Rewarding Learning

ADVANCED SUBSIDIARY (AS) General Certificate of Education 2014

Ce	ntre	Number
71		

Candidate Number

Biology

Assessment Unit AS 1

assessing Molecules and Cells

[AB111]

FRIDAY 13 JUNE, AFTERNOON



TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.

There is an extra lined page at the end of the paper if required.

Answer all eight questions.

You are provided with **Photograph 1.3** for use with Question 3 in this paper. Do not write your answers on this photograph.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75.

Section A carries 60 marks. Section B carries 15 marks.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You are reminded of the need for good English and clear presentation in your answers.

Use accurate scientific terminology in all answers.

You should spend approximately 20 minutes on Section B.

You are expected to answer Section B in continuous prose.

Quality of written communication will be assessed in Section B, and awarded a maximum of 2 marks.

For Exa use	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

Section A villus M LLLI I I I I Χ-

Adapted from: © Biology for CCEA AS Level by Dr J Napier, page 105, published by Colourpoint Educational, 2012. ISBN 976 1 78073 010 3

Between each villus is a region containing some actively dividing cells called stem cells. These are able to divide and develop into a variety of cell types, each of which becomes a component of the tissue layer labelled **X** in the diagram.

(a) State the name of tissue layer X.

Examiner Only Marks Remark

1 The wall of the ileum is made up of several tissue layers, as shown in the diagram below.

[1]

(b)	Paneth cells and goblet cells are two types of cell produced by the stem cells. State the functions of Paneth cells and goblet cells in the ileum.	Examin Marks	er Only Remark
	Paneth cells		
	Goblet cells		
	[2]		

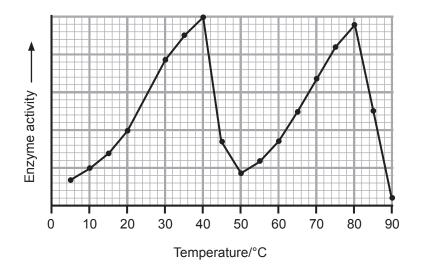
The mei	e diagram below shows two stages ir iosis. The diploid number of the cell s	n the process of nuclear divisions shown in stage A is 4.	DN by Examiner Marks
		XXX	
	Stage A	Stage B	
(a)	Identify stage B .		
			[1]
(b)	Describe the behaviour of the chror stage B .	nosomes between stage A an	d
			[4]

	otograph 1.3 is an electronmicrograph of a plant cell, with some parts		Examine	er Only
	surrounding cells also visible. Some structures in the photograph have		Marks	Remark
aire	eady been labelled.			
(a)	Identify the structures labelled A to C .			
	A			
	Α			
	В			
	C [21		
		3]		
(b)	The magnification of this photograph is \times 7500. Calculate the width of the cell in µm along the line X – X . (Show your working.)	:		
	Answer μm [31		
	μη [0]		
(c)	Within the chloroplast a membrane system is clearly visible. Outline how this membrane system increases the amount of light energy absorbed.			
		_		
		_		
	[:	2]		
(d)	Suggest a reason why a nucleus is not visible in the photograph.			
		-		
	[[1]		

4 Biological washing powders contain enzymes which help to break down stains on fabric. The enzyme activity in a biological washing powder at a range of different temperatures was investigated. The graph below shows the results.

Examiner Only

Marks Remark



(a) Describe and explain the trend shown in the graph between 5 $^\circ\text{C}$ and 45 $^\circ\text{C}.$



(b)	(i)	Suggest an explanation for the two different peaks observed in enzyme activity.	Examiner Marks F	Only Remark
		[2]		
	(ii)	Suggest why such a pattern of enzyme activity would be useful in biological washing powders.		
		[1]		
(c)	Sug 45°	gest an explanation for the enzyme activity observed between C and 55 °C.		
		[2]		

(a)	rea	tudent tested five solutions (A–E) with Benedict's reagent, Biuret gent, iodine solution and Clinistix. The student recorded the results he following manner:	Examine Marks	er Only Remark
	•	When tested with Benedict's reagent, solutions A and C both produced a brick-red precipitate.		
	•	When tested with Biuret reagent, only solution B produced a purple colour.		
	•	When tested with iodine solution, only solution D turned blue-black.		
	•	Solution E produced no colour change with any of the reagents.		
	•	When tested with Clinistix, only solution A gave a positive result.		
	(i)	In the space below, construct a table of the results obtained by this student. Your table should include the following:		
		 appropriate column headings positive test results recorded with a ✓ and negative results with an X. All boxes should be filled. No caption is required. 		
		[3]		

A	ly Iark
C	
D [4] (iii) Describe how the test with Benedict's reagent would have been carried out. [4]	
 (iii) Describe how the test with Benedict's reagent would have been carried out. [1] (b) After carrying out the tests outlined in (a), the student wished to identify substance E. After hydrolysis of E, it was found that the resulting solution now tested positive with both Benedict's reagent and 	
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identify substance E. After hydrolysis of E, it was found that the resulting solution now tested positive with both Benedict's reagent and	
Clinistix. Suggest which substance was originally present in solution E and give a reason for your answer.	
Substance E	
Reason	
[2]	

of f	uncti	s comprise a large group of organic molecules with a wide variety ions. The specific function of a protein depends on its shape which mined by its sequence of amino acids.	Examiner Marks F
(a)	(i)	Identify the elements which are present in all proteins.	
		[1]	
	(ii)	Explain what is meant when a protein is said to have a quaternary structure.	
		[1]	
Sor	ne fe	eatures of four human proteins are described below.	
		ratin is the major component of hair and nails. Its structure consists a repeating pattern of a sequence of seven amino acids.	
	-	psin is an enzyme found in the small intestine, where it is involved he digestion of proteins in food.	
		llagen is found in skin, where it maintains elasticity, and in dons, where it provides strength.	
	ass	cin is found in saliva, where it makes food slippery and thus ists its passage from the mouth to the stomach. Its structure udes many carbohydrate chains attached to the protein.	
(b)	(i)	From the list above, select a protein which could be categorised as follows. (Each protein may be used once, more than once, or not at all.)	
		a conjugated protein	
		a fibrous protein	
		a globular protein	
		• a protein which catalyses hydrolysis [4]	
	(ii)	Shampoo manufacturers sometimes state that their product contains amino acids.	
		Suggest why amino acids in shampoo are unlikely to be of use in the production of keratin in hair.	
		[1]	

