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Centre number

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Surname

Forename(s)

Candidate signature

I declare this is my own work.

GCSE

BIOLOGY

Higher Tier Paper 1

Practice Paper Series – Set 1

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a ruler
- a scientific calculator.

Instructions

- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 100.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions 06.3 and 11.2 you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully developed
 - shows how the points that you make are related or follow on from each other where appropriate.

For Examiner's Use

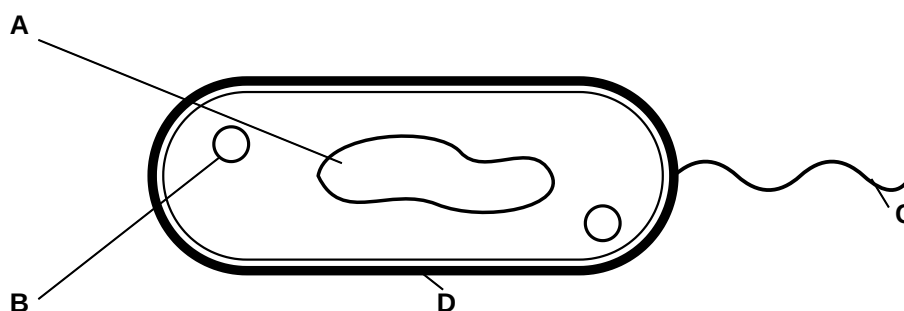
Question	Mark
1	
2	
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5	
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7	
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9	
10	
11	
TOTAL	

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sciencegcse.co.uk | Practice Paper Series – Set 1 | SGC/S1/SB/1H

0 1 Figure 1 shows a bacterial cell.

Figure 1



0 1 . 1 Name the structures labelled **A** and **B**. [2 marks]

A

B

0 1 . 2 Structure **C** is a flagellum. [1 mark]

Suggest the function of the flagellum.

0 1 . 3 Give **one** way in which the structure of a bacterial cell is different from the structure of an animal cell. [1 mark]

0 1 . 4 Which of these is the smallest? [1 mark]

Tick (✓) **one** box.

Animal cell

☐

Bacterial cell

☐

Plant cell

☐

Virus

☐

0 1 . 5 The bacterial cell is 2 μm long. [2 marks]

In a photograph the image of the cell is 4 mm long.

Calculate the magnification of the photograph.

Magnification = $\times$

0 2 Smoking is a risk factor for lung cancer.

0 2 . 1 What is meant by a **risk factor**? [1 mark]

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Scientists studied 10 000 people for 20 years.

Table 1 shows the results.

Table 1

	Number of people in the study	Number who developed lung cancer
Non-smokers	8000	24
Smokers	2000	72

0 2 . 2 Calculate the percentage of smokers who developed lung cancer. [2 marks]

Percentage of smokers = ... %

0 2 . 3 0.3% of the non-smokers developed lung cancer. [1 mark]

How many times more likely were smokers to develop lung cancer than non-smokers?

Number of times more likely = ...

0 2 . 4 A student concluded: [2 marks]

‘This study proves that smoking causes lung cancer.’

Give **two** reasons why the study does **not** prove this.

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0 2 . 5 Lung cancer is caused by cells dividing in an uncontrolled way to form a tumour. [2 marks]

Describe the difference between a **benign** tumour and a **malignant** tumour.

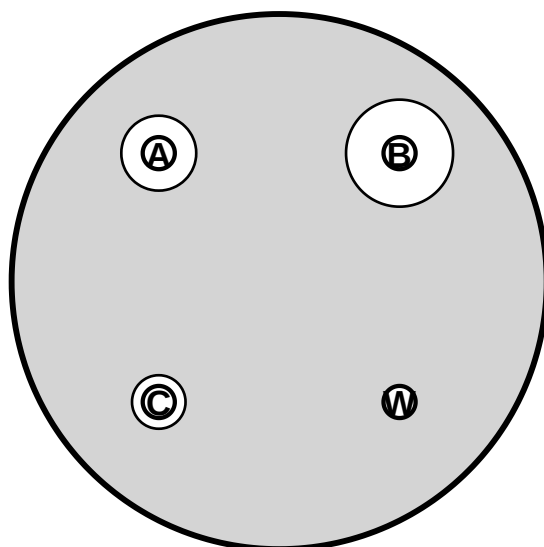
0 3 A student investigated the effect of three antibiotics, **A**, **B** and **C**, on the growth of bacteria.

