Bioenergetics – GCSE Biology Paper 1

1. No.3

0 3 Photosynthesis produces oxygen.

0 3 . 1 Complete the word equation for photosynthesis.

Choose answers from the box.

[3 marks]

carbon dioxide	**fat**	**glucose**
nitrogen	**protein**	**water**

_____ + _____ → _____ + oxygen

0 3 . 2 Explain how oxygen is used in cells.

[2 marks]

A student investigated the effect of light from different coloured light bulbs on photosynthesis.

The student:

- used pondweed in a beaker of water
- used different coloured light bulbs in a lamp
- counted the number of bubbles of oxygen the pondweed produced in 2 minutes for each colour of light bulb.

0 3 . 3 Give **one** hazard the student would need to consider when using the apparatus in this investigation.

Give the risk the hazard would cause.

[2 marks]

Hazard _____

_____

Risk _____

_____

0 3 . 4 The student needed to keep the temperature of the water in the beaker the same throughout the investigation.

Describe how the student could keep the temperature of the water the same.

[1 mark]

_____

_____

0 3 . 5 The beaker of water contained the pondweed.

Explain why the temperature of the water in the beaker needed to be kept the same throughout the investigation.

[2 marks]

_____

_____

_____

Table 3 shows the results.

Table 3

Colour of light bulb	Number of bubbles of oxygen produced in 2 minutes
Blue	46
Green	8
Red	38
Yellow	29

0 3 . 6 Which colour of light caused the highest rate of photosynthesis in the pondweed?

[1 mark]

Tick (✓) **one** box.

Blue ☐

Green ☐

Red ☐

Yellow ☐

0 3 . 7 What is the best way to display the data in **Table 3**?

[1 mark]

Tick (✓) **one** box.

Bar graph ☐

Line graph ☐

Scatter graph ☐

0 3 . 8 The student wanted to measure the **volume** of oxygen the pondweed produced in 2 minutes.

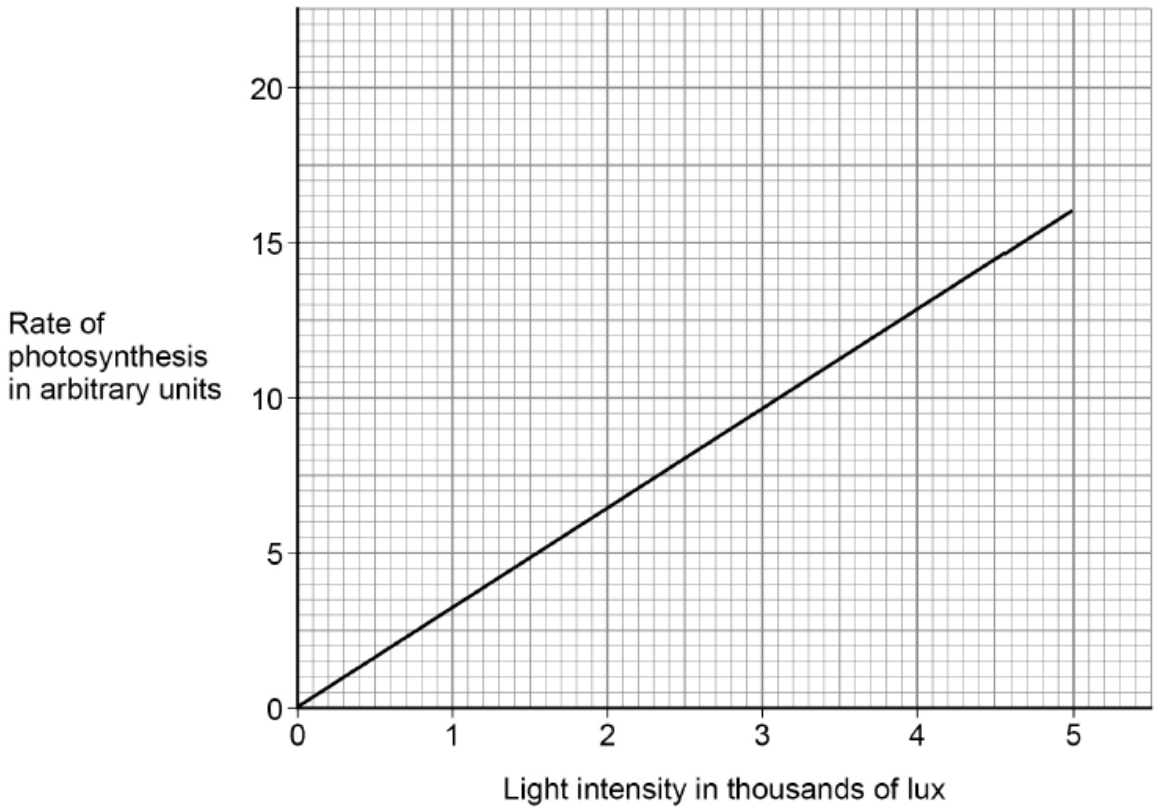
Name **one** piece of apparatus the student could use to measure the volume of oxygen.

