

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2023

	Centre Number							
Candidate Number								
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Biology

Assessment Unit AS 1
assessing
Molecules and Cells



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FRIDAY 12 MAY, 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. **You must answer the questions in the spaces provided.**

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. Do not write with a gel pen.

Answer all eight questions.

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.





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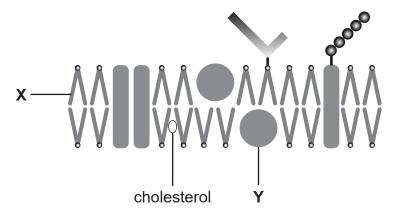


Section A

1 The diagram below represents part of a plasma membrane.

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(a)	Identify molecules X and Y .	
	X	
	Υ	[2]
(b)	State the function of cholesterol in plasma membranes.	
		[1]
(c)	Describe and explain how large, water-soluble substances cross plasma membranes.	
		[2]
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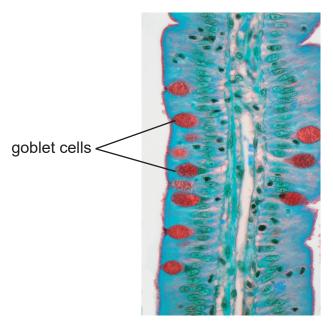


2 Many human tissues and organs are specialised for a particular function.

(a) Define the term 'tissue'.

[1]

(b) The photomicrograph below shows a section through part of a human villus. Goblet cells are labelled.



Source: © Steve Gschmeissner / Science Photo Library

	(i) State	the	role	of	aoblet	cells
--	----	---------	-----	------	----	--------	-------

[1]

(ii) Name the layer of the ileum in which villi are located.

___[1]



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					[2]
v) Describ	e and explain t	wo other ada	ptations of a	/illus.	
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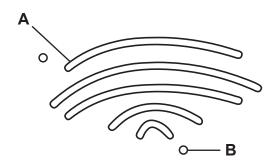
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3 The diagram below represents a Golgi apparatus.



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(a) Identify structures A and B.

Α							

(b) Describe two modifications which may be made to a protein as it moves through the Golgi apparatus from A to B.

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	2			



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4 The table below shows the number of chromosomes present in cell nuclei of females and males of some species.

Smaaina	Number of chromosomes per nucleus			
Species	Female	Male		
Red king crab	208	208		
Walking catfish	104	104		
Koala	16	16		
Jack jumper ants	2	1		

(a) Cell division by meiosis produces gametes which show genetic variation.

be achieved in red king crab gametes, compared with koala gametes.			
	[4		

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(b)	The process of reproduction in jack jumper ants is unusual. A fertilised egg develops into a female, whereas an unfertilised egg develops into a male. Cells from males in this species cannot undergo meiosis. Using the informatin the table on the previous page, suggest an explanation for this.	tion
(c)	Diagram A below represents a cell of a female jack jumper ant during metaphase I of meiosis .	
	Diagram A	
)()() _z	
	(i) Identify the structure labelled Z .	
		[1]
	(ii) Explain why the nuclear envelope is not visible at this stage.	
		[1]

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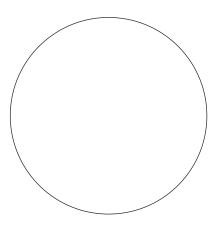
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(iii) In Diagram B, draw the chromosomes as they would appear in anaphase I of **meiosis** in a female of this species.

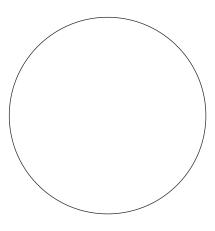
Diagram B



[1]

(iv) In Diagram C draw the chromosomes as they would appear in anaphase of **mitosis** in a female of this species.

Diagram C



[1]

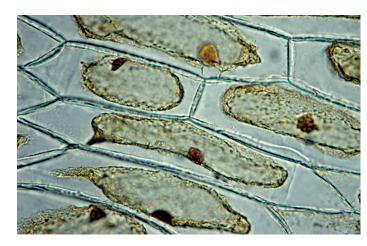
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5 The photomicrograph below shows onion cells which had been placed in a concentrated sugar solution for one hour.



