

Please write clearly in block capitals.

Centre number

--	--	--	--	--

Candidate number

--	--	--	--	--

Surname

Forename(s)

Candidate signature

I declare this is my own work.

GCSE COMBINED SCIENCE: TRILOGY

F

Foundation Tier
Biology Paper 1F

Time allowed: 1 hour 15 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.
- 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 maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use

Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	



JUN218464B1F01

IB/M/Jun21/E6

8464/B/1F

0 1

Cells are the building blocks of life.

0 1 . 1

Draw **one** line from each type of organism to the diagram of one of its cells.

[3 marks]

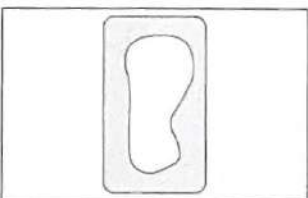
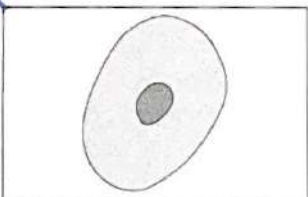
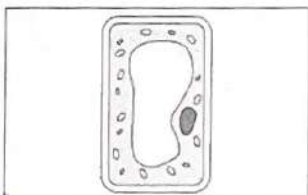
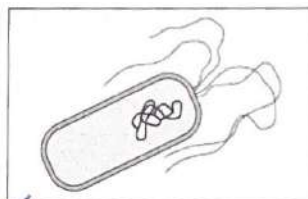
Type of organism

Diagram of one cell

Animal

Bacterium

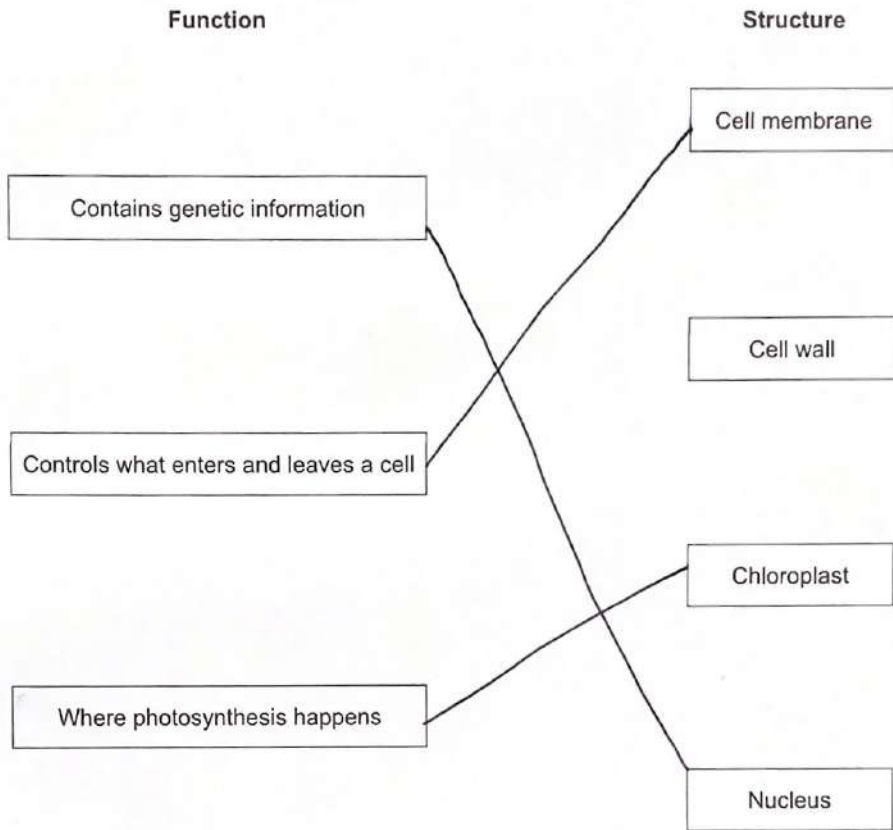
Plant



0 1 . 2 Cells contain structures. These structures have different functions.

Draw **one** line from each function to the correct structure.

[3 marks]



Question 1 continues on the next page

Turn over ►



0 1 . 3 Chemicals are produced in cells.

Complete the sentences.

Choose answers from the box.

[4 marks]

cellulose

DNA

glycogen

starch

urea

A chemical excreted by animals is urea.

A chemical stored in animal cells is glycogen.

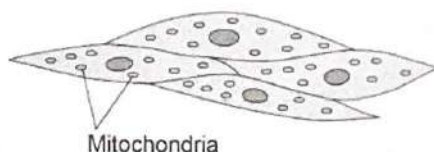
A chemical stored in plant cells is starch.

A chemical that strengthens plant cell walls is cellulose.



Figure 1 shows a diagram of muscle cells.

Figure 1



0 1 . 4 Give one function of muscle cells.

[1 mark]

They are able to contract and get shorter
or relax to get longer, hence allowing movement.

0 1 . 5 Explain how muscle cells are adapted for their function.

Use Figure 1.

[2 marks]

They contain many mitochondria which are
involved in respiration releasing energy stored
as chemical energy in glucose into movement
energy, allowing muscle cells to contract.

Question 1 continues on the next page

Turn over ►



0 1 . 6

One muscle cell was 0.05 mm wide.

When viewed using a microscope the image of the muscle cell was 2 mm wide.

Calculate the magnification used to view the cell.

Use the equation:

$$\text{magnification} = \frac{\text{width of image}}{\text{width of real cell}}$$

[2 marks]

width of real cell = 0.05mm

width of image = 2mm

no need to measure anything as all measurements
are already given.

$$\text{Magnification} = \times \quad 40$$

15

Substitute values into formula:

$$\text{magnification} = \frac{2\text{mm}}{0.05\text{mm}} = \underline{\underline{40}}$$

No units as mm's on top of the fraction
cancel out with the mm's on the bottom

Magnification never has a unit.



