mineral salts _____
(1 mark)

(v) Making food for the plant _____
(1 mark)

(b) (i) State the method of fruit dispersal for the plant in Figure 1, and give ONE reason to support your answer.

Method: _____

Reason: _____

(2 marks)

(ii) Explain why plants produced from the seeds of the tomato plant are NOT identical to the parent plant.

_____

_____

_____

(2 marks)

(c) (i) Suggest TWO advantages that may be gained by propagating this plant asexually, for example, by tissue culture.

_____

_____

(2 marks)

(ii) Suggest TWO characteristics that a farmer may want to keep in his crop of tomato plants.

_____

_____

(2 marks)

(d) Genetic engineering has been used to modify tomato plants.

Outline ONE concern that has been raised about the consumption of genetically modified foods.

_____

_____

(2 marks)

Total 15 marks

3. (a) Figure 2 shows an outline of part of the human body.

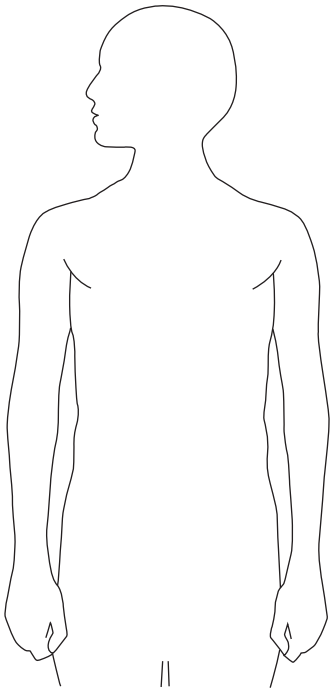


Figure 2. Outline of part of the human body

Use a label line in Figure 2 to illustrate the position of EACH of the following endocrine glands:

(i) Adrenals **(1 mark)**

(ii) Thyroid gland **(1 mark)**

(iii) The pituitary gland **(1 mark)**

(b) The pituitary gland produces several hormones that affect the function of other glands.

(i) Name TWO hormones produced by the pituitary gland and state the role of EACH.

_____

_____

_____

_____

(4 marks)

(ii) Suggest TWO effects of a poorly developed pituitary gland in humans.

_____

_____

(2 marks)

(c) Plants also produce hormones in the tip of their shoots that help them to respond to external stimuli such as light. Figure 3 illustrates an experiment to investigate a shoot's response to light.

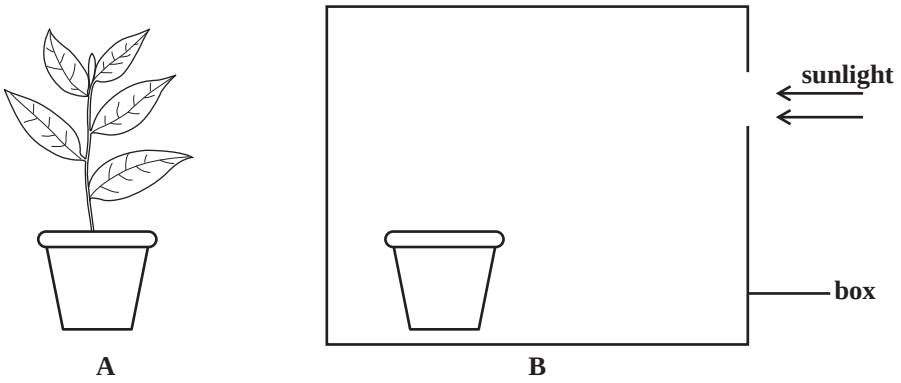


Figure 3. An experiment involving a shoot

(i) Figure 3A shows a shoot growing in sunlight. Complete Figure 3B to show the

a) response of the shoot to light coming from **only one** direction **(1 mark)**

b) distribution of the hormone responsible for the response shown in your drawing in B. **(1 mark)**

(ii) Explain how the hormone causes the response shown in Figure 3B.

_____

_____

(2 marks)

(iii) Suggest why this response to light is important to the survival of the plant.

_____

_____

_____

(2 marks)

Total 15 marks

SECTION B

Answer ALL questions.

Write your answers in the spaces provided at the end of each question.

4. (a) (i) Name the structures responsible for gaseous exchange in humans and in fish. **(2 marks)**

(ii) Identify THREE features that the structures named in (i) above have in common. **(3 marks)**

(b) Gaseous exchange occurs in plants as well as in animals.

(i) Draw and annotate a diagram to show how oxygen and carbon dioxide are exchanged across the respiratory surface of a human. **(3 marks)**

(ii) a) Name the process by which gases are exchanged in plants. **(1 mark)**

b) Explain why in plants there is a difference in the percentage of the respiratory gases exchanged during the day compared with the percentage exchanged during the night. **(3 marks)**

(c) Explain the effect of cutting and burning forests on the operation of the carbon cycle, and on the environment. **(3 marks)**

Total 15 marks

Write your answer to Question 4 here.

Space for diagram

5. (a) (i) With the aid of a diagram, describe how a nerve cell is adapted to carry out its function. **(6 marks)**

(ii) Suggest how loss of nerve cells from the brain may lead to loss of memory. **(2 marks)**

(b) Discuss the abuse of alcohol in humans. In your answer, identify THREE effects caused by the action of alcohol on the brain, and suggest TWO **social** and TWO **economic** consequences of alcohol abuse on society. **(7 marks)**

Total 15 marks

Space for diagram

Write your answer to Question 5 here.

Write your answer to Question 5 here.

6. (a) A recent outbreak of swine flu was caused by the H1N1 virus. One prevention measure adopted by some countries was an immunization programme.

(i) Distinguish between artificial immunity and natural immunity. In your answer, explain how artificial immunity and natural immunity protect the human body against infectious diseases. **(6 marks)**

(ii) Suggest TWO **disadvantages** of immunization. **(2 marks)**

(iii) The H1N1 virus is spread through the air. Suggest TWO precautions, other than immunization, that an individual can take to avoid getting the disease. **(2 marks)**

(b) (i) Name a pathogenic disease that is spread in a manner different from the H1N1 virus and suggest ONE measure that may be taken to control the spread of this disease. **(2 marks)**

(ii) How are the methods used in the control of the spread of viruses among crop plants similar to those used to control the spread of viruses among farm animals? **(3 marks)**

Total 15 marks

Write your answer to Question 6 here.

Write your answer to Question 6 here.

Write your answer to Question 6 here.

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2013003

TEST CODE **01207032**

JANUARY 2013

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

BIOLOGY

Paper 032 – General Proficiency

Alternative to SBA

2 hours 10 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. Answer ALL questions.
2. You are advised to take some time to read through the paper and plan your answers.
3. Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

1. A group of marine biologists conducted an investigation of the distribution of living organisms within a 25 m^2 area in two mangrove ecosystems at two different locations in a Caribbean country. One location was identified as 'Location A' and was found along the undeveloped east coast of the island which has no human inhabitants or industries. The other location was identified as 'Location B' and was found on the west coast of the island, near one of the country's major industrialized towns. The distribution of organisms in both locations was recorded in Table 1.

TABLE 1: NUMBER OF ORGANISMS FOUND IN A 25 m^2 AREA IN TWO MANGROVE ECOSYSTEMS

Organism	Location A	Location B
Red mangrove	15	5
Black mangrove	10	3
White mangrove	9	0
Succulent plant	35	15
Algae	Few	Numerous
Barnacle	400	52
Oyster	200	50
Fiddler crab	25	5
Guppy (fish)	200	40
Jelly fish	7	18
Beetle	80	20
Dragonfly	75	5
Mosquito	Numerous	Numerous
Tree frog	12	2
Heron	8	3
Snake	2	2
Migrant bird	25	10
Iguana	5	2
Crocodile	2	0

(a) **On the grid provided below**, draw a suitable graph to represent the results of the distribution of the **plant species** found in BOTH ecosystems (Location A and Location B) shown in Table 1.

(5 marks)

(b) (i) Name ONE piece of apparatus the biologists may have used to collect data about the distribution of the **plant species** presented in Table 1.

_____

(1 mark)

(ii) Describe how the apparatus named in (b) (i) is used to collect data on the distribution of **plant species**.

_____

_____

_____

(3 marks)

(iii) Give ONE limitation of using the apparatus described in (b) (ii) above.

_____

(1 mark)

(c) Another set of apparatus was used to collect data about the distribution of dragonflies living in the mangrove ecosystem.

Outline THREE methods that the biologists may have used to collect the data.

_____

_____

_____

(3 marks)

(d) (i) Calculate the species density of oysters in both locations.

Species density of oysters in Location A:

_____

_____

Species density of oysters in Location B:

_____

_____

(2 marks)

(ii) Suggest ONE reason for the difference in the distribution of oysters at the two locations.

_____

_____

(1 mark)

(e) (i) Construct a food web using at least SIX of the organisms in Table 1.

Space for drawing

(4 marks)

(ii) The iguanas (herbivores) and crocodiles (carnivores) were the largest organisms in the mangrove ecosystems studied. Explain why the numbers of these organisms were low compared with the numbers of other organisms in the ecosystem.

Iguanas: _____

_____

Crocodiles: _____

_____

(4 marks)

Total 24 marks

NOTHING HAS BEEN OMITTED.

GO ON TO THE NEXT PAGE

2. Figure 1 shows the external view of a bean seed before germination.

Figure 1. External view of a bean seed

(a) In the box provided below, make a labelled drawing of the bean seed as it may appear if cut longitudinally.

Space for drawing

(8 marks)

(b) Table 2 shows the average dry weight of bean plants over a 12-week period.

TABLE 2: AVERAGE DRY WEIGHT OF BEAN PLANTS OVER A 12-WEEK PERIOD

Time in Weeks from Planting of Seeds	Average Dry Weight (g)
0	1.4
2	5.2
4	31.6
6	49.0
8	63.4
10	66.0
12	61.0

(i) **On the graph paper provided on page 9**, plot a suitable graph to show the pattern of growth of the bean plants. **(5 marks)**

(ii) Explain the shape of the graph.

_____

_____

_____

_____

_____

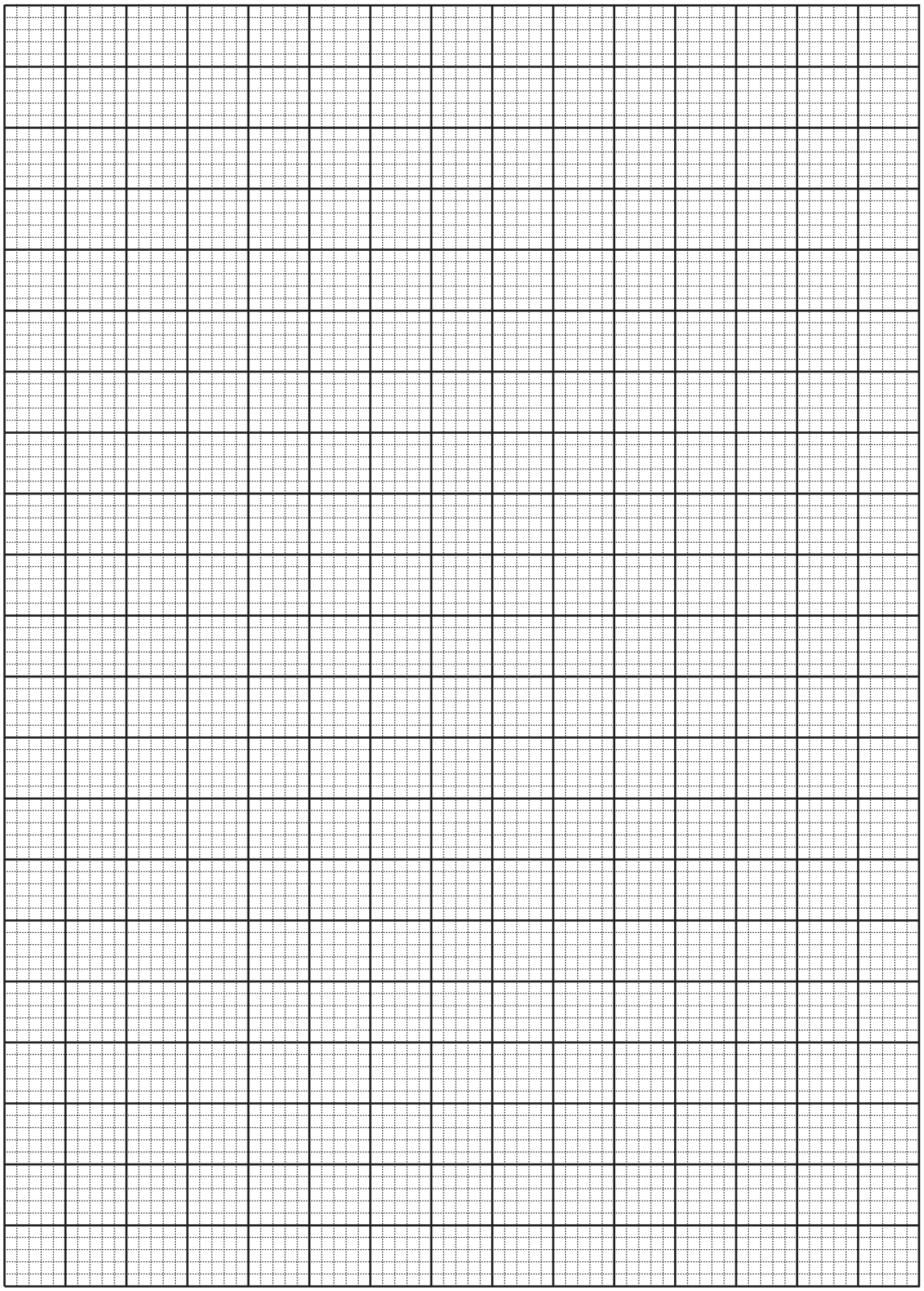
(4 marks)

(iii) Suggest a suitable aim for the experiment that was being carried out.

_____

_____

(2 marks)



(iv) List the apparatus and describe how the data in Table 2 may have been obtained.

Apparatus:

_____

_____

Procedure:

_____

_____

_____

_____

(6 marks)

(v) Suggest ONE limitation of this procedure.

_____

(1 mark)

Total 26 marks

3. Figure 2 shows the drawing of a human canine tooth.

Figure 2. Drawing of a human canine tooth (MAG × 1)

(a) Draw and label the tooth as it may appear from the front view.

Space for drawing

(6 marks)

(b) Calculate the magnification of the drawing in (a) above.

(2 marks)

(c) Explain how a canine tooth is adapted to carry out its function.

_____

_____

(2 marks)

Total 10 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2013045

TEST CODE **01207020**

MAY/JUNE 2013

C A R I B B E A N E X A M I N A T I O N S C O U N C I L

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours u s

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in two sections. Answer A questions.
2. For Section A, write your answers in the spaces provided in this booklet.
3. For Section , write your answers in the spaces provided at the end of each question, in this booklet.

. here appropriate, answers should be illustrated with diagrams.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

SECTION A

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

1. (a) Figure 1 shows the variation in height of a sample of men in a population.

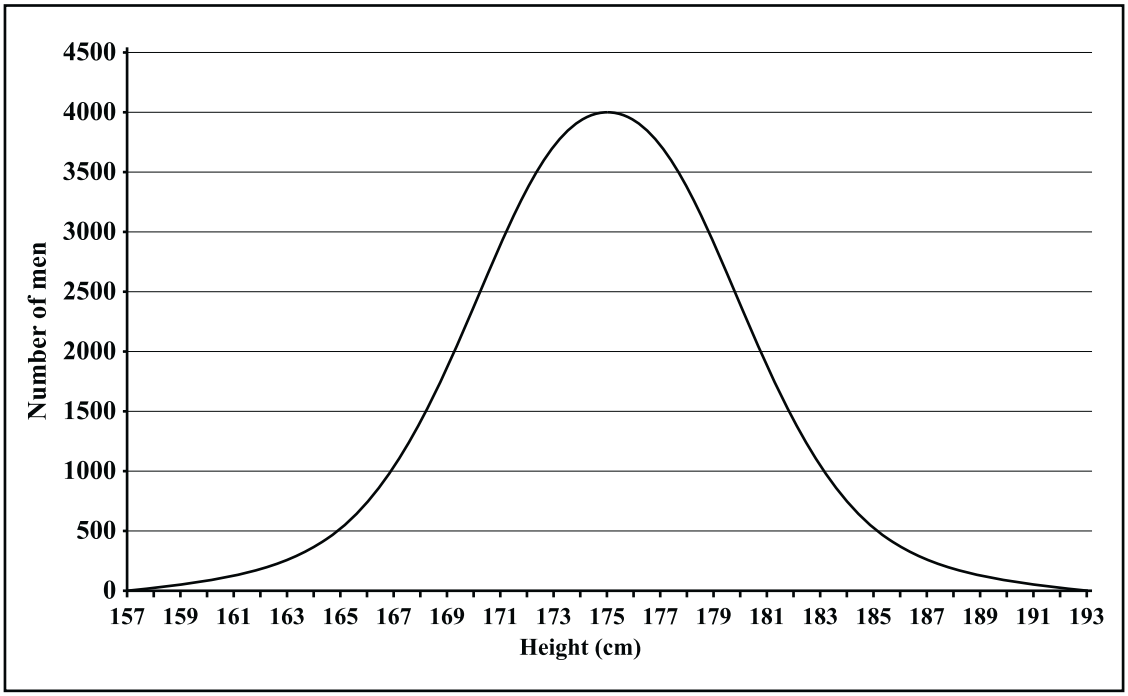


Figure 1. Height of a sample of men in a population

In the space below, construct a table using the data presented in Figure 1.

(3 marks)

GO ON TO THE NEXT PAGE

(b) Suggest T O **causes** of variation among members of the same species.

_____

(2 marks)

(c) The blood types of the members of a class of 30 students are recorded in Table 1.

TABLE 1: BLOOD TYPE OF 30 STUDENTS

Blood Type	Number of Students
A	3
	9
A	
O	10

Explain how the **type** of variation shown in Table 1 differs from the type of variation represented by Figure 1.

(4 marks)

(d) (i) lood transports substances within the human body. Name T O substances that are transported by blood.

(2 marks)

(ii) lood tests are done for the group of students. The amount of haemoglobin in the blood of three students is found to be below normal. Explain how this will affect the ability of these three students to perform well in sports.

(4 marks)

GO ON TO THE NEXT PAGE

(e) (i) In flowering plants, xylem vessels transport substances.

Draw and annotate a diagram to show how the following materials could be set up to investigate the rate at which water moves through the xylem vessels under T O different conditions.

Materials 2 beakers, water, dye, stopwatch, fan, ruler, plants with transparent stems **(4 marks)**

(ii) rite a suitable hypothesis for this investigation.

(2 marks)

(f) Relate the structure of xylem vessels to their role in the transport of water through plant stems.

(4 marks)

Total 25 marks

2. oth plants and animals respond to stimuli.

(a) Figure 2 is a diagram of the human eye.

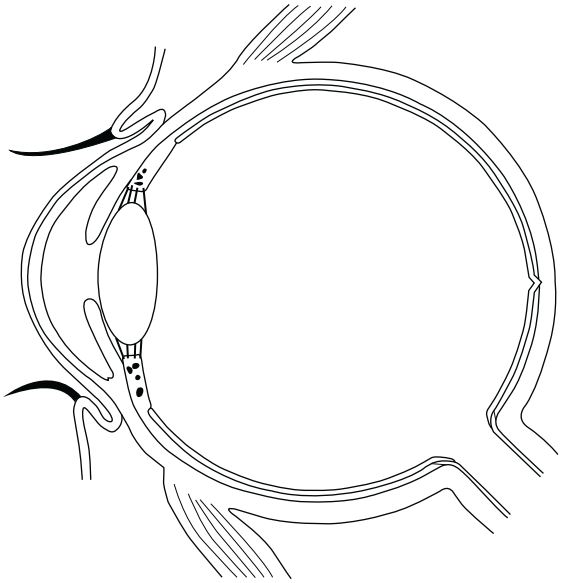


Figure 2. A section through the human eye

On Figure 2, write the name of the part and use a label line to identify EACH of the following parts of the eye

(i) The light sensitive layer

(ii) The elly-like substance that keeps the eye in shape

(iii) Carries nerve impulses to the brain

(iv) Controls the shape of the lens

(4 marks)

(b) Statements A and below describe two different examples of plant movement.

A. The roots of seedlings grow downwards in the soil.

. The shoots of cucumber seedlings grow towards light coming through an open window.

(i) Name the stimulus for EACH set of seedlings.

Seedlings in A _____

Seedlings in _____

(2 marks)

(ii) Name the hormone responsible for the response of the cucumber seedlings in .

(1 mark)

(iii) Suggest how the types of movement described in A and may be useful to the seedlings.

A _____

_____

_____

_____

(2 marks)

(c) Certain soil invertebrates show a marked response to moisture.

Describe ONE similarity and ONE difference between the response of soil invertebrates and the response of the cucumber seedlings in .

Similarity _____

_____

Difference _____

_____

(4 marks)

(d) Outline T O ways in which the nervous system functions differently from the endocrine system in humans.

(2 marks)

Total 15 marks

3. (a) Name T O metabolic waste products excreted by plants.

(2 marks)

(b) Figure 3 shows a side view of the human male reproductive system.

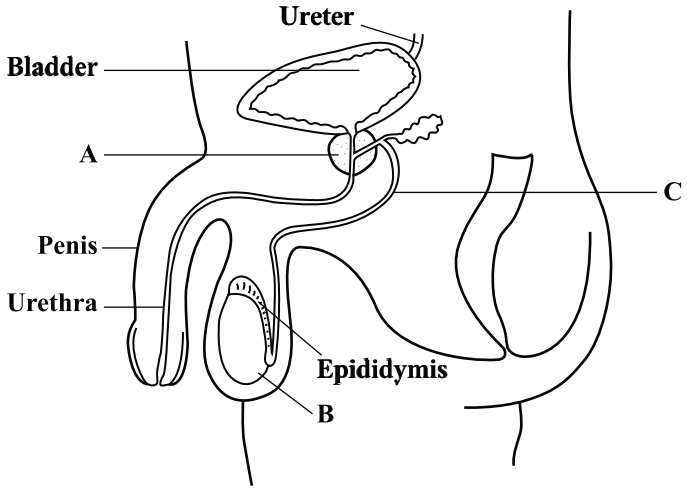


Figure 3. The human male reproductive system

(i) Name the parts labelled A, and C in Figure 3.

A _____

_____

C _____

(3 marks)

(ii) The kidneys excrete urea and water in the form of urine. Use arrows on the diagram in Figure 3 to show the pathway taken by urine on its way out of the male's body.

(2 marks)

(c) (i) Contraceptive methods may be temporary or permanent. Explain how ONE structure in Figure 3 can be manipulated to achieve permanent sterility in males.

_____

_____

(2 marks)

(ii) Explain how tubal ligation results in sterility in **females**.

_____

_____

(2 marks)

(d) New shoots can grow from the buds or eyes' of a potato tuber. Explain T O ways in which this method of reproduction is different from reproduction in humans.

_____

_____

_____

_____

(4 marks)

Total 15 marks

SECTION B

Answer ALL questions.

Write your answers in the spaces provided at the end of each question.

4. The human body comes into contact with many pathogens. Some of these pathogens are spread by vectors.

(a) Name T O ways by which the human body prevents itself from becoming infected. **(2 marks)**

(b) (i) Describe the life cycle of a **named** insect vector.

(ii) Explain how knowledge of the life cycle of this insect vector can be used to prevent the transmission of a named pathogenic disease. **(6 marks)**

(c) A student is about to travel to a country where yellow fever is rampant.

(i) Explain how a vaccine can provide the student with active acquired immunity against this disease.

(ii) Discuss why a vaccine that provides passive acquired immunity is NOT suitable for this student.

(7 marks)

Total 15 marks

Write your answer to Question 4 here.

Write your answer to Question 4 here.

5. Mangrove swamps are found along the coasts of many Caribbean countries. Mangrove trees are the dominant type of vegetation adapted for survival in waterlogged brackish soil. Animals usually found in this area include tree snakes, frogs, crabs, worms, blue herons (birds), termites, and anteaters.

(a) Define EACH of the following terms with reference to the mangrove swamp ecosystem:

Population

Physical (abiotic) factors

Habitat **(6 marks)**

(b) Some investors want to remove the mangrove swamp in an area near your home, to develop the land for housing. Propose ONE argument to support this plan and T O arguments against it. **(6 marks)**

(c) Explain the effect on the carbon cycle of cutting and burning large areas of mangrove trees across the Caribbean. **(3 marks)**

Total 15 marks

Write your answer to Question 5 here.

Write your answer to Question 5 here.

Write your answer to Question 5 here.

6. (a) (i) Sketch an outline of the human body and show the location of the pancreas and the pituitary gland in the outline.

(ii) Name ONE hormone secreted from EACH of the endocrine glands in (a) (i) above.

(iii) The pancreas also produces en ymes that are important in digestion. Name T O factors that may affect the activity of these en ymes.

(6 marks)

(b) Explain how hormones secreted from the pancreas work together with the liver to regulate blood sugar levels. **(5 marks)**

(c) If you were lost on a desert island for two days, how would a hormone secreted from your pituitary gland work to prevent you from becoming completely dehydrated?

(4 marks)

Total 15 marks

Space for diagram

Write your answer to Question 6 here.

Write your answer to Question 6 here.

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2013046

TEST CODE **01207032**

MAY/JUNE 2013

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

BIOLOGY

Paper 032 – General Proficiency

Alternative to SBA

2 hours u s

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. Answer A questions.
2. You are advised to take some time to read through the paper and plan your answers.
3. Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

1. A group of biologists are asked to conduct an ecological study of a forest with a river flowing through it.

(a) The biologists set up a line transect to investigate the changing distribution of organisms, two miles inland from the river bank on either side of the river. Describe how this apparatus is to be used.

(3 marks)

(b) The biologists also use a 1 m^2 quadrat to investigate the distribution of different plant species found within 100 m on either side of the river bank. Some of this data is given in Table 1.

TABLE 1: RESULTS FROM QUADRAT THROWS

Plant Organism	**Quadrat Number**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Cactus species (Xerophytes)	1	10	12	10		12	1	10	12	10
Flowering shrubs	3		6		2	3	3	2	3	0
Ferns	3	22		20	2	2	2	1	2	30

(i) Calculate the species density of EACH of the three plant species using the data in Table 1. Show your working in each case.