[1 mark]

0 3 . 9 Another student investigated the effect of light intensity on the rate of photosynthesis.

Figure 1 shows the results.

Figure 1



Describe what **Figure 1** shows about the relationship between light intensity and the rate of photosynthesis.

[2 marks]

2. No.1

0 1 A root is a plant organ.

Plant roots contain many different types of tissue.

0 1 . 1 What is a tissue?

[1 mark]

0 1 . 2 Tissue in the tip of a plant root contains stem cells.

Stem cells can differentiate into any type of cell.

Name the type of tissue in plants that contains stem cells.

[1 mark]

In the past many drugs were extracted from plants.

0 1 . 3 Aspirin is a painkiller.

Which plant does aspirin originate from?

[1 mark]

Scientists have extracted chemical **A** from the deadly nightshade plant.

Chemical **A** can be used as a painkiller.

Table 1 shows information about where chemical **A** is found.

Table 1

Part of deadly nightshade plant	Mass of chemical A in 100 g of plant tissue in grams
Roots	1.3
Leaves	1.2
Berries	0.7

0 1 . 4 The scientists usually extract chemical **A** from the berries of the deadly nightshade plant.

Suggest **one** reason why berries are used instead of leaves or roots.

[1 mark]

A deadly nightshade plant has chlorosis (yellow leaves).

The mass of chemical **A** found in the **leaves** of the plant is 60% of the mass shown in **Table 1**.

0 1 . 5 Calculate the mass of chemical **A** in 200 g of the **leaves** with chlorosis.

Give your answer in mg.

[4 marks]

Mass of chemical **A** = _____ mg

0 1 . 6 Suggest **one** reason why the leaves of the deadly nightshade plant have chlorosis.

[1 mark]

Chemical **A** has **not** been tested in large-scale clinical trials in the UK.

0 1 . 7 It is important for drugs to be tested in clinical trials before the drugs are approved for use by the public.

Give **two** reasons why.

[2 marks]

1 _____

_____

2 _____

_____

There are many online reports making claims about the effects of chemical **A**.

Some of these reports are biased.

0 1 . 8 Suggest **one** reason why a report making claims about the effects of chemical **A** may be biased.

[1 mark]

_____

_____

0 1 . 9 How can scientists be sure that claims about new drugs are valid?

[1 mark]

Tick (✓) **one** box.

Advertise the claims on social media. ☐

Ask an international company to produce the drug. ☐

Have the claims peer reviewed. ☐

Publish the claims in a newspaper. ☐

3. No.6

0 6 This question is about photosynthesis.

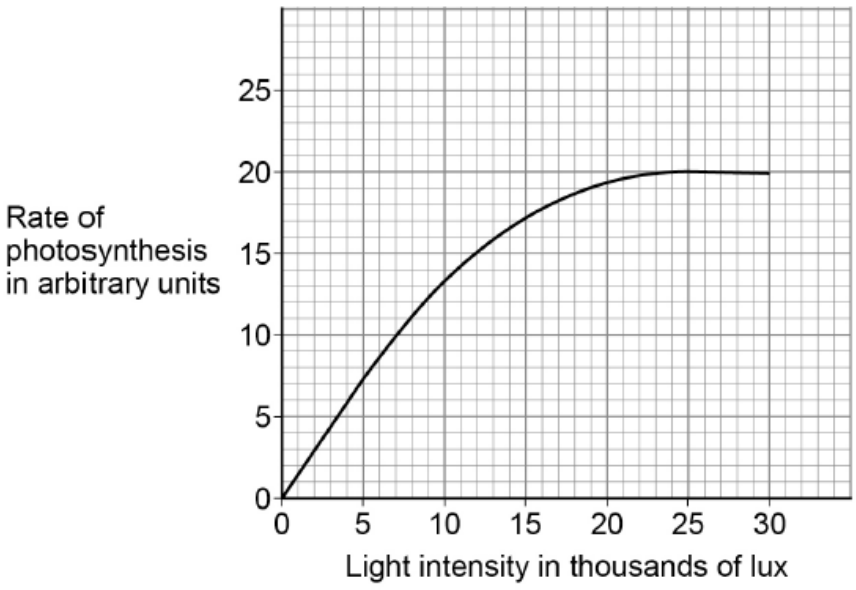
0 6 . 1 Complete the symbol equation for photosynthesis.

[1 mark]

6 _____ + 6 _____ → $C_6H_{12}O_6$ + 6 _____

Figure 8 shows how the rate of photosynthesis changes with light intensity.

