#### CARIBBEAN EXAMINATIONS COUNCIL

#### CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

"\*"Barcode Area"\*"
Front Page Bar Code

16 MAY 2016 (a.m.)

#### FILL IN ALL THE INFORMATION REQUESTED CLEARLY IN CAPITAL LETTERS.

TEST CODE 0 2 1 0 7 0 2 0									
SUBJECT BIOLOGY – UNIT 1 – Paper 02									
PROFICIENCY <u>ADVAN</u>	NCED								
REGISTRATION NUMBER	R								
SCHOOL/CENTRE NUMBER									
NAME OF SCHOOL/CENTRE									
CANDIDATE'S FULL NAME (FIRST, MIDDLE, LAST)									
DATE OF BIRTH D D M M Y Y Y									
SIGNATURE									

"\*"Barcode Area"\*"
Current Bar Code

# CXC

### **FORM TP 2016150**

MAY/JUNE 2016

#### CARIBBEAN EXAMINATIONS COUNCIL

## CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

#### **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.

Copyright © 2014 Caribbean Examinations Council All rights reserved.

02107020/CAPE 2016

#### **SECTION A**

#### **Answer ALL questions.**

Write your answers in the spaces provided in this booklet.

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

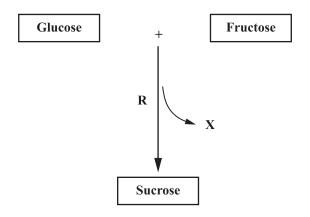


Figure 1. Formation of sucrose

(i)	Name the reaction labelled $\mathbf{R}$ and the reaction product labelled $\mathbf{X}$ in Figure 1.
	R
	X
	[2 marks
(ii)	In the box below, illustrate the full molecular ring structure of the glucose molecular involved in the reaction in Figure 1.

[2 marks]

GO ON TO THE NEXT PAGE

02107020/CAPE 2016

		-	١		١	-	٠	۰	١		۰
			٠.					•			
,											
	•	-	•		١			٠	٠		•
			٦,		٦			í	١		
		٠				٠				٠	
					3			٠			•
			,					í	,		
	-		-			-				-	
			•					•	•		•
	٠.	ď			٦.						
	-										
			ľ	٠.	ľ			1	ľ		•
	٠.		,		٦,			i	,		
	-	٠	٠	٠		٠		٠			٠
			•	1	•			1	•	٠.	•
		ď	,	í	,	í		í	,		
•	-	٠	3	۹	Į		١		۱	ŀ	٠
١			j	١.	ľ	1	9	١	ľ	٠.	i
		ď	ì	۲	è				ì		
٠			1	ŀ	Ė	1	۰	•	٩	ŀ	
						۹	ļ	١	ı	ſ.	
	٠	-	,	ø	١		;	5	į		٠
١			i	í	i	J	í	•	•	١	۰
						1			į	ſ.	
	٠	-		٠	i						
٠		•	٠	•	7	۲		ŀ		٠	٠
		-	1			-				-	
i			١	Ċ		4	Į		١	۲	١.
			i			Ġ			d	Į.	
•	•	-	ļ	١	١	٠	i	١	٠		-
			١	í		i				ì.	
	-			•		1			۱	ŀ	
			J	۱	ļ	4	ì		4		•
		-	ì	۲	٠			-	•		
١		•		١	١	٩	b	i		۲	
		٦.		١		٦.				۲.	
	٠	-	1		١	-	٠	•	٠		٠
			1	•	1	Š	5	i		·	
,		٠	i	Ė	ø	,		ì		٠	
	•	1	ŝ		3	1	٦	٠	٠		•
			1	ļ	ŧ	i	i	i			,
	-		-	•		-	•				
	ċ	1	į	į	ċ			1			
		ď	1	ľ	3		٠	i	١		
		٠	ı	3		٩	١	ŧ	ı	ŀ	
١.			J		1	٦.		١.	ľ	٠.	ľ
		-	ı	Ē			١	١	i		
١			١	3		٠		•		١.	
			J		ļ	٩	i	i	i	ī.	
	٠	-	i			c		í			٠
•			1	1	1		ı		۰	•	١
į			ŝ			1	į	١	į	ŀ	í
	٠	-	•	,	•	ς	٠	-	•		
			1	ľ	١	ď	ì	١	i		
						١	ì	i			
	ŀ		3			f		1	3		٠
			ì	٠		:		١	١	:	٠
	-		1	١	١		i			è	
۰			ı	Ļ	3	1	•	4	9	t.	٠
		ď		i	i	i	١	í			
١	•	٠	٩	ė					۹	١	
			i	1	١	١	i		í	1	٠
			ŀ		,		í	í			
١			١	è	į	ø			۲	٠	۰
			į		٩	÷				ŀ	i
	٠	-			•	-			١		
١			1	ŕ		į	١	i		ì	٠
	ď	ì	4	k	į	ŝ	ï		1	ŀ	
			١	1	•	٩	۱	į	ŕ	۱	٠
			1	ė	١	ı	١	í	i	ċ	
	-		ı	í	ė			i	j	ŀ	
			•	1		1	۰		ļ	Ì.	•
		ď			٠	ď			٠		
	-	٠		•						٠	