Cactus species

_____

_____

_____

Flowering shrubs

_____

_____

_____

Ferns

_____

_____

_____

(6 marks)

(ii) Suggest T O reasons why the number of ferns counted on the third throw of the quadrat was so low, compared with the results obtained on the other throws.

_____

_____

(2 marks)

(iii) Predict which of the three plant species would be found FURTHEST away from the river bank and give a reason for your answer.

_____

_____

(2 marks)

(c) A few of the organisms found in the area are shown in Figure 1.

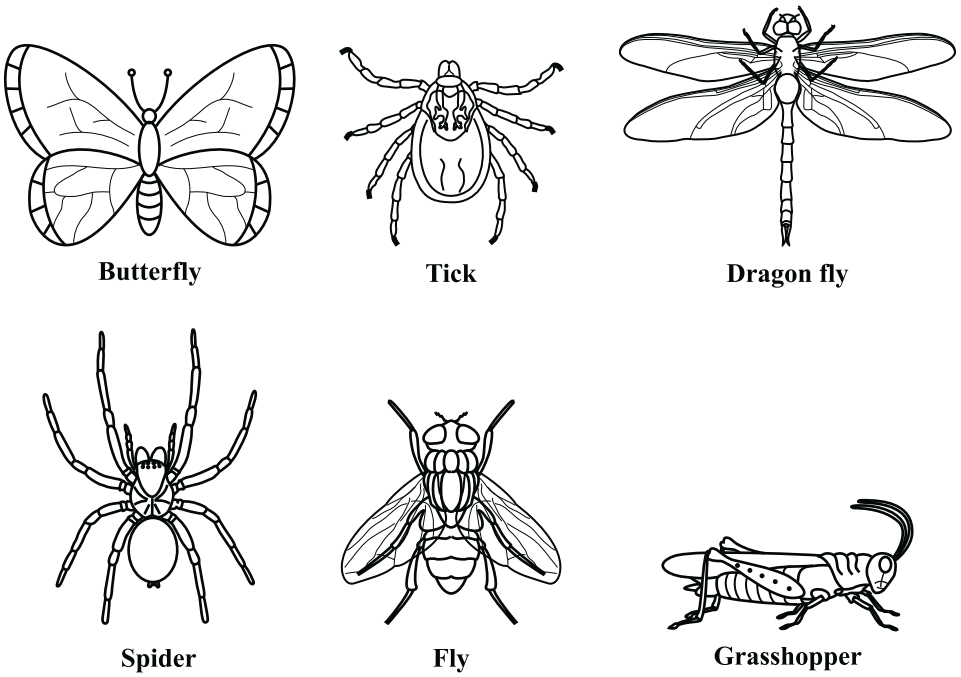


Figure 1. Some organisms found in the forest

(i) Name ONE visible feature, other than wings, shown in the organisms in Figure 1, and complete Table 2 to classify the organisms into groups, using this visible feature. **(5 marks)**

TABLE 2: CLASSIFICATION OF ORGANISMS IN FIGURE 1

Name of Visible Feature	Name of Group	Name of Organisms in Group
_____	1.	
	2.	

(ii) Describe the procedure which the biologists may have used to investigate the distribution of the animals that are able to fly.

_____

_____

_____

_____

(3 marks)

(iii) State ONE precaution that should be taken when using the procedure described in (c) (ii) above.

_____

(1 mark)

(d) The biologists observe that the larvae of the butterflies feed on the leaves of the ferns, and small birds eat these larvae. Draw a simple pyramid in the space below to represent this information.

(3 marks)

(e) Give ONE reason why the biologists should OR should not encourage developers to build houses in this area.

_____

_____

(2 marks)

Total 27 marks

NOTHING HAS BEEN OMITTED.

2. Forty-eight seeds are collected from fruits taken from the same dicotyledonous plant and the seeds are weighed. The masses of the seeds range from 0.10 mg to 0.2 mg.

(a) Suggest why the seeds do NOT have exactly the same weight.

_____

(2 marks)

(b) After a five-day period of germination, the seedlings are divided into two batches, A and , of 2 seedlings each. The dry mass of three of the seedlings from each batch is determined.

(i) ist the apparatus and describe a suitable procedure for investigating the dry mass of the seedlings.

Apparatus

_____

Procedure

_____

_____

_____

_____

(4 marks)

(ii) The remaining seedlings in atch are treated with varying amounts of organic fertili er. Suggest a suitable aim for this investigation.

_____

_____

(2 marks)

(iii) State which batch of seedlings would be considered the control, and give a reason for your answer.

atch _____

Reason _____

_____

(2 marks)

GO ON TO THE NEXT PAGE

(c) The average dry mass of three seedlings is determined over a 12-day period after germination and recorded in Table 3.

TABLE 3: AVERAGE DRY MASS OF SEEDLINGS

Number of days after germination	**1**	**2**	**4**	**7**	**9**	**10**	**12**
Average dry mass of seedlings from Batch A (mg)		1.	2.3	3.2	6.	7.6	.0
Average dry mass of seedlings from Batch B (mg)		1.	2.0	.	7.2	.2	12.2

(i) For Day 1, the dry mass of the three seedlings in atch A is 0. , 0.7 and 0. mg respectively, while the dry mass for the three seedlings in atch is 0. , 0.6 and 0. mg respectively.

Calculate the average dry mass of the three seedlings taken from EACH of the batches and **record your answer in Table 3**.
Show your working.

Average dry mass of seedlings from atch A

_____

_____

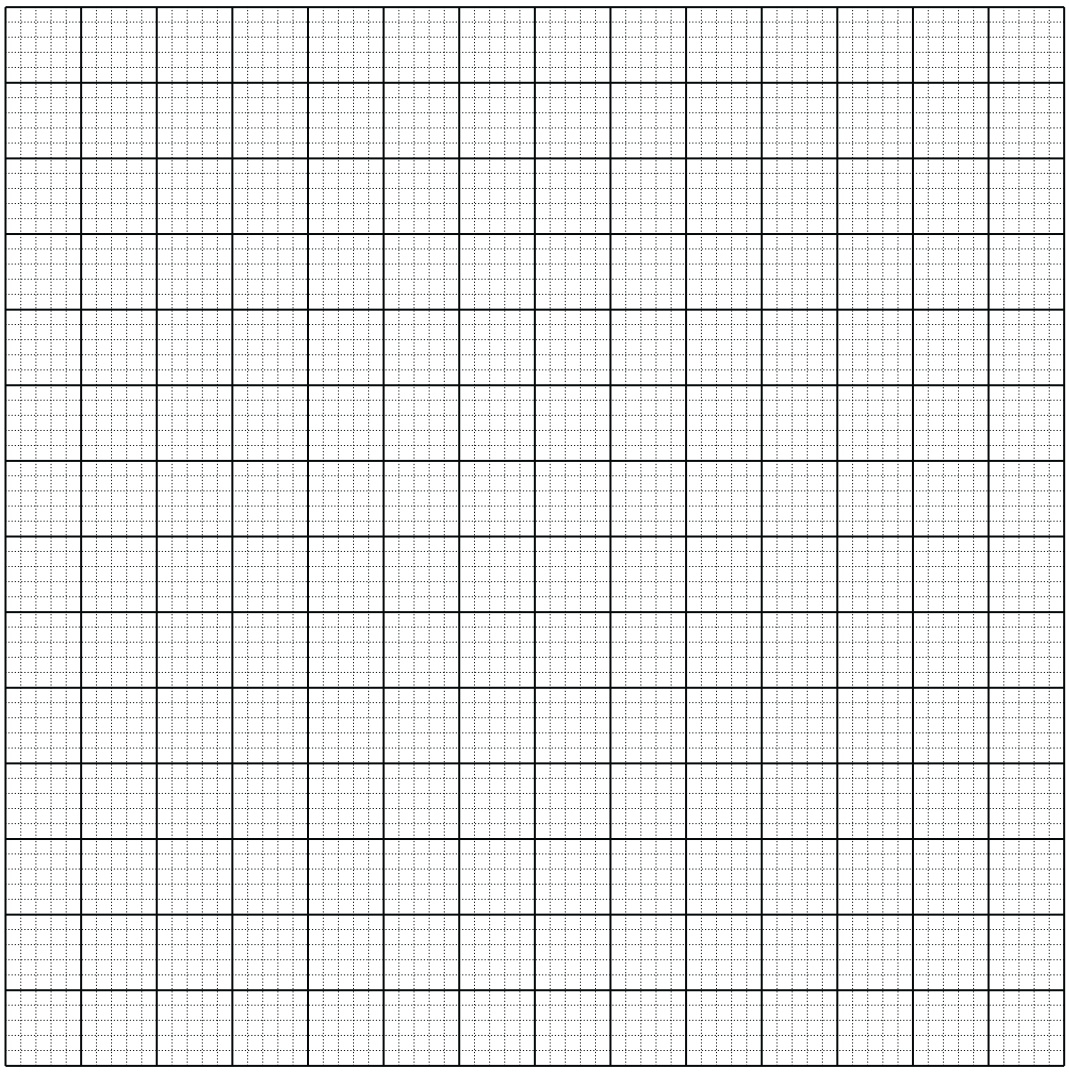
Average dry mass of seedlings from atch

_____

_____

(4 marks)

(ii) On the grid provided in Figure 2, plot a graph of the data in Table 3.



(5 marks)

Figure 2. Grid for data

(iii) Determine the average dry mass of the seedlings on Day , from the graph in Figure 2.

atch A _____

atch _____

(2 marks)

(iv) Explain the difference in the shape of the two graphs drawn in Figure 2.

_____

_____

(2 marks)

Total 23 marks

GO ON TO THE NEXT PAGE

3. Figure 3 shows the head of a bony fish with its gills.

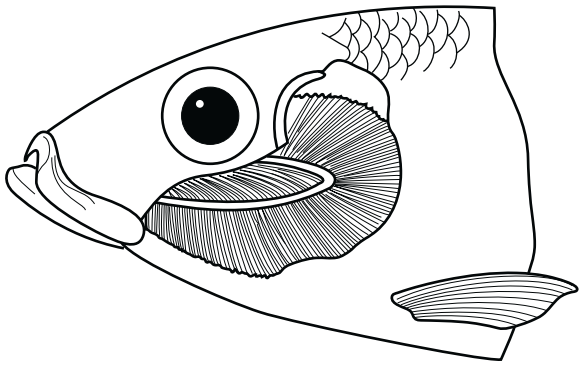


Figure 3. Head of a bony fish

(a) (i) Make a labelled drawing of the gills in the space provided below.

(6 marks)

(ii) Calculate the magnification of your drawing. **Show your working**.

_____

_____

(2 marks)

(b) Identify T O visible features of the gills drawn in (i) above that make them suited to their function in the bony fish.

_____

_____

(2 marks)

Total 10 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

TEST CODE **01207020**

FORM TP 2014002

JANUARY 2014

C A R I B B E A N E X A M I N A T I O N S C O U N C I L

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in two sections. Answer ALL questions.
2. For Section A, write your answers in the spaces provided in this booklet.
3. For Section B, write your answers in the spaces provided at the end of each question, in this booklet.
4. Where appropriate, answers should be illustrated by diagrams.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

SECTION A

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

1. The apparatus in Figure 1 is used to test the hypothesis that both green plants and small animals produce carbon dioxide during aerobic respiration.

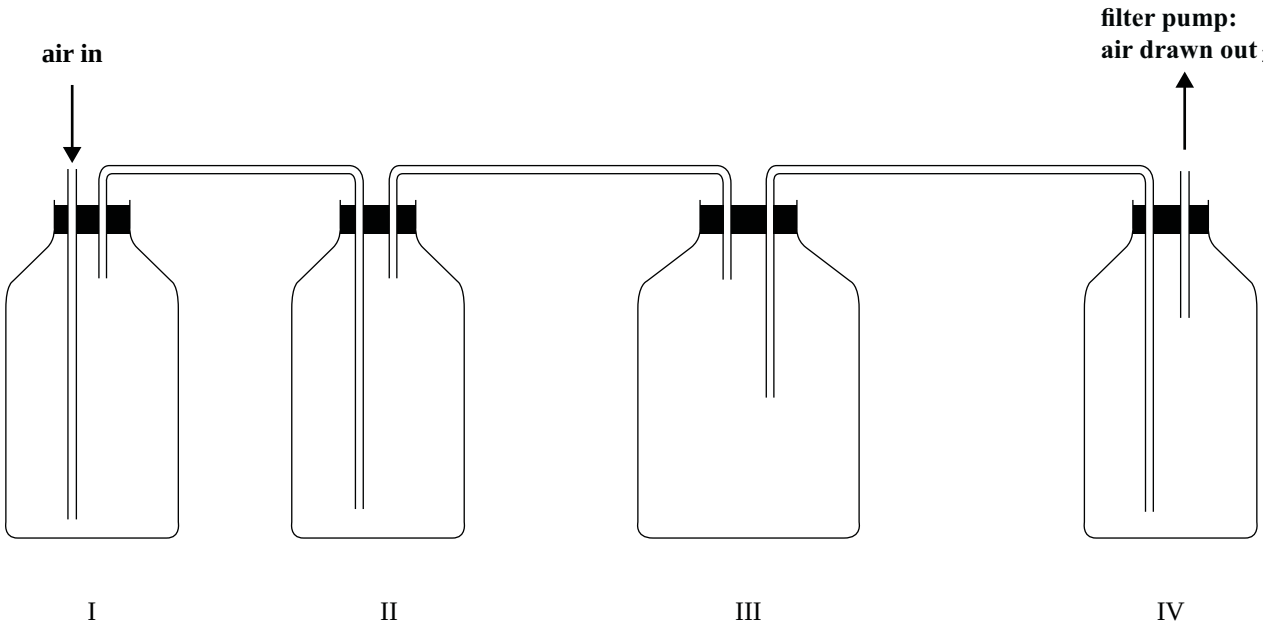


Figure 1. Apparatus used to investigate carbon dioxide production during aerobic respiration

(a) (i) Complete Figure 1 by identifying the materials that EACH jar should contain.

Jar I _____

Jar II _____

Jar III _____

Jar IV _____

(4 marks)

(ii) What is the expected observation in Jar IV?

_____

(1 mark)

(b) In order to test the hypothesis using plants only, a piece of black cloth is used to modify the apparatus shown in Figure 1.

(i) Describe how the apparatus in Figure 1 is modified to test the hypothesis that plants produce carbon dioxide during aerobic respiration.

_____

_____

_____

(2 marks)

(ii) Explain the function of the black cloth in the experiment.

_____

_____

(2 marks)

(iii) Suggest TWO precautions that should be taken when conducting this experiment.

_____

_____

(2 marks)

(c) (i) Write a chemical equation to summarize aerobic respiration.

_____

(2 marks)

(ii) Explain the importance of aerobic respiration to living organisms.

_____

_____

_____

(2 marks)

(d) In certain microorganisms, respiration occurs anaerobically. State the end products of **anaerobic** respiration.

_____

_____

(2 marks)

(e) Complete Table 1 to distinguish between photosynthesis and aerobic respiration.

TABLE 1: COMPARISON OF PHOTOSYNTHESIS AND AEROBIC RESPIRATION

	Photosynthesis	**Aerobic Respiration**
Organelle		
Is energy used or produced? **Write the word 'used' OR 'produced' in the correct column**		
Raw materials used		
Final products		

(8 marks)

Total 25 marks

2. (a) Figure 2 shows a vertical section through mammalian skin.

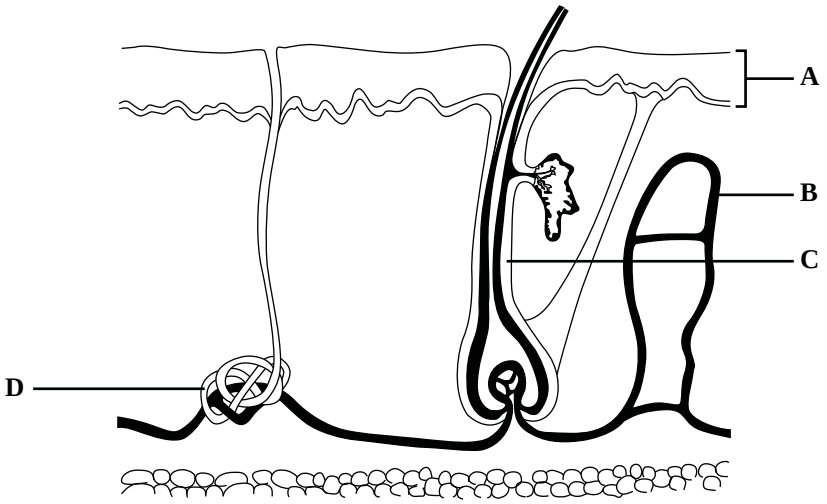


Figure 2. Vertical section through mammalian skin

(i) Name the structures labelled A, B, C and D shown in Figure 2.

A _____

B _____

C _____

D _____

(4 marks)

(ii) Melanin is a pigment that protects the skin from damage by UV light. Which structure in Figure 2 has the LARGEST quantities of this pigment?

_____

(1 mark)

(b) Albinism is characterized by a lack of melanin in the skin. A person with an albino phenotype has genotype, **aa.**

(i) State what is meant by EACH of the following terms:

a) Allele

_____

_____

b) Genotype

_____

_____

c) Phenotype

_____

_____

(3 marks)

(ii) Using a genetic diagram, explain how two non-albino parents could produce an albino offspring.

(6 marks)

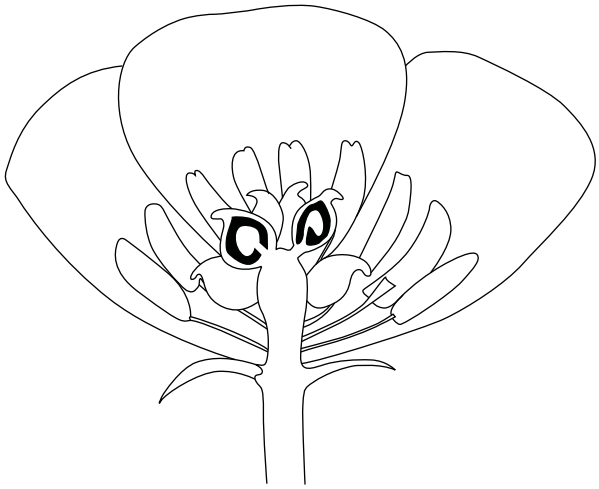
(iii) Suggest the genotypes of parents who will never have albino children.

_____

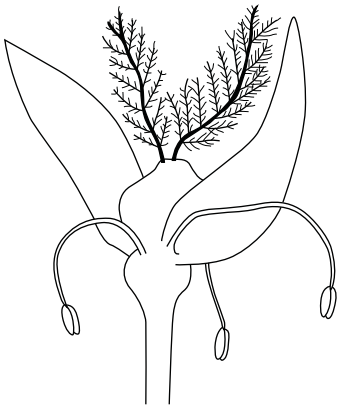
(1 mark)

Total 15 marks

3. Figure 3 shows two flowers, labelled X and Y, that were taken from two different plants.



Flower X



Flower Y

Figure 3. Diagram of two flowers from different plants

(a) (i) Indicate on EACH flower in Figure 3, the parts that give rise to the male gametes. Use a label line and the letter, M. **(2 marks)**

(ii) Suggest the agent of pollination for EACH flower.

X _____

Y _____

(2 marks)

(iii) What TWO features of EACH flower make them suited for the type of pollinating agent suggested in (ii) above?

X _____

_____

Y _____

_____

(4 marks)

(b) Describe the sequence of events which takes place after pollination to give rise to a fruit.

_____

_____

_____

_____

(5 marks)

(c) Figure 4 shows a fruit formed from Flower X.

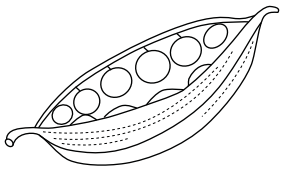


Figure 4. Fruit formed from Flower X

Suggest TWO methods of dispersal of the seeds found inside this fruit.

_____

_____

(2 marks)

Total 15 marks

SECTION B

Answer ALL questions.

Write your answers in the spaces provided at the end of each question.

4. (a) (i) Use labelled diagrams to show the structures of a generalized plant cell and a generalized animal cell. **(6 marks)**

(ii) Name TWO organelles which are unique to plant cells and suggest the significance of these organelles to the survival of the plant. **(4 marks)**

(b) (i) An animal cell and a plant cell are placed in a container of distilled water for 15 minutes. Explain the effect this would most likely have on EACH cell. **(3 marks)**

(ii) Explain how the process responsible for the results in (b) (i) differs from the process by which gases move in and out of leaf cells. **(2 marks)**

Total 15 marks

Space for diagram for (a) (i)

Write your answer to Question 4 here.

Write your answer to Question 4 here.

5. (a) (i) Draw a simplified labelled diagram of the nitrogen cycle to show THREE processes that involve bacteria and ONE process that does not involve bacteria. **(4 marks)**

(ii) State TWO consequences of nitrogen deficiency in plants. **(2 marks)**

(b) In a river near to a farming community, there are numerous dead organisms and an overgrowth of algae.

(i) Explain how excess nitrate fertilizer may be responsible for the overgrowth of algae and death of the aquatic organisms. **(3 marks)**

(ii) Discuss THREE ways in which this problem could be remedied. **(6 marks)**

Total 15 marks

Space for diagram for (a) (i)

Write your answer to Question 5 here.

Write your answer to Question 5 here.

6. (a) With the aid of an annotated diagram, describe the functions of the enamel, dentine and pulp of a named tooth. **(6 marks)**

(b) The mouth of a mammal usually contains several types of teeth, which allow it to consume a varied diet from both plant and animal sources.

Suggest THREE ways having a varied diet is beneficial to a mammal. **(3 marks)**

(c) An eighty-year-old man has lost all his teeth.

Explain how this might affect his ability to digest food and suggest how he could obtain the essential nutrients that his body requires. **(6 marks)**

Total 15 marks

Space for diagram for (a)

Write your answer to Question 6 here.

Write your answer to Question 6 here.

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

TEST CODE **01207032**

FORM TP 2014003

JANUARY 2014

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

BIOLOGY

Paper 032 – General Proficiency

2 hours 10 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. Answer ALL questions.
2. Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.
3. You are advised to use the first 10 minutes to read through the paper. Writing may begin during this time.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Answer ALL questions.

Write your answers in the spaces provided.

1. Five test tubes containing a mixture of 2 cm^3 amylase and 2 cm^3 1% starch suspension are each placed in water-baths kept at five different temperatures: 0 °C, 20 °C, 40 °C, 60 °C and 80 °C.

(a) After 15 minutes, a sample of the amylase-starch mixture contained in each test tube is tested for the presence of starch.

(i) List the pieces of the apparatus and describe the procedure used to test for the presence of starch in the samples, and the expected result if starch is present.

Apparatus

_____

Procedure

_____

_____

_____

Expected result

_____

(6 marks)

(ii) Suggest TWO precautions that must be taken to ensure accuracy of the results.

_____

_____

(2 marks)

(b) Another sample of the amylase-starch mixture is taken from each of the five test tubes after 20 minutes and tested for the presence of reducing sugar. The final results of colour changes observed in each tube are presented in Table 1.

TABLE 1: FINAL COLOUR CHANGES OBSERVED DURING TESTS FOR REDUCING SUGAR

Temperature of Sample (°C)	**0**	**20**	**40**	**60**	**80**
Colour Change	Blue	Yellow	Orange-red	Blue	Blue

(i) Explain how a reducing sugar could be formed in this experiment.

_____

_____

(2 marks)

(ii) Suggest a suitable aim for the experiment.

_____

_____

(2 marks)

(iii) Explain why the samples kept at 0 °C, 60 °C and 80 °C show a blue colour when tested for a reducing sugar.

_____

_____

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_____

(4 marks)

(iv) Suggest TWO possible sources of error in this experiment.

_____

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(2 marks)

(c) A similar experiment is carried out to investigate the pH at which amylase optimally converts substrates to products, and the results plotted on a graph similar to that shown in Figure 1.

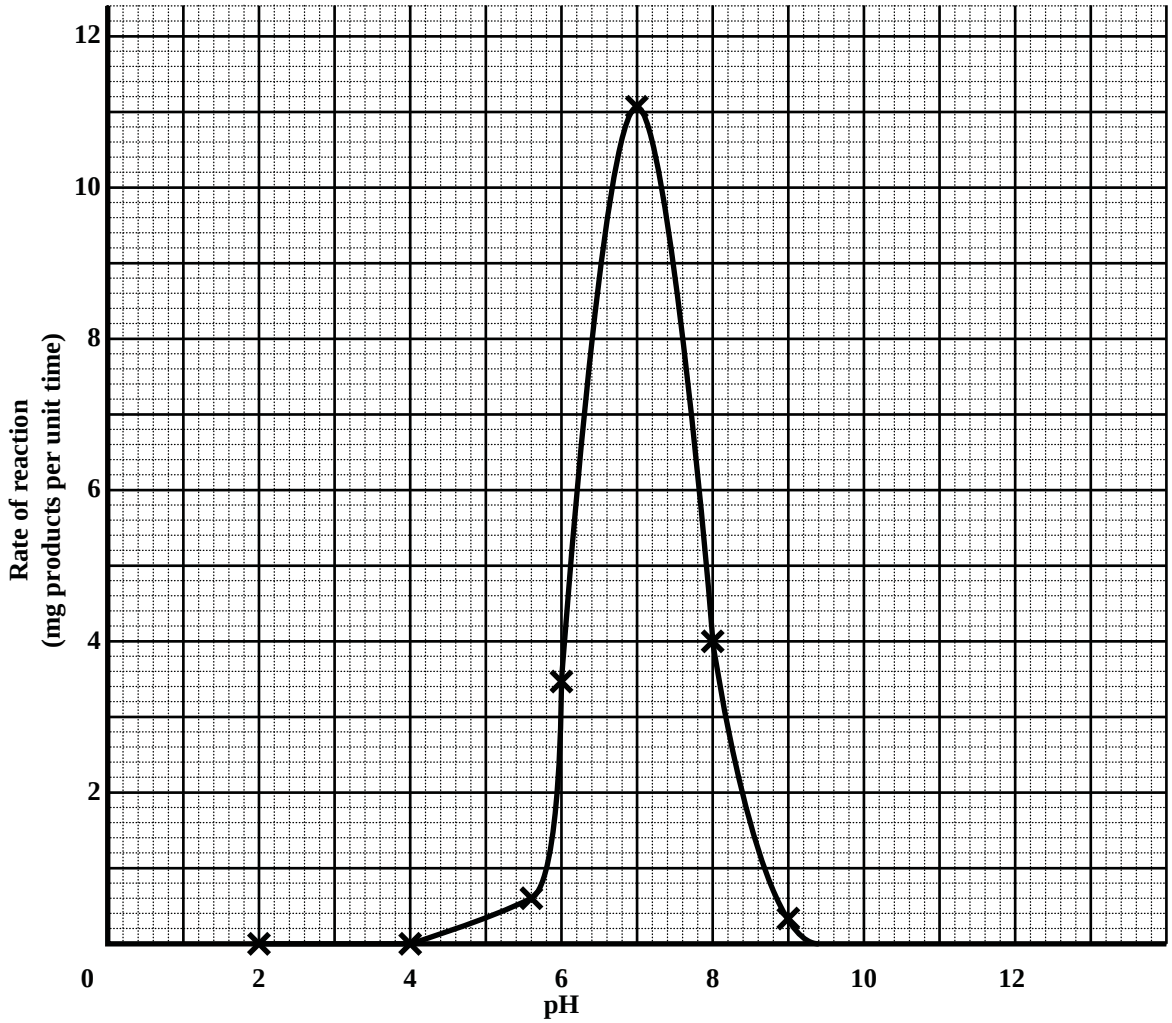


Figure 1. Graph showing rate of reaction of amylase at different pH levels

(i) In the space below, construct a table to represent the data in Figure 1.