This is the method used.

1. Spread bacteria over the surface of sterile agar in a Petri dish.
2. Place a paper disc soaked in each antibiotic on the agar.
3. Place a paper disc soaked in sterile water, **W**, on the agar.
4. Tape the lid onto the dish and incubate the dish at 25 °C for 48 hours.

Figure 2 shows the dish after 48 hours. The shaded area shows where bacteria grew.

Figure 2



Not to scale

0 3 . 1 The Petri dish and the agar were sterilised before use. [1 mark]
Give the reason for this.

0 3 . 2 Explain why the dish was incubated at 25 °C and **not** at 37 °C. [2 marks]

0 3 . 3 Describe how the student should transfer the bacteria onto the agar so that the culture is not contaminated. [2 marks]

0 3 . 4 The clear zone around disc **B** has a diameter of 20 mm. [2 marks]

Calculate the area of the clear zone around disc **B**.

Use the equation:

$$\text{area} = \pi r^2 \quad (\pi = 3.14)$$

Area = ... mm²

0 3 . 5 Explain what the results show about the effectiveness of antibiotics **A**, **B** and **C** against these bacteria. [2 marks]

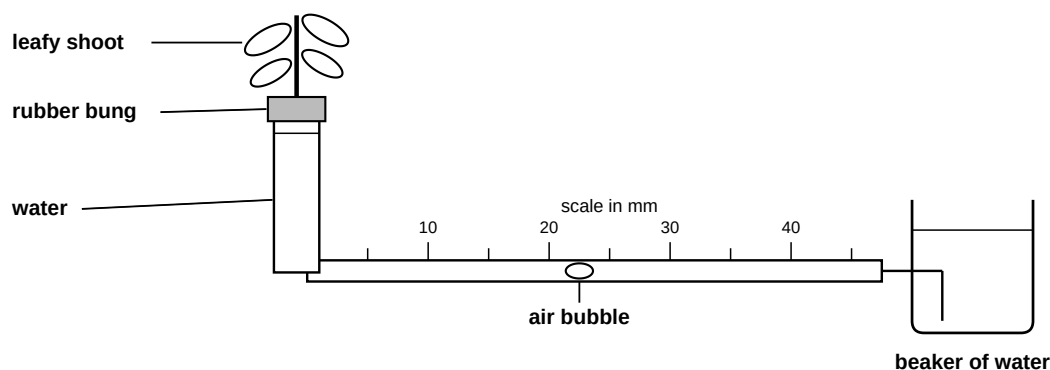
0 3 . 6 The bacteria in this investigation divide once every 20 minutes. [2 marks]

Calculate how many bacteria would be produced from one bacterium in 3 hours.

Number of bacteria = ...

- 0 4** A student used the apparatus in **Figure 3** to measure the rate of water uptake by a leafy shoot.

Figure 3



As the shoot takes up water, the air bubble moves along the capillary tube.

- 0 4 . 1** Name the tissue that transports water from the roots to the leaves of a plant. [1 mark]

- 0 4 . 2** Describe **two** ways in which this tissue is adapted for transporting water. [2 marks]

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The student measured how far the bubble moved in 10 minutes with the shoot in still air, and then with a fan blowing air across the shoot.

Table 2 shows the results.

Table 2

Condition	Distance moved by bubble in 10 minutes in mm
Still air	12
Fan on low speed	30
Fan on high speed	54

0 4 . 3 Calculate the rate of movement of the bubble with the fan on high speed. [2 marks]

Use **Table 2**.

Give your answer in mm per minute.

Rate = ... mm per minute

0 4 . 4 Explain why the rate of water uptake increased when the fan was switched on. [2 marks]

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0 4 . 5 Sugars made in the leaves are transported to other parts of the plant. [2 marks]
Name the tissue that transports the sugars **and** name this process.

Tissue

Process

0 5 Plants absorb mineral ions, such as nitrate ions, from the soil through root hair cells.

0 5 . 1 Describe **two** ways in which a root hair cell is adapted to absorb mineral ions. [2 marks]

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Question 5 continues on the next page

A scientist measured the uptake of nitrate ions by the roots of barley plants.
The roots were kept in a nitrate solution with oxygen bubbled through it, and then in the same solution without oxygen.

