OXFORD
INTERNATIONAL
AQA EXAMINATIONS

OXFORD AQA INTERNATIONAL A-LEVEL
BIOLOGY
(9610)

PAPER 5

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 ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

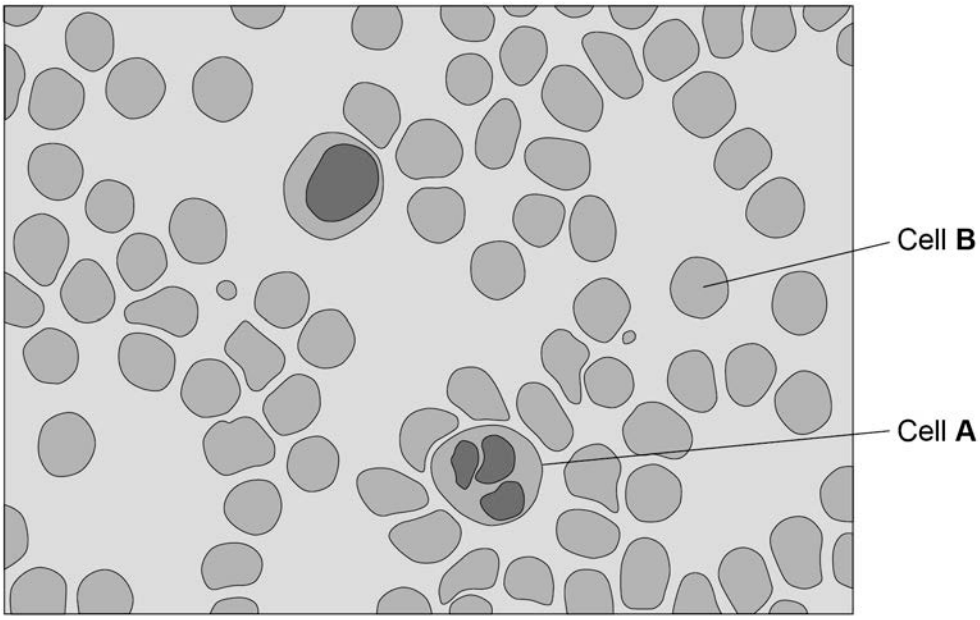
Forename(s) ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Candidate signature _____

Answer **all** questions in this section

1 **Figure 1** shows a blood smear seen under an optical microscope.

Figure 1



0 1 . 1 Make a labelled drawing of the white cell labelled **A**.

[2 marks]

0 1 . 2 The diameter of the red blood cell labelled **B** is 7 µm. Use this information to add a scale bar 10 µm long to your drawing.

[1 mark]

0 1 . 3 Explain why the red blood cells in the photograph have different shapes.

[2 marks]

0 1 . 3 You are provided with a prepared slide of blood and an optical microscope. Describe how you would measure the mean diameter of a red blood cell.

[4 marks]

2 Fibrin is a protein.
Congo red is a dye that binds to fibrin molecules and colours them red. When a suspension of Congo-red fibrin is digested, the dye goes into solution.

You are provided with

- fibrin powder that has been dyed with Congo red
- trypsin, an enzyme that hydrolyses fibrin
- any other laboratory apparatus that you might need.

Plan an investigation to the find effect of pH on the rate of hydrolysis of fibrin by Trypsin.

0 2 . 1 Describe how you would change the independent variable. Include the steps that you would take to ensure that confounding variables were kept constant and any controls that you would set up.

[4 marks]

0 2 . 2 Describe how you would measure the dependent variable.

[4 marks]

0 2 . 3 Giving the reasons for your choice of techniques, describe how you would use a graph and a statistical test to analyse your results.