(5 marks)

(ii) Write a conclusion for this investigation.

_____

_____

(2 marks)

Total 25 marks

2. The apparatus shown in Figure 2 is set up to investigate the effect of light intensity on the rate of photosynthesis in an aquatic plant.

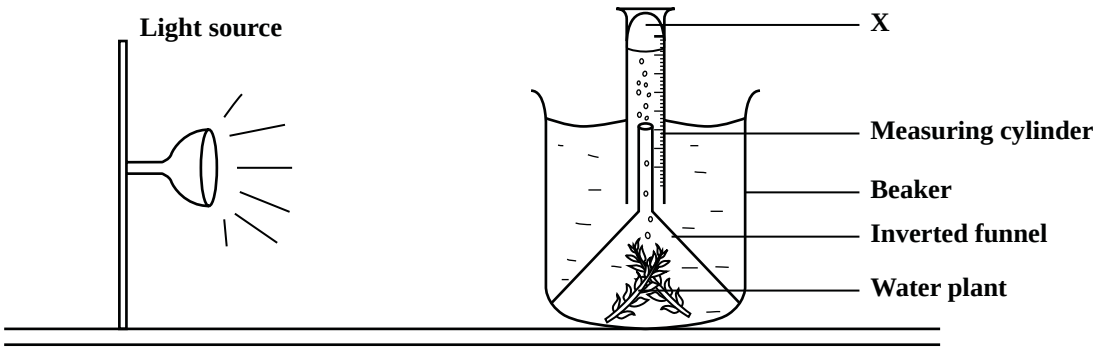


Figure 2. Apparatus to investigate effect of light intensity on rate of photosynthesis in an aquatic plant

(a) (i) Write a hypothesis that could be tested using the apparatus in Figure 2.

_____

_____

(2 marks)

(ii) Describe how the apparatus may be used to test the hypothesis in (a) (i) above.

_____

_____

_____

(3 marks)

(iii) Describe a suitable control for this investigation.

_____

_____

_____

(2 marks)

(b) (i) Identify the gas labelled **X**, in Figure 2.

_____

(1 mark)

(ii) Describe a test to confirm the gas identified in (b) (i) above.

_____

_____

(3 marks)

(c) Two leaves labelled A and B, were taken from two different types of aquatic plants found in a river. Leaf B has a darker green colour than Leaf A. One of the leaves was removed from a plant found about one metre below the surface of the water, while the other was taken from a plant found five metres below the surface of the water. Leaves A and B were placed on graph paper and the outline of their lamina drawn as shown in Figures 3A and 3B respectively.

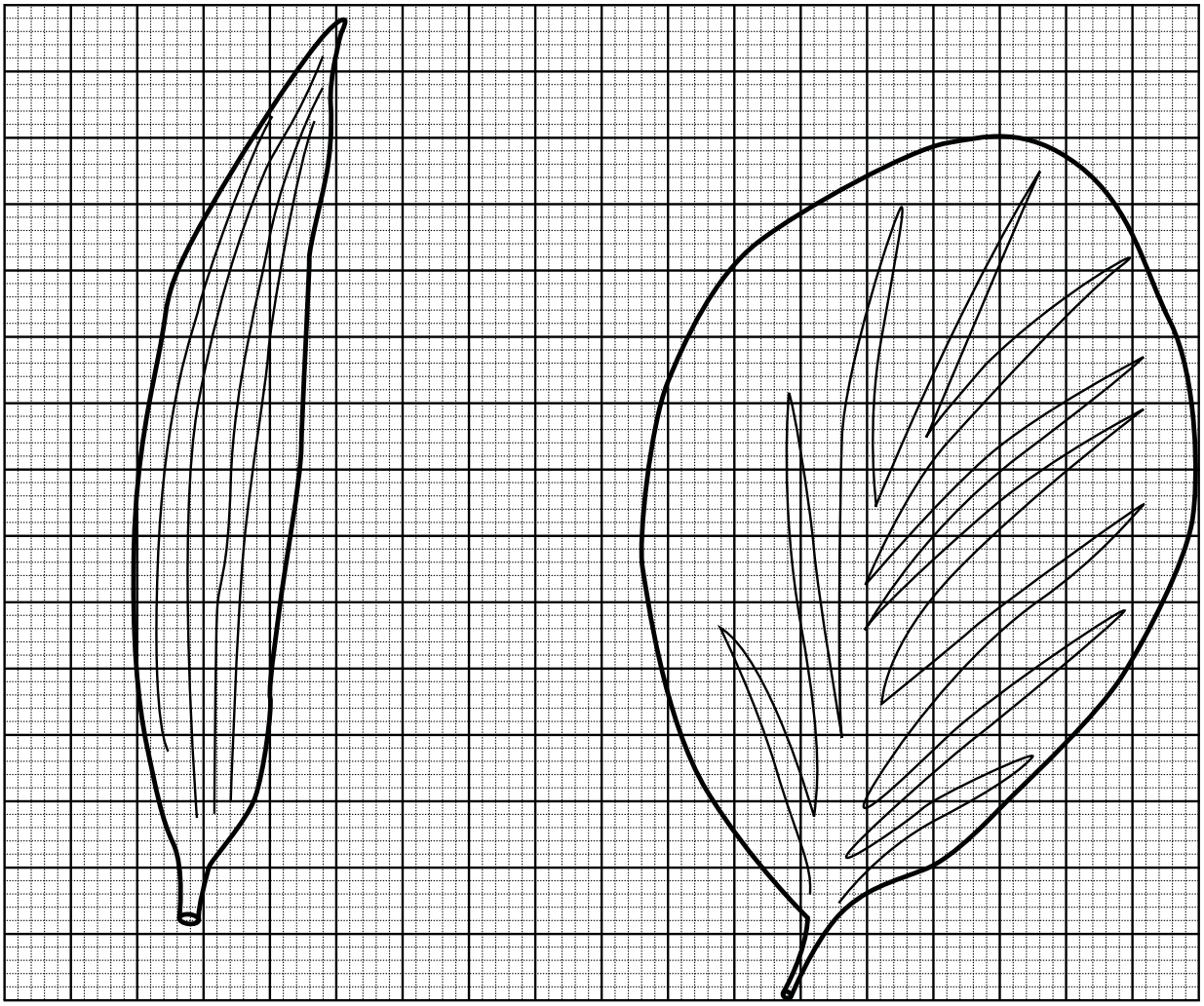


Figure 3A. Drawing of Leaf A

Figure 3B. Drawing of Leaf B

(i) Calculate the surface area of Leaf A and Leaf B.

Surface area of Leaf A _____

Surface area of Leaf B _____

(4 marks)

(ii) Suggest which of the leaves, A or B, is more likely to belong to a plant found at a depth of **five metres** below the surface of the water.

_____

(1 mark)

(iii) Explain your answer in (c) (ii) above.

_____

_____

_____

(2 marks)

Total 18 marks

3. (a) Figure 4 is a drawing of the external view of a blood vessel that transports blood away from the left side of the heart of a small mammal.

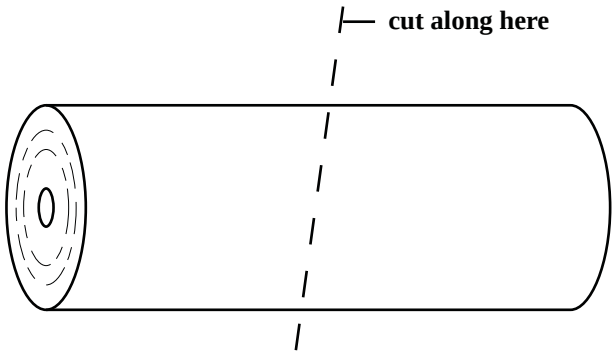


Figure 4. Drawing of external view of a blood vessel

(i) In the space below, produce a fully labelled drawing of the blood vessel as it would appear in transverse section when cut as shown in Figure 4.

(5 marks)

(ii) Calculate the magnification of your drawing. **Show your working.**

(2 marks)

(iii) Explain how ONE feature shown in your drawing makes the blood vessel suited to its function.

_____

_____

(2 marks)

(b) Hypertension (or high blood pressure) is among the leading causes of death in the Caribbean. Table 2 provides data about the number of deaths reported among males and females from this disease in some Caribbean countries from 1985 to 2000.

TABLE 2: DEATHS FROM HYPERTENSION IN SOME CARIBBEAN COUNTRIES FROM 1985 TO 2000

	Number of Deaths from Hypertension	
Year	**Male**	**Female**
1985	800	1050
1990	830	1040
1995	870	1120
2000	1150	1500

(i) On the grid provided on page 11, draw a suitable graph to represent the data in Table 2. **(5 marks)**

(ii) Suggest THREE reasons for the difference in the number of deaths among males and females, due to hypertension.

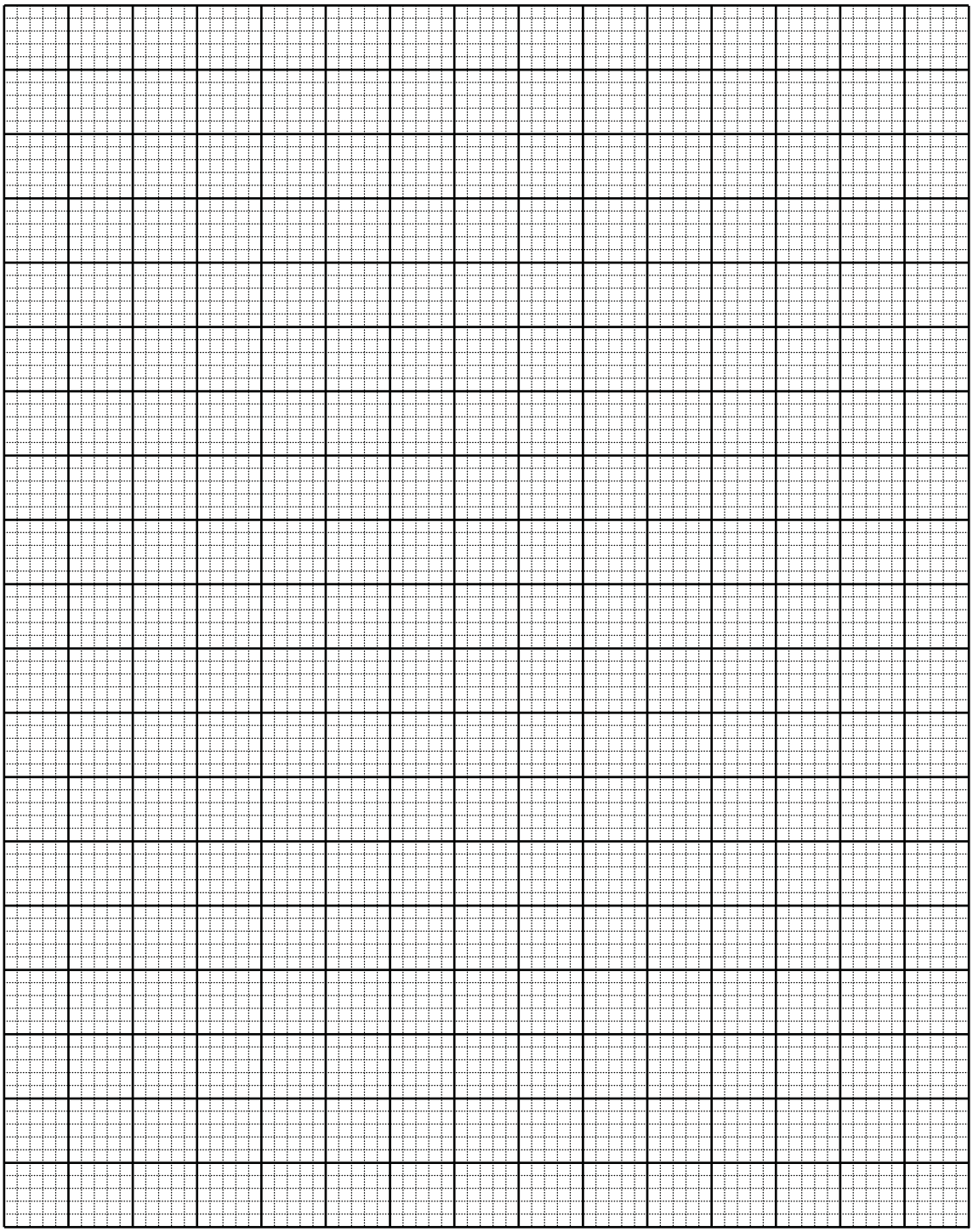
_____

_____

_____

(3 marks)

Total 17 marks



Graph showing number of deaths from hypertension

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2014045

TEST CODE **01207020**

MAY/JUNE 2014

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in two sections. Answer ALL questions.
2. For Section A, write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
3. For Section B, write your answers in the spaces provided at the end of each question, in this booklet.
4. Where appropriate, answers should be illustrated by diagrams.
5. If you need to re-write any answer and there is not enough space to do so on the original page, you must request extra lined pages from the invigilator. **Remember to draw a line through your original answer and correctly number your new answer in the box provided**.
6. **If you use extra pages you MUST write your registration number and question number clearly in the boxes provided at the top of EVERY extra page.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

SECTION A

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

1. (a) Figure 1 shows drawings of different types of fish collected by marine biologists who are studying the distribution of organisms living in a marine ecosystem.

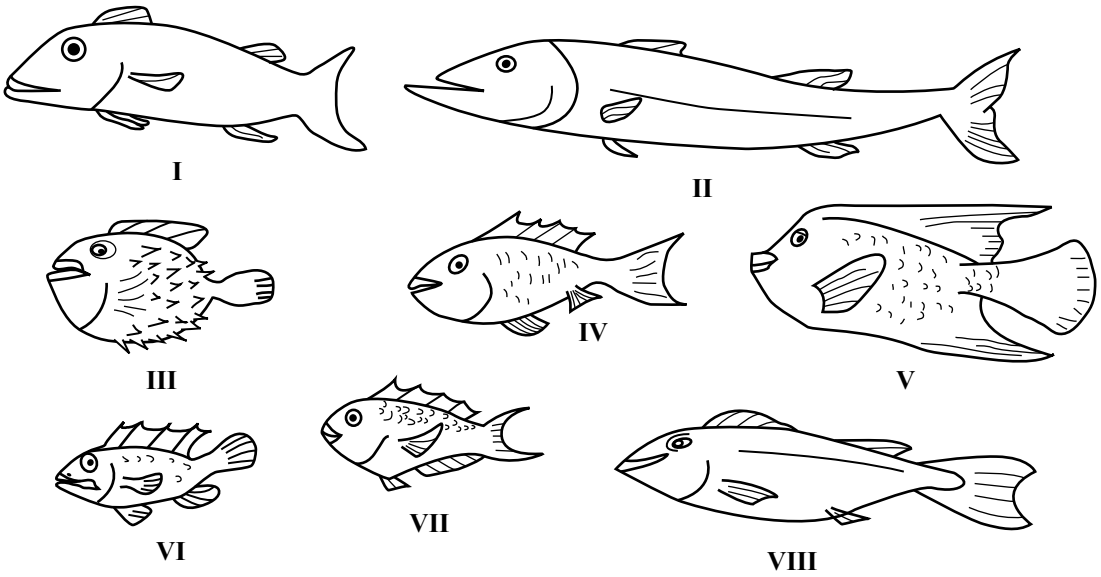


Figure 1. Fish collected from a marine ecosystem

(i) Construct a table in the space below to classify the fish in Figure 1 into groups using TWO visible features **other than size.**

(3 marks)

(ii) A gill from one of the fish is shown in Figure 2. Annotate Figure 2 to illustrate TWO characteristics that make the gill suitable for gaseous exchange.

(2 marks)

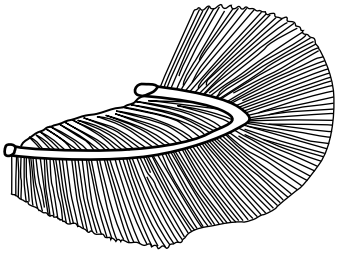


Figure 2. Gill of a fish

(iii) State TWO reasons why gaseous exchange is important in living organisms.

.....

.....

(2 marks)

NOTHING HAS BEEN OMITTED.

(b) Figure 3 shows a food web that the biologists constructed to describe the feeding relationships observed in this marine ecosystem.

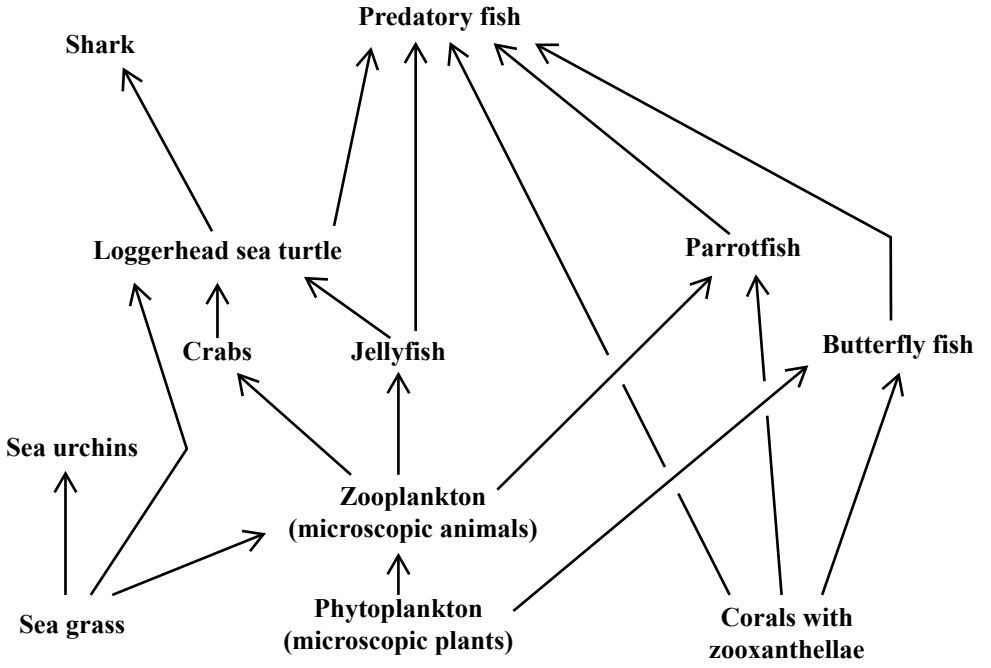


Figure 3. Food web in the marine ecosystem

(i) Identify TWO producers in the food web in Figure 3.

.....

.....

(2 marks)

(ii) State TWO characteristics of producers in a food web.

.....

.....

(2 marks)

(iii) Corals are found in shallow waters and contain microscopic algae known as zooxanthellae which contain chloroplasts. The corals provide the algae with carbon dioxide, shelter and protection, while the algae provide the corals with nutrients and oxygen.

Identify the type of feeding relationship between the coral and the zooxanthellae and give a reason for your answer.

.....

.....

(2 marks)

(c) At six-month intervals over a three-year period, marine biologists collected data on the estimated population size of parrotfish and a predatory fish. Table 1 presents this data.

TABLE 1: ESTIMATED NUMBER OF PARROTFISH AND PREDATORY FISH OVER THREE YEARS

Time (Months)	Estimated Number of Parrotfish	Estimated Number of Predatory Fish
January 2007	2 500	35
June 2007	2 000	40
December 2007	1 200	55
June 2008	1 100	80
December 2008	970	95
June 2009	400	105
December 2009	200	120

(i) Represent the data in Table 1 on a suitable graph on the grid provided on page 7. **(6 marks)**

(ii) Suggest an explanation for the differences in the shapes of the graphs.

.....

.....

.....

(2 marks)

(iii) Name TWO features that the predatory fish may have that allow it to carry out its role as a predator.

.....

.....

(2 marks)

(iv) Suggest what the likely consequences would be if the population size of the predatory fish is NOT controlled.

.....

.....

(2 marks)

Total 25 marks

GO ON TO THE NEXT PAGE

2. (a) Figure 4 shows an external view of the human heart.

(i) Identify the structures labelled A, B and C in Figure 4. **Write your answers on the lines provided in Figure 4**. **(3 marks)**

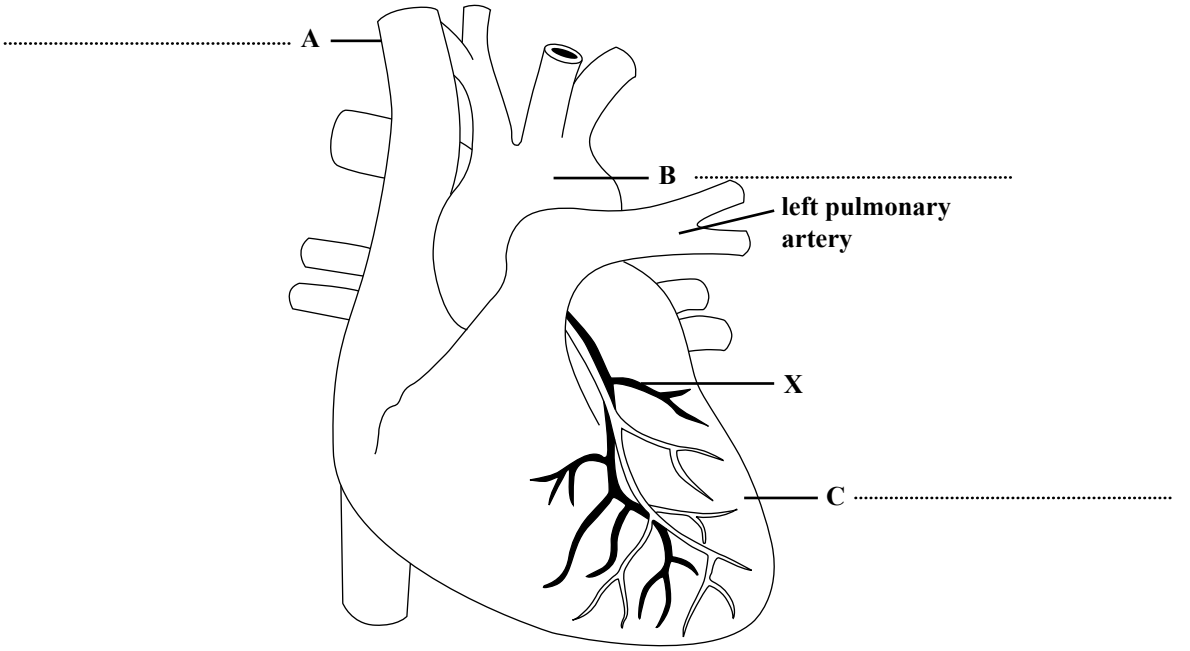


Figure 4. External view of the human heart

(ii) Explain how the function of the heart may be affected by a blockage of the blood vessel shown at X.

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(2 marks)

(b) Figure 5 shows blood vessels used to transport fluids around the body of a mammal.

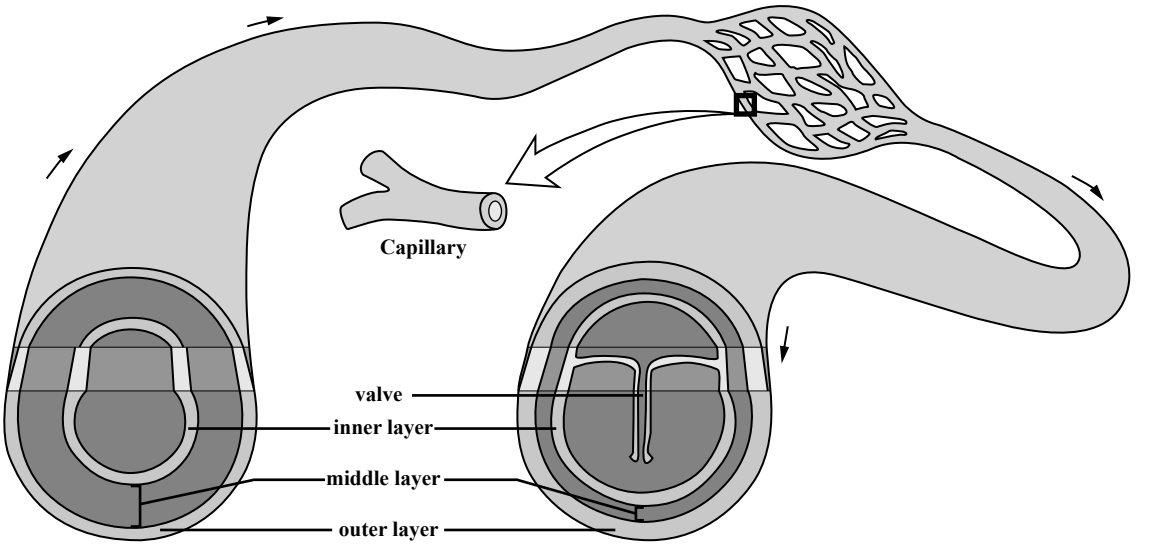

Figure 5. Blood vessels in a mammal

(i) Which blood vessel, A or B, represents a vein?

.....

