Please write clearly in block capitals.

H

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

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE

BIOLOGY

Higher Tier Paper 1

Practice Paper Series – Set 2

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 03.3 and 09.2 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	
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4	
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6	
7	
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9	
10	
11	
TOTAL	

This is an original practice paper written for sciencegcse.co.uk to match the style and demand of AQA GCSE Biology (8461) Paper 1 (Higher Tier). It is not an AQA examination paper and has not been produced or endorsed by AQA. It is not a prediction of a future examination.

0 1 Stem cells are found in plants and in animals.

0 1 . 1 Where is meristem tissue found in a plant? [1 mark]

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0 1 . 2 Meristem cells can differentiate into any type of plant cell throughout the life of the plant. [1 mark]

How are the stem cells in an adult human different?

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0 1 . 3 In therapeutic cloning, an embryo is produced with the same genes as the patient. [2 marks]

Stem cells from the embryo are used to treat the patient.

Explain why the patient's body is unlikely to reject these stem cells.

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0 1 . 4 Give **one** risk of treating patients with stem cells. [1 mark]

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0 1 . 5 Stem cells divide by mitosis. [2 marks]

Describe what happens to the chromosomes and to the nucleus during mitosis.

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0 1 . 6 Name **one** medical condition that stem cells may be able to treat in the future. [1 mark]

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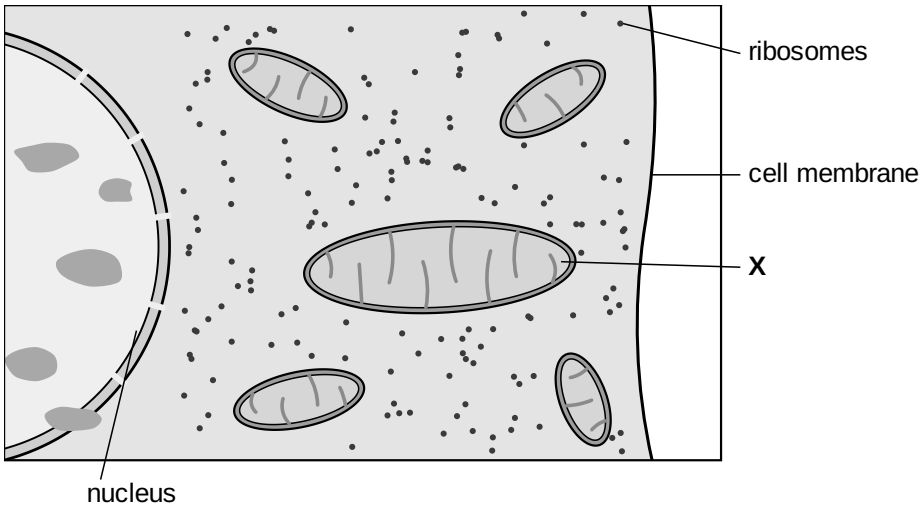
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0 2 **Figure 1** shows part of an animal cell seen with an electron microscope.

Figure 1



0 2 . 1 Name structure **X**. [1 mark]

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0 2 . 2 Give **one** advantage of using an electron microscope rather than a light microscope to study cells. [1 mark]

.....

.....

0 2 . 3 The image of structure **X** in **Figure 1** is 36 mm long. [2 marks]

The magnification of **Figure 1** is ×12 000

Calculate the real length of structure **X** in micrometres (µm).

1 mm = 1000 µm

Real length = ... µm

0 2 . 4 Give the real length of structure **X** in metres. [1 mark]

Give your answer in standard form.

Real length = ... m

Question 2 continues on the next page

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0 2 . 5 Heart muscle cells contain a large number of structure **X**. [2 marks]

Explain why.

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0 2 . 6 Bacterial cells are prokaryotic cells. [2 marks]

Name **two** sub-cellular structures that are found in both bacterial cells and animal cells.

1 .....

2 .....

0 3 Bacteria reproduce by simple cell division (binary fission).

0 3 . 1 A single bacterium was put into a flask of nutrient broth. [3 marks]

After 5 hours there were 32 768 bacteria in the flask.

Calculate the mean time between cell divisions.

Assume that every bacterium divided at the same rate and that no bacteria died.

Mean time between divisions = ... minutes

0 3 . 2 Bacteria can be grown on nutrient agar in a Petri dish. [2 marks]

The lid of the Petri dish is secured with adhesive tape, but the dish is **not** sealed all the way round.

Explain why the dish is not sealed all the way round.

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0 3 . 3 A mouthwash contains an antiseptic. [6 marks]

A student wants to identify the lowest mouthwash concentration tested that produces a clear zone around a filter-paper disc on a bacterial culture.

