OXFORD
INTERNATIONAL
AQA EXAMINATIONS

OXFORD AQA INTERNATIONAL A-LEVEL
BIOLOGY
(9610)

PAPER 1

Specimen 2018 Morning Time allowed: 1 hour 30 minutes

Materials
For this paper you must have:
- a pencil
- a ruler with millimetre measurements
- a calculator

Instructions
- use black ink or ball-point pen
- answer **all** questions
- show all your working.

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

Please write clearly, in block capitals, to allow character computer recognition.

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

Surname ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

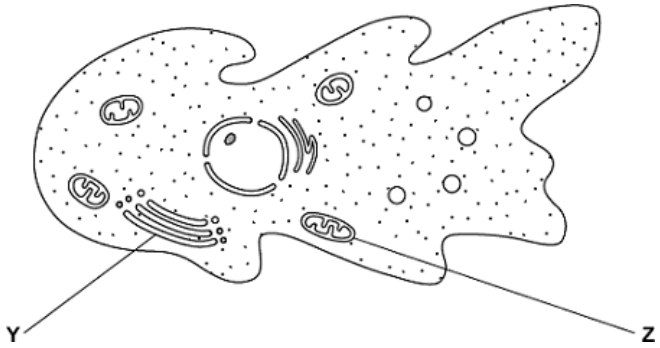
Forename(s) ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Candidate signature _____

Answer **all** questions in the spaces provided

1 An amoeba is a single-celled, eukaryotic organism. Scientists used a transmission electron microscope to study an amoeba. **Figure 1** shows its structure.

Figure 1



0 1 . 1 Name organelle **Y**.

[1 mark]

0 1 . 2 Name **two** other structures in the diagram which show that the amoeba is a eukaryotic cell.

[2 marks]

0 1 . 3 What is the function of organelle **Z**?

[1 mark]

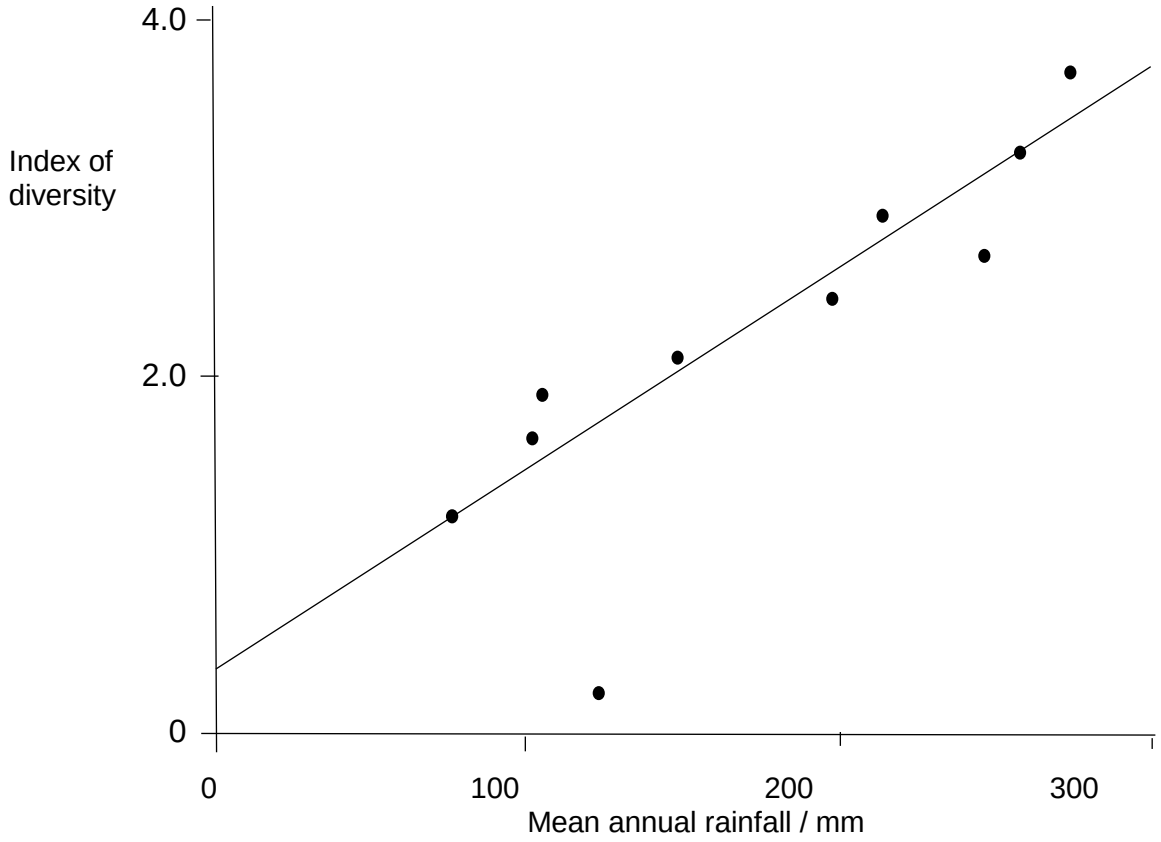
0 1 . 4 Explain why the scientists used a transmission electron microscope to study the structure of the amoeba.