(1 mark)

(ii) Identify ONE structure visible in Figure 5 which helps a **vein** to carry out its function.

.....

(1 mark)

(iii) Explain how the structure identified in (b) (ii) allows the vein to fulfil its function.

.....

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(2 marks)

(iv) Diets high in saturated fats may lead to the formation of plaques in blood vessels. Explain how such deposits may lead to hypertension.

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(2 marks)

(c) Figure 6 shows the transport vessels of a flowering plant.

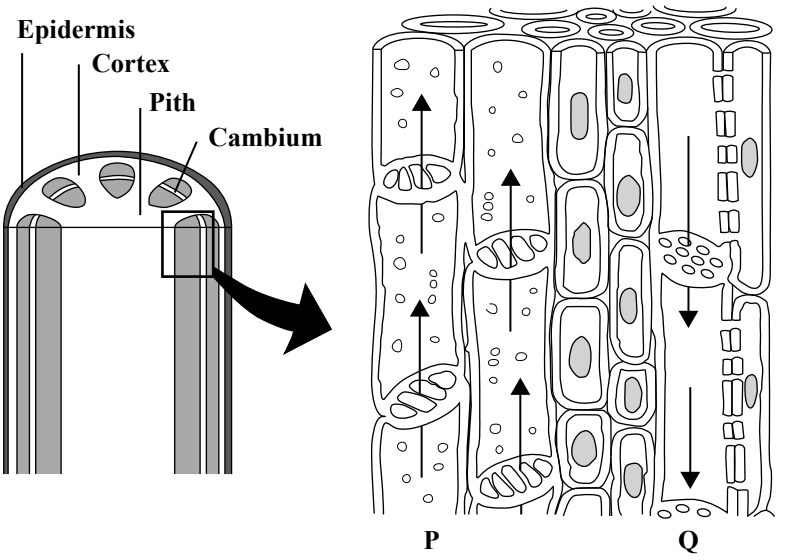

Figure 6. Transport vessels in a flowering plant

Identify the vessels shown at Positions P and Q in Figure 6.

P .....

Q .....

(2 marks)

(d) Explain why plants do NOT need an organ like a heart in their transport system, and outline ONE mechanism by which plants move fluids through their transport vessels.

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(2 marks)

Total 15 marks

3. (a) Figure 7 is a diagram of a nephron found in a human kidney.

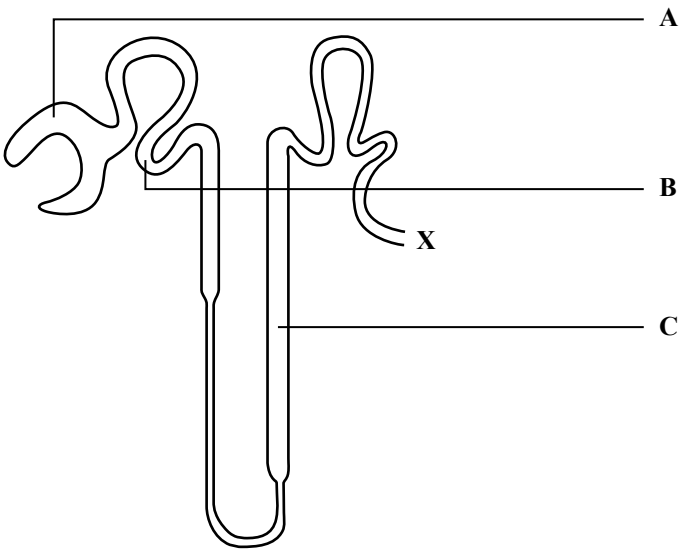

Figure 7. Diagram of a nephron

(i) Identify the structures labelled A, B and C in Figure 7 and briefly describe the process that takes place in EACH of these structures.

A .....

Process .....

.....

B .....

Process .....

.....

C .....

Process .....

.....

(6 marks)

(ii) Name the hormone secreted by the pituitary gland when there is NOT enough water in body cells.

.....

(1 mark)

GO ON TO THE NEXT PAGE

(iii) Explain why the composition of urine produced at X would differ in someone who drank a lot of water compared to someone who had no water to drink for over 24 hours.

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(4 marks)

(b) Table 2 shows a comparison of the substances found in the urine of a healthy person and that of someone who is diabetic.

TABLE 2: COMPOSITION OF URINE OF A HEALTHY PERSON AND OF A DIABETIC PERSON

Substance	% in Urine of Healthy Person	% in Urine of Diabetic Person
Glucose	0	10.0
Protein	0	0
Urea	2.0	6.0
Sodium chloride	0.6	0.4
Water	95	90

(i) Explain why there is glucose in the urine of the diabetic person, assuming that the kidneys are functioning properly.

.....

.....

(2 marks)

(ii) Describe TWO ways of managing diabetes mellitus.

.....

.....

(2 marks)

Total 15 marks

SECTION B

Answer ALL questions.

Write your answers in the spaces provided at the end of each question.

4. (a) With the aid of a diagram, outline THREE processes which return carbon to the atmosphere and ONE which removes it. (Include the form in which the carbon is found in the atmosphere.) **(6 marks)**

(b) Describe the impact of **cutting down** or **burning** large areas of forest on the recycling of carbon. **(6 marks)**

(c) Suggest THREE ways in which humans can make changes in their day-to-day activities to reduce the amount of carbon in the atmosphere. **(3 marks)**

Total 15 marks

Write your answer to Question 4 here.

Space for diagram for (a)

Write your answer to Question 4 here.

Write your answer to Question 4 here.

5. (a) Define the terms 'genotype', 'phenotype', 'recessive' and 'dominant'. **(4 marks)**

(b) (i) Albinism (lack of pigmentation) is an example of discontinuous variation. Give TWO examples of traits that show **continuous** variation. **(2 marks)**

(ii) A man with normal pigmentation and an albino woman produce two children, one of whom is an albino. Using appropriate symbols, draw a genetics diagram to show the genotypes of the parents and the expected phenotypes of the offspring. (Note that albinism is a trait caused by the inheritance of a recessive allele.) **(5 marks)**

(c) Many of the antibiotics used to control tuberculosis are no longer effective. Use the theory of natural selection to account for this. **(4 marks)**

Total 15 marks

Write your answer to Question 5 here.

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Write your answer to Question 5 here.

Write your answer to Question 5 here.

6. (a) (i) Name THREE types of tissue which coordinate to bring about movement in animals, and state THREE reasons why it is important for animals to be able to move. **(6 marks)**

(ii) Explain why, unlike animals, plants are able to survive without moving from place to place. **(2 marks)**

(b) A father **saw** his son step down onto the tarmac and **watched** as he ran towards him. Describe the changes that occurred in the father's eyes to keep his son's face in focus. **(7 marks)**

Total 15 marks

Write your answer to Question 6 here.

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Write your answer to Question 6 here.

Write your answer to Question 6 here.

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END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2014046

TEST CODE **01207032**

MAY/JUNE 2014

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

BIOLOGY

Paper 032 – Alternative to School-Based Assessment

General Proficiency

2 hours 10 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. Answer ALL questions.
2. Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.
3. Do NOT write in the margins.
3. You are advised to take some time to read through the paper and plan your answers.
4. If you need to re-write any answer and there is not enough space to do so on the original page, you must request extra lined pages from the invigilator. **Remember to draw a line through your original answer and correctly number your new answer in the box provided**.
5. **If you use extra pages you MUST write your registration number and question number clearly in the boxes provided at the top of EVERY extra page.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

1. Figure 1 is a drawing of a longitudinal section through a tomato fruit.

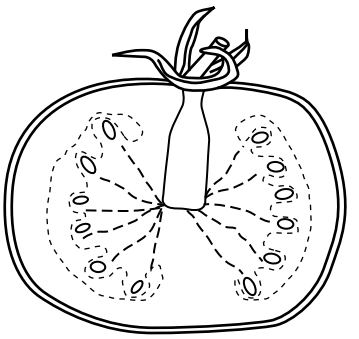

Figure 1. Longitudinal section through a tomato fruit

(a) In the space below, make a labelled drawing of the tomato in Figure 1, at a magnification of x 2.

(7 marks)

(b) The tomato fruit is placed in a juice extractor and the juice collected in a jar. Food tests are carried out to investigate the nutrient composition of the tomato. Complete Table 1 to describe the procedure used to carry out EACH of the food tests, and state the conclusion for EACH test.

TABLE 1: FOOD TESTS CARRIED OUT ON TOMATO JUICE

Food Nutrient	Procedure	Observation	Conclusion
Reducing sugar		Blue colour	
Protein		Blue colour	
Fat		Water mark on filter paper	
Starch		Brown mixture	

(9 marks)

(c) The apparatus in Figure 2 is set up to investigate one of the conditions necessary for the germination of tomato seeds.

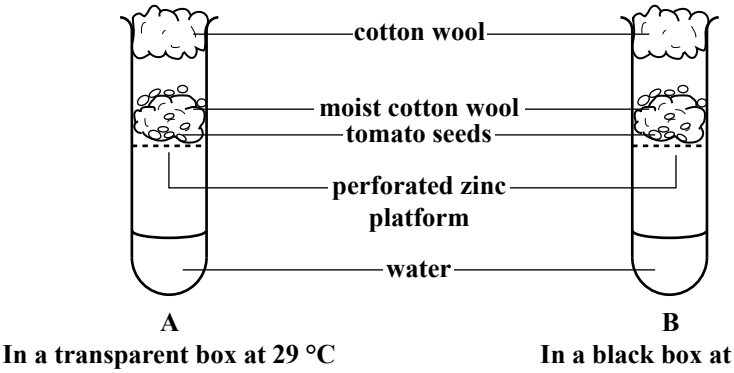

Figure 2. Investigating the germination of tomato seeds

(i) Write a suitable aim for this investigation.

.....

.....

(2 marks)

(ii) Suggest TWO precautions which need to be taken to ensure that the results of this investigation are valid.

.....

.....

(2 marks)

(iii) Explain the importance of moisture in the cotton wool.

.....

.....

(2 marks)

(iv) Describe how the investigation could be modified to determine if oxygen is necessary for germination.

.....

.....

(2 marks)

(v) Some seeds that were planted deeply in the soil germinated but did not come up above ground. Suggest why this happened.

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(2 marks)

(d) Figure 3 shows drawings of six germinated tomato seedlings collected at different times after the experiment was set up. The magnification of each drawing is x 3.

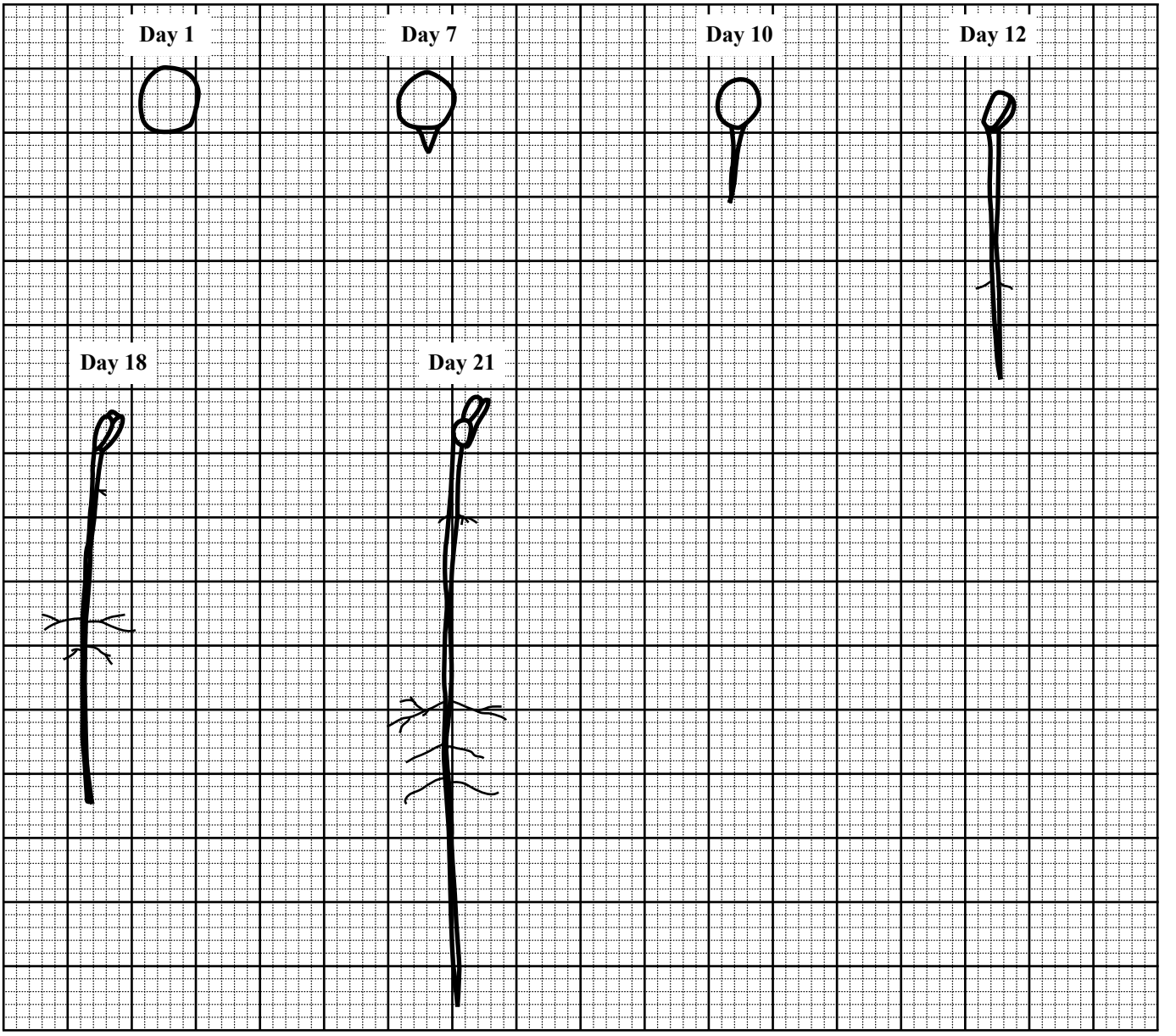


Figure 3. Germinating tomato seedlings

Measure the length of the radicle of EACH of the tomato seedlings in Figure 3 and record your answer in a suitable table in the space provided below.

(6 marks)

(e) Not all plants produce seeds. Some plants reproduce by their leaves, such as the one shown in Figure 4.

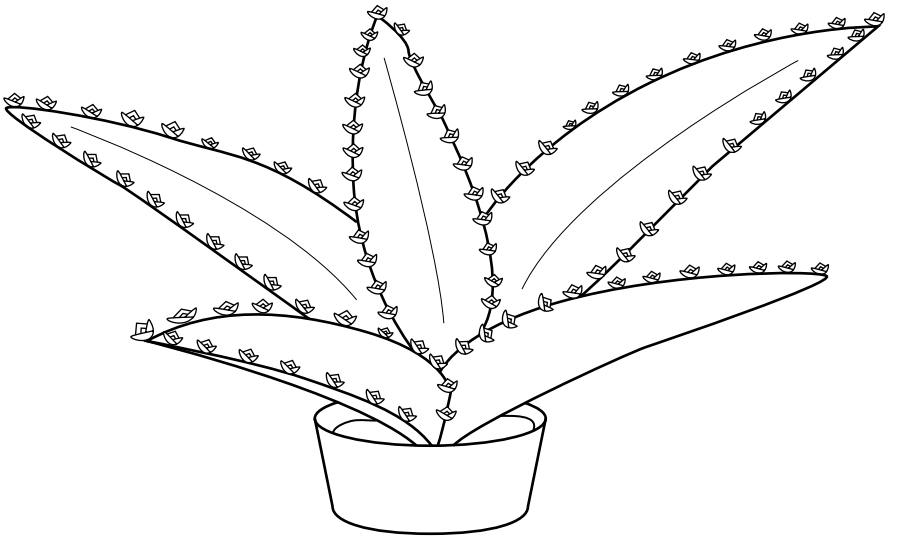


Figure 4. Drawing of leaves of a plant

(i) Name the type of reproduction carried out by this plant.

.....

(1 mark)

(ii) Suggest TWO advantages of this type of reproduction compared to the production of seeds for reproduction.

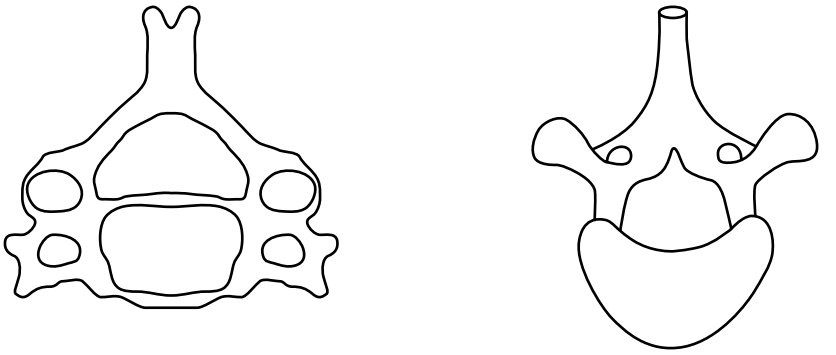
.....

.....

(2 marks)

Total 35 marks

2. Figure 5 shows two human vertebrae labelled A and B.



A **B**

Figure 5. Drawings of two human vertebrae

(a) In the space below, construct a table to compare any THREE characteristics of the two vertebrae, A and B.

(6 marks)

(b) Table 2 shows the average bone density of males and females between the ages of 25 and 85 years.

TABLE 2: AVERAGE BONE DENSITY OF MALES AND FEMALES 25–85 YEARS OLD

Age (years)	Bone Density (mg/cm^3)	
	Males	**Females**
25	1 200	1 050
35	1 150	1 050
45	1 100	1 050
55	1 100	980
65	1 000	900
75	1 000	860
85	980	740

(i) On the grid provided on page 11, plot a suitable graph to represent the data in Table 2. **(7 marks)**

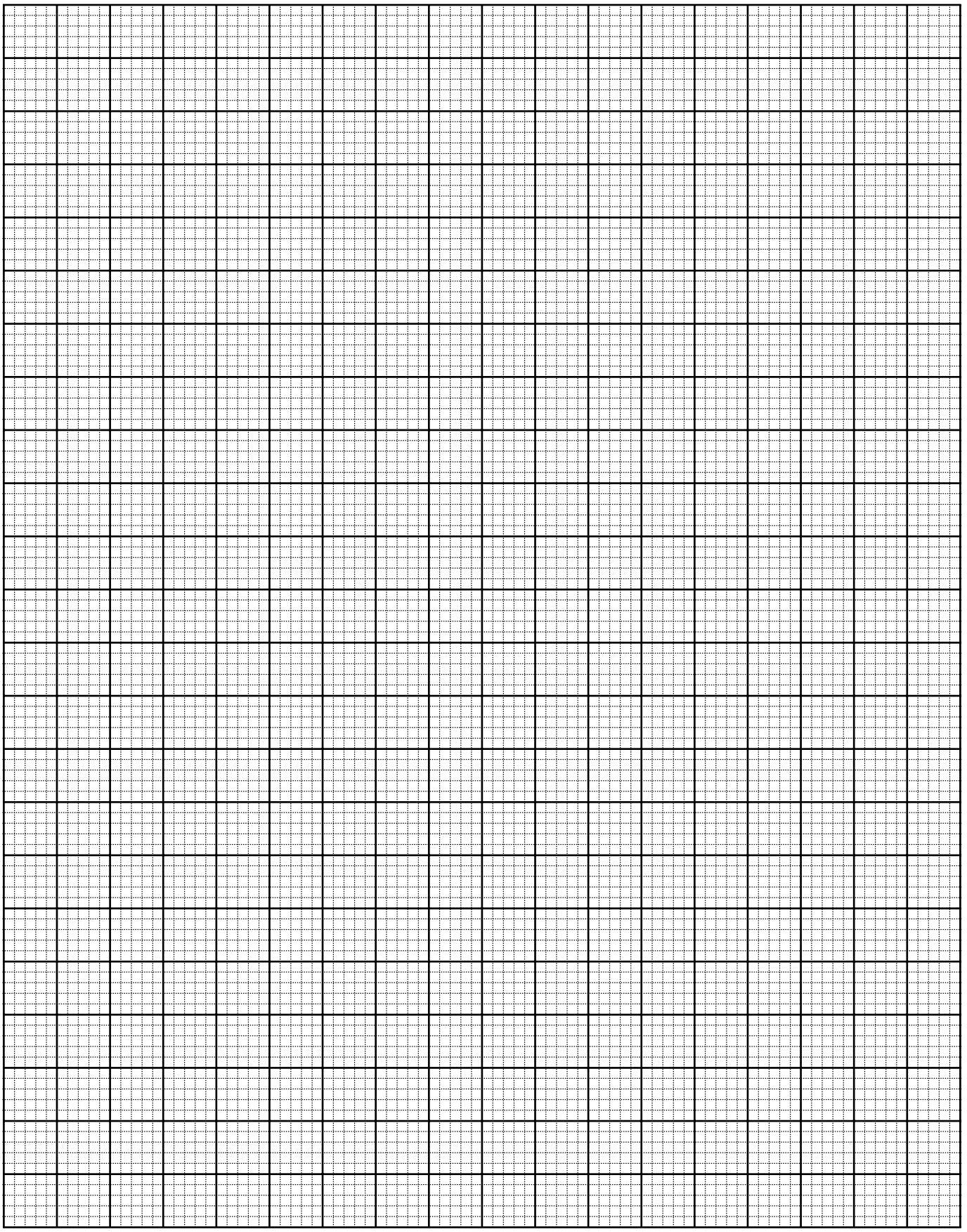
(ii) Write a conclusion that could be drawn from the data represented by the graph on page 11.

.....

.....

(2 marks)

Total 15 marks



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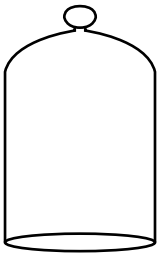
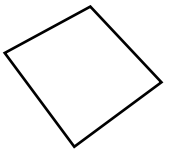
3. The apparatus in Figure 6 is used to construct a model of the human respiratory system.

2 balloons



bell jar



rubber sheet

rubber stopper with Y-tube inserted

Figure 6. Apparatus used to construct a model of the human respiratory system

(a) In the space below, draw the model as it would appear after it is set up.

(5 marks)

(b) Name the structure in the human respiratory system that is represented by the rubber sheet.

.....

(1 mark)

(c) Describe how the model could be used to demonstrate breathing in humans.

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(4 marks)
Total 10 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2015002

TEST CODE **01207020**

JANUARY 2015

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®

EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in two sections. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. Where appropriate, answers should be illustrated by diagrams.
5. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
6. **If you use the extra page(s) you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

NOTHING HAS BEEN OMITTED.

SECTION A

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

1. (a) Figure 1 shows two plant organs.

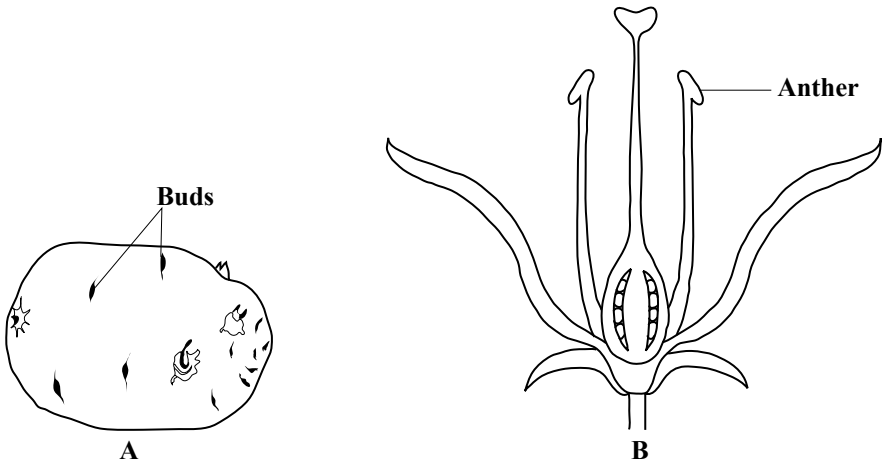

Figure 1. Plant organs

(i) Identify the type of reproduction carried out by EACH of the plant organs shown in Figure 1.

A: .....

B: .....

(2 marks)

(ii) Outline the sequence of events that would take place from pollination to the formation of the seed/fruit from the organ shown in Figure 1B.

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(3 marks)

(b) Mitosis and meiosis occur at different points in the life cycle of a typical flowering plant. Describe TWO differences between the **outcomes** of cell division by mitosis and cell division by meiosis.

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(4 marks)

(c) The plant from which the flower shown in Figure 1B comes, exists in two varieties: one produces blue flowers while the other produces white flowers. A cross between two blue-flowered plants produces 100 seeds. Seventy-four of the plants that develop from these 100 seeds have blue flowers while 26 have white flowers.

Deduce the **genotypes** of the parent plants. Explain your answer with the aid of a genetic diagram.

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Space for diagram for (c)

(3 marks)

(d) Figure 2 shows the growth of a seedling over eight days.