	(iii)	With reference to the molecular structure of sucrose, explain why sucrose has an advantage over glucose as a transport sugar in plants.
<i>a</i> >		[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.
		[3 marks] Total 15 marks
		GO ON TO THE NEXT PAGE

02107020/CAPE 2016

•	(a)	(i)	Using a simplified diagram of a small section of ribonucleic acid (RNA), describe the structure of RNA. <i>Note: Details of the chemical composition of components are NOT required</i> .
			[5 moulte]
			[5 marks]
		(ii)	Comment on the role of m-RNA in eukaryotes.
			[2 marks]

02107020/CAPE 2016

2.

(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	

given. Write your answers in Table 1.

(ii)	Suggest a null hypothesis for the test cross in (b).

Determine the genotype of EACH phenotypic category in Table 1, using the symbols

(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	(Observed – Expected ) <sup>2</sup> Expected		
Bitter, non-explosive	88				
Bitter, explosive	68		0.65		
Non-bitter, non-explosive	62		2.25		
Non-bitter, explosive	81		0.65		
			$X^2 =$		

[2 marks]

[2 marks]

[2 marks]

GO ON TO THE NEXT PAGE

02107020/CAPE 2016

(i)

"*"Barcode	Area"*"
Sequential I	Bar Code

(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.
	[2 marks]

TABLE 3: CHI-SQUARE DISTRIBUTION

Degrees		Probability									
of Freedom	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
			,	Nonsigi	nificant				S	ignificar	it

**Total 15 marks** 

GO ON TO THE NEXT PAGE

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

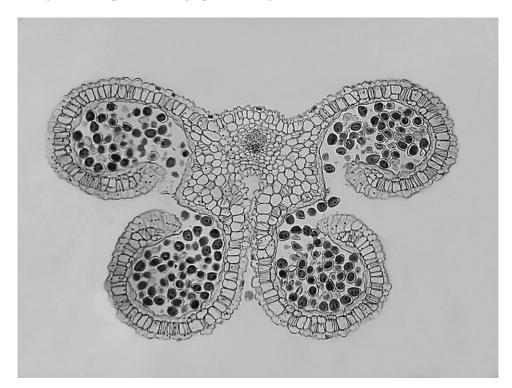


Figure 2. Photomicrograph of a mature anther

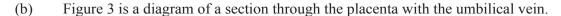
Source: http://www.microscopyview.com/MENU/M14-BOTA/S14A-01-16/S14A-02A.html

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

[6 marks]

GO ON TO THE NEXT PAGE

02107020/CAPE 2016



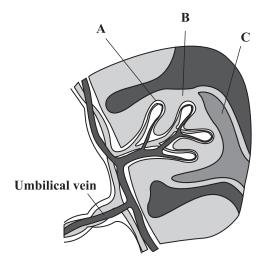


Figure 3. Diagram showing a section through a placenta

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		
В		
С		

		[3 marks]
(ii) (	Outline TWO functions of the placenta.	
		[2 marks]

GO ON TO THE NEXT PAGE

(iii)

F= -2	
A	
X	
	l .
	1
THIS AREA	
· · · · · · ·	
	l .
3-1	
WRITE IN	
	II
	1
novoa	
	001050000000000000000000000000000000000
	02107020/CAPE 2016
	UZ 1070ZU/CAFF ZU10
	====:0=0;01112=010
	1

Comment on the importance of the amnion during foetal development. In your comment, give TWO effects of reduced levels of the amniotic fluid.
[4 marks]

GO ON TO THE NEXT PAGE

**Total 15 marks** 

#### **SECTION B**

#### **Answer ALL questions.**

Write your answers in the spaces provided in this booklet.