The student has:

- a culture of bacteria
- Petri dishes of sterile nutrient agar
- small discs of filter paper
- the mouthwash
- sterile water and measuring cylinders
- the equipment needed for aseptic technique.

Plan an investigation the student could carry out.

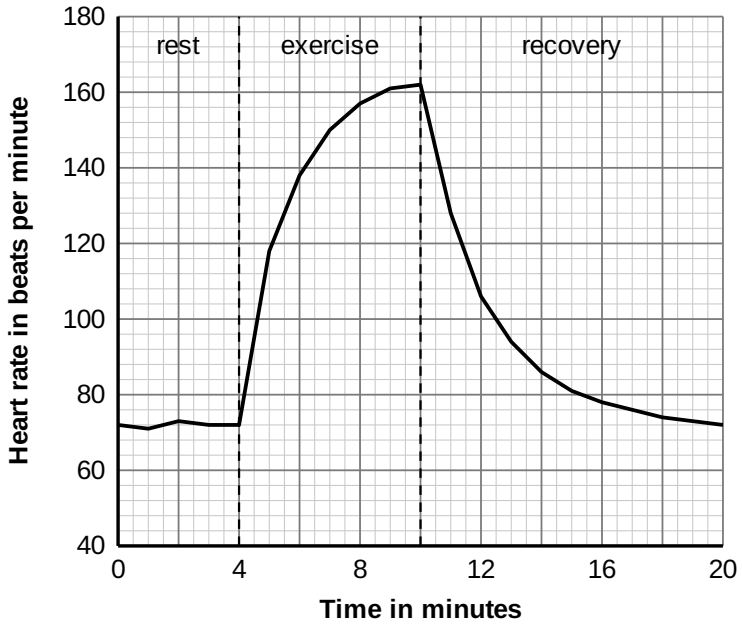
Your plan should give valid results.

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0 4 A student measured her heart rate before, during and after a period of exercise.

Figure 2 shows the results.

Figure 2



0 4 . 1 Calculate the percentage increase in the student's heart rate from rest to the end of the exercise. [2 marks]

Percentage increase = ... %

0 4 . 2 Explain why the student's heart rate increased during the exercise. [3 marks]

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Question 4 continues on the next page

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0 4 . 3 Towards the end of the exercise the student's leg muscles began to ache and to contract less strongly. [2 marks]

Explain why.

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0 4 . 4 How long after the end of the exercise did the student's heart rate fall to 10 beats per minute above her resting heart rate? [1 mark]

Use **Figure 2**.

Time = ... minutes

0 4 . 5 The student trained for 10 weeks and then repeated the test. [1 mark]

Her heart rate returned to the resting rate more quickly after the exercise.

Suggest why.

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0 5 Protease enzymes digest proteins.

0 5 . 1 Name the products of protein digestion. [1 mark]

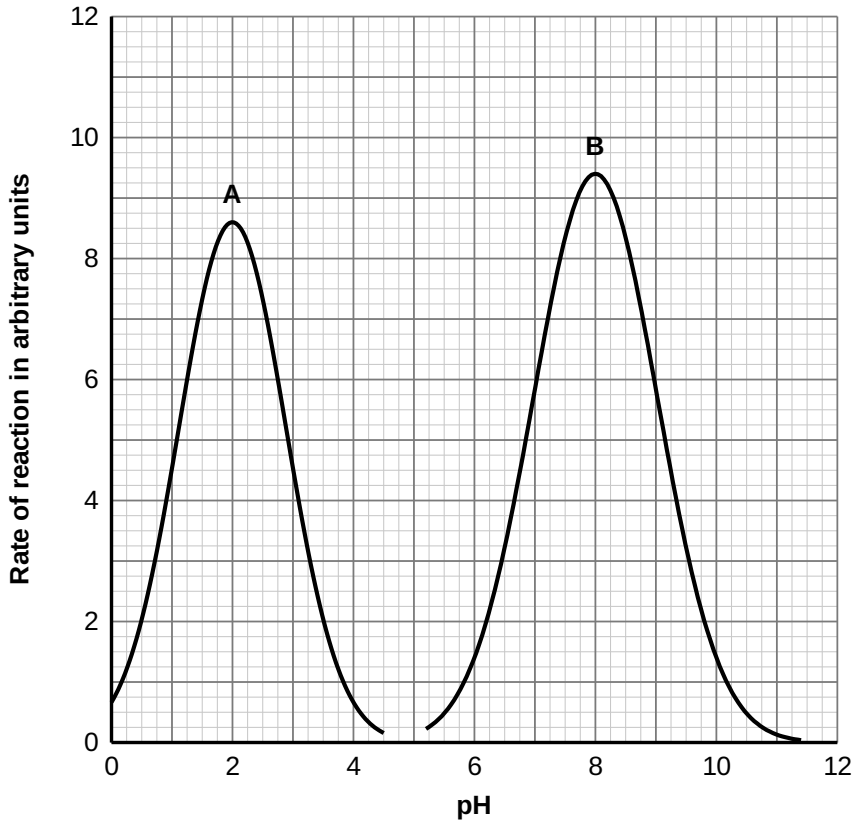
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Question 5 continues on the next page

