

Please write clearly in	block capitals.		
Centre number		Candidate number	
Surname			
Forename(s)			
Candidate signature			

AS BIOLOGY

Paper 1

Thursday 24 May 2018

Afternoon

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a ruler with millimetre measurements
- a scientific calculator.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer all questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Show all your working.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for the questions are shown in brackets.
- The maximum mark for this paper is 75.

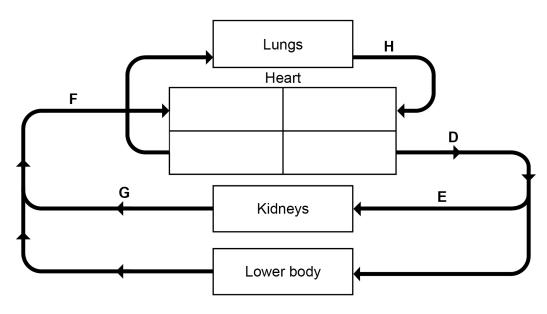
For Examiner's Use			
Question	Mark		
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
TOTAL			



Answer all questions in the spaces provided.

0 1. 1 Figure 1 shows part of the blood circulation in a mammal.

Figure 1



Use Figure 1 to give the letter that represents each of these blood vessels.

[3 marks]

Aorta	
Renal vein	
Vena cava	

0 1 . 2 Name the blood vessels that carry blood to the heart muscle.

[1 mark]

0 1 . 3

Figure 2 shows a photograph of part of a mitochondrion from a mouse liver cell taken using a transmission electron microscope at \times 62 800 magnification.

Figure 2



Produce a scientific drawing of the mitochondrion in Figure 2 in the box below.

Label the following parts of the mitochondrion on your drawing.

- Matrix
- Crista

[4 marks]

Turn over ▶

8



0 2.1	What is a monomer? [1 mark]
0 2.2	Lactulose is a disaccharide formed from one molecule of galactose and one molecule of fructose.
	Other than both being disaccharides, give one similarity and one difference between the structures of lactulose and lactose. [2 marks]
	Similarity
	Difference



0 2 . 3	Following digestion and absorption of food, the undigested remains are processed to form faeces in the parts of the intestine below the ileum.
	The faeces of people with constipation are dry and hard. Constipation can be treated by drinking lactulose. Lactulose is soluble, but is not digested or absorbed in the human intestine.
	Use your knowledge of water potential to suggest why lactulose can be used to help people suffering from constipation.
	[2 marks]
0 2.4	Lactulose can also be used to treat people who have too high a concentration of hydrogen ions (H ⁺) in their blood.
	The normal range for blood H $^{+}$ concentration is 3.55×10^{-8} to 4.47×10^{-8} mol dm $^{-3}$
	A patient was found to have a blood H^+ concentration of $2.82 \times 10^{-7} \text{mol dm}^{-3}$
	Calculate the minimum percentage decrease required to bring the patient's blood H ⁺ concentration into the normal range.
	[2 marks]
	Answer =

0 3.1	Draw and label a single DNA nucleotide.	[2 marks]
0 3 . 2	Give two features of DNA and explain how each one is important in the	
0 3 . 2	semi-conservative replication of DNA.	[2 marks]
0 3 . 2	semi-conservative replication of DNA.	[2 marks]
0 3 . 2	semi-conservative replication of DNA.	[2 marks]
0 3 . 2	semi-conservative replication of DNA.	[2 marks]
0 3 . 2	semi-conservative replication of DNA. 1	[2 marks]
0 3 . 2	semi-conservative replication of DNA. 1	[2 marks]



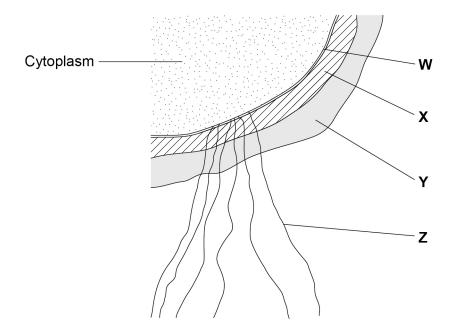
5

	Dealisation of wite the advict DNA (wtDNA) is different from that of evaluation DNA			'
0 3 . 3	Replication of mitochondrial DNA (mtDNA) is different from that of nuclear DNA.			
	The replication of the second strand of mtDNA only starts after two-thirds of the first strand of mtDNA has been copied.			
	A piece of mtDNA is 16 500 base pairs long and is replicated at a rate of 50 nucleotides per second.			
	Tick (✓) the box that shows how long it would take to copy this mtDNA. [1 mark]			
	Α	330 seconds		
	В	440 seconds		
	С	550 seconds		
	D	660 seconds		

Turn over for the next question

0 4 Figure 3 shows part of a prokaryotic cell.

