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16 MAY 2016 (a.m.)

FILL IN ALL THE INFORMATION REQUESTED CLEARLY IN CAPITAL LETTERS.

TEST CODE

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SUBJECT BIOLOGY – UNIT 1 – Paper 02

PROFICIENCY ADVANCED

REGISTRATION NUMBER

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SCHOOL/CENTRE NUMBER

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NAME OF SCHOOL/CENTRE

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CANDIDATE’S FULL NAME (FIRST, MIDDLE, LAST)

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“*”Barcode Area”
Current Bar Code

DATE OF BIRTH

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FORM TP 2016150



TEST CODE **02107020**

MAY/JUNE 2016

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

C A R I B B E A N A D V A N C E D P R O F I C I E N C Y E X A M I N A T I O N [®]

BIOLOGY

UNIT 1 – Paper 02

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. You may use a silent, non-programmable calculator to answer questions.
5. You are advised to take some time to read through the paper and plan your answers.
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.

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02107020/CAPE 2016

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SECTION A

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

1. (a) Figure 1 shows the formation of sucrose.

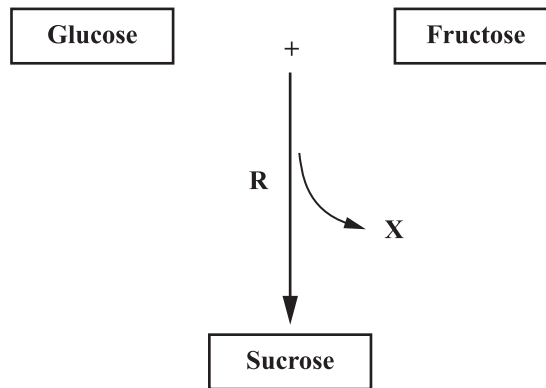


Figure 1. Formation of sucrose

- (i) Name the reaction labelled **R** and the reaction product labelled **X** in Figure 1.

R

X

[2 marks]

- (ii) In the box below, illustrate the full molecular ring structure of the glucose molecule involved in the reaction in Figure 1.

[2 marks]

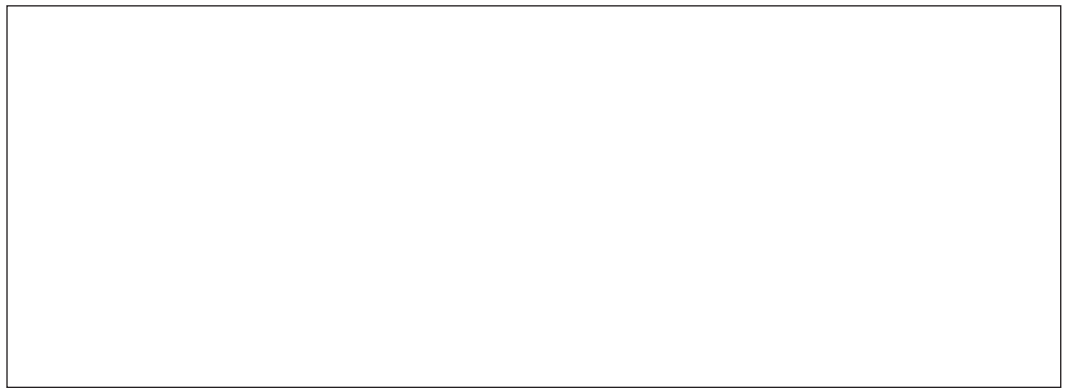
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- (iii) With reference to the molecular structure of sucrose, explain why sucrose has an advantage over glucose as a transport sugar in plants.

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[3 marks]

- (b) (i) Draw a simple labelled diagram to illustrate the fluid mosaic model of plasma membrane structure.



[5 marks]

- (ii) With reference to the fluid mosaic model, explain how large polar molecules can pass through the membrane.

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[3 marks]

Total 15 marks

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2. (a) (i) Using a simplified diagram of a small section of ribonucleic acid (RNA), describe the structure of RNA. *Note: Details of the chemical composition of components are NOT required.*

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[5 marks]

- (ii) Comment on the role of m-RNA in eukaryotes.

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[2 marks]

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- (b) A plant geneticist is investigating the inheritance of genes for bitter taste (*Su*) and explosive rind (*e*) in watermelon. Explosive rind is recessive and causes the watermelon to burst when cut. Non-bitter watermelons are as a result of the homozygous recessive allele (*su*). The geneticist wishes to determine if the genes assort independently. A **test cross** is done between a bitter, non-explosive plant and a plant homozygous recessive for both traits. Table 1 shows the offspring produced.

TABLE 1: CATEGORIES OF OFFSPRING AND RESPECTIVE NUMBERS RECORDED

Phenotype	Number	Genotype
Bitter, non-explosive	88	
Bitter, explosive	68	
Non-bitter, non-explosive	62	
Non-bitter, explosive	81	

- (i) Determine the genotype of EACH phenotypic category in Table 1, using the symbols given. Write your answers in Table 1. **[2 marks]**
- (ii) Suggest a null hypothesis for the test cross in (b).