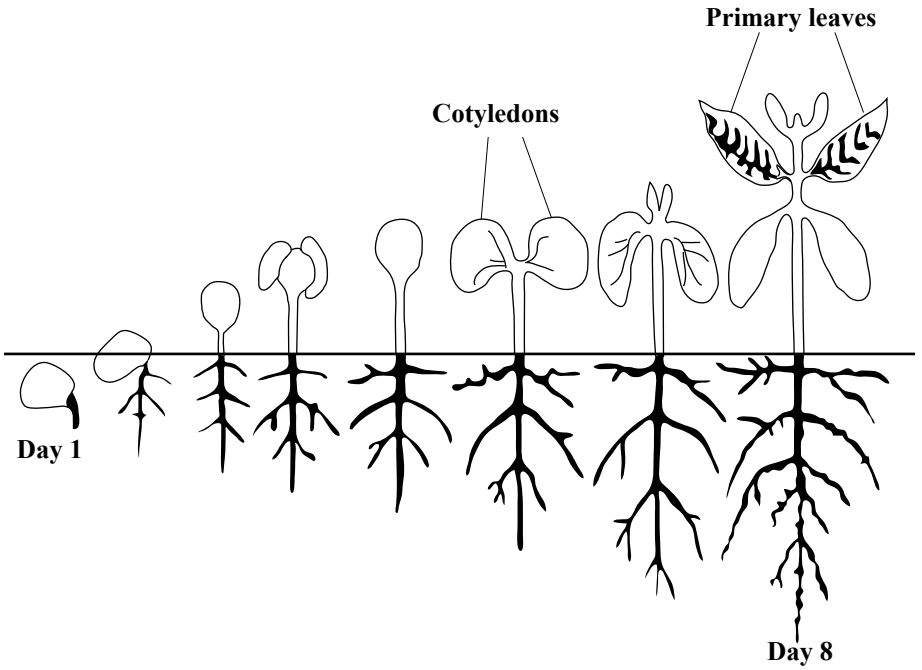


Figure 2. Diagram showing growth of a seedling over eight days

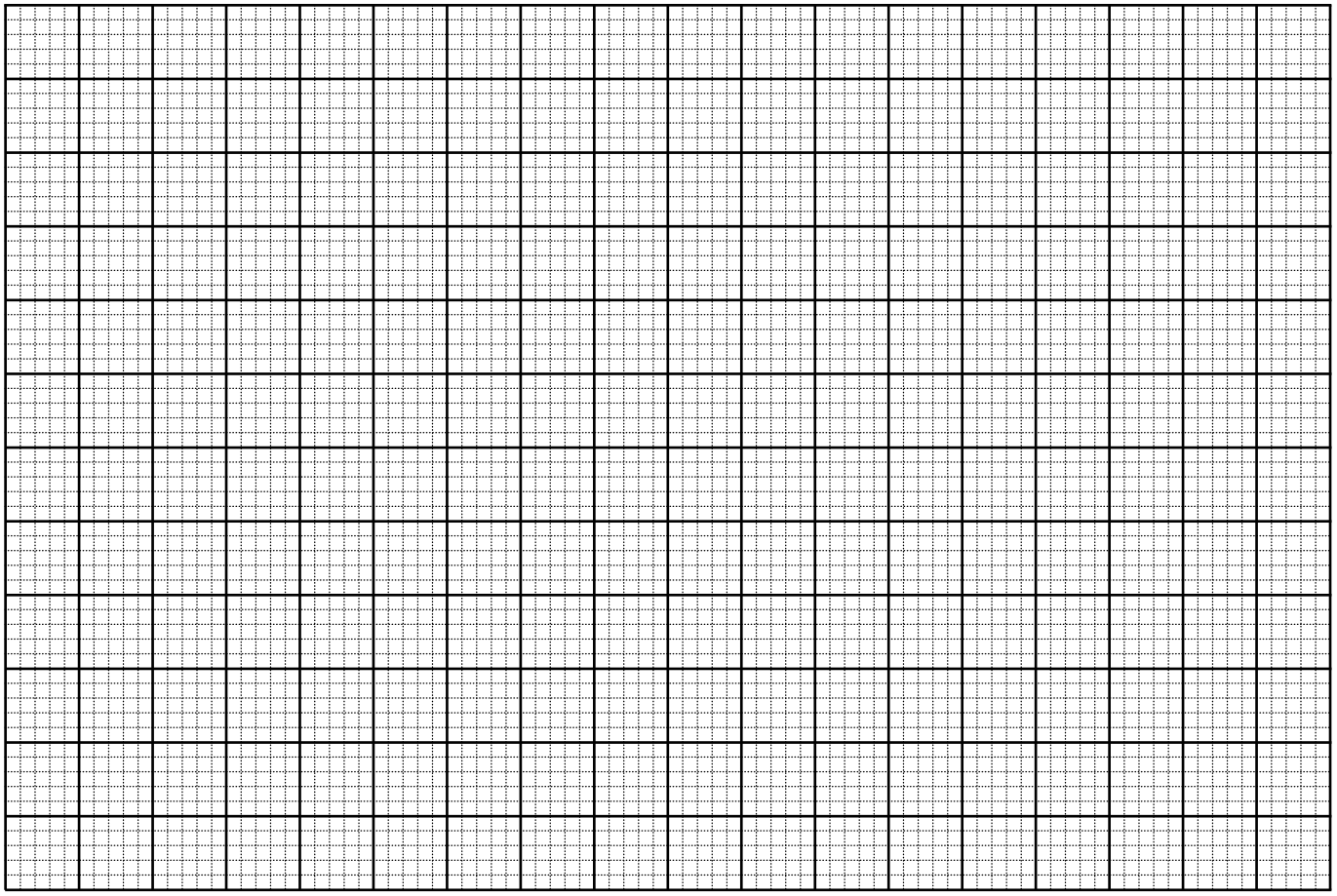
(i) Measure the length of the **radicle** of the seedling on EACH day and record your measurements in Table 1.

TABLE 1: LENGTH OF RADICLE AFTER GERMINATION

Days After Germination	Length of Radicle (cm)
1	
2	
3	
4	
5	
6	
7	
8	

(1 mark)

(ii) Plot the data in Table 1 on the graph paper below. Put days on the horizontal (x) axis.



(4 marks)

(iii) State TWO factors, other than water, that are required for the germination of the seed shown in Figure 2.

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(2 marks)

GO ON TO THE NEXT PAGE

(iv) Describe an investigation to test the hypothesis, 'Water is needed for the germination of seeds'.

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(4 marks)

(e) Suggest why the cotyledons (seed leaves) become smaller as the primary leaves increase in size.

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(2 marks)

Total 25 marks

2. Figure 3 is a diagram of the human alimentary canal.

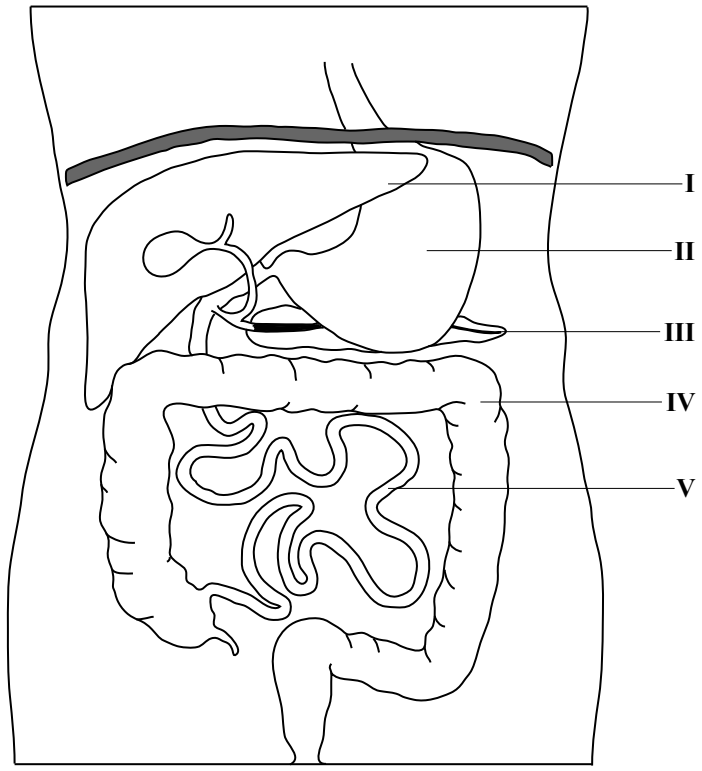

Figure 3. Diagram of the human alimentary canal

(a) (i) Identify the structures labelled I, II, III, IV and V in Figure 3.

I: .....

II: .....

III: .....

IV: .....

V: .....

(5 marks)

(ii) Using the symbol, **X**, indicate **on** Figure 3, TWO places where protein digestion takes place. **(2 marks)**

(iii) Suggest TWO reasons why the locations indicated in (a) (ii) are suitable for protein digestion to take place.

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(2 marks)

(iv) Give TWO reasons why living organisms need protein.

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(2 marks)

(b) Nitrogen is needed for the synthesis of proteins.

(i) In the liver, excess protein is converted to urea which is excreted by some animals. Briefly describe ONE route by which the nitrogen excreted from animals (in the form of urea) is made available to plants.

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(2 marks)

(ii) Suggest TWO signs of nitrogen deficiency in plants.

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(2 marks)

Total 15 marks

3. (a) Figure 4 is a concept map on diseases. Choose the correct term from the following list and complete the concept map in Figure 4.

Active, Artificial, Hereditary, Damaged organs, Natural, Microorganisms, Pathogenic

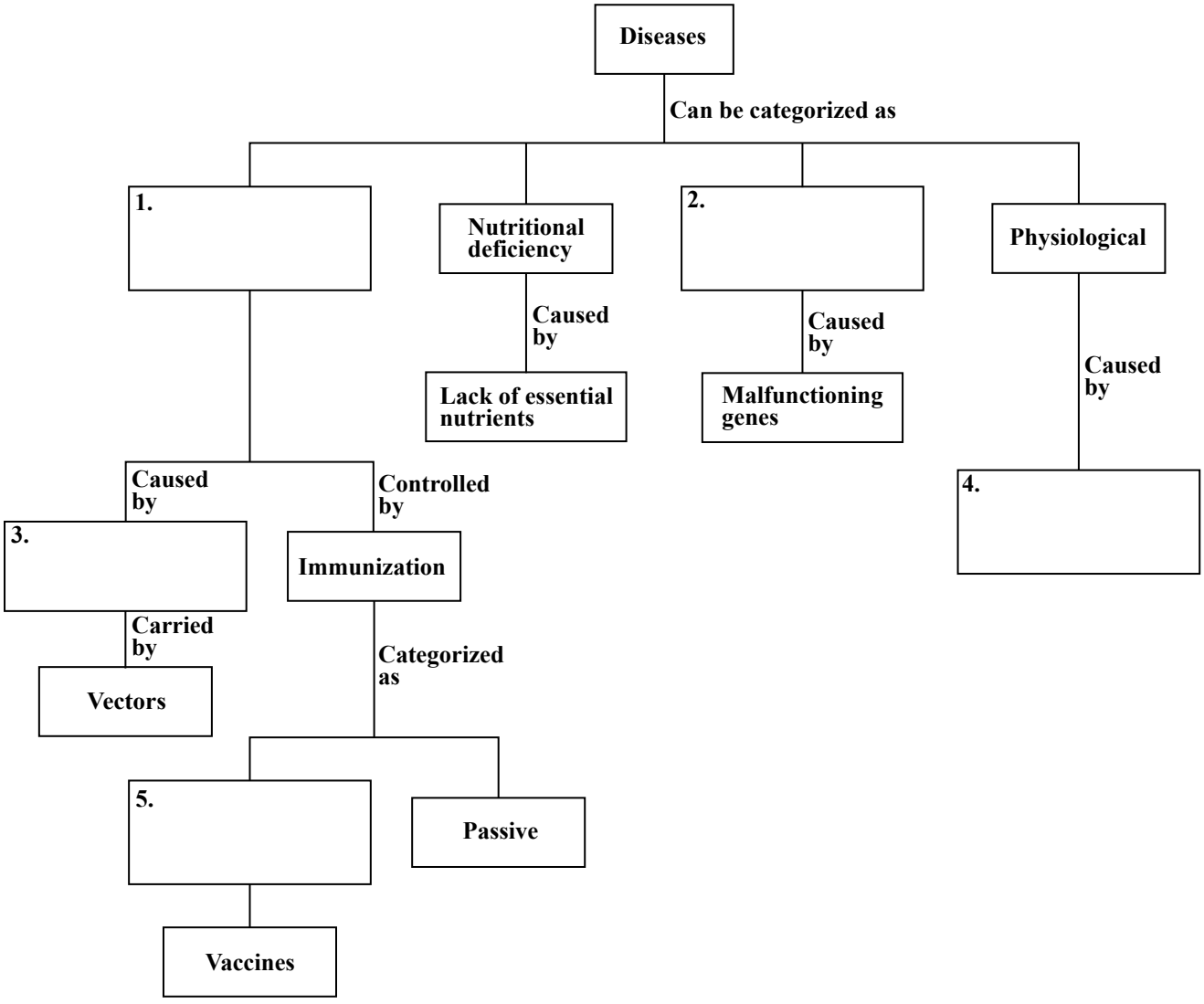

Figure 4. Concept map on diseases

(5 marks)

(b) Suggest THREE ways in which physiological diseases may be managed.

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(3 marks)

(c) (i) For which category of diseases would gene therapy be appropriate?

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(1 mark)

(ii) Suggest TWO ways, other than gene therapy, in which genetic engineering is used for the prevention and treatment of diseases.

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(2 marks)

(d) (i) Name TWO diseases transmitted by a **named** insect vector.

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(2 marks)

(ii) Suggest TWO measures that could be used to control the population of the insect vector named in (d) (i).

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(2 marks)
Total 15 marks

SECTION B

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

4. Figure 5 shows the internal structures of two leaves from plants growing in different environmental conditions.

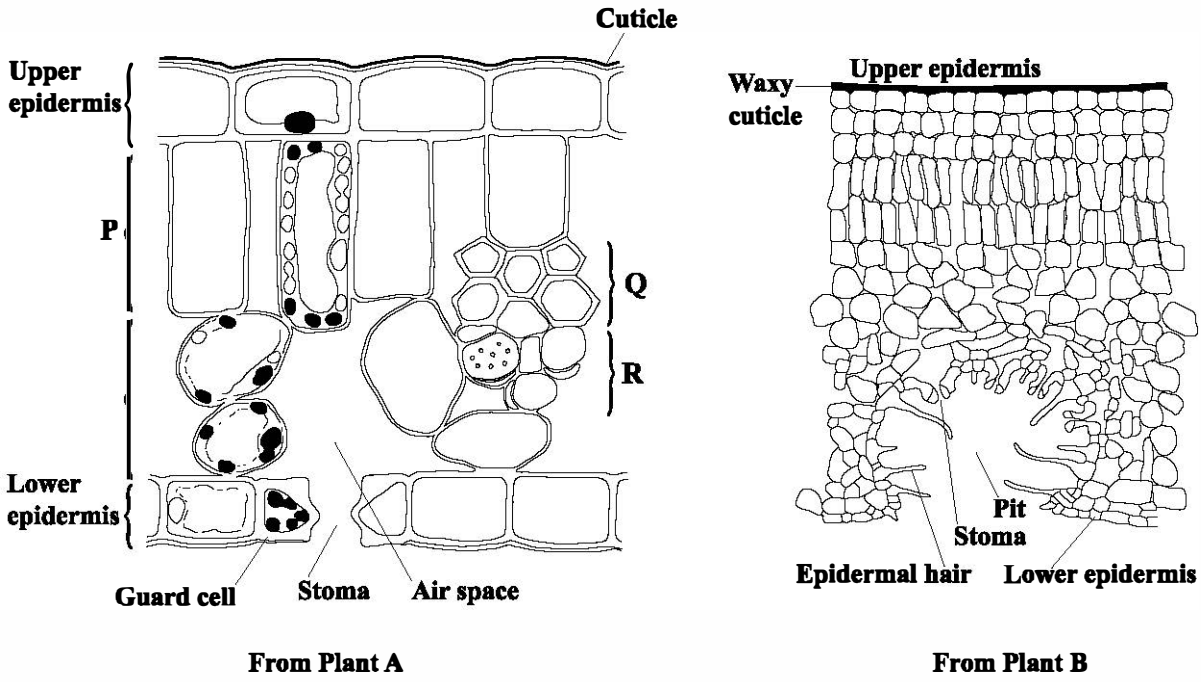

Figure 5. Internal structures of leaves from two plants

(a) Identify the structures labelled P, Q and R in Figure 5 and state the role of EACH in photosynthesis.

P .....

Role .....

Q .....

Role .....

R .....

Role .....

(6 marks)

GO ON TO THE NEXT PAGE

(b) Describe ONE difference in the cuticles and ONE difference in the lower epidermis of the two plants, A and B, and explain the significance of these differences.

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(4 marks)

(c) Suggest the type of environment in which each plant, Plant A and Plant B would be found growing, and THREE adaptations expected in Plant B, **other** than those shown in Figure 5.

Environment for Plant A .....

Environment for Plant B .....

Adaptions .....

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(5 marks)

Total 15 marks

5. (a) Draw a clearly labelled diagram to show the internal structure of human skin.

Space for diagram for (a)

(5 marks)

(b) A biologist travels to the Sahara desert to study its organisms. Daytime temperatures in the desert are very high and night-time temperatures are very low.

(i) Explain how the biologist's skin allowed him to maintain a relatively normal body temperature during his first **day** and **night** in the desert. In your answer, state the term used to describe the maintenance of a constant body temperature.

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(7 marks)

(ii) Suggest TWO ways the biologist could modify his behavior during the day, and ONE way during the night, to help regulate his body temperature in the desert.

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(3 marks)

Total 15 marks

6. (a) Table 2 is an incomplete table showing organisms and their natural habitat.

(i) Complete Table 2 to match EACH organism with its natural habitat.

TABLE 2: ORGANISMS AND THEIR NATURAL HABITAT

Organism	Natural Habitat
Cactus	
Mora	Forest
King fish	
	Pond
Red mangrove	

(4 marks)

(ii) Describe briefly a technique for sampling organisms in the pond.

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(2 marks)

(b) Harry plants tomato seedlings 10 cm apart and Karen plants the same variety 30 cm apart. The plots of land are identical in size and are located next to each other. The plants in both plots receive the same amount of water and fertilizer. At harvest, Karen reaps many more tomatoes, which are larger and healthier than Harry's tomatoes.

Explain THREE factors that may have caused a lower yield of tomatoes in Harry's plot.

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(6 marks)

(c) Suggest THREE ways by which human activity could adversely affect an oyster population living in a mangrove swamp.

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(3 marks)

Total 15 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

EXTRA SPACE

If you use this extra page, you MUST write the question number clearly in the box provided.

Question No. [ ]

EXTRA SPACE

If you use this extra page, you MUST write the question number clearly in the box provided.

Question No. ☐

FORM TP 2015003

TEST CODE **01207032**

JANUARY 2015

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

BIOLOGY

Paper 032 – General Proficiency

Alternative to SBA

2 hours 10 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. You are advised to take some time to read through the paper and plan your answers.
5. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
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DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

1. (a) Figure 1 shows a bean seed.

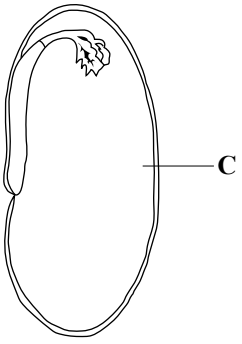

Figure 1. A bean seed

In the box below, make a large drawing **twice** the size of the one shown in Figure 1.

(3 marks)

(b) A student wants to investigate the food substances found in Structure C in Figure 1, before and after the seed germinated. He performs tests for sugar, protein, fat and starch, on a seed **before** germination. Table 1 shows the results of these food tests.

(i) Complete Table 1 by outlining the procedure for EACH food test.

TABLE 1: FOOD TESTS AND OBSERVATIONS

Nutrient	Test Procedure	Observation
Reducing sugar		Solution in test tube remains blue.
Protein		A purple/lilac colour is seen.
Fat		The top layer of the liquid in the test tube appears milky.
Starch		Blue/black colour is seen.

(4 marks)

(ii) Based on the observations in Table 1, what can be concluded about the nutrients stored in Structure C?

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(2 marks)

(iii) Suggest ONE use of EACH food nutrient stored in Structure C for the developing embryo.

Reducing sugar: .....

Protein: .....

Fat: .....

Starch: .....

(2 marks)

(c) The test for sugar is repeated on Structure C **after** a seed germinates, and an orange precipitate is observed.

Based on this observation, suggest the type of enzymes stored in the seed. Give ONE reason to support your answer.

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(2 marks)

(d) (i) Using the following list of apparatus and materials, design an experiment to investigate how temperature affects the activity of the enzyme, amylase.

Test tubes; beakers; thermometers; Bunsen burners; iodine solution; Benedict's solution; white tiles; distilled water; mortar and pestle; spatulas; amylase; seeds

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(6 marks)

(ii) Describe TWO precautions that should be taken to improve the accuracy of the results of the experiment.

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(2 marks)

(e) A woman is given some cooked bean seeds to eat after fasting for 12 hours. She chews the food continuously for three minutes before swallowing it. A sample of the food is tested for starch, protein and sugar, at different times. Table 2 is an incomplete table of the results of the food tests.

TABLE 2: RESULTS OF FOOD TESTS

Nutrient	**Food Sample in**	
	Mouth After Three Minutes	**Small Intestine After One Hour**
Starch	Absent	Absent
Protein	Present	
Sugar	Present	Present

Complete Table 2 for protein in the small intestine, and give a reason for your answer.

Reason .....

.....

(2 marks)

Total 23 marks

2. (a) A farmer wants to choose an area, A or B, to plant vegetables. He takes a sample of the top soil from each area to a soil-testing laboratory. The results of the soil composition tests are shown in Figure 2.

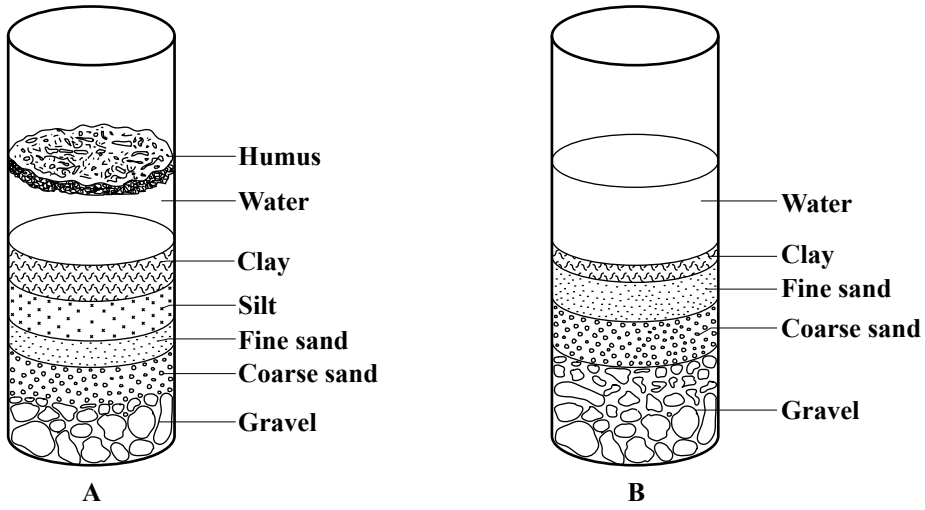

Figure 2. Results of soil composition tests

(i) Based on the results presented in Figure 2, suggest which area would be more suitable for the farmer to plant vegetables. Give ONE reason to support your answer.

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(2 marks)

(ii) Using the following list of apparatus and materials, outline the procedure for obtaining the results presented in Figure 2.

Two large measuring cylinders; stirring rod; soil samples in petri dishes; a beaker of water; balance

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(2 marks)

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(b) The apparatus and materials shown in Figure 3 are used to extract organisms from the soil.

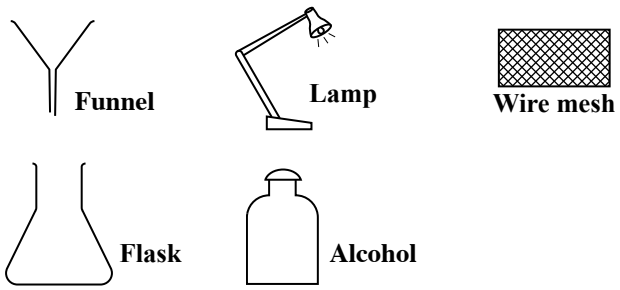

Figure 3. Apparatus and materials used to extract soil organisms

(i) **In the box below**, draw a labelled diagram to show how the apparatus and materials shown in Figure 3 could be set up to extract the animals that inhabit the soil.

(5 marks)

(ii) What is the function of the lamp in the experiment?

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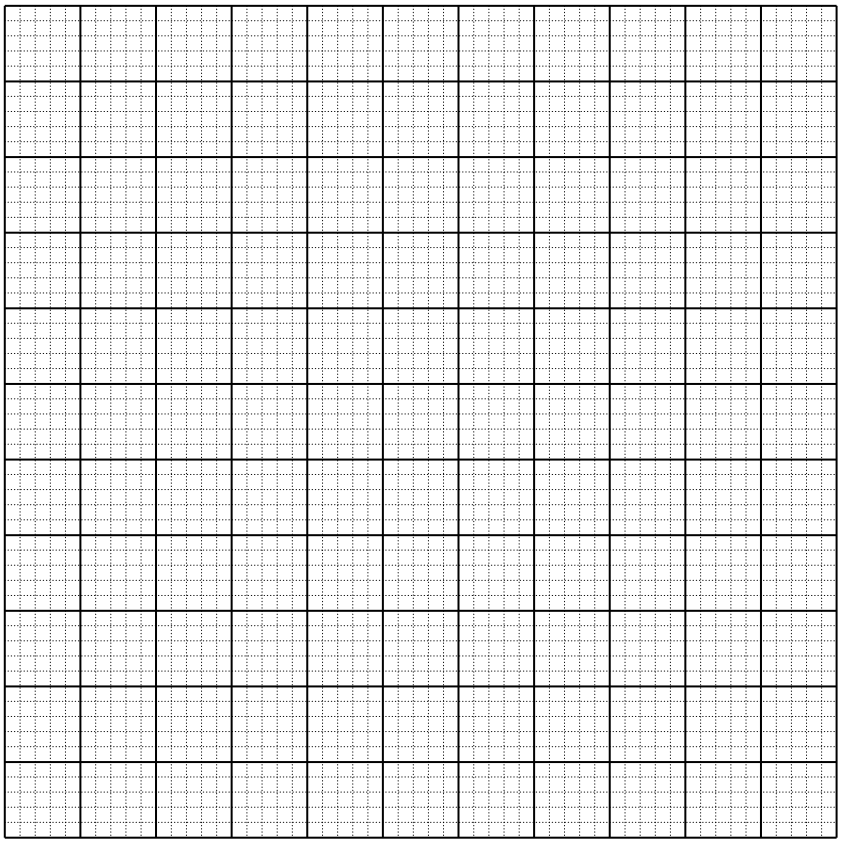
(2 marks)

(iii) Table 3 shows the number of various soil organisms extracted from the soil.

TABLE 3: NUMBER OF SOIL ORGANISMS

Organism	Number
Nematode	12
Ant	20
Mite	15
Earthworm	5
Millipede	19

Represent the data in Table 3 as a bar chart on the grid below.



(5 marks)

GO ON TO THE NEXT PAGE

(iv) The soil samples are brought to the laboratory in a black bag. When the samples are poured out onto a tray, some small insects crawl quickly back into the soil. Write a hypothesis for this observation.