Figure 3



0 4 . 1	Name the structures labelled W to Z in Figure 3 .	[2 marks]
	W	
	X	
	Υ	
	z	
0 4.2	Name the main biological molecule in:	[2 marks]
	W	
	X	



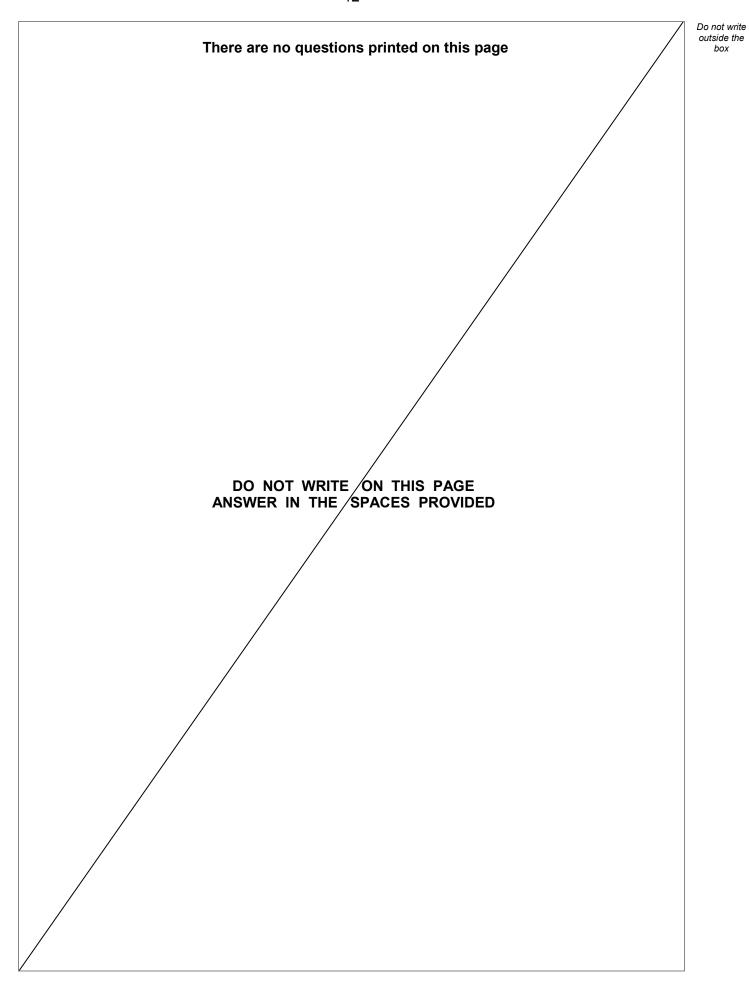
0 4.3	Name the process by which prokaryotic cells divide. [1 mark]
0 4.4	Some prokaryotic cells can divide every 30 minutes. A liquid culture contained a starting population of 1.35×10^4 cells.
	Assuming each cell divides every 30 minutes, calculate how many cells there will be after 3 hours. Assume no cells die during this time.
	[2 marks]
	Answer =
	Turn over for the next question
	tani ete. iei ment queenen

0 5 Figure 4 represents a triglyceride. Figure 4 Q Q P Q 0 5 . 1 Name the molecules represented in Figure 4 by: [2 marks] Box P Box Q 0 5 . Name the type of bond between P and Q in Figure 4. [1 mark]



0 5.3	Describe how you would test a liquid sample for the presence of lipid and how you would recognise a positive result. [2 marks]	Do not write outside the box
		5
	Turn over for the next question	



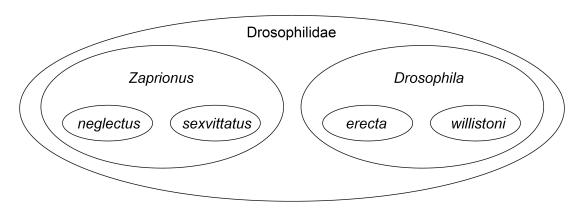




Do not write outside the box

0 6 Figure 5 represents the phylogenetic classification of four different species of fruit fly.

