AQA Style

GCSE
BIOLOGY

H

Higher Tier Biology Paper 1

Time allowed: 1 hour 45 minutes

Materials
- A ruler
- A pen and pencil
- A scientific calculator

Instructions
- Answer **all** questions using a black pen.
- Answer the questions in the space available and cross through any work you do not want to be marked.
- In any calculations, make sure you show your working out.

Information
- The maximum mark for this paper is 100.
- The marks available for each question are shown in brackets.
- You must make your work as neat as possible and use good English in your answers.
- You should make sure you leave time to check your answers.

Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Name _____

Date _____

DO NOT WRITE ON THIS PAGE.

ANSWER IN THE SPACES PROVIDED.

0 1 During digestion, digestive enzymes convert food into small soluble molecules.

0 1 . 1 Name the enzyme that breaks down fats into fatty acids and glycerol.

[1 mark]

_____

0 1 . 2 Name the type of molecule produced when carbohydrates are broken down by carbohydrase.

[1 mark]

_____

0 1 . 3 Starch is broken down by an enzyme called amylase.
Name **two** places in the body where amylase is produced.

[2 marks]

1. _____

2. _____

0 1 . 4 Describe how you would test a piece of food to show it contains protein.

[2 marks]

_____

_____

0 1 . 5 Bile is a substance that increases the rate of fat digestion.

Name the organ that produces bile.

[1 mark]

_____

0 1 . 6 Explain **one** way that bile increases the rate of fat digestion.

[2 marks]

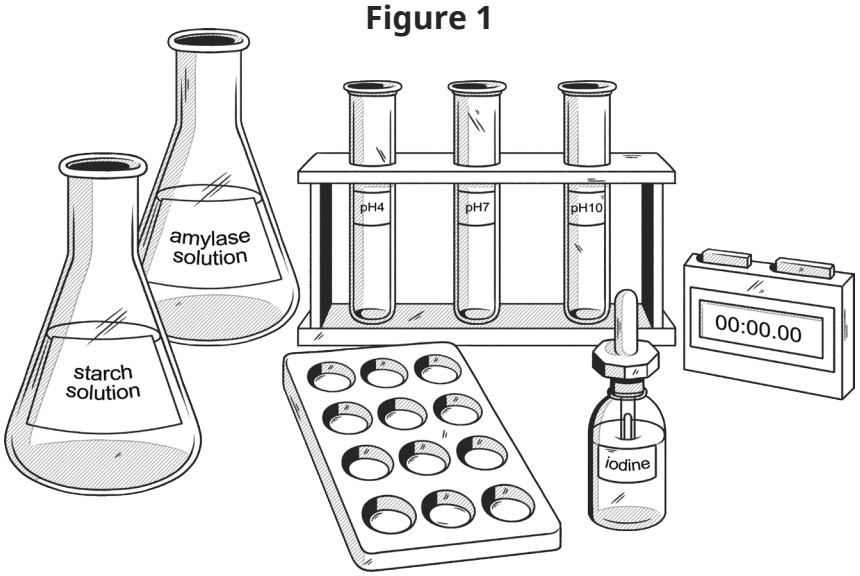
_____

_____

_____

0 1 . 7 **Figure 1** shows some of the apparatus used to investigate the effect of pH on the rate of enzyme activity.

Figure 1



Describe a method that could be used to investigate the effect of pH on the rate of enzyme activity.

You should include:

- any equipment not shown in the diagram;
- what you would measure;
- variables you would control.

[6 marks]

15

0 2 Some students investigated the effect of different concentrations of sugar solution on pieces of carrot.

The students used the method below.

1. Cut a carrot into six sticks.
2. Measure the mass of each carrot stick.
3. Place each carrot stick into a test tube containing a different concentration of sugar solution and leave them for 2 hours.
4. After 2 hours, remove each carrot stick from the solution and place on blotting paper for 30 seconds.
5. Measure the mass of each carrot stick again.

0 2 . 1 Suggest why students placed the carrots on blotting paper for 30 seconds.

[1 mark]

_____

_____

0 2 . 2 Suggest **two** improvements that the students could make to their method.

[2 marks]

1. _____

_____

2. _____

_____

Question 2 continues on the next page.

0 2 . 3 **Table 1** shows the students' results.