(i) Explain what is meant by the term 'endosymbiosis' and how it relates to the orig of these organelles in eukaryotes.	<b>→.</b>	(a)		ought to have evolved from prokaryotes.	Cilioropiasts
			(i)		to the origin
is mark					
					[S marks]

GO ON TO THE NEXT PAGE

02107020/CAPE 2016

02107020/CAPE 2016

	globular nature of these molecules.	
•		•••
•		•••
•		•••
•		•••
•		•••
•		•••
•		•••
		•••
•		
-		•••
-		•••
•	Г	 <b>6</b> 1

5.	(a)	Evaluate the use of genetically modified organisms in agriculture. Include an explanation of the term 'genetically modified organism'.

02107020/CAPE 2016

			[7
Explain the steps involved for human insulin from	yed in the use of recoacteria under the f	combinant DNA technological combination of the combine of the comb	ology for the pro
<ul><li>Gene isolation</li><li>Gene insertion into</li></ul>	a vector		
	•••••		

	•••••
	•••••
	•••••
	•••••
[8 ma	

02107020/CAPE 2016

"\*"Barcode Area"\*"
Sequential Bar Code

**Total 15 marks** 

GO ON TO THE NEXT PAGE

6.	(a)	Spore	production is one type of asexual reproduction seen in fungi.
		(i)	Using an example with which you are familiar, give an account of the process involved in this type of asexual reproduction.
			[5 marks]

02107020/CAPE 2016

(ii)

DO NOT WRITE IN THIS AREA

Fungi can also produce offspring by sexual reproduction. Discuss the conditions under which asexual reproduction is <b>more advantageous</b> than sexual reproduction.
[3 marks]

GO ON TO THE NEXT PAGE

02107020/CAPE 2016

- 1
. ^
. ~
- 7
SHL N
>
- E
~
<b>&gt;</b>
- >
·
- t
2
-
He
2
\ 
2
2
2
2
2
2
2
2
2
ATHICARE
2
ATHICARE
A NOT WRITE IN THIS ARE
ATHICARE
A NOT WRITE IN THIS ARE
A NOT WRITE IN THIS ARE
A NOT WRITE IN THIS ARE

Comment	on the role of	i gonadai ii	officies.	include the	c mannes of	the gonac	iai 11011
		••••••	•••••			•••••	
		•			••••••	•	
		•			••••••	•	
		••••••	•••••			•••••	
		•			***************************************	• • • • • • • • • • • • • • • • • • • •	
						•	
						•	
	•••••						

**END OF TEST** 

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

02107020/CAPE 2016

Total 15 marks

#### **EXTRA SPACE**

If you use this	s extra page, you MU	JST write the ques	stion number clea	rly in the box pr	ovided.
Question No.					
					•••••
					•••••
					•••••

#### **EXTRA SPACE**

ii you use u	ins extra page, yo	u MOSI write ti	ie question num	ber clearly in the	box provided.
Question No.					

## CANDIDATE'S RECEIPT

#### **INSTRUCTIONS TO CANDIDATE:**

1.	Fill in all the information requested clearly in capital letters.					
	TEST CODE: 0 2 1 0 7 0 2 0					
	SUBJECT: BIOLOGY – UNIT 1 – Paper 02					
	PROFICIENCY: ADVANCED					
	REGISTRATION NUMBER:					
	FULL NAME:(BLOCK LETTERS)					
	Signature:					
	Date:					
<ol> <li>3.</li> </ol>	Ensure that this slip is detached by the Supervisor or Invigilator and given to you when you hand in this booklet.  Keep it in a safe place until you have received your results.					
	INSTRUCTION TO SUPERVISOR/INVIGILATOR:					
_	n the declaration below, detach this slip and hand it to the candidate as his/her receipt for this booklet ected by you.					
I he	reby acknowledge receipt of the candidate's booklet for the examination stated above.					
	Signature: Supervisor/Invigilator					
	Date:					