Figure 5



0 6 . 1	Figure 5 shows a hierarchy.	Explain how.	[2 marks]
	-		
0 6 . 2	Name the taxon to which Dro	osophilidae belongs.	
		sooprimade selenge.	[1 mark]

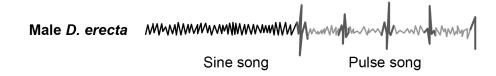


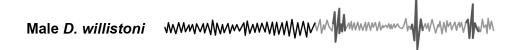
Drosophila fruit flies display courtship behaviour. One of the stages of courtship is singing by males. Normally a male will produce a 'sine song', in which continual noise is made, and a 'pulse song', in which there is continual noise with some louder peaks.

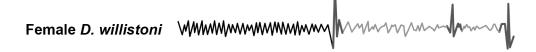
Scientists showed fruit flies a visual stimulus that made them sing. They made recordings of these songs.

Figure 6 shows the recordings of the songs of three flies over the same time period.

Figure 6









ecies.	Do not write outside the box
[2 marks]	
ne visual ongs led to	
o any attempt to	
t attempt to [2 marks]	

0 6.3	D. erecta and D. willistoni are closely related species but different species.	
	Describe evidence from Figure 6 that supports this statement. [2 marks]	
0 6 . 4	The scientists repeated their experiments, using female fruit flies as the visual	
	stimulus. When a male and female <i>D. willistoni</i> were together, their songs led to mating.	
	When two female <i>D. willistoni</i> were together, their songs did not lead to any attempt to mate.	
	Use information from Figure 6 to suggest why the two females did not attempt to mate. [2 marks]	



0 7.1	What is the proteome of a cell? [1 mark
0 7.2	Give two structural differences between a molecule of messenger RNA (mRNA) and a molecule of transfer RNA (tRNA).
	[2 marks
	2



0 7.3	Starting with mRNA in the cytoplasm, describe how translation leads to the of a polypeptide.	production
	Do not include descriptions of transcription and splicing in your answer.	[5 marks]
	_	
	Turn over for the next question	

There are no questions printed on this page DO NOT WRITE ON THIS PAGE ANSWER IN THE SPACES PROVIDED



0 8 . 1 State and explain the property of water that can help to buffer changes in temperature. [2 marks] 0 8 . 2 Water is used to hydrolyse ATP. Name the **two** products of ATP hydrolysis. [1 mark] 2

Turn over ▶

Do not write outside the

box



Hydrolysis of ATP is catalysed by the enzyme ATP hydrolase.

A student investigated the effect of ATP concentration on the activity of ATP hydrolase. She used shortening of strips of muscle tissue caused by contraction as evidence that ATP was being hydrolysed.

- She took four slides **A**, **B**, **C** and **D**, and added strips of muscle tissue of the same length to each slide.
- She then added the same volume of ATP solutions of different concentrations to the four slides and left each slide for five minutes.
- She then recorded the final length of each strip of muscle tissue.

Her results can be seen in Table 1.

Table 1

Slide	Concentration of ATP solution added to slide / ×10 ⁻⁶ mol dm ⁻³	Final length of muscle tissue after 5 minutes / mm	
Α	2	36	
В	4	31	
С	6	29	
D	8	26	

0 8 . 3	Other than those given, name two variables the student should have controlled [2	d. marks]
	1	
	2	



0 8 . 4	Describe and explain the pattern shown by the data in Table 1.	
	[2 marks] Description	
	Explanation _	
0 0 5	The budge hade of A dual day 3 of a A week day 3 celebrate of ATD value and a CO 500 Left and a celebrate	
0 8 5	The hydrolysis of 1 dm ³ of a 1 mol dm ⁻³ solution of ATP releases 30 500 J of energy.	
	60% of the energy released during the hydrolysis of 1 mol dm ⁻³ of ATP is released as heat; the rest is used for muscle contraction.	
	The student added 0.05 cm ³ of ATP solution to slide D .	
	Calculate the energy available from ATP for contraction of the muscle on this slide. [3 marks]	
	Answer = J	

Turn over ▶

10



0 9.1	Describe the pathway taken by an oxygen molecule from an alveolus to the	blood. [2 marks]
		[Z marks]
		_
0 9 . 2	Explain how one feature of an alveolus allows efficient gas exchange to occ	cur. [2 marks]



Question 9 continues on the next page DO NOT WRITE ON THIS PAGE ANSWER IN THE SPACES PROVIDED