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(2 marks)

(c) Figure 4 shows a food web of soil organisms in a terrestrial ecosystem.

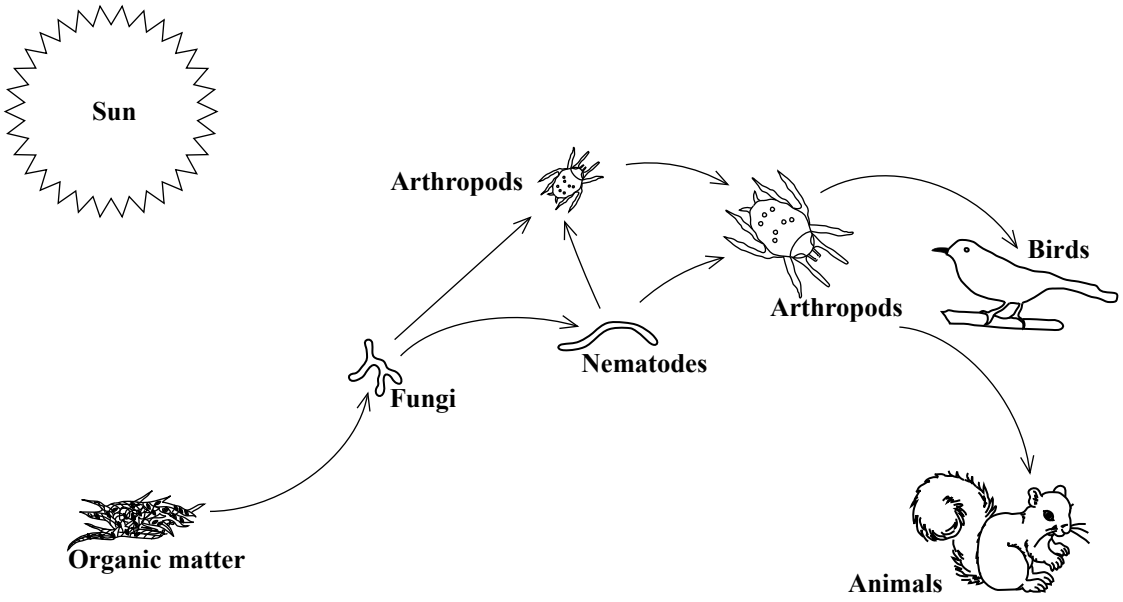

Figure 4. Food web in a terrestrial ecosystem

Suggest how the population of fungi and the arthropods would be affected if all the nematodes were killed by a pesticide. Give a reason for your answer.

Fungi .....

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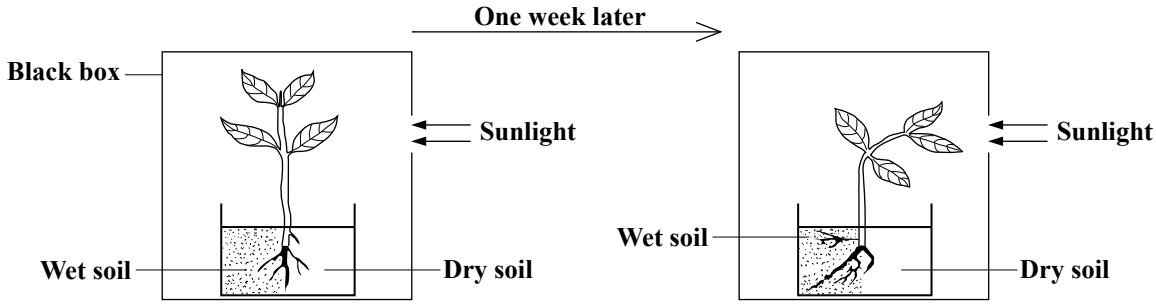
Arthropods .....

.....

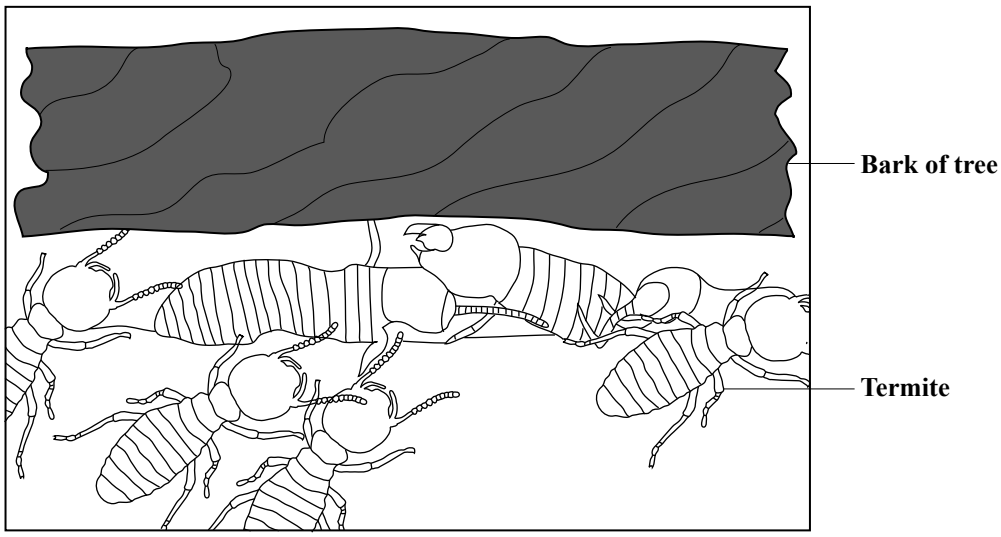
(2 marks)

Total 20 marks

3. (a) The organisms shown in Figures 5A and 5B both show movement.



A



B

Figure 5. Organisms that show movement

(i) What is the difference between the type of movement shown by the plant in Figure 5A and that shown by the termites in Figure 5B?

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(2 marks)

GO ON TO THE NEXT PAGE

(ii) Observe the position of the new roots of the plant in Figure 5A, one week later. Write a hypothesis for this observation.

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(2 marks)

(b) Figure 6 shows the apparatus used by some students in a laboratory to illustrate diffusion of a solid (copper sulphate crystal) in water.

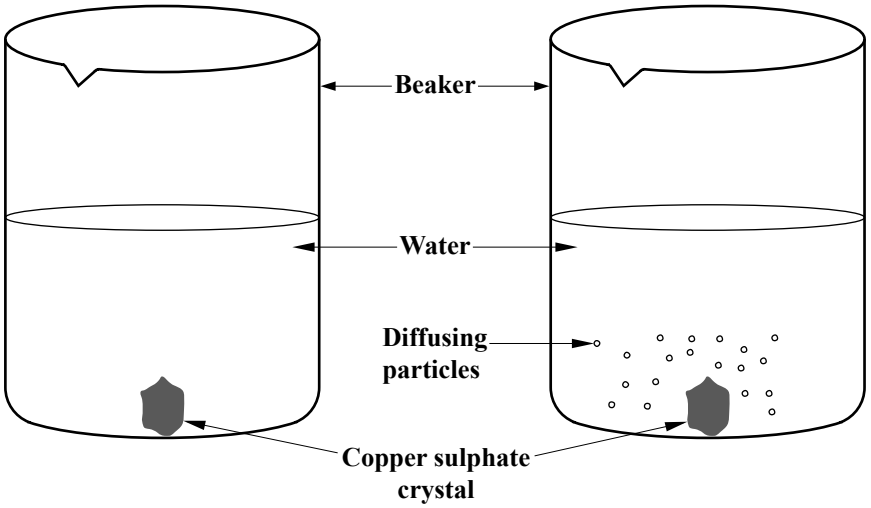

Figure 6. Apparatus to demonstrate diffusion of a solid in water

(i) Outline a procedure using the apparatus and materials in Figure 6 to investigate the hypothesis, 'Temperature increases the rate of diffusion'.

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(4 marks)

(ii) An investigation designed to test the hypothesis stated in (b) (i) on page 11 yields data which is recorded in Table 4.

TABLE 4: TIME TAKEN FOR COPPER SULPHATE PARTICLES TO SPREAD AT DIFFERENT TEMPERATURES

Temperature (°C)	Time (minutes)
10	15
25	8
40	5
75	3
90	

Plot the data from this table on the grid provided on page 13. **(4 marks)**

(iii) Predict the time it would take for the particles to diffuse throughout the water at 90 °C.

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(1 mark)

(iv) Write a conclusion for this investigation.

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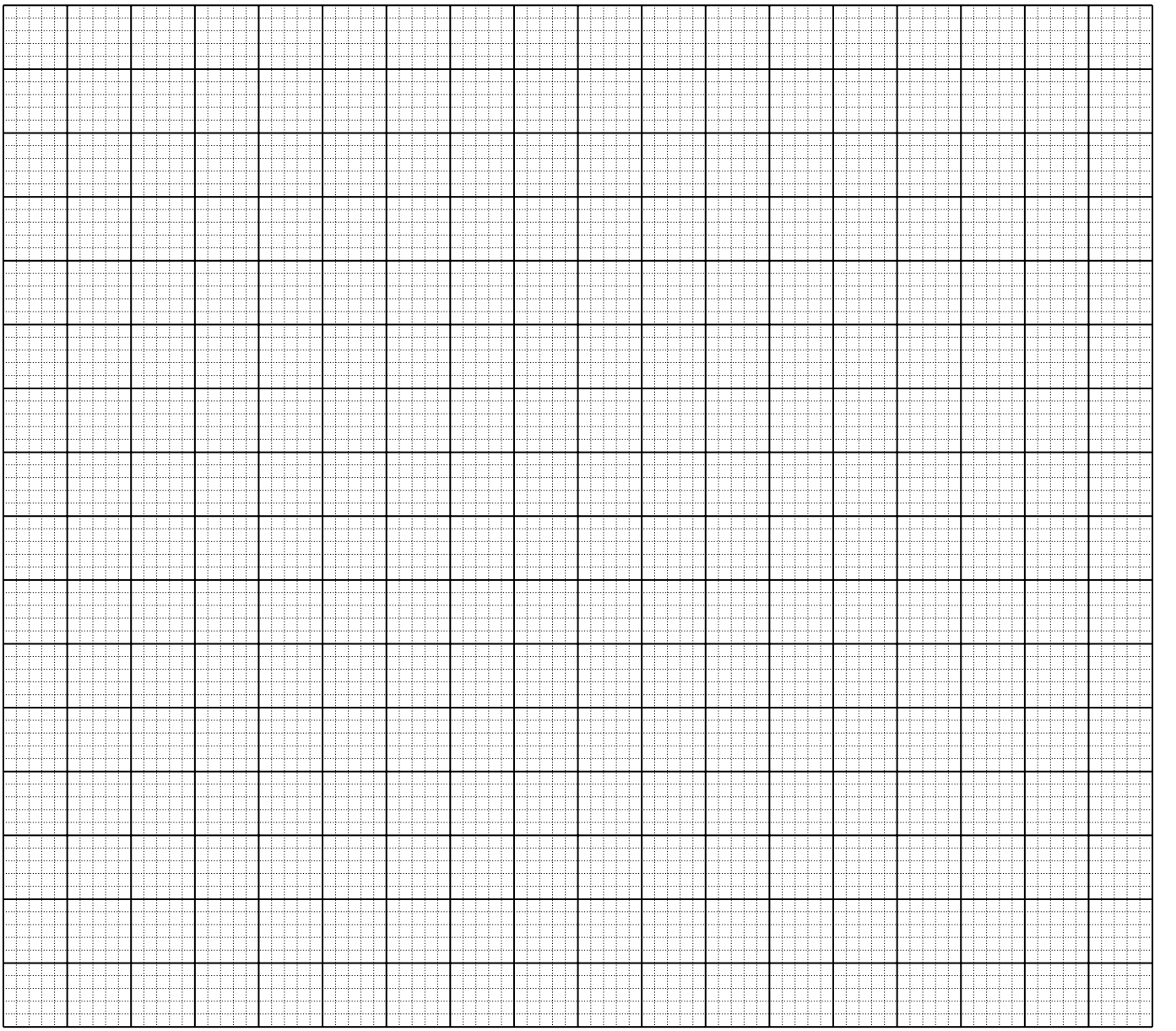
(1 mark)



(c) Figure 7 shows an experiment set up to investigate osmosis.

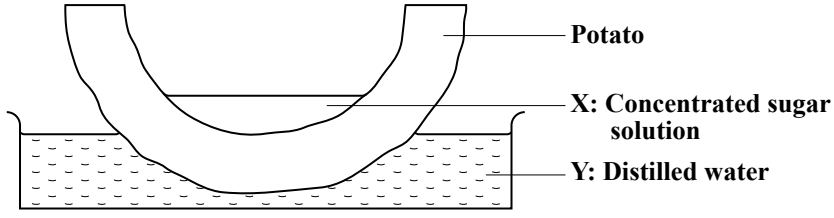


Figure 7. Experiment to investigate osmosis in potato tissue

(i) Predict how the levels of X and Y would change after one hour.

X .....

Y .....

(1 mark)

(ii) Compare the two processes by which the particles are moving in the experiment in Figure 6 on page 11 and the experiment in Figure 7.

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(2 marks)

Total 17 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2015045

TEST CODE **01207020**

MAY/JUNE 2015

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in TWO sections. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. Where appropriate, answers should be illustrated with diagrams.
5. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
6. **If you use the extra page(s) you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

SECTION A

Answer ALL questions in this section.

Write your answers in the spaces provided in this booklet.

1. Students of an ecology class conduct a field study in an area located on the boundary between a savannah and a forest. In addition to using various sampling methods to estimate species abundance, they observe the feeding patterns of the organisms.

(a) (i) Describe TWO sampling methods which the students could use to estimate the abundance of **plant species** in the area.

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(4 marks)

(ii) Describe ONE method they could use to collect data on the mobile **animals** which inhabit the area.

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(2 marks)

(b) The students record their data in a table similar to Table 1.

TABLE 1: DATA ON ORGANISMS IN THE FIELD STUDY

Species Names	Estimated Numbers in 100 m^2	Feeding Behaviour
Savannah grass	1000	
Grasshopper	50	Eats grass and leaves
Caterpillar	25	Eats leaves
Poui tree	2	
Hawk	3	Eats woodpeckers and lizards
Woodpecker	5	Eats caterpillars
Lizard	15	Eats caterpillars

GO ON TO THE NEXT PAGE

Use the data in Table 1 to construct EACH of the following:

(i) A food web

(4 marks)

(ii) A pyramid of numbers to show the feeding relationships among the organisms living in the area

(2 marks)

(c) The students also collect samples of topsoil from an area under some trees.

(i) Describe an experiment that the students could use to investigate the water-holding capacity of the soil.

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(3 marks)

(ii) State FOUR ways in which soil is important to living organisms.

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(4 marks)

(d) Figure 1 shows the apparatus that the students use to extract small animals (invertebrates) living in the soil.

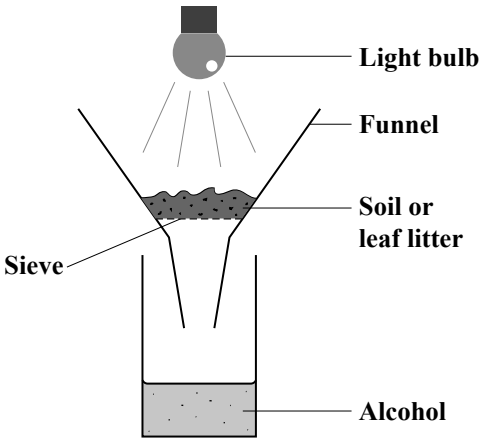

Figure 1. Apparatus for extracting small animals

Outline how EACH of the following functions in the apparatus:

Light bulb .....

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(2 marks)

Alcohol .....

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(1 mark)

(e) Fungi and bacteria are found in forest soils. Explain the role of these organisms in the cycling of nutrients in the forest.

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(3 marks)

Total 25 marks

GO ON TO THE NEXT PAGE

2. (a) The following chemical equation for photosynthesis represents the reactants used and the products formed.

$$6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$$

(i) Name TWO conditions, which are NOT shown in the equation, that are essential for this process.

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(2 marks)

(ii) Name the gas given off in this process and state which of the reactants produce this gas.

Gas .....

Reactant .....

(2 marks)

(iii) Explain TWO ways in which plants utilize the glucose produced during this process.

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(4 marks)

(iv) State THREE environmental factors which affect photosynthesis.

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(3 marks)

(b) Unlike plants, animals are unable to synthesize glucose. A boy eats a meal of cassava. Explain how his body converts the starch in the cassava to glucose. Name the organs and the enzymes involved in this process.

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(4 marks)

Total 15 marks

3. Figure 2 is a diagram of the human female reproductive system.

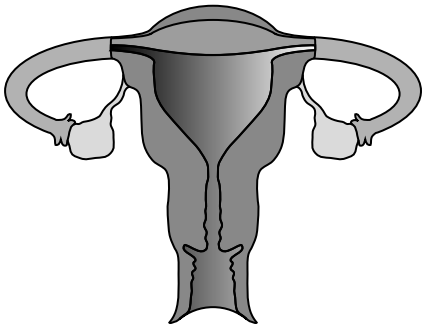

Figure 2. Structure of the human female reproductive system

(a) Label the organs in Figure 2 to show where

(i) the female gametes (ova) are made **(1 mark)**

(ii) fertilization would normally occur **(1 mark)**

(iii) implantation of a fertilized gamete would normally occur. **(1 mark)**

(b) Outline the mechanism by which male and female gametes come together in the human reproductive system to form a zygote.

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(3 marks)

(c) (i) Name the type of cell division by which female gametes are made.

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(1 mark)

(ii) Describe TWO ways in which the type of cell division named in (c) (i) differs from that by which the embryo grows and develops after fertilization of an ovum.

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(4 marks)

(d) Embryonic stem cells are undifferentiated cells formed as the embryo grows and develops. These cells are capable of differentiating into specialized cells of tissues and organs in the human body.

(i) Suggest TWO reasons why cell specialization is important.

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(2 marks)

(ii) Explain why embryonic stem cells can be used in the treatment of physiological diseases.

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(2 marks)

Total 15 marks

SECTION B

Answer ALL questions in this section.

Write your answers in the spaces provided at the end of each question.

4. Albinism is seen in persons who are homozygous for the recessive allele of a certain gene. This gene codes for the production of the skin pigment, melanin. Persons who inherit the dominant allele of this gene produce the normal amount of melanin for their race.

(a) Distinguish between the following paired terms: allele/gene; dominant/recessive; homozygous/heterozygous. **(6 marks)**

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(b) (i) Use a genetic diagram to show how a couple with normal pigmentation may produce an albino child. Use the following symbols to represent the alleles: A – normal; a – albino. **(5 marks)**

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(ii) Suggest TWO precautions that albino persons living in the Caribbean should take when going outdoors. **(2 marks)**

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(c) Observation of the members of a population shows that there is variation in skin colour. Suggest THREE ways by which this type of variation could occur. **(2 marks)**

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Total 15 marks

5. The central nervous system coordinates the link between stimuli and responses.

(a) Make a labelled diagram of a horizontal section through the human eye and describe how the eye enables us to see. **(6 marks)**

Space for diagram

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(b) Discuss the effects of alcohol abuse on the human body's ability to respond to stimuli and maintain homeostasis. **(9 marks)**

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Total 15 marks

6. (a) Name THREE characteristics which distinguish a biological species and THREE factors that lead to the formation of a new species. **(6 marks)**

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(b) The distribution of variant forms of the peppered moth, *Biston betularia*, changed between pre-industrial and post-industrial Britain. Account for the increase in the numbers of the dark form in the post-industrial era. **(3 marks)**

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(c) Use the theory of natural selection to explain antibiotic resistance. **(6 marks)**

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Total 15 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

EXTRA SPACE

If you use this extra page, you MUST write the question number clearly in the box provided.

Question No. ☐

FORM TP 2015046

TEST CODE **01207032**

MAY/JUNE 2015

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

BIOLOGY

Paper 032 – General Proficiency

Alternative to School-Based Assessment

2 hours 10 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of THREE questions. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. You are advised to take some time to read through the paper and plan your answers.
5. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
6. **If you use the extra page(s) you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

1. (a) You are required to investigate the movement of water in and out of plant tissues, given the following equipment and materials.

Equipment

Five 100 cm^3 beakers labelled 1, 2, 3, 4, and 5
A ruler
Razor blade/sharp knife
Stop clock

Materials

Five potato cylinders
Paper towel
Distilled water
Different concentrations of sucrose solution: 1%, 5%, 10% and 20%

Procedure

A. Pour 25 cm^3 of distilled water in the beaker labelled 1.

B. Pour 25 cm^3 of the sucrose solutions in the beakers as follows: 1% in Beaker 2; 5% in Beaker 3; 10% in Beaker 4; and 20% in Beaker 5.

C. Cut each potato cylinder to a length of 5.0 cm.

D. Place one potato cylinder in each of the labelled beakers and let stand for 30 minutes.

Proceed to answer Question 2.

E. After 30 minutes, remove each potato cylinder, blot quickly to remove excess water, measure its length and **record your results in Table 1** on page 3.

F. Note the texture (soft, firm, flaccid, turgid) and record your answer in Table 1 on page 3.

TABLE 1: RESULTS OF EXPERIMENT

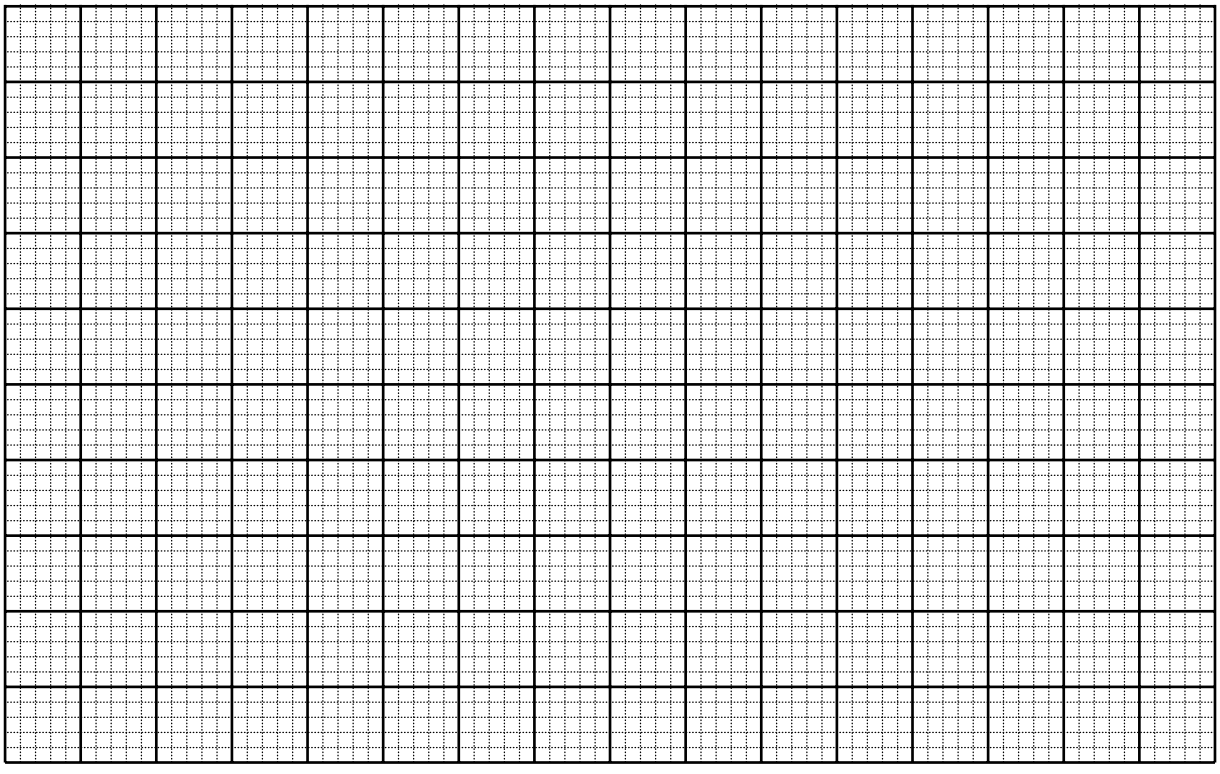
Beaker Number	Original Length (cm)	Final Length (cm)	Difference in Length (cm)	% Difference in Length	Texture
1					
2					
3					
4					
5					

(7 marks)

(b) Calculate the difference in length for EACH of the potato cylinders. Record your answers in Table 1. **(2 marks)**

(c) Calculate the percentage difference in length for EACH of the potato cylinders. Record your answers in Table 1. **(2 marks)**

(d) **On the grid provided below**, draw a histogram of the percentage difference in length.



(4 marks)

GO ON TO THE NEXT PAGE

(e) Explain the results of the experiment with respect to the length and texture of the potato.

Length .....

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Texture .....

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(6 marks)

(f) Why is it necessary to remove the potato skin?

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(1 mark)

(g) State TWO precautions that should be taken in this experiment, and ONE limitation of the experiment.

Precautions .....

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(2 marks)

Limitation .....

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(1 mark)

(h) What measurement could have been used in this experiment, OTHER than length?

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(1 mark)

(i) Outline how this experiment could be modified to give more reliable results.

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(2 marks)

(j) Explain why the change in length is NOT considered to be 'growth' of the potato tissue.