Table 1

Concentration of Sugar Solution (arbitrary units)	Mass of Carrot Stick at Start (g)	Mass of Carrot Stick after 24 Hours (g)	Change in Mass (g)	Percentage (%) Change in Mass
1.0	20.0	28.8	+8.8	+44
2.0	18.0	21.6	+3.6	+20
3.0	16.0	16.8	+0.8	
4.0	21.2	17.8	-3.4	-16
5.0	13.0	10.4	-2.6	-20
6.0	17.0	7.5	-9.5	-56

Calculate the percentage change in mass for the carrot stick that was placed in the sugar solution of 3.0 arbitrary units.

Show your working.

[2 marks]

percentage change in mass = _____ %

0 2 . 4 Explain why it is useful to calculate the percentage (%) change in mass of each carrot stick.

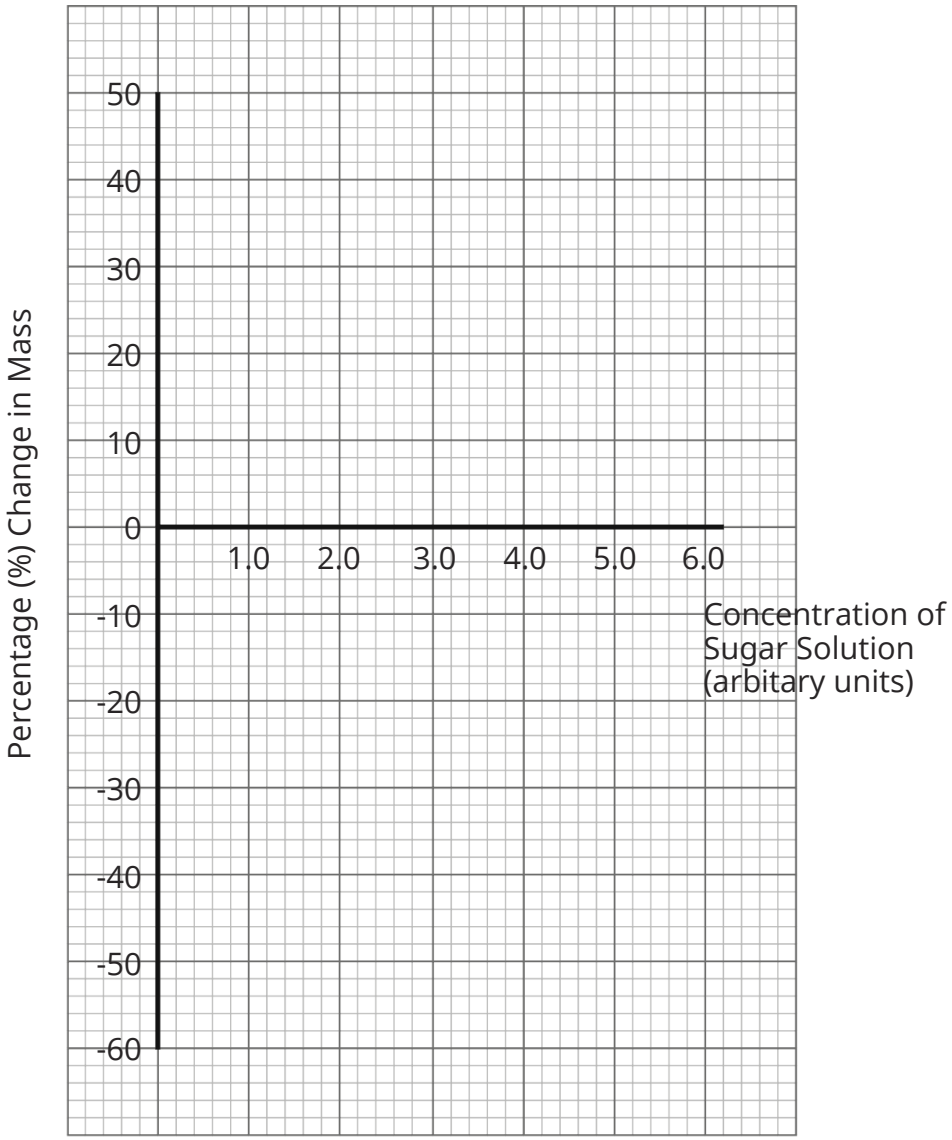
[2 marks]

0 2 . 5 Complete **Figure 2** using the results in **Table 1**.

- Plot the percentage change in mass for each concentration of sugar solution.
- Draw a line of best fit, ignoring any anomalous results.

