

GCSE

BIOLOGY

Biology Test 2: Infection and response and Bioenergetics (Higher)

Total number of marks: 32

0 6

A virus called RSV causes severe respiratory disease.

0 6 . 1

Suggest **two** precautions that a person with RSV could take to reduce the spread of the virus to other people.

[2 marks]

1 wash hands regularly

2 cover nose / mouth when coughing

0 6 . 2

One treatment for RSV uses monoclonal antibodies which can be injected into the patient.

Scientists can produce monoclonal antibodies using mice.

The first step is to inject the virus into a mouse.

Describe the remaining steps in the procedure to produce monoclonal antibodies.

The spleen cells, which produce lymphocytes, is surgically removed. [3 marks]

Lymphocytes produce antibodies specific to the antigen. Spleen cells are fused with myeloma to form hybridoma cells, which divide indefinitely and produce monoclonal antibodies.

0 6 . 3

Describe how injecting a monoclonal antibody for RSV helps to treat a patient suffering with the disease.

The monoclonal antibody is complementary to the antigens [2 marks]

on the surface of the virus. White blood cells then engulf the virus.

A trial was carried out to assess the effectiveness of using monoclonal antibodies to treat patients with RSV.

Some patients were given a placebo.

0 6 . 4

Why were some patients given a placebo?

[1 mark]

To compare the effects of the treatment vs no treatment on the patients.

A number of patients had to be admitted to hospital as they became so ill with RSV.

The results are shown in **Table 3**.

Table 3

Treatment received by patient	% of patients within each group admitted to hospital with RSV
Group A: Monoclonal antibody for RSV	4.8
Group B: Placebo	10.4

The trial involved 1 500 patients.

- Half of the patients (group A) were given the monoclonal antibodies.
- Half of the patients (group B) were given the placebo.

0 6 . 5

Calculate the total number of patients admitted to hospital with RSV during the trial.

[2 marks]

$$\frac{4.8\% + 10.4\%}{2} = 7.6\%$$

$$7.6\% \text{ of } 1500 = 0.076 \times 1500 = 114$$

Total number of patients admitted to hospital = 114

0 6 . 6

Evaluate how well the data in **Table 3** supports the conclusion:

'monoclonal antibodies are more effective at treating RSV than a placebo'.

[2 marks]

The table supports the conclusion as over double the number of patients in the experiment were hospitalised with the placebo compared to the monoclonal antibody group. However, there may have been other factors which affected the outcome such as age, gender or any existing illnesses.

0 3

This question is about photosynthesis.

0 3

1

Complete the word equation for photosynthesis:

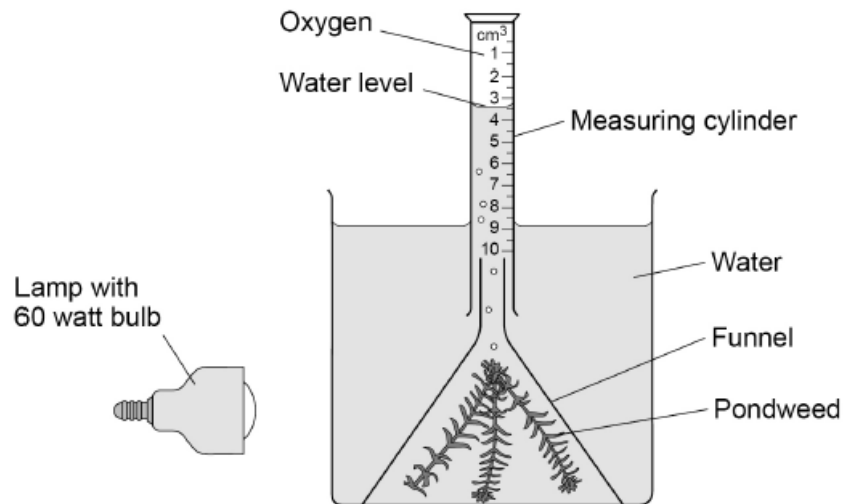
[2 marks]

carbion dioxide + water → glucose + oxygen

A student investigated photosynthesis using pondweed.

Figure 3 shows the apparatus the student used.

Figure 3



This is the method used.