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[2 marks]

- (iii) A Chi-square test is conducted on the results of the test cross. Table 2 is incomplete for calculated values.

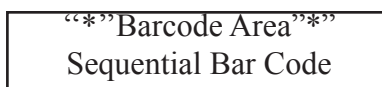
Complete Table 2 by writing the missing values in the relevant spaces.

TABLE 2: CALCULATED VALUES FOR CHI-SQUARE TEST FOR DATA GIVEN IN TABLE 1

Phenotype	Observed	Expected	$\frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}}$
Bitter, non-explosive	88		
Bitter, explosive	68		0.65
Non-bitter, non-explosive	62		2.25
Non-bitter, explosive	81		0.65
			$\chi^2 =$

[2 marks]

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- (iv) Using the table of probabilities provided below, and with reference to the calculated Chi-square value from Table 2, evaluate the validity of the hypothesis.

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[2 marks]

TABLE 3: CHI-SQUARE DISTRIBUTION

Degrees of Freedom	Probability											
	0.95	0.90	0.80	0.75	0.50	0.30	0.20	0.10	0.05	0.01	0.001	
1	0.004	0.02	0.06	0.15	0.46	1.07	1.64	2.71	3.84	6.64	10.83	
2	0.10	0.21	0.45	0.71	1.39	2.41	3.22	4.60	5.99	9.21	13.82	
3	0.35	0.58	1.01	1.42	2.37	3.66	4.64	6.25	7.82	11.34	16.27	
4	0.71	1.06	1.65	2.20	3.36	4.88	5.99	7.78	9.49	13.28	18.47	
5	1.14	1.61	2.34	3.00	4.35	6.06	7.29	9.24	11.07	15.09	20.52	
6	1.63	2.20	3.07	3.83	5.35	7.23	8.56	10.64	12.59	16.81	22.46	
7	2.17	2.83	3.82	4.67	6.35	8.38	9.80	12.02	14.07	18.48	24.32	
8	2.73	3.49	4.59	5.53	7.34	9.52	11.03	13.36	15.51	20.09	26.12	
9	3.32	4.17	5.38	6.39	8.34	10.66	12.24	14.68	16.92	21.67	27.88	
10	3.94	4.86	6.18	7.27	9.34	11.78	13.44	15.99	18.31	23.21	29.59	
	Nonsignificant								Significant			

Total 15 marks

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3. (a) Figure 2 is a photomicrograph showing a cross section of a mature anther.

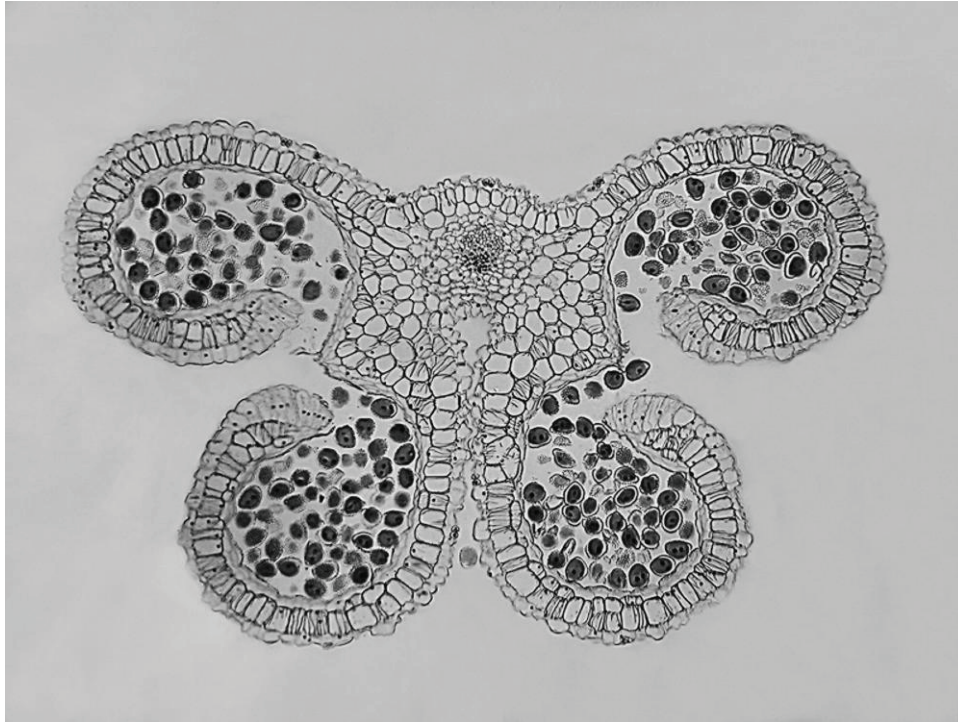
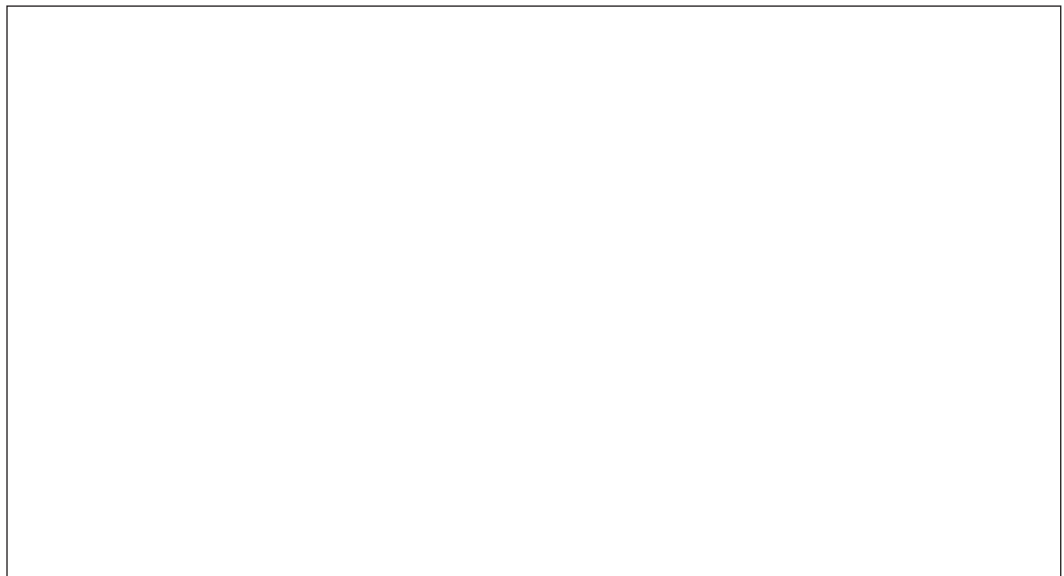