[3 marks]

Figure 2



0 2 . 6 Explain why the percentage change in mass was negative in sugar solutions with a concentration above 4.0 arbitrary units.

[3 marks]

13

0 3 *Salmonella* bacteria can be transmitted from chickens to humans.

0 3 . 1 Name the type of drug that could be used to treat a *Salmonella* infection.

[1 mark]

0 3 . 2 To reduce the spread of the bacteria, chickens are vaccinated against *Salmonella*.

Explain how the vaccination reduces the spread of the bacteria.

[4 marks]

0 3 . 3 A scientist wants to prepare a culture of *Salmonella* on an agar plate.

Describe the steps the scientist would need to take to prepare an uncontaminated culture of *Salmonella* using aseptic technique.

You should explain the reasons for each of the steps you describe.

[6 marks]

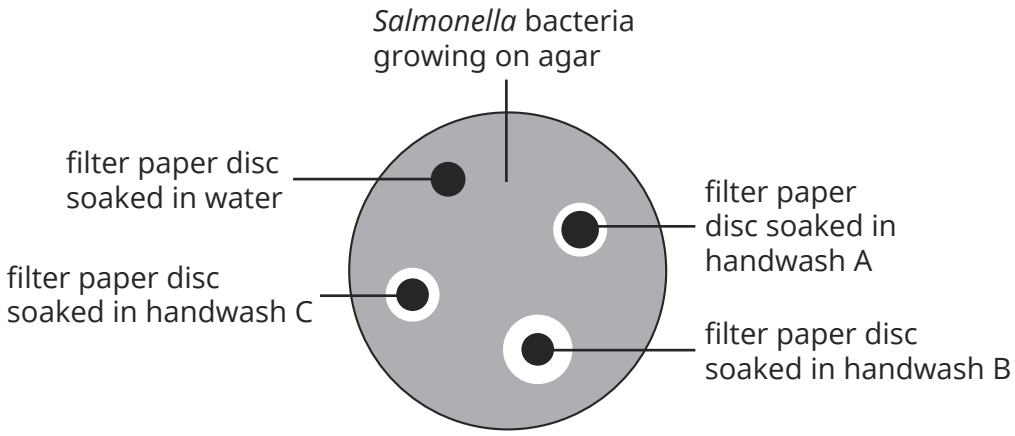
0 3 . 4 After the culture had been prepared, the scientist investigated the effect of three types of antiseptic handwash on the *Salmonella* bacteria.

She followed the method below.

- Soak a filter paper disc in each type of handwash.
- Soak a filter paper disc in water.
- Place the filter paper discs onto an agar plate with *Salmonella* bacteria culture, using sterile tweezers.
- Incubate the agar plate for 48 hours.

Figure 3 shows the agar plate after 48 hours.

Figure 3



Suggest which handwash would be the best to use after handling raw chicken.

[1 mark]

handwash _____

0 3 . 5 Explain why the handwash you identified in **03.4** would be the best to use after handling raw chicken.

[1 mark]

_____

_____

_____

0 3 . 6 Explain why the scientist included a filter paper disc soaked in water.

[1 mark]

_____

_____

0 3 . 7 Bacteria multiply by binary fission. *Salmonella* has a mean division time of 40 minutes.

There are 2000 *Salmonella* bacteria present in a bacterial culture.

Calculate the number of *Salmonella* bacteria present after 4 hours.

Give your answer in standard form.