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(2 marks)

Total 30 marks

2. Figure 1 shows the gaseous exchange surfaces of three different organisms.

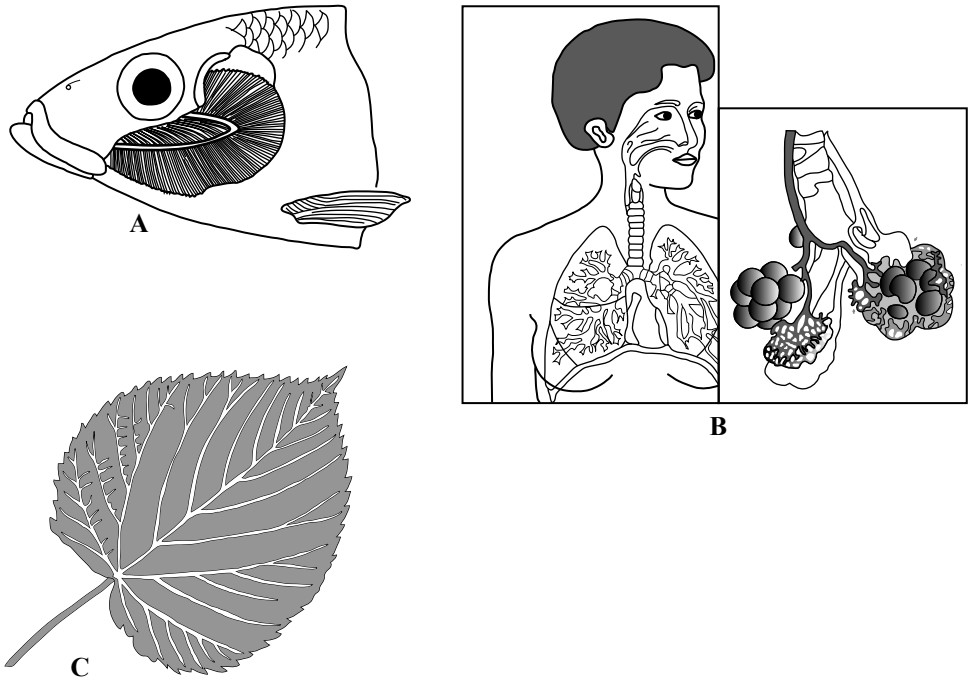

Figure 1. Gaseous exchange surfaces of different organisms

(a) Identify TWO features **common** to these gaseous exchange surfaces.

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(2 marks)

(b) Explain how the exchange of gases makes possible a process common to **A**, **B** and **C**. Name the gases and the process.

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(3 marks)

(c) In the box below, make a large, clearly labelled drawing of the leaf labelled **C** in Figure 1. This drawing must be twice the size shown in Figure 1.

(4 marks)

(d) An experiment is conducted to investigate the effect of exercise on the rate of breathing in smokers and in non-smokers. Data collected from this investigation is presented in Table 2.

TABLE 2: EFFECT OF EXERCISE ON SMOKERS AND NON-SMOKERS

Time before and after exercise (in minutes)	Number of Breaths per Minute	
	Non-smokers	Smokers
0 (At rest)	6	8
1	9	12
3	8	12
5	7	11
7	6	10
9	6	9

(i) **On the grid provided on page 9**, plot a graph to represent the data shown in Table 2. **(4 marks)**

(ii) State TWO variables that should be kept constant by the investigators.

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(2 marks)

(iii) What conclusion could be drawn from the data?

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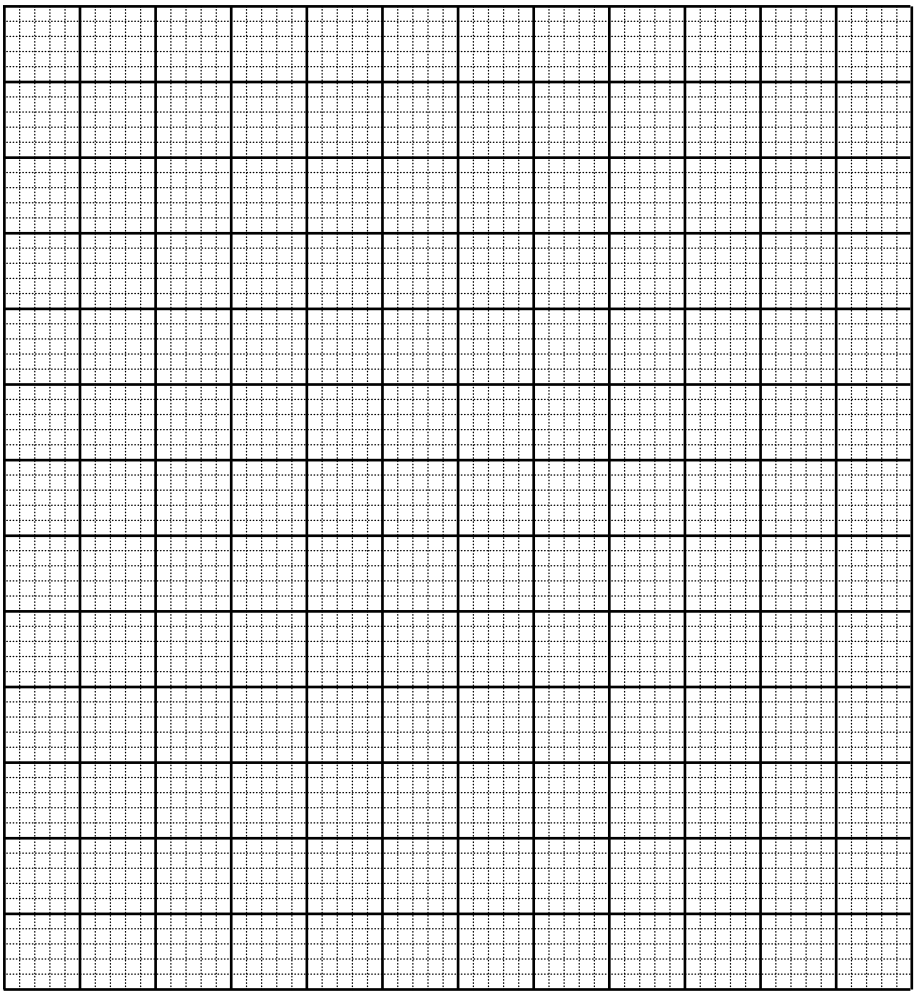
(2 marks)

Total 17 marks

GO ON TO THE NEXT PAGE



3. In an investigation carried out in a school laboratory, 16 woodlice are placed in a choice chamber set up as shown in Figure 2.

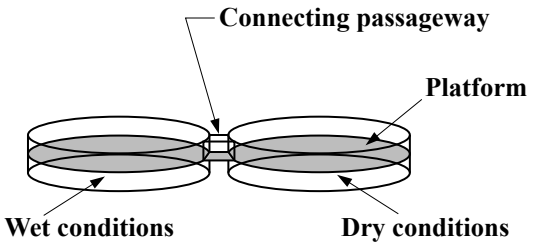


Figure 2. Choice chamber

(a) Based on the choice chamber shown in Figure 2, write a suitable hypothesis for this investigation.

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(2 marks)

(b) Where should the woodlice be placed at the **start** of the experiment? Use a label line on the diagram in Figure 2 to indicate your answer. **(1 mark)**

(c) Identify TWO factors (conditions) that should be kept constant during this investigation.

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(2 marks)

(d) At the end of an hour, the woodlice are distributed as shown in Figure 3.

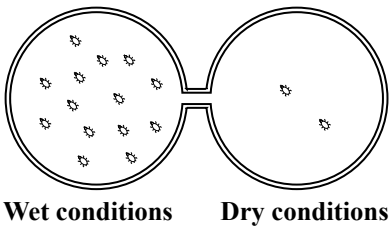

Figure 3. Distribution of woodlice

GO ON TO THE NEXT PAGE

(i) I**n the space below**, construct a suitable table to record the observations that can be made from Figure 3.

(4 marks)

(ii) What conclusion could be drawn about the response of the woodlice?

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(1 mark)

(iii) Suggest ONE reason why this response is useful for the survival of woodlice in their natural habitats.

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(1 mark)

(e) Explain how the apparatus shown in Figure 2 could be adapted to investigate the response of woodlice to light.

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(2 marks)

Total 13 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2016002

TEST CODE **01207020**

JANUARY 2016

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®

EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in two sections. Answer ALL questions.
2. For Section A, write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. For Section B, write your answers in the spaces provided in this booklet.
5. Where appropriate, answers should be illustrated by diagrams.
6. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
7. **If you use the extra page(s), you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

SECTION A

Answer ALL questions.

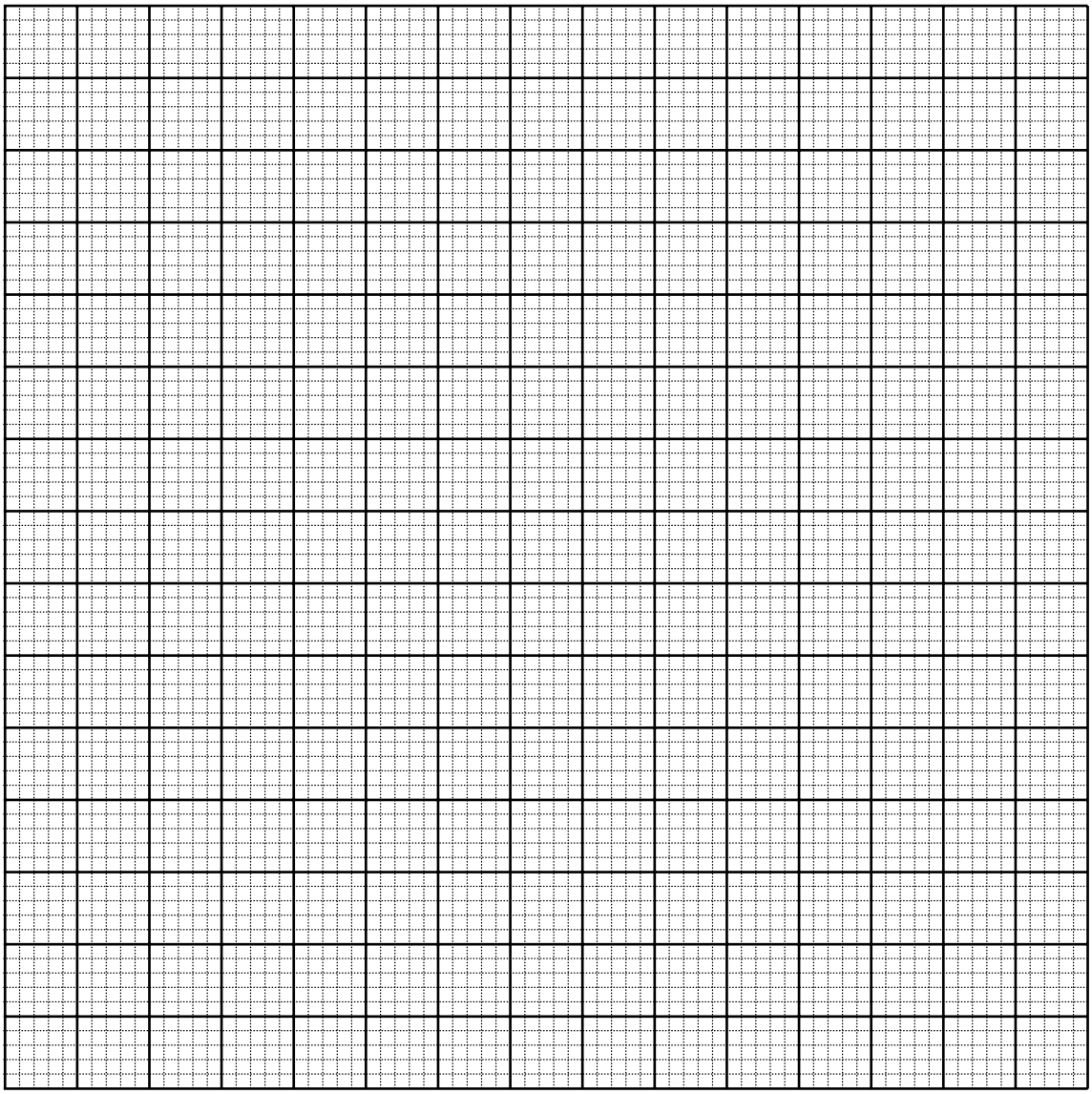
Write your answers in the spaces provided in this booklet.

1. The data provided in Table 1 were collected to investigate the growth of plants in light and dark conditions, and to make comparisons with the growth patterns in humans.

TABLE 1: DATA COLLECTED TO INVESTIGATE GROWTH

Day	Height of Plant Grown in Sunlight (cm)	Height of Plant Grown in Darkness (cm)	Length of Human Baby (cm)
5	10	10	45
10	12	13	49
15	15	17	53
20	20	17	58
25	25	16	62
30	30	15	65

(a) On the grid provided below, plot the data obtained for **both plants** on the same graph, using appropriate scales and legends.



(5 marks)

(b) (i) Describe the pattern of growth obtained for EACH plant.

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(2 marks)

GO ON TO THE NEXT PAGE

(ii) Explain the differences observed in the growth of the plants under these two conditions (light and dark).

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(4 marks)

(c) Complete the following definition for 'growth' by writing the correct words from the list in brackets.

(**transient, temporary, mass, permanent, organs**)

Growth may be defined as a ..... increase in the .....

and volume of an organism when food is absorbed and converted to living matter.

(2 marks)

(d) Suggest why the measurements of length taken for the plants are incomplete, UNLIKE the measurements taken for a baby.

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(1 mark)

(e) Suggest TWO ways in which this experiment could be refined to obtain more accurate data for measuring growth.

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(2 marks)

GO ON TO THE NEXT PAGE

(f) Describe ONE way in which the pattern of growth in plants differs from the pattern of growth in animals.

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(2 marks)

(g) (i) Describe an experiment to demonstrate the response of plants exposed to light on one side only.

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(2 marks)

(ii) How does this response to light benefit plants in a forest?

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(1 mark)

(iii) Explain how and why the response of invertebrates (like earthworms) to light differs from that shown by plants.

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(3 marks)

(h) State ONE role that light plays in **human** growth and development.

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(1 mark)

Total 25 marks

GO ON TO THE NEXT PAGE

2. (a) The diagram shown in Figure 1 represents part of the carbon cycle. Complete the diagram by writing the appropriate term in EACH of the boxes labelled A, B and C. **(3 marks)**

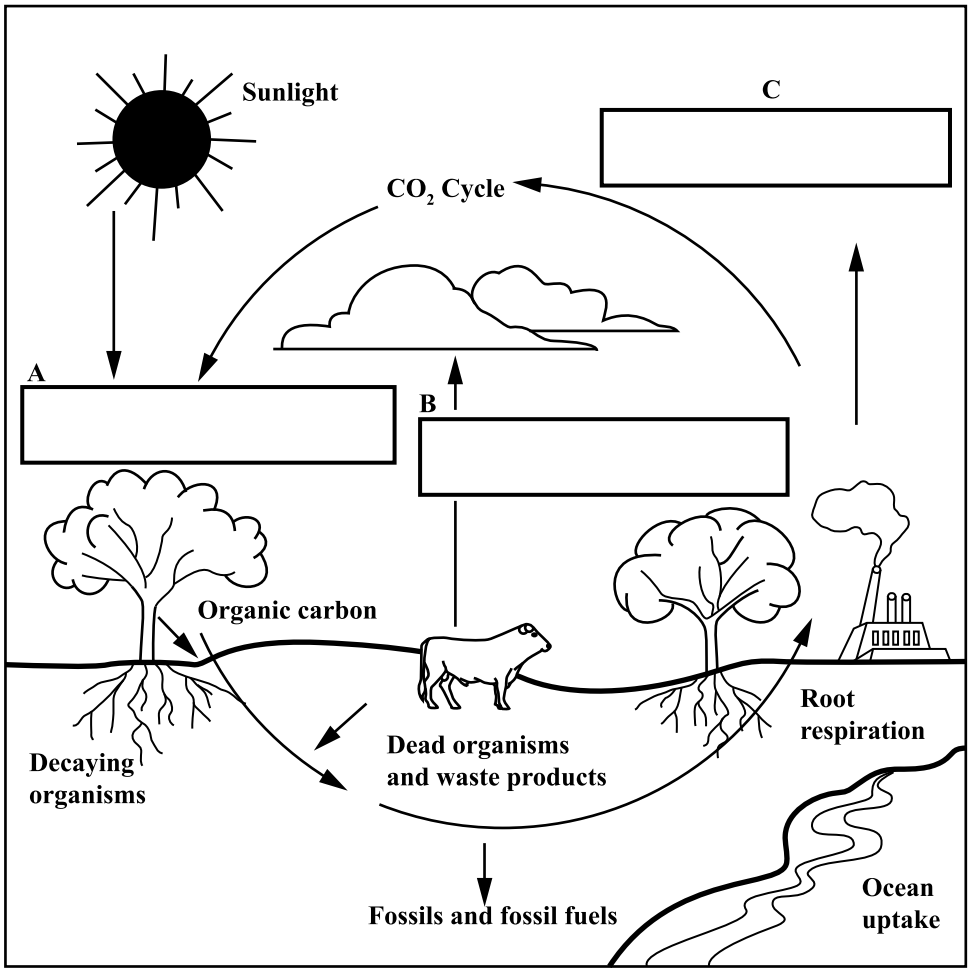

Figure 1. Part of the carbon cycle

(b) Write a chemical equation and a word equation to summarize EACH of the following processes:

(i) Photosynthesis

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(2 marks)

GO ON TO THE NEXT PAGE

(ii) Aerobic respiration

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(2 marks)

(c) Outline TWO outcomes of the removal of trees by cutting and burning.

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(2 marks)

(d) Suggest TWO ways in which small island states such as those in the Caribbean may be affected by large-scale climate change.

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(2 marks)

(e) (i) Outline TWO ways in which the improper disposal of household waste contributes to land pollution or water pollution.

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(2 marks)

(ii) Suggest TWO ways by which people could dispose of their household waste in an environmentally friendly manner.

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(2 marks)
Total 15 marks

3. (a) Figure 2 is a diagram of guard cells seen in a dicotyledonous leaf taken from a plant that has been watered 12 hours before and placed in sunny conditions.

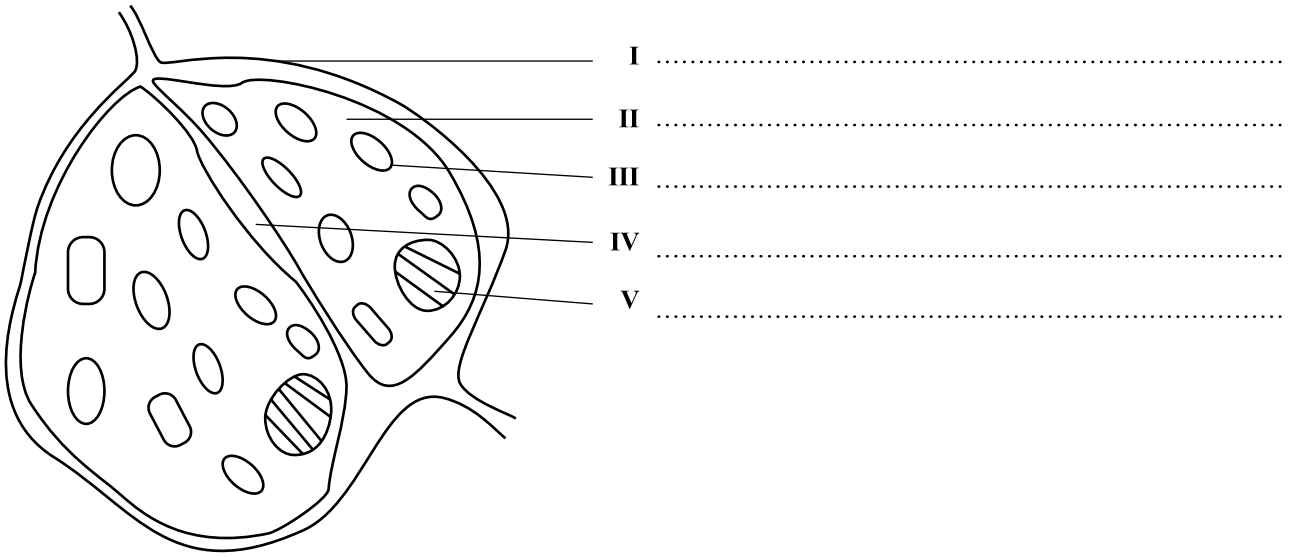

Figure 2. Diagram of plant guard cells

(i) Identify the structures labelled I, II, III, IV and V in Figure 2. Write your answers in the spaces provided in Figure 2. **(5 marks)**

(ii) State ONE function of EACH of the structures labelled I and IV.

I .....

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IV .....

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(2 marks)

(b) In the space below, draw an annotated diagram to show the appearance of the guard cells after the plant is watered in the early morning. Use an arrow to show the movement of the water in the cell.

(6 marks)

(c) Explain why the behaviour of an animal cell would differ from that of a plant guard cell when they are placed in dilute solutions.

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(2 marks)

Total 15 marks

SECTION B

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

4. (a) With the aid of a labelled diagram of the human alimentary canal, explain how a sandwich consisting of bread and chicken is digested to supply the body with nutrients.

Space for diagram in (a)

Explanation

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(10 marks)

(b) Both plants and humans store some of their unused nutrients.

(i) Name TWO storage organs in plants and the nutrients stored in EACH.

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(2 marks)

(ii) Suggest THREE reasons why plants need to store nutrients.

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(3 marks)

Total 15 marks

NOTHING HAS BEEN OMITTED.

5. (a) Name FOUR major components that make up human blood, and explain how the oxygen transported by the blood becomes available to cells for the production of energy.

Components

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Explanation

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(8 marks)

(b) Sickle-cell anaemia is an inherited condition in which the blood of affected persons cannot transport oxygen efficiently.

(i) Describe TWO symptoms of sickle-cell anaemia.

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(2 marks)

(ii) Fazul and Shanna both carry the sickle-cell trait. What is the chance that a child born to them would suffer from sickle-cell anaemia? Explain your answer with the aid of a genetic diagram. Use the following symbols: A – normal; S – sickle-cell.

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(5 marks)

Total 15 marks

GO ON TO THE NEXT PAGE

6. (a) Genetic engineering technology can be used to improve crop plants.

Describe the process of genetic engineering, and state TWO advantages and TWO disadvantages of this technology.

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(6 marks)

(b) A tomato farmer observes that one of his plants produces fruits with an attractive deep red colour which he wants to preserve. He therefore selects the seeds from this fruit for his next crop.

(i) Suggest what might have led to the appearance of this deep red colour, and describe ONE **negative** implication for biological evolution.

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(4 marks)

(ii) Describe an approach, other than selecting seeds, that the farmer could have adopted for introducing new traits in his tomato crop, and explain how this process differs from the process occurring in nature.

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(5 marks)

Total 15 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

EXTRA SPACE

If you use this extra page, you MUST write the question number clearly in the box provided.

Question No. [ ]

EXTRA SPACE

If you use this extra page, you MUST write the question number clearly in the box provided.

Question No. ☐

FORM TP 2016003

TEST CODE **01207032**

JANUARY 2016

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

BIOLOGY

Paper 032 – General Proficiency

Alternative to SBA

2 hours 10 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. Answer ALL questions.
2. Use this answer booklet when responding to the questions. For EACH question, write your answer in the space provided and return the answer booklet at the end of the examination.
3. Do NOT write in the margins.
4. You are advised to take some time to read through the paper and plan your answers.
5. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
6. **If you use the extra page(s), you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

1. (a) (i) Place the fish on the white tile laying it on its side. Measure the **distance from the mouth to the operculum** (gill cover).

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(2 marks)

(ii) Raise the operculum and gently remove the gills. Place an intact gill in the petri dish with water. Use the hand lens to carefully observe the gill. In the space below, make a clearly labelled drawing to show the visible structures of the gill. Label EACH of the following: **gill raker; gill lamellae; gill bar**.

(5 marks)

(b) Explain TWO ways in which the gills of the fish are similar to the lungs of a human.

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(4 marks)

GO ON TO THE NEXT PAGE

(c) (i) Figure 1 shows data obtained by scientists investigating the effect of heat pollution on the breathing rate of one species of fish. These fish are living in a river that is used by an electric power company for disposal of its effluent.

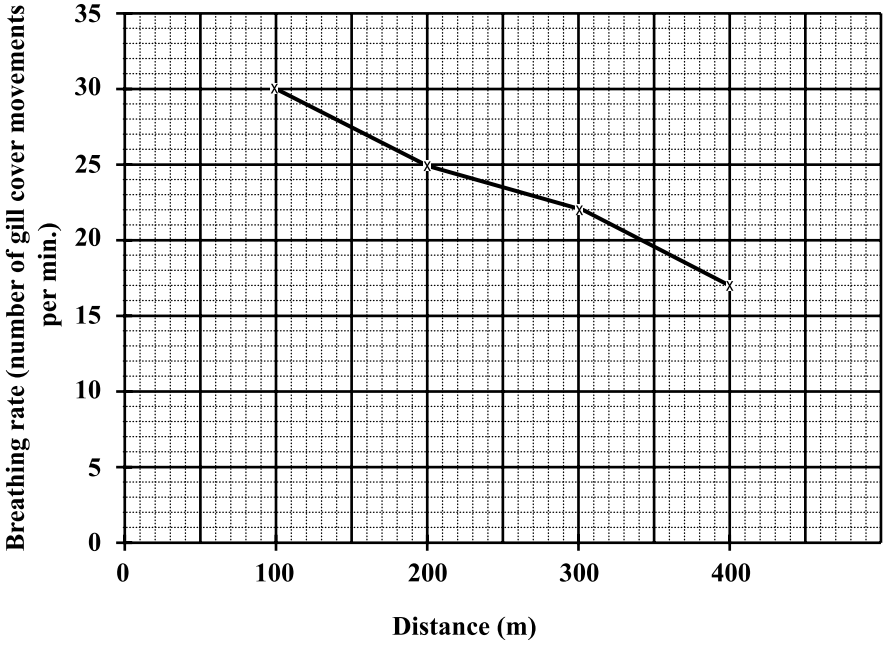

Figure 1. Breathing rate of fish and distance from effluent source

In the space below, **construct a table to show the data in Figure 1**.

(4 marks)

(ii) Write a conclusion that could be drawn from the data presented in Figure 1.

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(2 marks)

(d) Explain how temperature may affect the breathing rate of fish.

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(2 marks)

(e) Suggest TWO OTHER factors that may affect the breathing rate of the fish living in this environment.

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(2 marks)

Total 21 marks

NOTHING HAS BEEN OMITTED.