[2 marks]

0 2 . 1 What is a *species?*

[2 marks]

Figure 2



At each site the scientists used traps to collect the ants. They used a large number of traps placed at random.

0 2 . 2 Explain the importance of using a large number of traps at each site.

[1 mark]

0 2 . 3 Explain the importance of placing the traps at random.

[1 mark]

The data that the scientists collected at one site are shown in Table **1**

Table 1

Species of ant	Number of ants
Veromessor pergandei	**17**
Pogonomyrmex desertorum	**23**
Pheidole sitarches	**8**

0 2 . 4 Use these data to calculate the index of diversity for this site. Show your working.

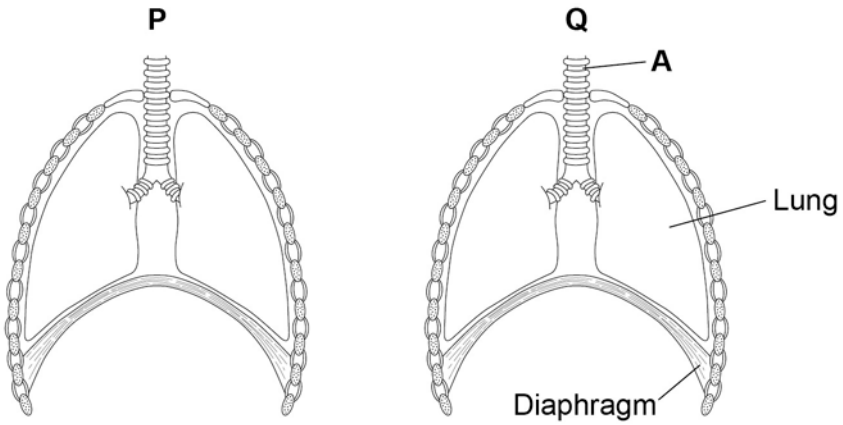
[3 marks]

0 2 . 5 Suggest an explanation for the data shown in **Table 1.**

[2 marks]

3 Figure **3** shows the position of the diaphragm at times **P** and **Q**.

Figure 3



0 3 . 1 Name the structure labelled **A** in **Figure 3.**

[1 mark]

0 3 . 2 Describe what happens to the diaphragm between times **P** and **Q** to bring about the change in its shape.

[2 marks]

0 3 . 3 Air moves into the lungs between times **P** and **Q**. Explain how the diaphragm causes this.