[6 marks]

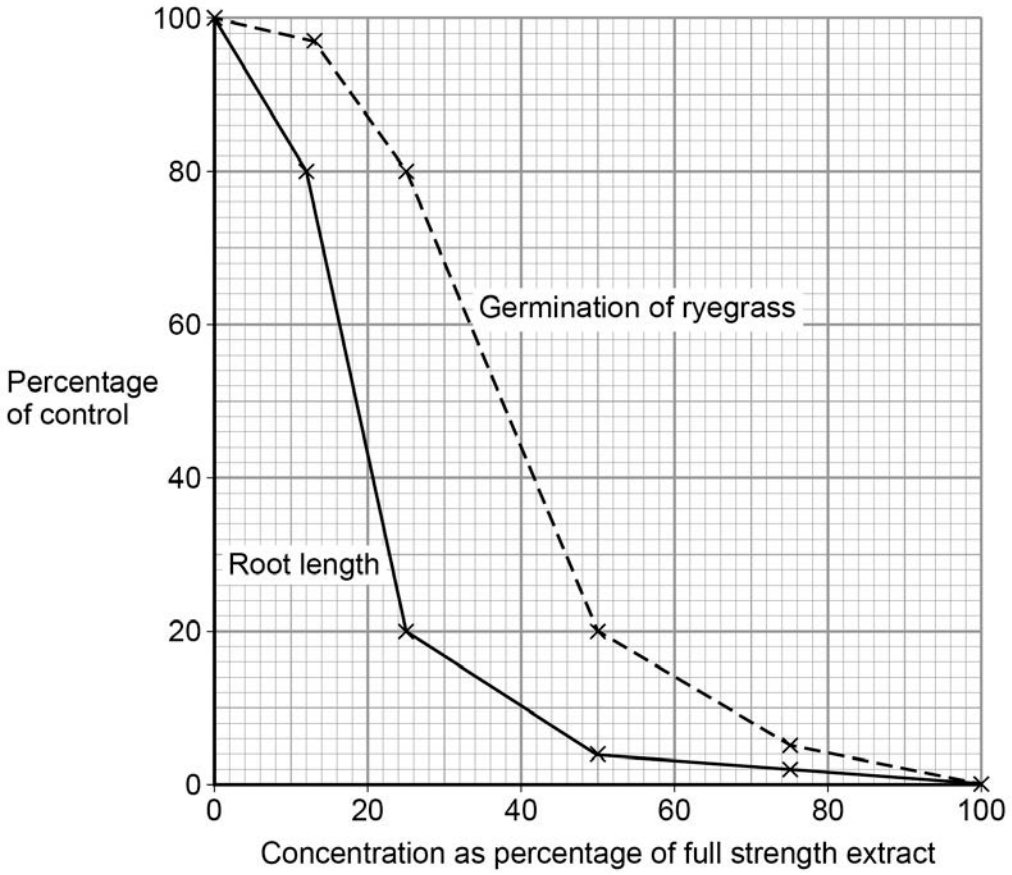
3 Wheat is an important food crop. Ryegrass is a weed that grows in wheat crops.

Australian scientists investigated one aspect of competition between wheat and ryegrass.

- They crushed up some wheat plants and mixed the crushed plants with distilled water.
- Water-soluble substances in the crushed plants dissolved in the distilled water.
- The scientists called this solution the full-strength extract.
- The scientists then made a series of dilutions of the full-strength extract.
- They put ryegrass seeds into each dilution and recorded how many seeds started to grow. If the seeds started to grow, they measured the lengths of the roots of the seedlings.
- They presented their results as percentages of a control experiment.

The graph in **Figure 2** below shows the effects of different concentrations of the extract on the germination of ryegrass and on the length of the roots of the seedlings that grew from them.

Figure 2



0 3 . 1 Describe the control that the scientists set up in this investigation.

[1 mark]

0 3 . 2 The scientists found a positive correlation between the inhibition of germination and the concentration of the extract.

Describe how they could find out whether this correlation was significant.

[2 marks]

0 3 . 3 Explain why a correlation does not mean that the extract caused inhibition of germination.

[1 mark]

0 3 . 4 The scientists concluded that wheat plants produce substances that help them to compete with ryegrass.

Give evidence from the investigation to support this conclusion.

[2 marks]

0 3 . 5 Why might this conclusion not be valid?

[3 marks]

0 3 . 6 The scientists who carried out this investigation found a variety of wheat that was very effective in competing with ryegrass.

Describe and explain **one** way in which growing this variety of wheat would be an advantage to the environment.

[2 marks]

0 3 . 7 Describe and explain **one** disadvantage of growing only this variety of wheat.

[2 marks]

4 A mycorrhizal fungus is a fungus that colonises and lives in the roots of plants. The fungus absorbs mineral ions from the soil. These mineral ions may be used by the plant.