(c)	role	veral cell structures play a role in protein synthesis. Describe the of each of the following structures in the synthesis of a functional tein.	Examine Marks	er Only Remark
	•	Ribosomes		
	•	Rough endoplasmic reticulum		
	•	Golgi body		
		[3]		
(d)	via	ne proteins are secreted out of the cell in which they are produced, vesicles which fuse with the plasma membrane. ne this process of secretion out of a cell.		
		[1]		
(e)	use thre a pa	search in protein biochemistry has been greatly enhanced by the of molecular modelling software which allows users to view the e-dimensional structure of a protein. Often, scientists researching articular protein will make the molecular modelling file for that tein available to download via the internet.		
	Sug	gest an advantage of this file-sharing for scientific research.		
		[1]		

During the summer of 2013, it was reported that large numbers of oysters had died in Carlingford Lough in County Down. Tests on the dead oysters Marks Remark showed the presence of a virus called Ostreid Herpes Virus (OsHV). It is thought that the extended period of warm weather triggered increased infection rates in oyster populations. The diagram below shows the structure of a Herpes Virus, similar to that which infects oysters. Envelope proteins Lipid envelope Capsid DNA 1 © TWiV – This Week in Virology with Vincent Racaniello and friends. www.twiv.tv/virus-structure/ (adapted) Creative Commons Attribution 3.0 License (a) Using the information in the diagram, state one way in which the structure of this virus is similar to the structure of: HIV _____ a bacteriophage _____ [2]

Examiner Only

(b) Various methods are used to diagnose infection by this virus. Each method has been classified, according to its appropriateness and ease of use. The table below summarises this.

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The classifications used in the table are summarised as follows:

 \mathbf{a} – the recommended method for reasons of specificity and sensitivity \mathbf{b} – a standard method with moderate diagnostic sensitivity and specificity

c – a method which is useful in some situations, but factors including cost and/or accuracy severely limit its application.

Initially, tissue from dead oysters is examined using a light microscope, since the virus causes changes in the appearance of the nucleus of an infected cell. If a viral infection is suspected, then PCR can be carried out.

(i) Suggest why PCR is not undertaken until tissue samples have been examined with a light microscope.

_____ [1]

Examiner Only Marks Remark

(ii) Suggest why 'obvious signs' is classified as c.

_____[2]

_ [2]

(iii) Suggest why 'PCR' is classified as **a**.

	ed with buffer. It is then incubated with primers, an enzyme an xyribonucleotides.	C Marks
(i)	Name the enzyme used in PCR.	
		_ [1]
(ii)	How many types of deoxyribonucleotides should be included?	,
		[1]
	ow are the sequences of one primer pair which can be used whing for OsHV.	nen
	C9 : 5'-GAG-GGA-AAT-TTG-CGA-GAG-AA-3'	
	C10: 5'-ATC-ACC-GGC-AGA-CGT-AGG-3'	
(iii)	Give the base sequence to which primer C10 would bind.	
		_ [1]
(iv/)	Explain why primers are added in pairs.	
(1•)		
		_ [1]
(v)	Knowledge of the DNA of oysters was necessary for the scier who developed this test for OsHV. Suggest why.	itists
		_ [1]
		_ []

	Section B		Examine Marks	er Only Remark
	ality of written communication is awarded a maximum of 2 marks in this ction.	S	Marks	Remark
8	Give an account of the process of osmosis in cells and explain the effe of changing external solute concentrations on both animal and plant cells.	ect [13]		
	Quality of written communication	[2]		

Section B

	iner Only
 Marks	Remark

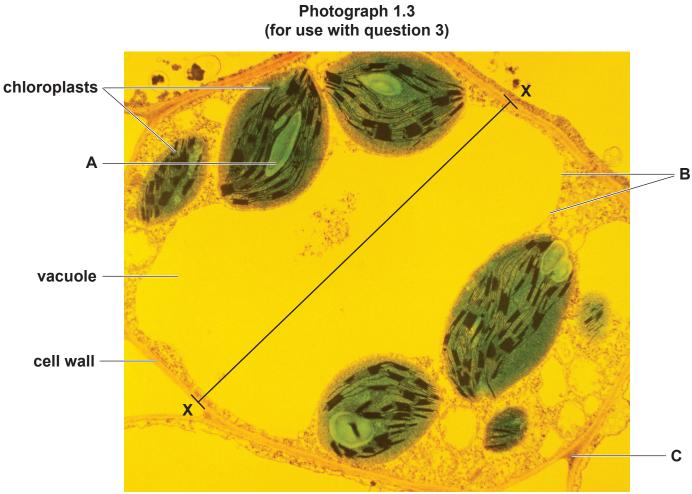
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Marks	Remark

Extra lined page			aminer Only	
		Marks	Remark	

THIS IS THE END OF THE QUESTION PAPER

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GCE Biology Advanced Subsidiary (AS) Assessment Unit AS 1 Molecules and Cells Summer 2014



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