[3 marks]

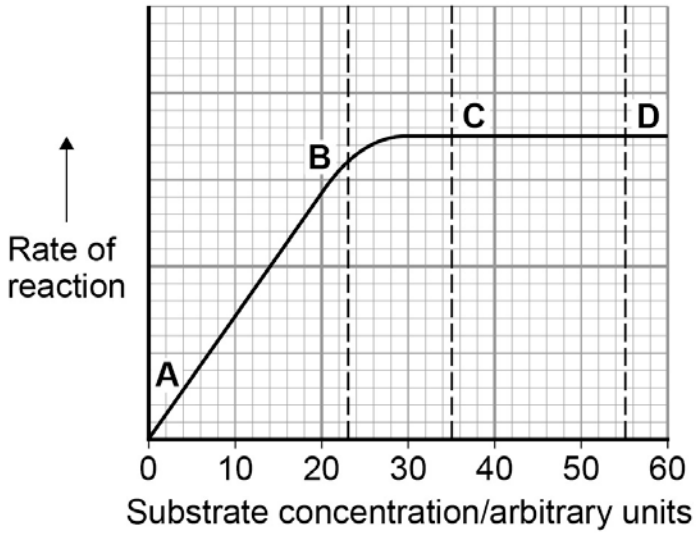
0 3 . 4 Describe how oxygen in air in the alveoli enters the blood in capillaries.

[2 marks]

0 4 . 1 An enzyme catalyses only one reaction. Explain why.

[2 marks]

Figure 4



0 4 . 2 Give **two** factors that the student should have kept the same throughout the investigation.

[2 marks]

0 4 . 3 Describe a suitable control for this investigation

[1 mark]

0 4 . 4 Explain the purpose of this control.

[1 mark]

0 4 . 5 Use the graph in **Figure 4** to describe the effect of substrate concentration on the rate of this enzyme-controlled reaction.

[2 marks]

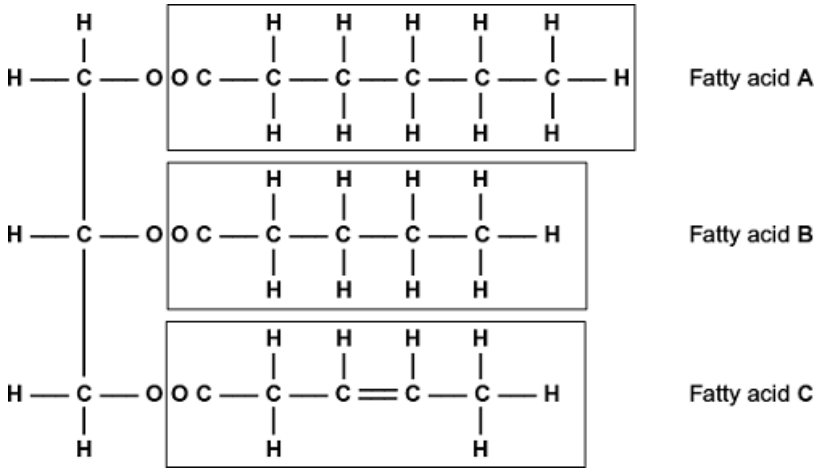
0 4 . 6 What limits the rate of this reaction between points **A** and **B**? Give the evidence from the graph in **Figure 4** to support your answer.

[2 marks]

0 5 . 1 Some seeds contain lipids. Describe how you could use the emulsion test to show that a seed contains lipids.

[3 marks]

Figure 5



0 5 . 2 A triglyceride molecule is formed by condensation. From how many molecules is this triglyceride formed?

[1 mark]

0 5 . 3 The structure of a phospholipid molecule is different from that of a triglyceride. Describe how a phospholipid is different.

[2 marks]

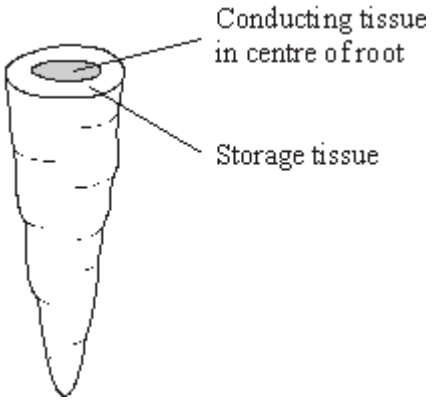
0 5 . 4 Use the diagram in **Figure 5** to explain what is meant by an unsaturated fatty acid.

[2 marks]

Turn over for next question

6 **Figure 6** shows a carrot.

Figure 6



0 6 . 1 A group of students investigated the effect of sucrose concentration on the length of cylinders cut from a carrot.