Scientists investigated the effect of a mycorrhizal fungus on the growth of pea plants with a nitrate fertiliser or an ammonium fertiliser. The fertilisers were identical, except for nitrate or ammonium.

The scientists took pea seeds and sterilised their surfaces. They planted the seeds in sand that had been heated to 85 ^{o}C for 2 days before use. The sand contained no mineral ions useful to the plants.

0 4 . 1 Explain why the scientists sterilised the surfaces of the seeds and grew them in sand that had been heated to 85 ^{o}C for 2 days.

[2 mark]

0 4 . 2 Explain why it was important that the sand contained no mineral ions useful to the plants.

[1 mark]

The pea plants were divided into four groups, **A**, **B**, **C** and **D**.

- Group **A** – heat-treated mycorrhizal fungus added, nitrate fertiliser
- Group **B** – mycorrhizal fungus added, nitrate fertiliser
- Group **C** – heat-treated mycorrhizal fungus added, ammonium fertiliser
- Group **D** – mycorrhizal fungus added, ammonium fertiliser

The heat-treated fungus had been heated to 120 ^{o}C for 1 hour.

0 4 . 3 Explain how groups **A** and **C** act as controls.

[2 marks]

After 6 weeks, the scientists removed the plants from the sand and cut the roots from the shoots. They dried the plant material in an oven at 90 ^{o}C for 3 days. They then determined the mean dry masses of the roots and shoots of each group of plants.

0 4 . 4 Suggest what the scientists should have done during the drying process to be sure that all of the water had been removed from the plant samples.

[2 marks]

The scientists' results are shown in **Table 1.**

Table 1

Treatment	Mean dry mass / g per plant (+ standard deviation)	
	Root	**Shoot**
A – heat-treated fungus and nitrate fertiliser	0.40 (±0.05)	1.01 (±0.12)
B – fungus and nitrate fertiliser	1.61 (±0.28)	9.81 (±0.33)
C – heat-treated fungus and ammonium fertiliser	0.34 (±0.03)	0.96 (±0.26)
D – fungus and ammonium fertiliser	0.96 (±0.18)	4.01 (±0.47)

0 4 . 5 What conclusions can be drawn from the data in Table 3 about the following?
The effects of the fungus on growth of the plants.

[2 marks]

0 4 . 6 The effects of nitrate fertiliser and ammonium fertiliser on growth of the plants

[2 marks]

The scientists determined the dry mass of the roots and shoots separately. The reason for this was they were interested in the ratio of shoot to root growth of pea plants. It is the shoot of the pea plant that is harvested for commercial purposes.

0 4 . 7 Explain why determination of dry mass was an appropriate method to use in this investigation.