Figure 2. Photomicrograph of a mature anther

Source: <http://www.microscopyview.com/MENU/M14-BOTA/S14A-01-16/S14A-02A.html>

In the box below, make a plan drawing of the anther in Figure 2. Use annotated labels to identify TWO tissues.



[6 marks]

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(b) Figure 3 is a diagram of a section through the placenta with the umbilical vein.

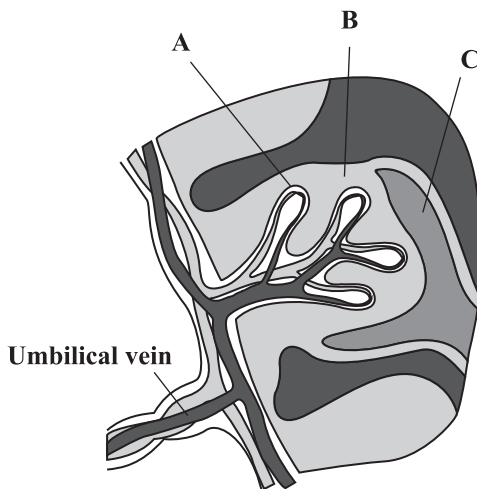


Figure 3. Diagram showing a section through a placenta

Source: Biology Unit 1 for CAPE Examinations by Ramesar, Jones and Jones, 2011

(i) Identify the structures labelled A, B and C and indicate whether EACH is of foetal or maternal origin. Write your answers in the following table.

Label	Name of Structure	Foetal or Maternal Origin
A		
B		
C		

[3 marks]

(ii) Outline TWO functions of the placenta.

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[2 marks]

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- (iii) Comment on the importance of the amnion during foetal development. In your comment, give TWO effects of reduced levels of the amniotic fluid.

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[4 marks]

Total 15 marks

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SECTION B

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

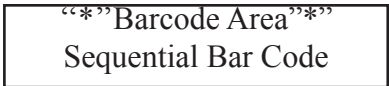
4. (a) According to the endosymbiotic theory, organelles such as mitochondria and chloroplasts are thought to have evolved from prokaryotes.

(i) Explain what is meant by the term ‘endosymbiosis’ and how it relates to the origin of these organelles in eukaryotes.

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[3 marks]

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CANDIDATE'S RECEIPT

INSTRUCTIONS TO CANDIDATE:

1. **Fill in all the information requested clearly in capital letters.**

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SUBJECT: BIOLOGY – UNIT 1 – Paper 02

PROFICIENCY: ADVANCED

REGISTRATION NUMBER:

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FULL NAME: _____
(BLOCK LETTERS)

Signature: _____

Date: _____

2. **Ensure that this slip is detached by the Supervisor or Invigilator and given to you when you hand in this booklet.**
3. **Keep it in a safe place until you have received your results.**
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INSTRUCTION TO SUPERVISOR/INVIGILATOR:

Sign the declaration below, detach this slip and hand it to the candidate as his/her receipt for this booklet collected by you.

I hereby acknowledge receipt of the candidate's booklet for the examination stated above.

Signature: _____
Supervisor/Invigilator

Date: _____