The students used a cork borer to cut cylinders from the carrot. Describe how the students should cut these cylinders to make sure this would produce reliable results.

[2 marks]

0 6 . 2 They measured the initial length of each cylinder then placed the cylinders into test tubes containing different concentrations of sucrose solution. Stoppers were placed in the tubes and the tubes were left overnight. Explain why the stoppers were placed in the tubes.

[2 marks]

The students then measured the final lengths of the carrot cylinders. Their results are shown in **Table 2**.

Table 2

Concentration of sucrose / mol dm^{-3}	$\frac{\text{Final length}}{\text{Initial length}}$
0.0	1.4
0.2	1.4
0.4	1.2
0.6	1.1
0.8	0.9

0 6 . 3 The students used these results to find the concentration of sucrose that has the same water potential as the carrot cylinders. Describe how they could have done this.

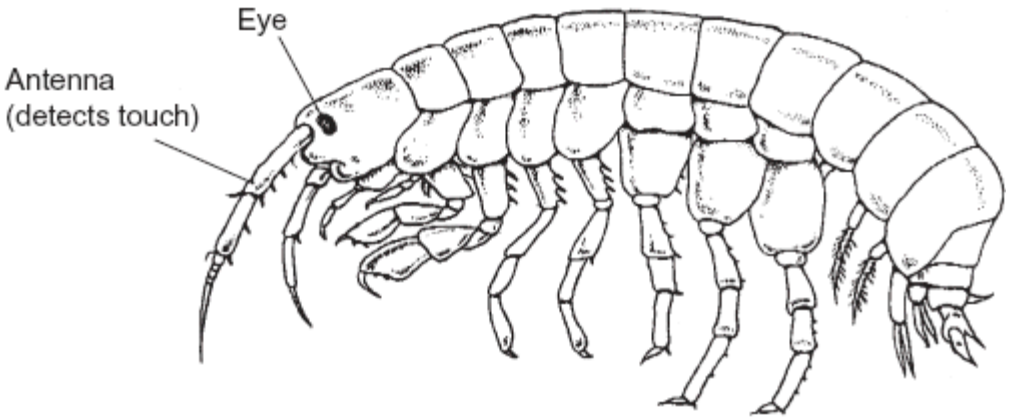
[2 marks]

0 6 . 4 Was it important in this investigation that the carrot cylinders had the same initial length? Explain your answer.

[1 mark]

7 **Figure 7** shows a fresh-water shrimp.

Figure 7



Biologists collected shrimps from a stream inside a cave and from the same stream when it was in the open.

They measured the maximum diameter of each shrimp's eye. They also measured the length of its antenna. From these measurements they calculated the mean values for each site. **Table 3** shows their results.

Table 3

	Shrimps from the stream	
	Inside the cave	In the open
Mean diameter of eye /mm	0.09	0.24
Mean length of antenna /mm	8.46	5.81

0 7 . 1 The biologists measured the maximum diameter of each shrimp's eye. Explain why they measured the maximum diameter/

[1 mark]

0 7 . 2 A scientist working many years earlier suggested that animals which live in caves had similar adaptations. These adaptations included

- Smaller eyes
- Greater use of sense organs such as those involved in detecting touch.

Do the data in **Table 3** support this scientist's suggestion? Explain your answer.

[2 marks]