Source: © Getty Images

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(a)	Describe and explain the appearance of the onion cells.					
	[3]					



(b) The absorption of water by cells in a seed is an important part of the first stage of plant growth, called germination.

An investigation was carried out into the effect of fertiliser concentration on the germination of some seeds. The table below shows the results of this investigation.

Concentration of	Percentage of seeds which germinated			
fertiliser/ arbitrary units	Aubergine	Tomato	Chilli	
0	65	67	71	
5	78	81	86	
10	82	92	98	
15	90	94	99	
20	81	90	94	
25	69	85	88	
30	58	64	70	
35	44	60	65	

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(i)	Describe the trends shown in the table.						
		[3]					

[Turn over



		(ii)	Using your knowledge and understanding of osmosis, suggest an explanation for the effect of higher concentrations of fertiliser on germination of seeds.
			[2]
	(c)	(i)	Define the term 'pressure potential'.
			[1]
		(ii)	Explain why pressure potential does not affect an animal cell.
			[1]
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Join Rhe cau A g rhe	euma euma roup uma	atoid arthritis is a disease in which the collagen in cartilage breaks down, pain and stiffness in the joints. of protease enzymes called MMPs can act as biomarkers for toid arthritis.	
Join Rhe cau A g rhe	euma using roup uma (i)	atoid arthritis is a disease in which the collagen in cartilage breaks down, pain and stiffness in the joints. of protease enzymes called MMPs can act as biomarkers for toid arthritis.	
Join Rhe cau A g rhe	euma using roup uma (i)	atoid arthritis is a disease in which the collagen in cartilage breaks down, pain and stiffness in the joints. of protease enzymes called MMPs can act as biomarkers for toid arthritis. Define 'biomarker'. Suggest how protease enzymes such as MMPs may contribute to	

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	(iii)	A patient suffering from rheumatoid arthritis had their MMP levels monitored, and it was noted that MMP levels were increasing steadily. Suggest what the consequences of this may be for the patient.
		[1]
(c)		on-competitive inhibitor of MMPs has been developed as a drug for umatoid arthritis.
	(i)	Describe and explain how a non-competitive inhibitor slows the rate of an enzyme-controlled reaction.
		roa
	/ii\	Suggest how this drug could slow down the progress of rhoumatoid arthritis
	(11)	Suggest how this drug could slow down the progress of rheumatoid arthritis but is not likely to relieve symptoms completely.
		[2]
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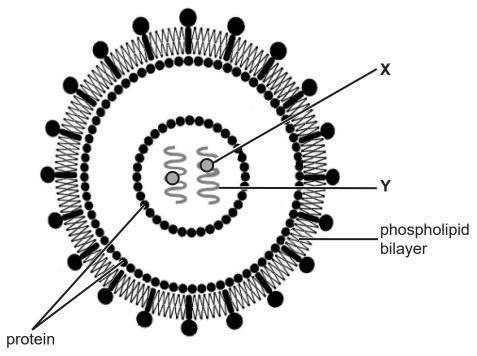
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7 HIV (human immunodeficiency virus) damages some cells of the immune system and weakens the ability to fight infections and disease.

The diagram below represents the structure of HIV.



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(a)	(i)	Identify the genetic material (Y) found in HIV.
-----	-----	---------------------------------	--------------------------

 [1]

(ii) Identify enzyme X and explain its role in HIV.

Enzyme	X	 	
Role			

[2]

[Turn over



		e of lymphocyte (white blood cell). The infection process is le diagram below.
	Stage 1:	Binding to lymphocyte membrane
	Stage 2:	Endocytosis
	Stage 3:	Genetic material and enzyme X enter cell cytoplasm
	Stage 4:	Integration of HIV DNA into host cell DNA
	Stage 5:	Replication
	Stage 6:	Assembly of new HIV particles
	Stage 7:	Many new HIV particles released from lymphocytes
(i)	HIV can ente	er lymphocytes via endocytosis. Describe the process is.
		[2]

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,	est how intervention at stage 1 or stage 7 could help prevent the d of HIV throughout the body.	
Stage	1 – binding to lymphocyte membrane	
Stage	7 – release of the virus	
		[2]