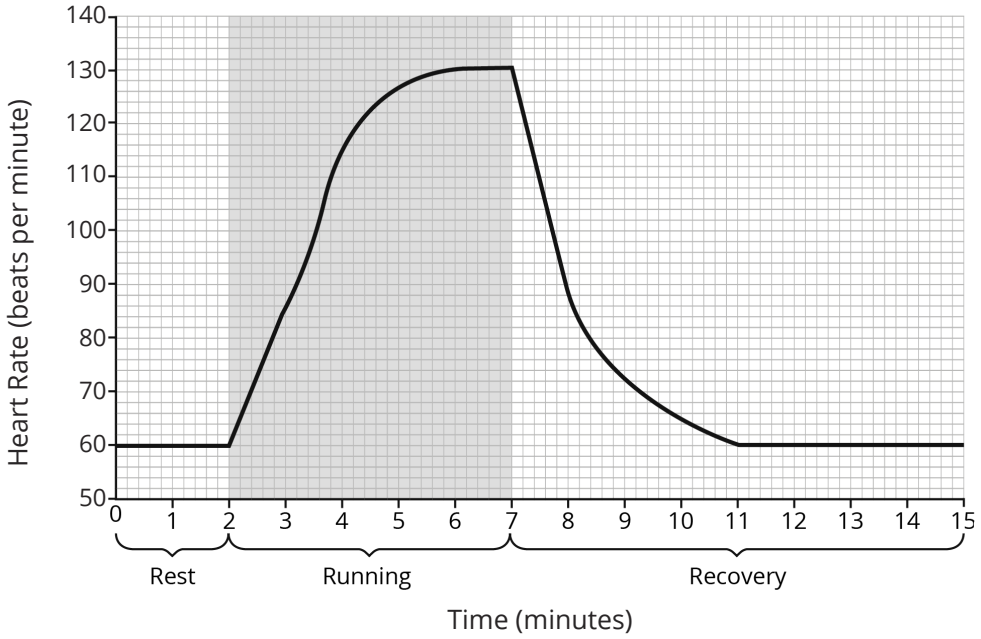
[3 marks]

number of bacteria = _____

17

0 4 A person is training for a running event. Their heart rate was measured during their training. The results are shown in **Figure 4**.

Figure 4



0 4 . 1 Describe how the person's heart rate changes during each stage shown on the graph.

You should include data from the graph in your answer.

[3 marks]

0 4 . 2 Explain why the person's heart rate increased during exercise.

[4 marks]

0 4 . 3 After 5 minutes, the person's legs began to ache due to a build-up of lactic acid. This created an oxygen debt.

Explain how the body deals with a build-up of lactic acid.

[4 marks]

11

0 5 **Figure 5** shows a diagram of the human heart.

Figure 5

0 5 . 1 Name and describe the function of structures **A** and **B**.

[4 marks]

Structure **A**

name _____

function _____

_____

Structure **B**

name _____

function _____

_____

0 5 . 2 The heart contains valves to prevent blood from flowing in the wrong direction. In some people, the valves may leak or become faulty. Faulty heart valves can be replaced using biological or mechanical valves.

Evaluate the advantages and disadvantages of replacing faulty heart valves with mechanical valves over biological valves.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

0 5 . 3 In the UK, around 73 000 people die from coronary heart disease every year.

Explain why statins are increasingly prescribed to anyone at risk of developing coronary heart disease.

[2 marks]

_____

_____

10

0 6 Measles is a highly contagious disease that causes fever and a red skin rash. It can be fatal if complications arise.

0 6 . 1 Measles spreads easily through groups of young children.

Explain why children pass on the disease so easily.

[2 marks]

0 6 . 2 The World Health Organisation (WHO) sets a target for 95% of five-year-olds to be vaccinated against measles. In 2017, the UK met this target and was granted measles elimination status. This 'measles-free' status was lost when vaccination rates for the second dose of the measles vaccine fell to 87.4% in 2019.

Explain why it is important that a high percentage of children are vaccinated against measles.

[2 marks]

0 6 . 3 It is difficult to develop drugs to treat measles infections.

Explain why.

[3 marks]

0 6 . 4 Patients may be prescribed painkillers to treat the symptoms of measles.

Before painkillers can be prescribed to patients, they must be tested and trialled.

Give three reasons that new drugs need to be tested.

[3 marks]

1. _____

_____

2. _____

_____

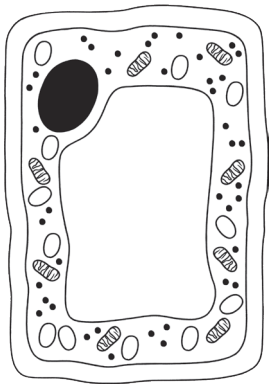
3. _____

_____

10

0 7 **Figure 6** shows a plant cell.

Figure 6



0 7 . 1 The plant cell is 70μm long.

The cell is magnified 400 times.

Use the equation to calculate the size of the microscope image of the cell in mm.

$$\text{magnification} = \frac{\text{image size}}{\text{real size}}$$

[3 marks]

image size = _____ mm

0 7 . 2 Phloem vessels are made from tubes of elongated plant cells. Phloem vessels transport molecules around the plant.

Name the process that takes place in phloem vessels.

[1 mark]

0 7 . 3 Monoclonal antibodies can be used to locate molecules.

Describe how monoclonal antibodies are produced.