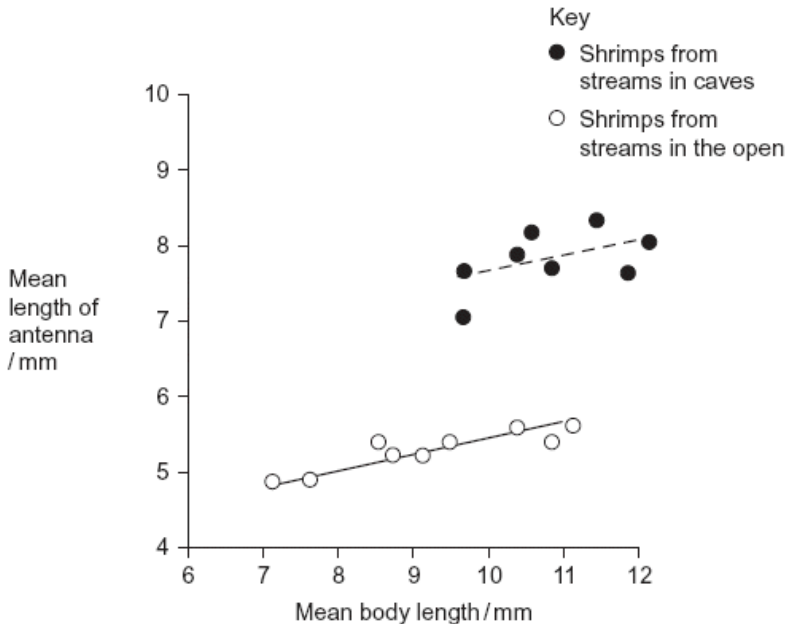
0 7 . 3 The data in **Table 3** are mean values. Explain how standard deviations of these mean values would help you to interpret the data in **Table 3.**

[2 marks]

Turn over for the next question

The biologists investigated shrimps living in other streams. They measured the length of the antennae of these shrimps. They also measured their body length. **Figure 8** shows the mean antenna length plotted against mean body length for each site.

Figure 8



0 7 . 4 Do the data in **Figure 8** support the conclusion that shrimps with longer bodies have longer antennae? Give the reason for your answer.

[1 mark]

Other biologists investigated the genetic diversity of these shrimps. **Table 4** shows some of the data they collected.

Table 4

Gene	Allele	Percentage of shrimps with this allele in steam	
		Inside a cave	In the open
PGI	**A**	0.9	2.5
	B	0.0	3.3
	C	98.2	66.4
	D	0.9	6.6
	E	0.0	21.3
ACO2	**J**	0.0	5.6
	K	0.0	76.7
	L	100.0	17.8

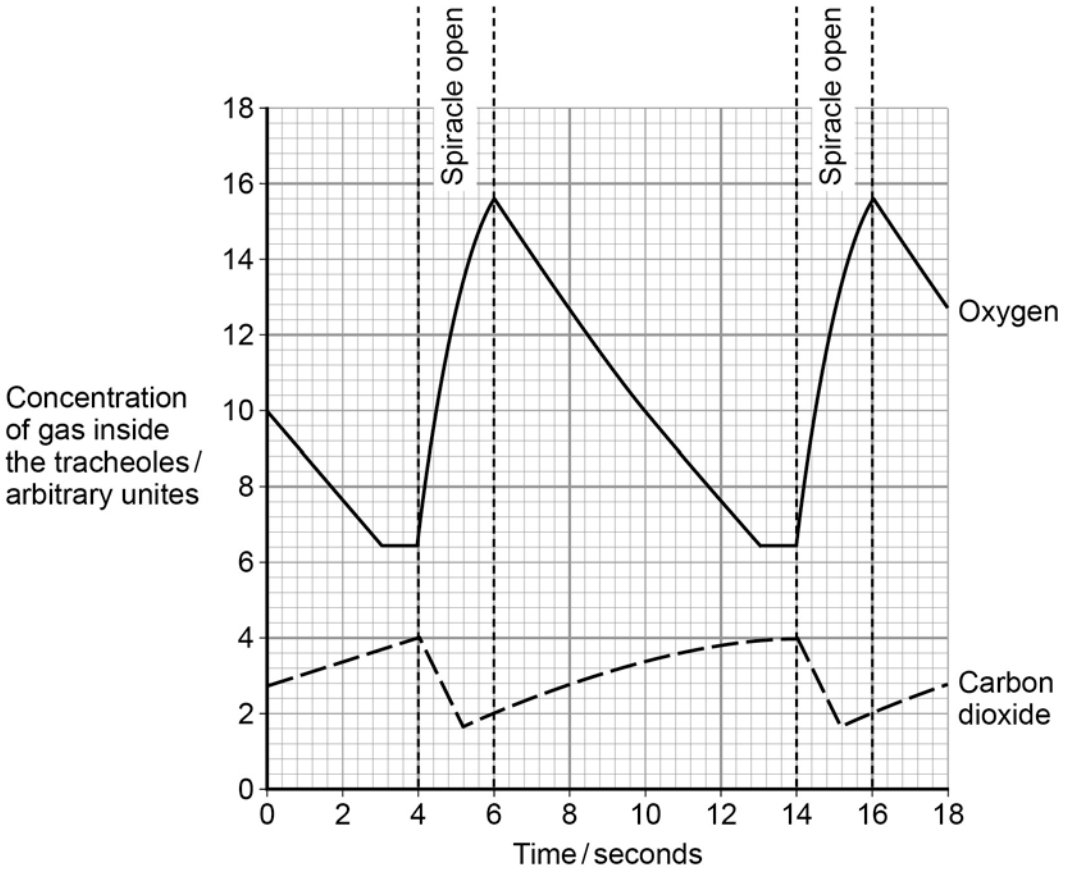
0 7 . 5 The biologists concluded that the shrimps in the open had a higher genetic diversity than those in the cave. Explain how the data in **Table 4** support this conclusion.