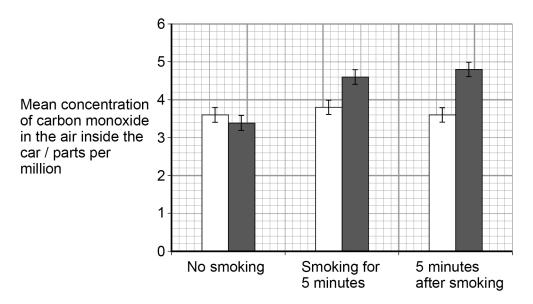
Turn over ▶

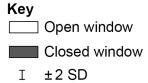


Carbon monoxide is a poisonous gas that is present in cigarette smoke. This carbon monoxide can be absorbed into the blood where it binds with haemoglobin.

Scientists investigated the concentration of carbon monoxide in cars in which people were smoking or not smoking. They measured the concentration with the car windows open and closed. **Figure 7** shows the scientists' results as they presented them. A value of \pm 2 standard deviations from the mean includes over 95% of the data.

Figure 7







0 9 . 3	In England, in October 2015, a law was introduced making it illegal to smoke in a car carrying someone who is under the age of 18.	O.
	Following the introduction of the law, a politician stated:	
	'It is dangerous to smoke when a child is in the car. Higher levels of deadly toxins can build up, even on short journeys, and children breathe faster than adults, meaning they inhale more of the deadly toxins.'	
	Use the information provided and the data in Figure 7 to evaluate the politician's statements.	
	[4 marks]	
		· 「
		⊢



1 0

Read the following passage.

Sizes of populations of normal intestinal bacteria are usually controlled by T cells that are produced slowly and in small numbers by the immune system. These T cells do not normally survive for very long. As a result, they do not release large amounts of cytokines. Cytokines are chemicals that can cause swelling of the lining of the intestines.

5

Crohn's disease is a long-lasting disease that causes swelling of the lining of the intestines. It is believed that Crohn's disease can be caused by a loss of tolerance to normal intestinal bacteria, as shown by an unusually large response by T cells. This response can be triggered by pathogenic bacteria in the intestines of people with a genetic tendency to Crohn's disease.

10

Some people's Crohn's disease can be controlled by a drug called 5-aminosalicylic acid (5-ASA) that reduces swelling. Another drug called 6-mercaptopurine (6-MP) may also be used. 6-MP inhibits an enzyme required to make adenine and guanine. This is effective because most cells can recycle nucleotides, but T cells are not able to do so.

15

Use information from the passage and your own knowledge to answer the questions.



1 0 . 1	The Crohn's disease symptom of swelling of the lining of the intestines could be triggered by pathogenic bacteria in the intestines (lines 6–10).	
	Suggest how. [3 mark	ːs]
		_
		_
		_
		_
		_ _
		_
		_
		_
		_ _
		_
		_
		-
	Question 10 continues on the next page	

Turn over ►

1 0.2	Suggest the meaning of 'a genetic tendency to Crohn's disease' (line 10).	
	[2 marks]
		-
		-
		-
		-
		-
		-
		-
		-
1 0 . 3	Suggest why 5-ASA is only effective in controlling the swelling of the lining of the	
	intestines in some people with Crohn's disease (lines 11–12). [2 marks]	
	[2 mains	1
		-
		-
		_
		-
		-
		-
		-
		_
		-