1. Set up the apparatus as shown in **Figure 3**.
2. Switch on the lamp.
3. After 20 minutes, record the volume of oxygen collected in the measuring cylinder.
4. Repeat steps 1–3 using bulbs of different power output.

0 3 . 2 What was the independent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

Power output of bulb

Rate of photosynthesis

Time to collect oxygen

Volume of oxygen collected

0 3 . 3 Suggest **two** ways the method could be improved so the results would be more valid.

[2 marks]

- 1 Ensure the bulb is placed the same distance
from the funnel in each experiment.
- 2 Use the same mass of pondweed in each
experiment.

Table 3 shows the student's results.

Table 3

Power output of bulb in watts	Volume of oxygen collected in 20 minutes in cm ³	Rate of photosynthesis in cm ³ /hour
60	0.5	1.5
100	0.8	2.4
150	1.1	X
200	1.2	3.6
250	1.2	3.6

0 3 . 4 Calculate value **X** in **Table 3**.

[1 mark]

$$1.1 \times 3 = 3.3$$

$$X = \underline{3.3} \text{ cm}^3/\text{hour}$$

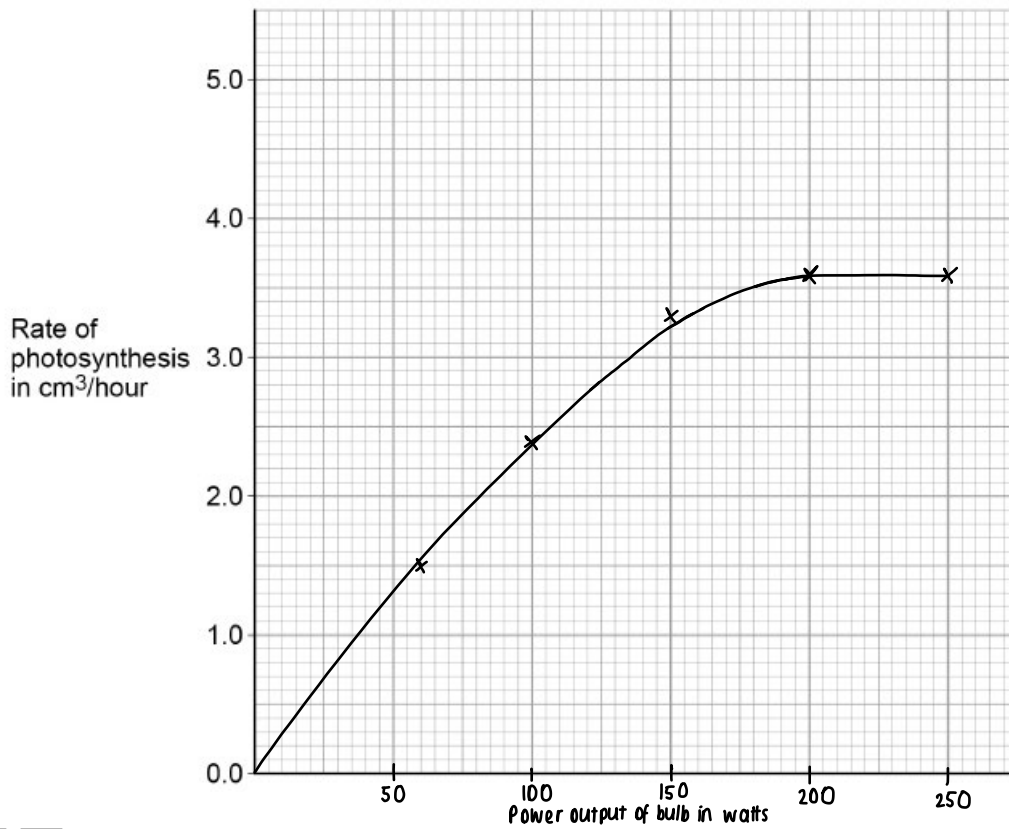
03.5 Complete **Figure 4**.

[4 marks]

You should:

- label the x-axis
- use a suitable scale
- plot the data from **Table 3** and your answer to Question 03.4
- draw a line of best fit.