Table 3 shows the results.

Table 3

Condition	Rate of uptake of nitrate ions in arbitrary units
Oxygen bubbled through the solution	48
No oxygen	12

- 0 5 . 2** Calculate the percentage decrease in the rate of uptake when the oxygen was removed. [2 marks]

Percentage decrease = ... %

- 0 5 . 3** The concentration of nitrate ions in the roots was higher than the concentration in the solution. [3 marks]

Explain why removing the oxygen reduced the rate of uptake of nitrate ions.

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- 0 5 . 4** The rate of uptake did **not** fall to zero when the oxygen was removed. [1 mark]
Suggest **one** reason why.

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Turn over for the next question

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06 Monoclonal antibodies can be used to treat some types of cancer.

06.1 Name the type of white blood cell that produces antibodies. [1 mark]

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06.2 A monoclonal antibody binds to only **one** type of antigen. [2 marks]

Explain why.

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06.3 Describe how monoclonal antibodies are produced **and** explain why they can be used to treat cancer without harming most other body cells. [6 marks]

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Question 6 continues on the next page

Doctors compared a monoclonal antibody treatment with chemotherapy for one type of cancer.

Table 4 shows the results.

Table 4

Treatment	Percentage of patients whose tumour became smaller	Percentage of patients with severe side effects
Monoclonal antibody	45	12
Chemotherapy	50	48

- 0 6 . 4** Some doctors prefer to use the monoclonal antibody treatment even though a smaller percentage of tumours became smaller. [2 marks]

Suggest why.

Use **Table 4**.

- 0 7** A grower has a greenhouse full of tomato plants.

Some of the plants have yellow leaves. Some of the plants are much smaller than the others.

- 0 7 . 1** The yellow leaves could be caused by a lack of magnesium ions in the soil. [2 marks]

Explain why a lack of magnesium ions causes yellow leaves.

Question 7 continues on the next page

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- 0 7 . 2** The small plants could be caused by a lack of nitrate ions in the soil. [2 marks]
Explain why a lack of nitrate ions causes stunted growth.

- 0 7 . 3** The grower thinks the plants may have a disease instead. [2 marks]
Give **two** ways the grower could find out whether the plants have a disease.

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- 0 7 . 4** The grower finds aphids on the stems of some plants. [2 marks]
Aphids feed by piercing the stem and taking sugars from the phloem.
Explain why a large number of aphids reduces the growth of a plant.

- 0 7 . 5** Give **one** physical defence that plants have against pathogens. [1 mark]

- 0 8** The heart pumps blood around the body.

- 0 8 . 1** Which blood vessel carries oxygenated blood from the lungs to the heart? [1 mark]

Tick (✓) **one** box.

Aorta

☐

Pulmonary artery

☐

Pulmonary vein

☐

Vena cava

☐

0 8 . 2 The natural resting heart rate is controlled by a group of cells that act as a pacemaker. [1 mark]

Where in the heart are these cells found?

0 8 . 3 Some people have an irregular heartbeat. [2 marks]

Describe how an artificial pacemaker helps a person who has an irregular heartbeat.

0 8 . 4 The heart muscle receives blood through the coronary arteries. [3 marks]

Explain what happens to the heart muscle if a coronary artery becomes blocked.

Turn over for the next question

- 0 9** A student investigated the effect of pH on the rate of breakdown of starch by amylase. This is the method used.

1. Mix amylase solution, starch solution and a buffer solution of known pH in a test tube.
2. Every 10 seconds, put one drop of the mixture onto a drop of iodine solution on a spotting tile.
3. Record the time taken for the starch to be broken down.
4. Repeat at each pH three times.

Table 5 shows the results.

Table 5

pH	Time taken for starch to be broken down in seconds		
	Test 1	Test 2	Test 3
5	180	170	190
6	90	80	100
7	60	50	120
8	100	110	90

- 0 9 . 1** Name the product formed when amylase breaks down starch. [1 mark]

- 0 9 . 2** Describe how the student knows when the starch has been broken down. [1 mark]
-
-

- 0 9 . 3** One of the results at pH 7 is anomalous. [2 marks]

Calculate the mean time taken at pH 7. Do **not** include the anomalous result.