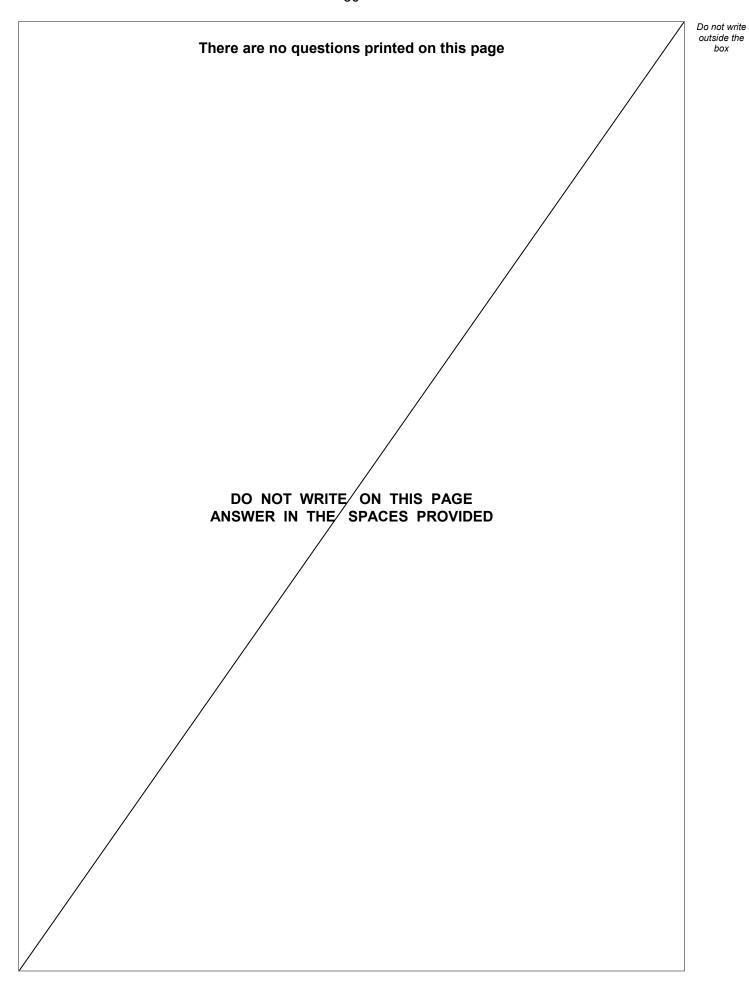
Do not write
outside the
box

1 0 . 4	Suggest why 6-MP can be used to control the symptoms of Crohn's disease (lines 13–15).
	Do not include details of enzyme inhibition or protein synthesis in your answer. [3 marks]

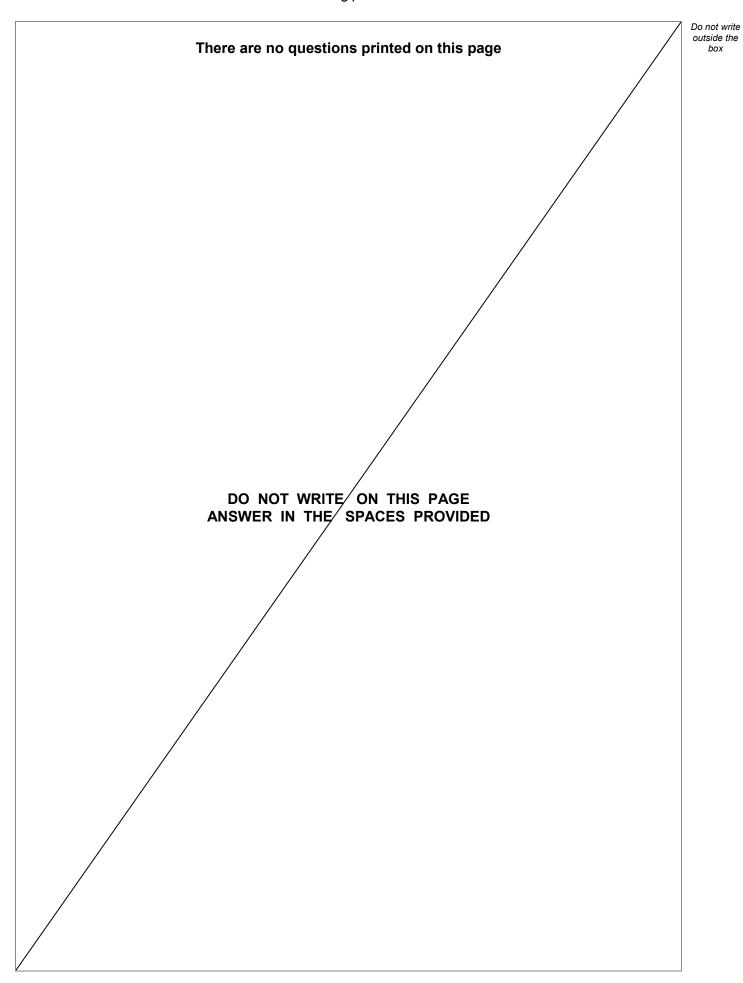
10

END OF QUESTIONS











There are no questions printed on this page DO NOT WRITE ON THIS PAGE ANSWER IN THE SPACES PROVIDED Copyright information For confidentiality purposes, from the November 2015 examination series, acknowledgements of third party copyright material will be published in a separate booklet rather than including them on the examination paper or support materials. This booklet is published after each examination series and is

available for free download from www.aqa.org.uk after the live examination series.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team, AQA, Stag Hill House,

Copyright © 2018 AQA and its licensors. All rights reserved.



Do not write outside the

box