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Figure 3 shows how pH affects the rate of reaction of two protease enzymes, **A** and **B**.

Figure 3



0 5 . 2 One of the enzymes is produced in the stomach. [2 marks]

Which enzyme is produced in the stomach?

Give a reason for your answer.

Enzyme .....

.....

.....

0 5 . 3 Explain why enzyme **B** has a very low rate of reaction at pH 4 [3 marks]

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Question 5 continues on the next page

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0 5 . 4 Give **two** functions of the hydrochloric acid in the stomach. [2 marks]

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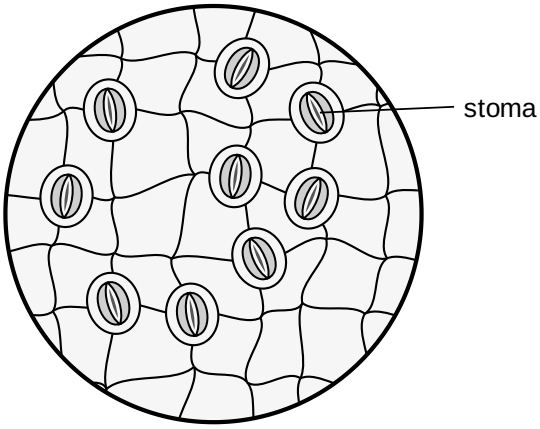
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0 6 A student used a light microscope to look at the lower surface of a leaf.

Figure 4 shows what the student saw.

Figure 4



0 6 . 1 The diameter of the field of view was 0.30 mm [3 marks]

There are 9 stomata in **Figure 4**.

Calculate the number of stomata per mm^2 of the leaf surface.

Use the equation:

$$\text{area of a circle} = \pi r^2$$

Use $\pi = 3.14$

Give your answer to 2 significant figures.

Number of stomata = ... per mm^2

Question 6 continues on the next page

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0 6 . 2 The upper surface of the same leaf had 25 stomata per mm^2. [2 marks]

Suggest why there are more stomata on the lower surface of the leaf.

0 6 . 3 Explain how guard cells help to control water loss from a leaf. [2 marks]

0 6 . 4 Give **one** environmental factor, other than temperature, that affects the rate of transpiration. [1 mark]

0 7 Plants can be damaged by pathogens and by animals.

0 7 . 1 Give **two** visible signs that a plant may have a disease. [2 marks]

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0 7 . 2 A virus damages the chloroplasts in the leaves of a plant. [2 marks]

Explain why the infected plant grows more slowly than a healthy plant.

Question 7 continues on the next page

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Holly trees have some leaves with sharp spines and some leaves without spines.

A student counted the leaves with spines at different heights on a holly tree.

Table 1 shows the results.

Table 1

Height above the ground in m	Percentage of leaves with spines
0.0 to 0.5	94
0.5 to 1.0	90
1.0 to 1.5	81
1.5 to 2.0	55
2.0 to 2.5	18
2.5 to 3.0	6

0 7 . 3 Describe the pattern in the results. [1 mark]

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0 7 . 4 Deer eat holly leaves. A deer can reach leaves up to about 2 m above the ground. [2 marks]

Use this information to explain the results in **Table 1**.

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0 7 . 5 Give **one** chemical defence of plants. [1 mark]

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0 7 . 6 The leaves of some plants have yellow spots that look like butterfly eggs. [1 mark]

Suggest how this protects the plant.