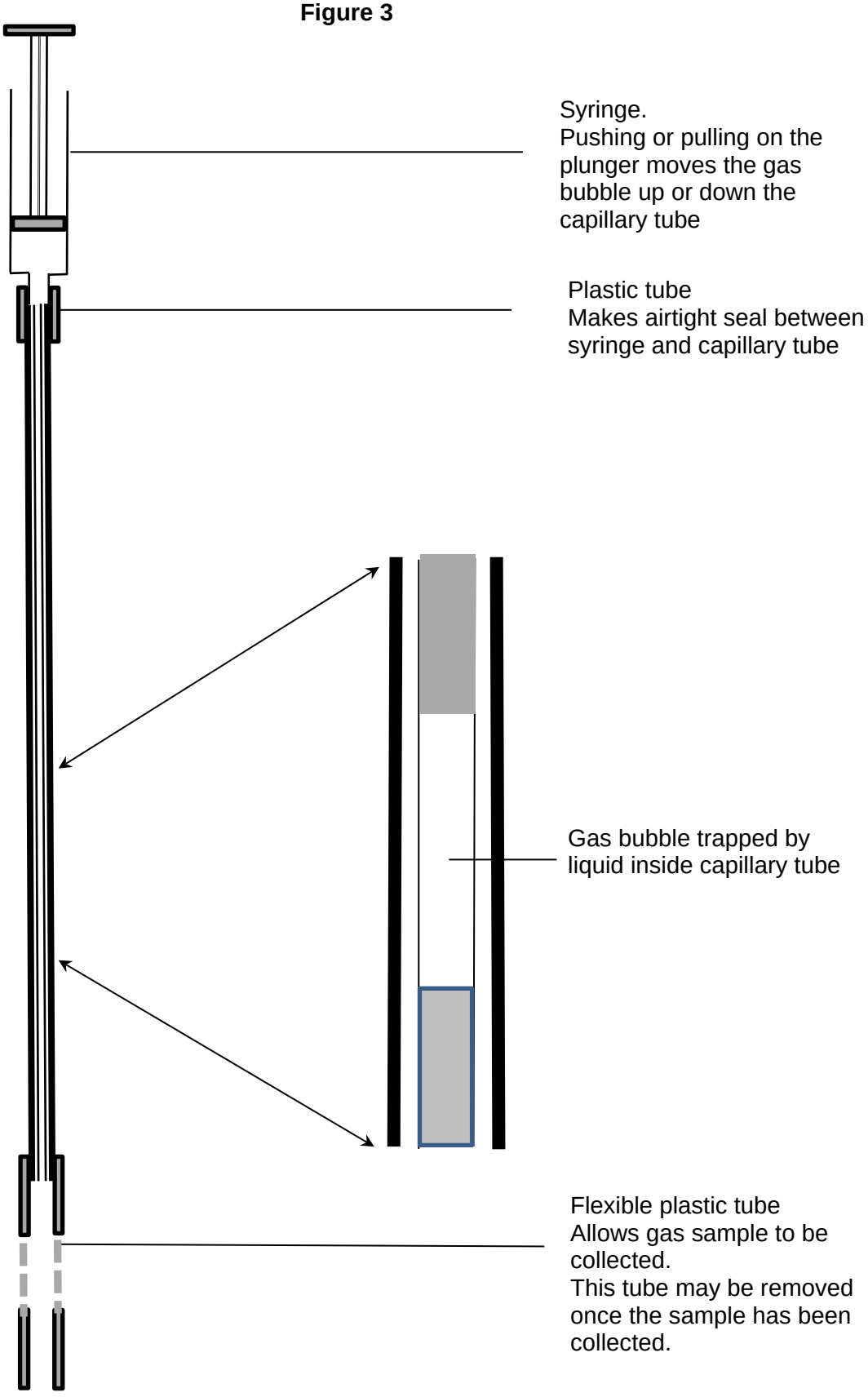
[2 marks]

0 4 . 8 Which of the treatments **A**, **B**, **C** or **D** gave the best result in commercial terms? Write your answer in the box

[1 mark]

5 The apparatus shown in **Figure 3** below may be used to analyse small samples of gas.

Figure 3



A group of students kept a small green plant in bright light in a sealed tube. They kept a second plant in the dark in a similar tube.
After 12 hours they used the apparatus shown in the diagram to estimate the concentration of carbon dioxide and then the concentration of oxygen in the air surrounding each plant.

- They estimated the concentration of carbon dioxide by absorbing the carbon dioxide in the sample with potassium hydroxide solution.
- They estimated the concentration of oxygen by absorbing the oxygen in the sample with pyrogallol solution made alkaline with potassium hydroxide.

0 5 . 1 The students estimated the volume of oxygen absorbed from each sample after they had measured the volume of carbon dioxide absorbed. Suggest why.

[2 marks]

Their results are shown in **Table 2**

Table 2

Treatment	Length of bubble / mm		
	at start	after mixing with potassium hydroxide solution	After mixing with potassium hydroxide solution and pyrogallol
Plant kept in bright light	93	93	70
Plant kept in the dark	107	104	86

0 5 . 2 Use the results in the table to calculate the percentage of oxygen in the air surrounding the plant that had been kept in the dark. Show your working.

[2 marks]

0 5 . 3 There was more carbon dioxide in the gas sample that had been kept in the dark. Explain why.

[1 mark]

0 6 . 1 This question is about the importance of proteins in living organisms.

The tertiary structure of a protein is important to the way in which enzymes function. Explain how.

[6 marks]

0 6 . 2 What is an antibody? Explain how antibodies help protect against disease.

[6 marks]

0 6 . 3 Describe the role of proteins in the passage of a nerve impulse along a neurone.

[6 marks]

Quality of written communication [2 marks]

END OF QUESTIONS