[4 marks]

0 7 . 4 Molecule **Z** is produced in the leaves of the plant. A scientist wants to see where in the plant this molecule is transported to.

Explain how the scientist could use monoclonal antibodies to track the movement of molecule **Z**.

[4 marks]

0 7 . 5 The scientist finds that molecule **Z** is transported from the leaves to the rest of the plant through the phloem.

Name molecule **Z**.

[1 mark]

13

0 8 Plant cells contain chloroplasts to absorb light energy for photosynthesis.

0 8 . 1 Complete the word equation for photosynthesis.

[2 marks]

carbon dioxide + _____ $\xrightarrow{\text{light energy}}$ _____ + _____

0 8 . 2 A farmer grows spinach in a greenhouse. He needs to optimise photosynthesis to produce the highest crop yield. He increases the amount of light available for photosynthesis by using lamps.

The intensity of light on the spinach plants can be calculated using the inverse square law:

$$\text{light intensity} \propto \frac{1}{\text{distance}^2}$$

Calculate the light intensity when the greenhouse lamps are 25cm from the spinach plants.

[2 marks]

_____

_____

_____

_____

light intensity = _____ arbitrary units

0 8 . 3 The distance between the greenhouse lamps and the spinach is doubled.

Describe what will happen to the light intensity.

[1 mark]

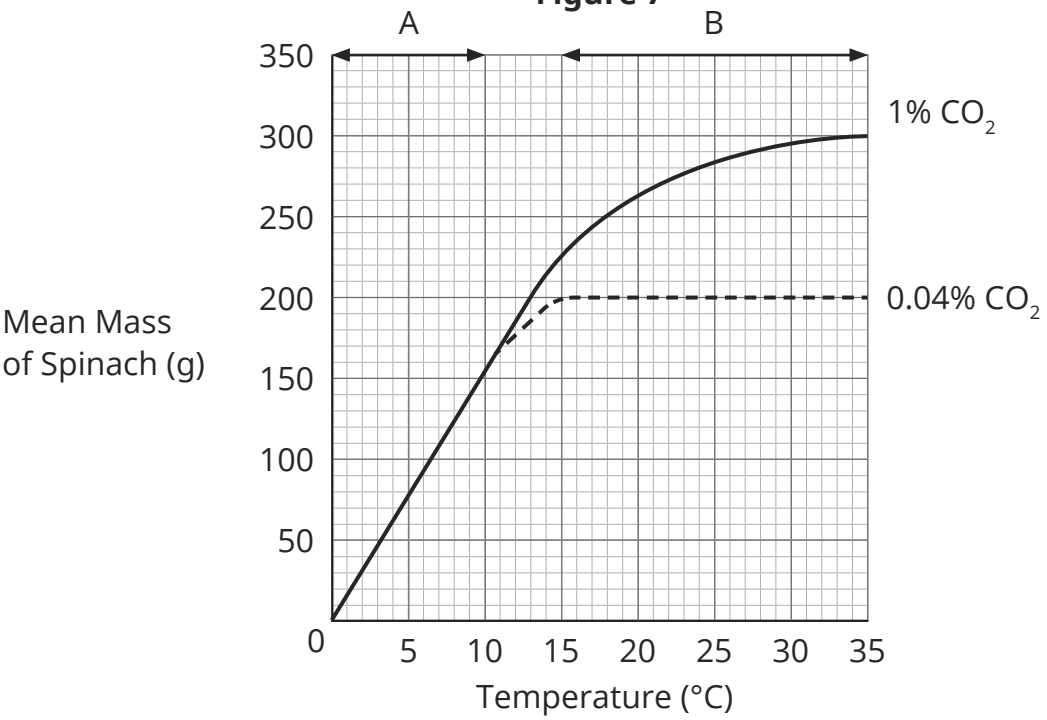
_____

_____

0 8 . 4 The farmer compares the mass of spinach plants grown in different conditions.

The results are shown in **Figure 7**.

Figure 7



Explain the effect of temperature and carbon dioxide concentration on the mean mass of spinach plants.

You should refer to the limiting factors in sections **A** and **B** of the graph in your answer.

[4 marks]

0 8 . 5 Plant diseases can also affect the rate of photosynthesis.

The farmer notices spots of discolouration on some of the leaves of his spinach plants.

Give **two** other signs that would indicate that the spinach plants had a disease.

[2 marks]

1. _____

2. _____

11

END OF QUESTIONS