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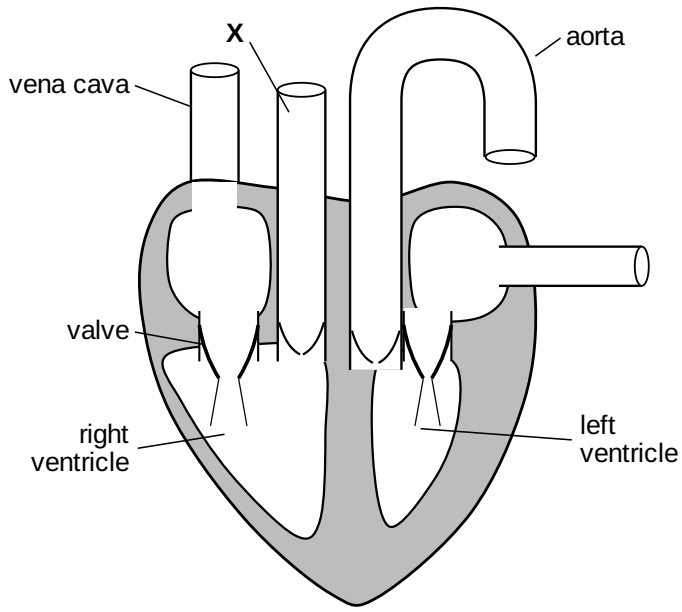
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0 8 **Figure 5** shows a section through the human heart.

Figure 5



0 8 . 1 Name blood vessel **X**. [1 mark]

0 8 . 2 Describe the route taken by blood through the right side of the heart, from the vena cava to the lungs. [2 marks]

0 8 . 3 The wall of the left ventricle is thicker than the wall of the right ventricle. [2 marks]

Explain why.

Question 8 continues on the next page

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A faulty heart valve can be replaced by a mechanical valve or by a biological valve.

Table 2 gives information about the two types of valve.

Table 2

	Mechanical valve	**Biological valve**
Made from	metal and carbon	tissue from pigs or cows
Average time before the valve needs to be replaced	more than 25 years	10 to 15 years
Medicines needed after surgery	anticoagulant tablets every day for life	usually none after the first 3 months
Other information	blood clots can form on the valve; anticoagulants increase the risk of bleeding	replacing a worn-out valve needs more open-heart surgery

0 8 . 4 Doctors usually recommend a mechanical valve for a 35-year-old patient but a biological valve for a 75-year-old patient. [3 marks]

Suggest why.

Use **Table 2**.

0 9 Human papillomavirus (HPV) is spread by sexual contact. HPV can cause cancer of the cervix.

0 9 . 1 Explain how a malignant tumour in the cervix can lead to tumours in other parts of the body. [2 marks]

Question 9 continues on the next page

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0 9 . 2 The human body has several ways of defending itself against pathogens such as HPV. [6 marks]

Describe how the body stops pathogens from entering it, and how white blood cells destroy pathogens that do get in.

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In 2008 a country started to vaccinate girls aged 12 to 13 against HPV.

Table 3 shows data for the country.

Table 3

Year	Percentage of girls aged 12 to 13 vaccinated against HPV	New cases of cervical cancer per 100 000 women aged 20 to 24
2006	0	8.0
2010	70	7.9
2014	86	7.6
2018	88	3.4
2022	89	1.0

0 9 . 3 Calculate the percentage decrease in new cases of cervical cancer per 100 000 women aged 20 to 24 from 2006 to 2022 [2 marks]

Percentage decrease = ... %

0 9 . 4 The number of new cases of cervical cancer in women aged 20 to 24 did **not** fall much between 2006 and 2014 [2 marks]

Suggest why.

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1 0 Pregnancy tests contain monoclonal antibodies.

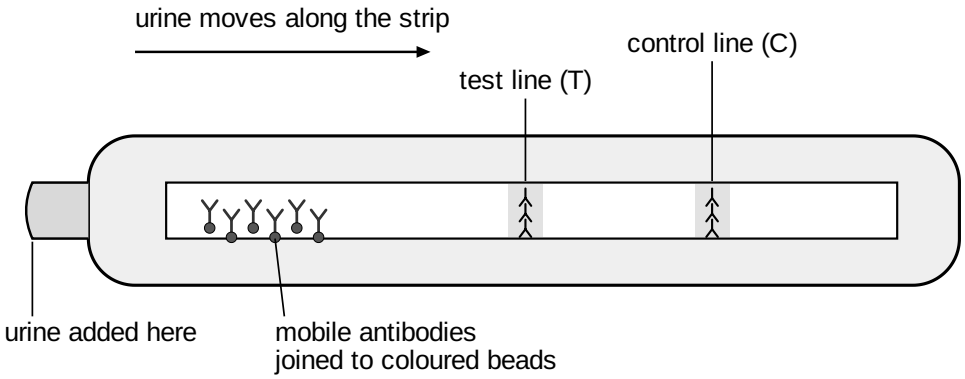
The antibodies bind to a hormone called hCG. hCG is found in the urine of women who are pregnant.

1 0 . 1 To produce monoclonal antibodies, mouse lymphocytes are combined with a particular kind of tumour cell to make hybridoma cells. [2 marks]

Explain why lymphocytes are combined with tumour cells.