[1 mark]

Turn over for the next question

8 The graph in **Figure 9** shows the concentration of oxygen and carbon dioxide inside the tracheoles of an insect over an 18 second period. The insect was at rest.

Figure 9



0 8 . 1 Use the graph in **Figure 9** to calculate the frequency of spiracle opening.
Show your working.

[2 marks]

Frequency _____ times per minute

0 8 . 2 Describe what happens to the oxygen concentration in the tracheoles between 0 and 4 seconds.

[2 marks]

0 8 . 3 Using information from the diagram, suggest what stimulates the spiracles to open. Provide evidence from the graph to justify your answer.

[2 marks]

Large insects contract muscles associated with the abdomen to force air in and out of the spiracles. This is known as 'abdominal pumping'. **Table 5** shows the mean rate of abdominal pumping of an insect before and during flight.

Table 5

Stage of flight	**Mean rate of abdominal pumping / dm^3 of air kg^{-1} $hour^{-1}$**
Before	42
During	186

0 8 . 4 Calculate the percentage increase in the rate of abdominal pumping before and during flight. Show your working.

[2 marks]

Answer _____%

0 8 . 5 Abdominal pumping increases the efficiency of gas exchange between the tracheoles and muscle tissue of the insect. Explain why.

[2 marks]

Turn over for the next question

9 Read the following passage.

Human milk contains all the nutrients a young baby needs in exactly the right proportions. It is formed in the mammary glands by small groups of milk-producing cells. These cells absorb substances from the blood and use them to synthesise the lipids, carbohydrates and proteins found in milk. Milk-producing cells are roughly cube-shaped and have a height to breadth ratio of approximately 1.2 : 1.

The main carbohydrate in milk is lactose. Lactose is a disaccharide formed by the condensation of two monosaccharides, glucose and galactose. (A molecule of galactose has the same formula as a molecule of glucose – the atoms are just arranged in a different way.)

Lactose is synthesised in the Golgi apparatus and transported in vesicles through the cytoplasm. Because lactose is unable to escape from these vesicles, they increase in diameter as they move towards the plasma membrane. The vesicle membranes fuse with the plasma membrane and the vesicles empty their contents out of the cell.

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

0 9 . 1 What is the name of the bond between the two monosaccharides that make up a molecule of lactose?

[1 mark]

0 9 . 2 The breadth of a milk-producing cell is 26 µm. Calculate the height of this cell.

[1 mark]

Height=_____µm

0 9 . 3 Describe and explain how you would expect the height to breadth ratio of an epithelial cell from a lung alveolus to differ from the height to breadth ratio of a milk-producing cell.

[2 marks]

0 9 . 4 How many oxygen atoms are there in a molecule of galactose?

[1 mark]

0 9 . 5 How many oxygen atoms are there in a molecule of lactose?

[1 mark]

0 9 . 6 The lactose-containing vesicles increase in diameter as they move towards the plasma membrane of the milk-producing cell (lines 11-12). Use your knowledge of water potential to explain why.

[2 marks]

0 9 . 7 Suggest **one** advantage of milk-producing cells containing large numbers of mitochondria.

[2 marks]

END OF QUESTIONS