Figure 8



0 6 . 2 Which part of the graph could be represented by the equation $y = mx + c$?

[1 mark]

Tick (✓) **one** box.

From 0 to 5 000 lux ☐

From 10 000 to 15 000 lux ☐

From 15 000 to 20 000 lux ☐

From 20 000 to 25 000 lux ☐

A student investigated the effect of colour of light on the rate of photosynthesis in leaves.

Figure 9 shows how the investigation was set up.

Figure 9

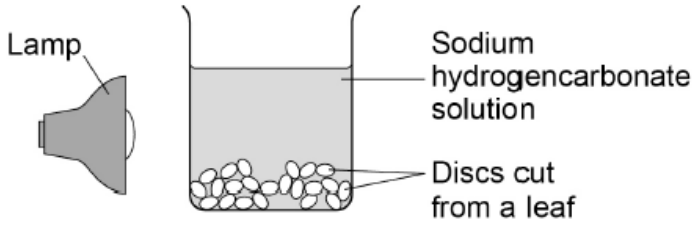


Table 5 shows the results.

Table 5

Colour of light	Time taken for 10 leaf discs to reach the surface of the solution in seconds
Blue	115
Green	831
Red	397

0 6 . 3 Give **one** way the student could change the colour of the light shining on the leaf discs.

[1 mark]

0 6 . 4 Give the independent variable and the dependent variable in this investigation.

[2 marks]

Independent variable _____

Dependent variable _____

0 6 . 5 All of the air had to be removed from the leaf discs before placing them in the beaker.

Suggest **one** reason why.

[1 mark]

0 6 . 6 The leaf discs were placed in a beaker of sodium hydrogencarbonate ($NaHCO_3$) solution.

Explain why sodium hydrogencarbonate solution was used instead of water.

[2 marks]

0 6 . 7 Explain why the leaf discs moved to the surface of the solution during the investigation.

[2 marks]

There are two types of chlorophyll in leaves.

Figure 10 shows the percentage of different wavelengths of light that the two types of chlorophyll absorb.

Figure 10

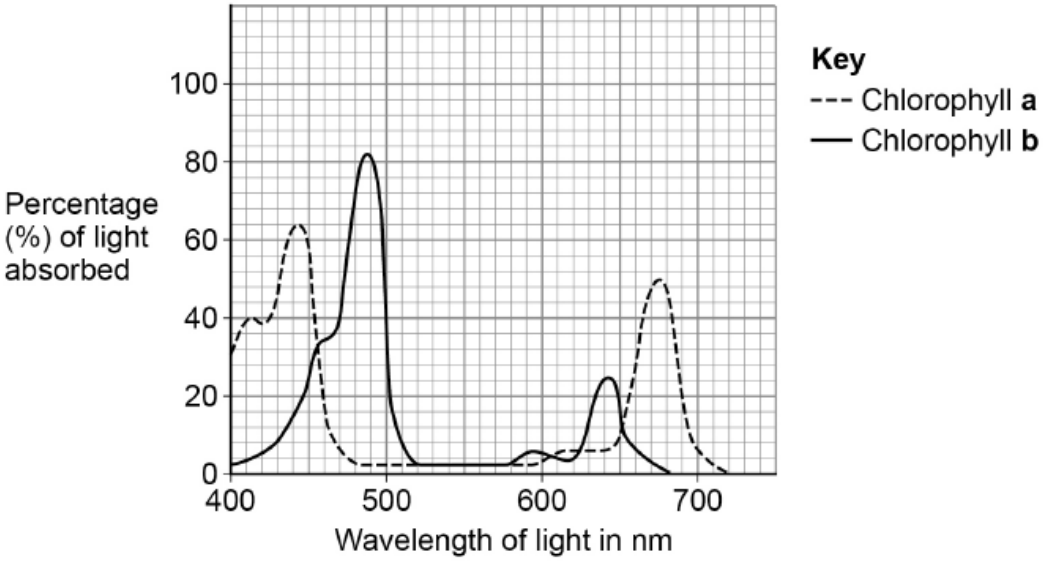


Table 6 shows the colour of different wavelengths of light.

Table 6

Range of wavelength of light in nm	380 – 435	450 – 499	500 – 570	571 – 590	620 – 720
Colour of light	violet	blue	green	yellow	red

0 6 . 8 Suggest the advantage to a plant of having two types of chlorophyll.

[1 mark]

0 6 . 9 **Table 5** is repeated below.

Table 5

Colour of light	**Time taken for 10 leaf discs to reach the surface of the solution in seconds**
Blue	115
Green	831
Red	397

The leaf discs in the investigation are green.

Explain the results in **Table 5** for blue light and for green light.

Use data from **Figure 10** and **Table 6**.

[4 marks]