Figure 6 shows a pregnancy test strip.

Figure 6



The mobile antibodies and the antibodies fixed at the test line both bind to hCG.

The antibodies fixed at the control line bind to the mobile antibodies.

1 0 . 2 Explain why a coloured line appears at the test line (T) only if the urine contains hCG. [3 marks]

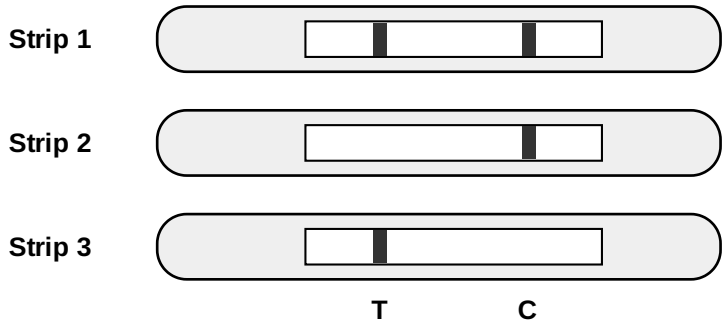
Question 10 continues on the next page

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Figure 7 shows three test strips after use.

Figure 7



1 0 . 3 Give the result of each test strip. [2 marks]

Strip 1

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Strip 2

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Strip 3

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Table 4 shows the concentration of hCG in the urine of a woman after an egg was fertilised.

Table 4

Days after fertilisation	7	10	14	21
Concentration of hCG in units per dm^3	4	20	110	1800

1 0 . 4 The test strip only detects hCG at concentrations above 25 units per dm^3. [2 marks]

The woman used a test strip 10 days after fertilisation.

Explain why the test gave a negative result, and suggest what the woman should do.

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Turn over for the next question

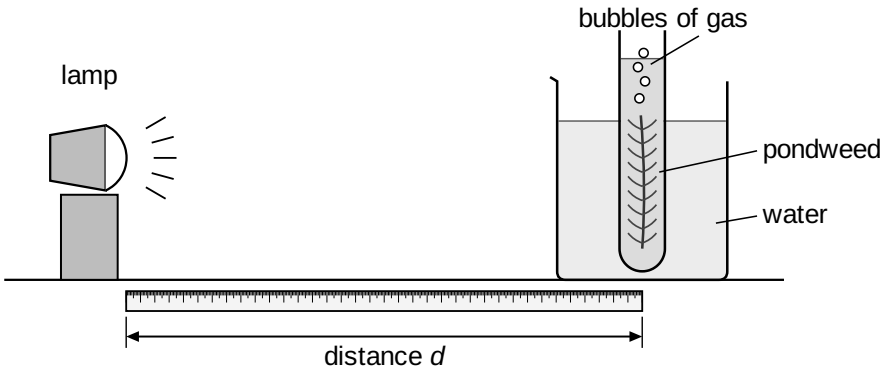
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1 1 A student investigated how light intensity affects the rate of photosynthesis in pondweed.

Figure 8 shows the apparatus.

Figure 8



The student counted the number of bubbles of gas released in one minute at different distances, *d*, from the lamp.

Table 5 shows the results.

Table 5

Distance *d* in cm	10	15	20	30	40
Number of bubbles per minute	64	28	16	7	4

1 1 . 1 Light intensity is inversely proportional to the square of the distance from the lamp. [2 marks]

Use data from **Table 5** to show that the rate of photosynthesis is inversely proportional to the square of the distance.

1 1 . 2 Explain why the rate of photosynthesis decreased as the distance increased. [2 marks]

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Question 11 continues on the next page

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A grower tested different conditions for growing tomato plants in a greenhouse. The light intensity was high.

Table 6 shows the rate of photosynthesis and the extra cost of each condition.

Table 6

Condition	Temperature in °C	Concentration of carbon dioxide in %	Rate of photosynthesis in arbitrary units	Extra cost per day in £
A	15	0.04	4.0	0
B	15	0.10	4.4	15
C	25	0.04	6.0	40
D	25	0.10	9.0	55

1 1 . 3 Explain why adding carbon dioxide at 15 °C increased the rate of photosynthesis by only a small amount. [2 marks]

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1 1 . 4 Each extra unit of rate of photosynthesis produces extra tomatoes worth £20 per day. [2 marks]

Which condition, **B**, **C** or **D**, gives the greatest extra profit compared with condition **A**?

Show your working.

Condition .....

1 1 . 5 Suggest **one** reason why the grower might not use condition **D** in winter. [1 mark]

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END OF QUESTIONS

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