2. Figure 2 shows the early growth of a pea seedling after germination.

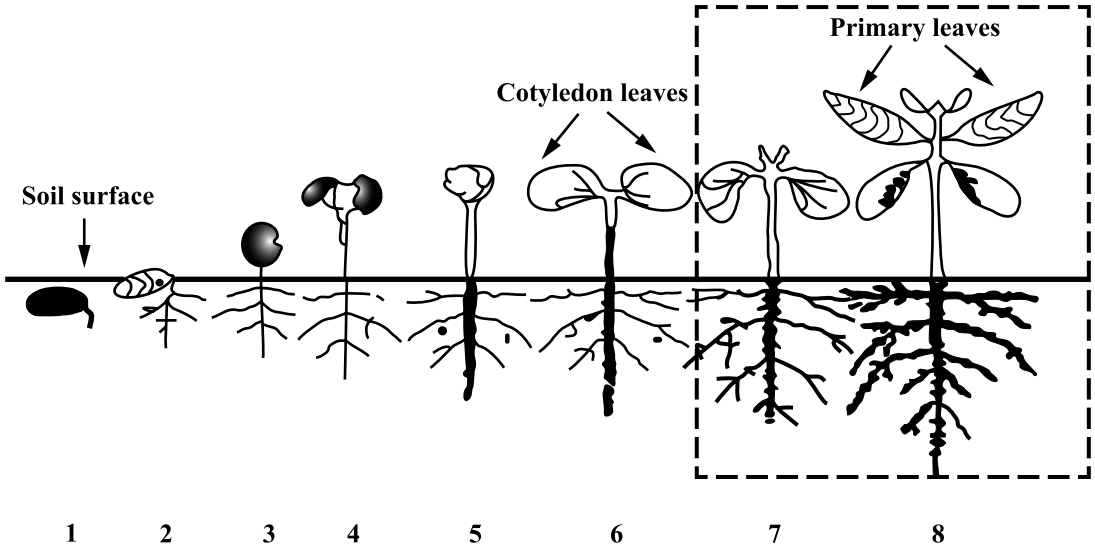

Figure 2. Germination of a pea seedling

(a) (i) Measure the lengths of the **roots** from the soil surface to the root tips from **Day 2 to Day 8**.

Record these measurements in a suitably constructed table in the space below.

(4 marks)

(ii) Plot the data from the table in (a) (i) on page 8 on the grid provided in Figure 3.

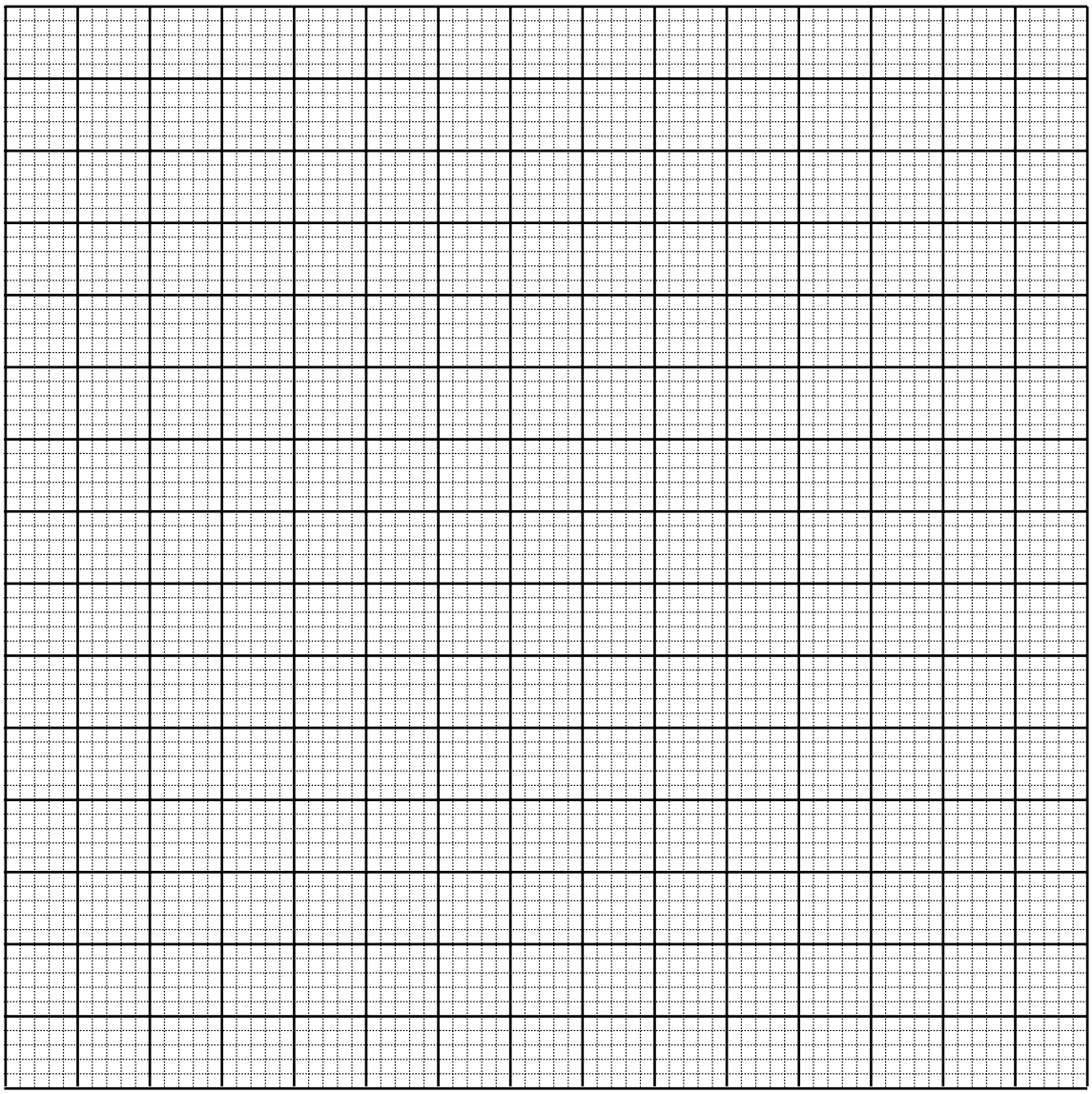

Figure 3. Graph showing changes in root length during germination

(4 marks)

(b) Suggest why the cotyledon leaves decrease in size between Days 6 and 8, whereas the primary leaves show an increase in size from Day 7 to Day 8.

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(2 marks)

(c) Some students want to investigate the effect of light direction on the growth of the seedling at **Day 8**.

(i) Describe the procedure they could use to conduct their investigation.

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(3 marks)

(ii) Describe a suitable control for this investigation.

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(2 marks)

(d) How does the usual response to light, shown by the shoots of green flowering plants, benefit the plant?

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(2 marks)

Total 17 marks

3. John observes that leftover pineapple kept at 15 °C in the refrigerator tastes sweeter than pineapple consumed just after being peeled (at room temperature). He thinks that this occurs because of an enzyme, which acts at the lower temperature to hydrolyse the stored sucrose to glucose and fructose.

(a) State a hypothesis that could be tested to explain John's observation.

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(2 marks)

(b) Describe an experiment that could be used to test the hypothesis stated in (a) above. Write your answer under the following headings:

Equipment and materials

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(3 marks)

Procedure

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(4 marks)

(c) State ONE precaution and ONE limitation for this experiment.

Precaution .....

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Limitation .....

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(2 marks)

(d) In the space below, produce a table to show how the data from the experiment could be captured. Insert a title for the table and appropriate headings. (**You are NOT required to input data in the table**.)

(3 marks)

(e) Explain how the expected results could be used to support the hypothesis.

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(2 marks)

(f) Outline how the experiment described in (b) on page 11 could be modified to determine the effect of pH on the enzyme's activity.

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(3 marks)

(g) Figure 4 shows the data obtained from an investigation.

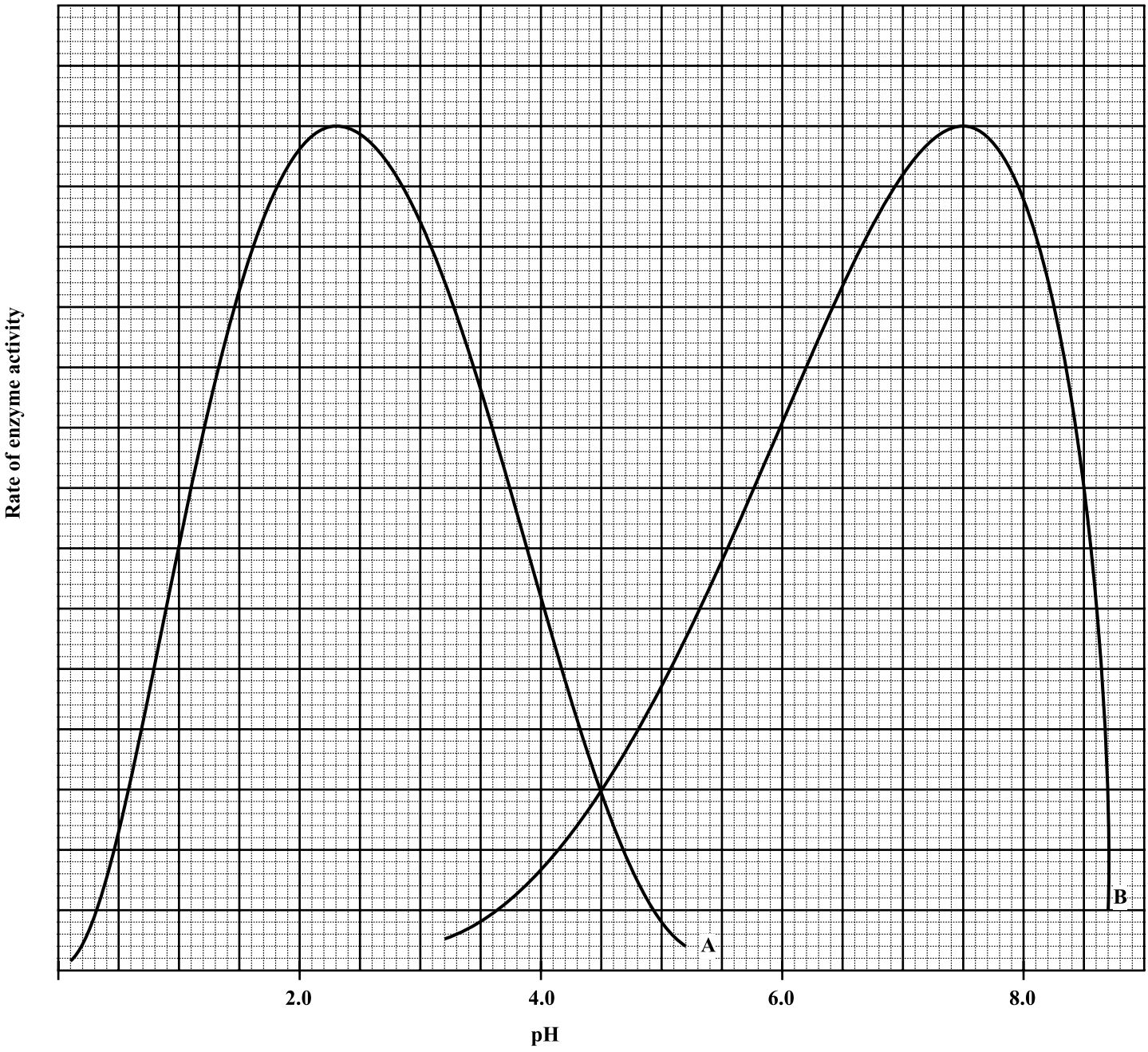

Figure 4. Effect of pH on the rate of enzyme activity

(i) Deduce the optimum pH for the activity of EACH enzyme, A and B.

Enzyme A .....

Enzyme B .....

(2 marks)

GO ON TO THE NEXT PAGE

(ii) In which part of the alimentary canal is Enzyme A MOST likely to be active?

.....

(1 mark)

Total 22 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2016045

TEST CODE **01207020**

MAY/JUNE 2016

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in TWO sections. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. Where appropriate, answers should be illustrated with diagrams.
5. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
6. **If you use the extra page(s), you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

"*"Barcode Area"*"
Sequential Bar Code

SECTION A

Answer ALL questions in this section.

Write your answers in the spaces provided in this booklet.

1. (a) Students investigate the effect of temperature on the rate of reaction of the enzyme, catalase. They use crushed potato as the source of the enzyme and place 5 mg into each of 7 test tubes. They add 3 cm^3 of 1% hydrogen peroxide to each test tube and place them into water-baths kept at the following temperatures: 0 °C, 10 °C, 20 °C, 30 °C, 40 °C, 50 °C and 60 °C. They count the number of bubbles released per minute from each test tube and record the data in Table 1.

TABLE 1: EFFECT OF TEMPERATURE ON CATALASE ACTIVITY

Test Tube	Temperature (°C)	Number of O_2 Bubbles per Minute
1	0	0
2	10	1
3	20	5
4	30	10
5	40	15
6	50	1
7	60	0

(i) Plot a graph on the grid provided on page 5 to show the relationship between the number of oxygen bubbles released and temperature. **(4 marks)**

(ii) From your graph, determine the optimum temperature for the enzyme.

.....

(1 mark)

GO ON TO THE NEXT PAGE

Graph showing the effect of temperature on the rate of an enzyme-catalyzed reaction

GO ON TO THE NEXT PAGE

(iii) Explain the shape of the graph at EACH of the following temperature ranges:

0–10 °C .....

.....

.....

.....

.....

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11–40 °C .....

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.....

> 40 °C .....

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(6 marks)

(iv) Write a conclusion that the students could draw from their results.

.....

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(1 mark)

GO ON TO THE NEXT PAGE

(v) Suggest ONE reason why living organisms need to maintain a constant internal temperature.

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(1 mark)

(vi) Describe TWO precautions that the students should take when doing this experiment.

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(2 marks)

(vii) How could this experiment be modified to investigate the effect of pH on enzyme activity?

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(2 marks)

(b) Name TWO enzymes that function in protein digestion and describe the role of EACH.

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(2 marks)

(c) Before food can be chemically digested by enzymes, it must first be mechanically broken down in the alimentary canal.

(i) Name TWO parts of the alimentary canal that are responsible for the mechanical digestion of food.

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(2 marks)

(ii) Give TWO reasons why **mechanical** digestion of food is important.

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(2 marks)

(iii) Explain the significance of **chemical** digestion of food.

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(2 marks)

Total 25 marks

NOTHING HAS BEEN OMITTED.

2. (a) (i) In the box provided below, draw a **food web** consisting of the following organisms:

- Algae
- Small fish
- Tadpole
- Water snake
- Egret
- Eagle

(3 marks)

(ii) What is the role of the organism at the start of the food web?

.....

.....

(1 mark)

(iii) Name the organism which performs EACH of the following functions in the food web drawn in (a) (i) **on page 10**.

a) Both as a prey and a predator .....
(1 mark)

b) Primary consumer .....
(1 mark)

c) Secondary consumer .....
(1 mark)

b) Tertiary consumer (top carnivore) .....
(1 mark)

(iv) From your food web in (a) (i), draw a **food chain** consisting of THREE organisms.

(1 mark)

(v) What is the role of the organism to which the arrow points in a food chain?

.....
(1 mark)

(vi) Explain why energy flows in one direction in the food chain.

.....

.....
(2 marks)

(b) List THREE features of an environment which support living organisms.

.....

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.....
(3 marks)

Total 15 marks

GO ON TO THE NEXT PAGE

3. (a) Define EACH of the following terms:

(i) Stimulus .....

.....

(1 mark)

(ii) Receptor .....

.....

(1 mark)

(iii) Effector .....

.....

(1 mark)

(b) Figure 1 is a diagram of a section through the human eye.

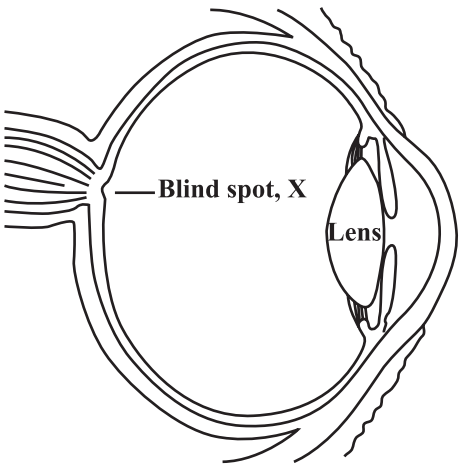

Figure 1. Section through the human eye

(i) Label EACH of the following parts of the eye on Figure 1:

- Pupil
- Ciliary muscles
- Retina
- Optic nerve **(4 marks)**

(ii) Why is X called the 'blind spot'?

.....

.....

(1 mark)

GO ON TO THE NEXT PAGE

(c) A boy looks up from reading his book to see a helicopter flying in the distance. Account for the changes that would occur in the lens of both of his eyes to enable him to see the helicopter.

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(3 marks)

(d) Figure 2 shows two eyes labelled A and B, under two different light conditions.

A **B**

Figure 2. Eyes under different light conditions

Which of the eyes in Figure 2, A or B, shows the appearance of an eye exposed to dim light? Explain your answer.

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.....

.....

(3 marks)

(e) Why is it important for the eye to respond when exposed to very bright light?

.....

.....

(1 mark)
Total 15 marks

GO ON TO THE NEXT PAGE

SECTION B

Answer ALL questions in this section.

Write your answers in the spaces provided in this booklet.

4. (a) In the box below, draw a labelled diagram of the female reproductive system, and using an arrow, trace the path that a spermatozoon would have to take to fertilize an ovum.

(6 marks)

(b) A young couple wants to choose between two contraceptive methods — barrier or surgical. Discuss why the male may prefer the barrier method rather than the surgical method of contraception. Your answer should include TWO advantages of the barrier method and THREE disadvantages of the surgical method.

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(5 marks)

(c) A biologist discovers that the flowers of a species of plants have no male reproductive parts. Suggest ONE method by which these plants produce offspring, and THREE advantages of this method.

Method .....

Advantages .....

.....

.....

.....

.....

(4 marks)
Total 15 marks

GO ON TO THE NEXT PAGE

5. (a) With the aid of a chemical equation, explain what is meant by the term 'photosynthesis', and discuss how a dicotyledonous leaf is adapted to capture maximum sunlight and carbon dioxide for the process.

Photosynthesis .....

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Equation .....

Adaptations .....

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(11 marks)

GO ON TO THE NEXT PAGE

(b) Outline how decomposers assist in the cycling of carbon dioxide to make it available to green plants.

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(4 marks)

Total 15 marks

6. (a) State TWO causes of anaemia and describe TWO signs/symptoms of the disease.

Causes .....

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Signs/symptoms .....

.....

(4 marks)

(b) Sickle-cell anaemia is caused by the presence of a recessive allele. Persons who are heterozygous and carry the sickle-cell allele are more resistant to a type of severe malaria than persons who are homozygous for the normal haemoglobin allele.

(i) State what is meant by EACH of the following terms:

Homozygous .....

.....

Heterozygous .....

.....

(2 marks)

(ii) With the aid of a genetic diagram, show how a man and a woman who do NOT have sickle-cell anaemia can have a child who has the disease.

(6 marks)

(iii) Explain why the sickle-cell allele is more common in the population, in countries where the severe form of malaria is present.

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(3 marks)
Total 15 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2016046

TEST CODE **01207032**

MAY/JUNE 2016

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

BIOLOGY

Paper 032 – General Proficiency

Alternative to School-Based Assessment

2 hours 10 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of THREE questions. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. You are advised to take some time to read through the paper and plan your answers.
5. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
6. **If you use the extra page(s), you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

"*"Barcode Area"*"
Sequential Bar Code

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

1. (a) You have been provided with 10 g each of two different types of soil labelled, **X** and **Y**, taken from two different locations. You are required to investigate the water-holding capacity of each sample of soil.

Procedure

A. Fold one of the filter papers provided and place it into one of the funnels.

B. Moisten the filter paper, then insert the funnel into the 500 ml measuring cylinder.

C. Pour the 10 g of Sample **X** onto the filter paper in the funnel and add 50 ml of water.

D. Repeat Procedures A to C, for Sample **Y**.

E. Note the time.

Let the cylinders stand for 45 minutes.
Proceed to Question 2 or 3 during this time.

(i) After 45 minutes, record the volume of water collected in EACH measuring cylinder.

Volume of water collected from Sample X .....

Volume of water collected from Sample Y .....

(2 marks)

GO ON TO THE NEXT PAGE

(ii) Calculate the percentage water-holding capacity using the formula

$$\frac{\text{Volume of water poured onto sample} - \text{Volume of water collected}}{\text{Volume of water poured onto sample}} \times 100$$

Show all working.

Sample **X** =

Sample **Y** =

(4 marks)

(iii) Identify TWO possible sources of error in this investigation.

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(2 marks)

(iv) Explain why knowing the percentage water-holding capacity of soil is useful in setting up a vegetable garden.

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(3 marks)

GO ON TO THE NEXT PAGE

(v) Write a suitable conclusion for this investigation.

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(2 marks)

(b) (i) Dip the indicator paper into the volume of water collected from each soil sample provided, to determine the pH value.

pH value for Sample **X** .....

pH value for Sample **Y** .....

(2 marks)

(ii) Classify EACH soil sample as either acidic, alkaline or neutral, based on your results in (b) (i) above.

Sample **X** .....

Sample **Y** .....

(2 marks)

(c) Identify TWO **other** abiotic factors that could be investigated to determine the suitability of the two different locations from which the soil samples are taken, for setting up the school vegetable garden.

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(2 marks)

GO ON TO THE NEXT PAGE

(d) Figure 1 shows some organisms in one of the soil samples.

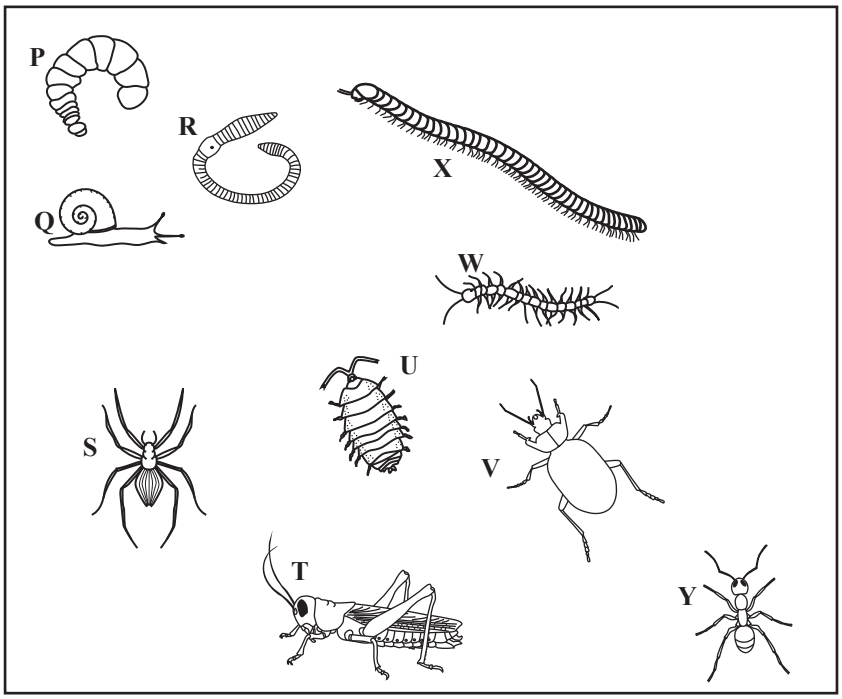

Figure 1. Organisms in one of the soil samples

(i) Identify TWO features that could be used to classify the organisms into at least two groups.

.....

.....

(2 marks)

(ii) Construct a table to show how the organisms could be grouped using the two features identified in (d) (i) above.

(4 marks)

(iii) Which of the soil samples, **X** or **Y**, would be a MORE likely habitat for these soil organisms. Give a reason for your answer.

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(2 marks)

(iv) Name TWO methods that could be used to collect the organisms from the soil.

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(2 marks)

Total 29 marks

NOTHING HAS BEEN OMITTED.

2. (a) Figure 2 is a diagram of the apparatus used to investigate the production of carbon dioxide during respiration in animals.

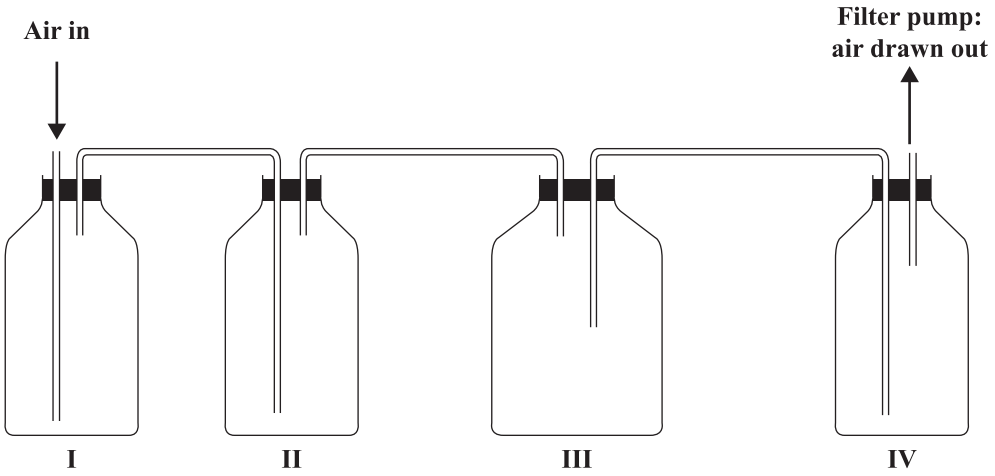

Figure 2. Apparatus for investigating the production of CO_2 during respiration

(i) Identify the contents of Flasks I, II, III and IV in Figure 2.

I .....

II .....

III .....

IV .....

(4 marks)

(ii) Write a suitable aim for this investigation.

.....

.....

(1 mark)

(iii) State TWO precautions that should be taken when setting up this experiment.

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(2 marks)

GO ON TO THE NEXT PAGE

(iv) Describe a suitable control for this investigation.

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(2 marks)

(b) Outline an investigation for testing the production of oxygen by the pond plant, *Elodea*.

Apparatus .....

.....

Procedure .....

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Expected result .....

.....

(6 marks)

(c) Distinguish between 'excretion' and 'egestion'.

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(2 marks)

Total 17 marks

GO ON TO THE NEXT PAGE

3. You are provided with two bones.

(a) (i) In the box below, draw the bones as they are positioned in the organism and label the following features:

- Cartilage
- Position of ligaments
- Position of the joint formed between the bones
- Position of muscles

(8 marks)

(ii) Calculate the magnification of your drawing. **Show your working.**

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(2 marks)

(b) (i) Identify the type of joint formed between the two bones drawn in (a) (i) on page 12.

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(1 mark)

(ii) Give a reason for your answer in (b) (i) above.

.....

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(1 mark)

(iii) Give TWO ways by which the ends of the bones are protected during movement.

.....

.....

.....

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(2 marks)

Total 14 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.