Figure 4



03.6 Determine the expected rate of photosynthesis with a bulb of power output 75 watts.

Use **Figure 4**.

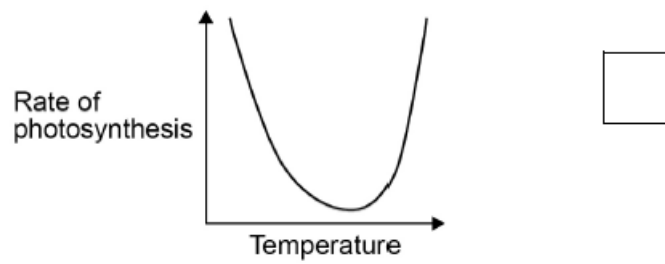
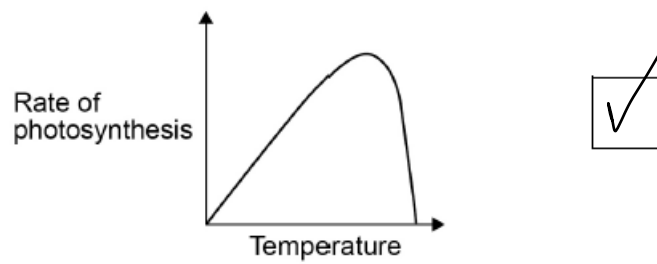
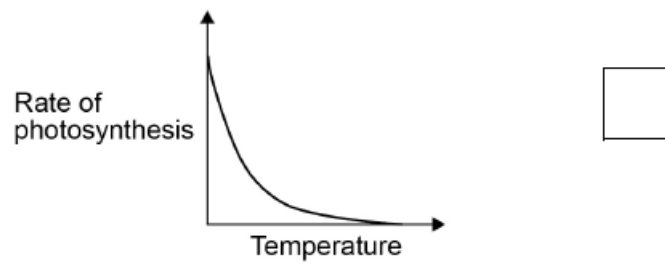
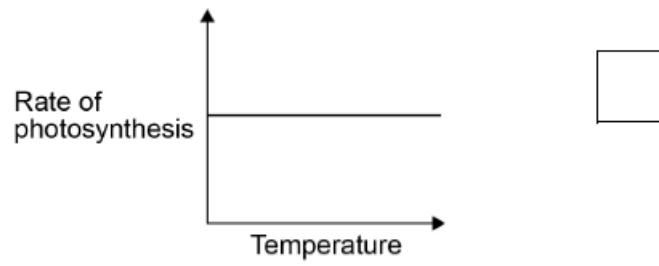
[1 mark]

Rate of photosynthesis at 75 watts = 1.85 cm³/hour

0 3 . 7 Which graph shows the effect of temperature on the rate of photosynthesis?

[1 mark]

Tick (✓) **one** box.



0 5

Many plants have evolved defence mechanisms.

Figure 8 shows part of a gorse plant and part of a deadly nightshade plant.

Figure 8



Gorse plant



Deadly nightshade plant

0 5 . 1

The gorse plant has evolved to have sharp thorns.

What type of defence response are thorns?

Mechanical defence

[1 mark]

0 5 . 2

How do thorns defend the gorse plant?

Prevent predators from eating the plant

[1 mark]

0 5 . 3

The deadly nightshade plant has poisonous berries.

What type of defence response are poisonous berries?

Chemical defence

[1 mark]

0 5 4

A scientist noticed that in one area the gorse plants had yellow leaves and had stunted growth.

One reason for yellow leaves and stunted growth is a deficiency of nitrate ions in the soil.

Explain **two** other possible reasons for the yellow leaves and stunted growth.

Do **not** refer to nitrate ions in your answer.

[5 marks]

Reason 1 Tobacco mosaic virus can infect the plant

Explanation The virus can invade chloroplasts and reduce the amount of chlorophyll in the leaf. This reduces the plant's ability to photosynthesise and so less glucose is produced so less glucose is available to make amino acids and cellulose, resulting in stunted growth.

Reason 2 Magnesium deficiency

Explanation Magnesium is needed to make chlorophyll, which is needed for photosynthesis. Less/no chlorophyll means less glucose is produced and the plant cannot grow to its full size as glucose is needed for growth.