Mean time = ... seconds

Question 9 continues on the next page

09.4 Calculate the rate of reaction at pH 6. [2 marks]

Use the equation:

$$\text{rate} = \frac{1}{\text{mean time}}$$

Give your answer to 2 significant figures.

Rate = _____ s⁻¹

09.5 Explain why the time taken for the starch to be broken down was longer at pH 8 than at pH 7. [3 marks]

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09.6 Give **one** variable the student should have controlled in this investigation. [1 mark]

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10 Liver disease is a non-communicable disease.

10.1 What is meant by a **non-communicable** disease? [1 mark]

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Question 10 continues on the next page

Scientists studied the link between the amount of alcohol people drink and liver disease.

Table 6 shows the results.

Table 6

Units of alcohol drunk per week	Number of people with liver disease per 1000 people
0	2
1 to 14	4
15 to 28	9
29 to 42	21
more than 42	45

- 1 0 . 2** Describe the relationship between the amount of alcohol drunk and liver disease. [2 marks]

Use data from **Table 6**.

- 1 0 . 3** Calculate how many times more likely a person who drinks more than 42 units per week is to have liver disease than a person who drinks no alcohol. [1 mark]

Number of times more likely = _____

- 1 0 . 4** Explain why the data in **Table 6** do **not** prove that alcohol causes liver disease. [2 marks]

Question 10 continues on the next page

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1 0 . 5 Alcohol can affect the liver. [2 marks]

Give **two** other effects of alcohol on the body.

1

2

1 0 . 6 Having one disease can make a person more likely to develop another disease. [2 marks]

Give **two** examples of how one disease can lead to another.

1

2

1 1 A student wants to find the concentration of the solution inside potato cells.

1 1 . 1 What is meant by **osmosis**? [1 mark]

1 1 . 2 The student has potatoes, a cork borer, a knife, a balance, paper towels, distilled water, and sugar solutions of different concentrations. [6 marks]

Plan an investigation the student could do to find the concentration of the solution inside the potato cells.

Your plan should include how to make the results as accurate as possible.

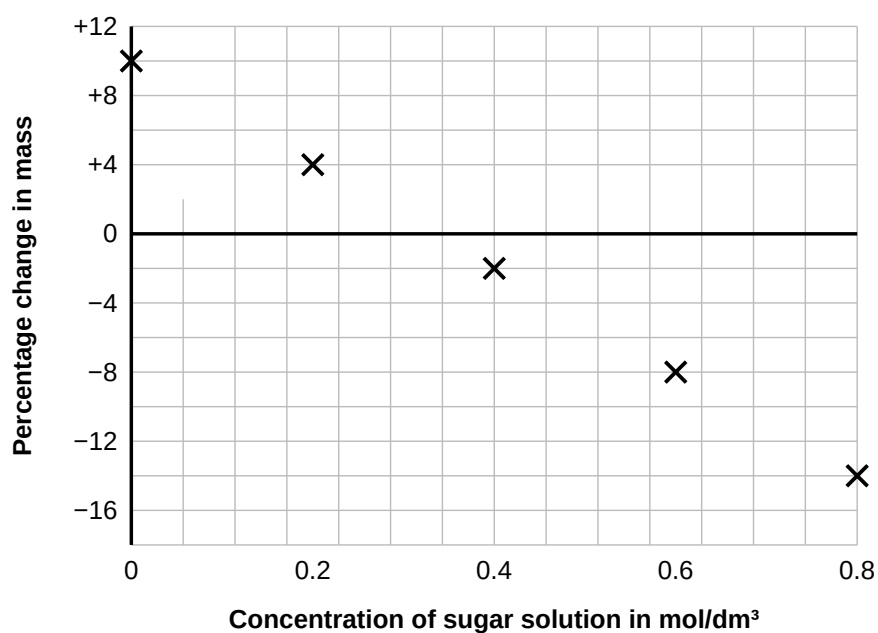
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Question 11 continues on the next page

The student carried out the investigation.

Figure 4 shows the results.

Figure 4



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1 1 . 3 Draw a line of best fit on **Figure 4**. [2 marks]

Use your line to estimate the concentration of the solution inside the potato cells.

Concentration = ... mol/dm³

1 1 . 4 The student calculated the percentage change in mass of each potato cylinder instead of using the change in mass. [1 mark]

Explain why.

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END OF QUESTIONS

Additional page, if required.

Write the question numbers in the left-hand margin.

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