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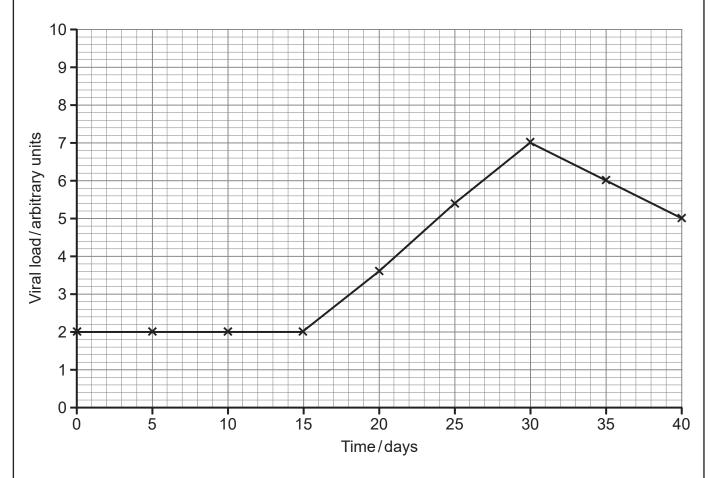


(c) The results of research carried out on HIV infection in a small number of people are summarised in the graph below. Viral load is a measure of the number of virus particles present in the body and was recorded over the first 40 days of infection.

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(i)	Describe the results of the research.	
		[3]
(ii)	Calculate the percentage increase in viral load from day 5 to day 25.	
	(Show your working.)	
		0/ [0]
		% [2]
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Section B Quality of written communication will be assessed in this section. 8 (a) DNA and RNA are nucleic acids. Describe the structure of nucleic acids and describe the functions of DNA and RNA. [9] (b) Describe the process of semi-conservative replication of DNA. [6] (a) DNA and RNA are nucleic acids. Describe the structure of nucleic acids and describe the functions of DNA and RNA. 13859

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	(b)	Describe the process of somi consequative replication of DNA
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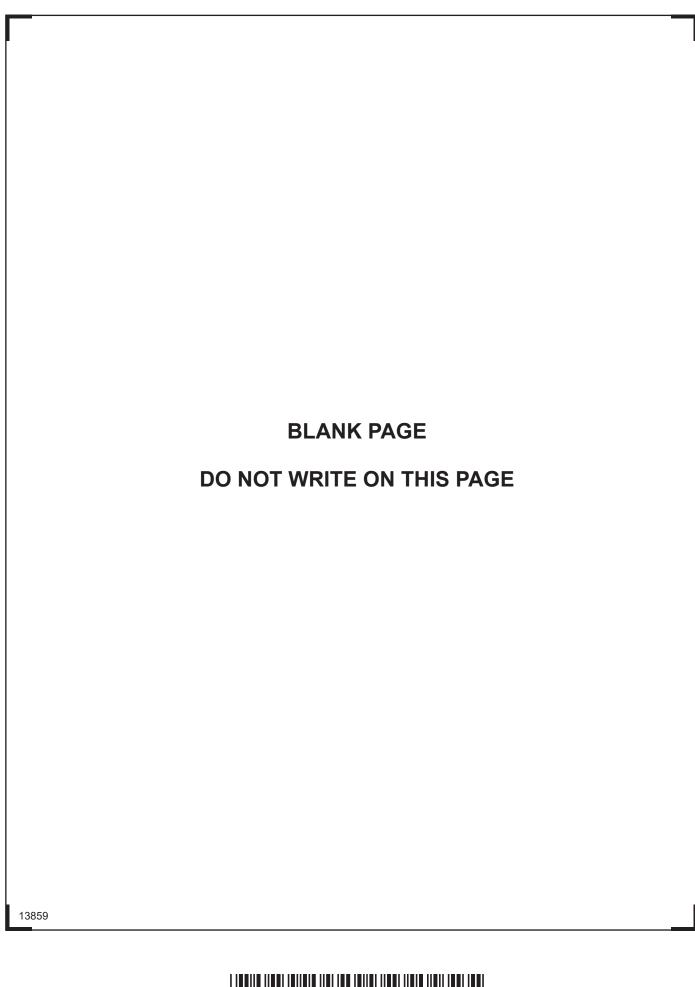
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