0 2

Antibiotics are used to treat bacterial infections.

0 2 . 1

Which substance is used as an antibiotic?

[1 mark]

Tick (✓) **one** box.

Aspirin

☐

Digitalis

☐

Penicillin

☒

Gonorrhoea and chlamydia are two sexually transmitted infections.

Gonorrhoea and chlamydia infections can be treated with antibiotics.

0 2 . 2

Give **one** symptom of gonorrhoea.

[1 mark]

Yellow/green/white discharge from genitals (vagina/penis)
AND/OR pain when ~~po~~ urinating/peeing.



A scientist investigated which antibiotics were most effective at treating gonorrhoea and chlamydia.

This is the method used.

1. Grow gonorrhoea bacteria in a Petri dish.
2. Prepare four different antibiotic solutions, **A, B, C** and **D**, of the same concentration.
3. Cut four filter paper discs to the same size.
4. Soak each paper disc in a different antibiotic solution.
5. Put the four paper discs into the Petri dish.
6. Repeat steps 3 to 5 using a Petri dish with chlamydia bacteria growing in it.
7. Keep both Petri dishes at 25 °C for 3 days.

0 2 . 3

Give **two** control variables used in this investigation.

[2 marks]

- 1 The concentration of each antibiotic is the same.
- 2 Cutting paper discs from the same type of paper
- 3 Cutting discs to exactly the same size
- 4, All plates are kept at the same temperature while incubating.
- 5, All plates are left for the same amount of time to incubate.

Question 2 continues on the next page

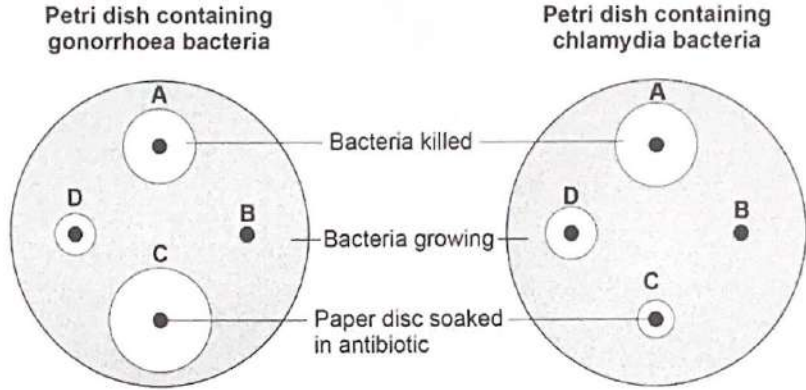
Turn over ►



Figure 2 shows the results.

A clear area around a paper disc is where the antibiotic has killed the bacteria.

Figure 2



0 2 . 4 Which antibiotic did **not** kill either type of bacterium?

[1 mark]

Tick (✓) **one** box.

A ☐ B ☒ C ☐ D ☐

There is no 'zone of inhibition' for B in either the gonorrhoea or the chlamydia petri dish. (the white circles).

0 2 . 5 Which antibiotic would be the most effective to treat a person with a **gonorrhoea** infection?

[1 mark]

Tick (✓) **one** box.

A ☐ B ☐ C ☒ D ☐

Has the largest 'zone of inhibition' by radius so killed gonorrhoea in the largest area.



0 2 . 6

Which antibiotic would be the most effective to treat a person who had both gonorrhoea and chlamydia infections?

[1 mark]

Tick (✓) one box.

A ☒B ☐C ☐D ☐

While C is very effective for gonorrhoea its rather ineffective for chlamydia. A is most effective for chlamydia and still very effective against gonorrhoea.

0 2 . 7

Antibiotics cannot be used to treat HIV infections.

Suggest one reason why.

[1 mark]

HIV is a virus and antibiotics are not effective in destroying or inhibiting them, they can be only used against bacteria.

Fungi can cause an infection of the fingernails and toenails.

Fungal nail infections can spread from one person to another person.

0 2 . 8

Some people go to nail salons to have their nails shaped and painted.

Suggest one way workers in nail salons can reduce the risk of infections being spread.

[1 mark]

Disinfecting tools and surfaces between clients reduces the direct contact. (use new tools/files)

OR

Refusing to work on people with fungal infections in the salon with their tools

Extension

0 2 . 9

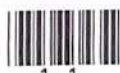
Suggest one reason why fungal infection of toenails is more common than fungal infection of fingernails.

[1 mark]

Feet are washed/cleaned less frequently than hands are, allowing for infection easier to establish.

OR

Feet are kept in socks and shoes often in warm and maybe even moist conditions. These are ideal conditions for fungal infections to establish. Hands are more exposed.

Turn over ►
IB/M/Jun21/B464/B/1F

~~less possible so less likely to get noticed initially~~

0 3

Anaerobic respiration in yeast is called fermentation.

The equation for fermentation is:



0 3 . 1

How does the equation show that fermentation is an anaerobic reaction?

[1 mark]

glucose doesn't react with oxygen, there is no oxygen present so it must be anaerobic.

Air consists of several gases, including oxygen, but only oxygen is used in aerobic respiration.

Fermentation in yeast is used in the manufacture of beer, wine and bread.

0 3 . 2

Why is fermentation used when making beer and wine?

[1 mark]

Yeast will convert anaerobically glucose to ethanol and carbon dioxide. Ethanol is a type of ~~alcohol~~ alcohol that creates the alcohol content of beer and wine.

0 3 . 3

Explain why fermentation is used when making bread.

[2 marks]

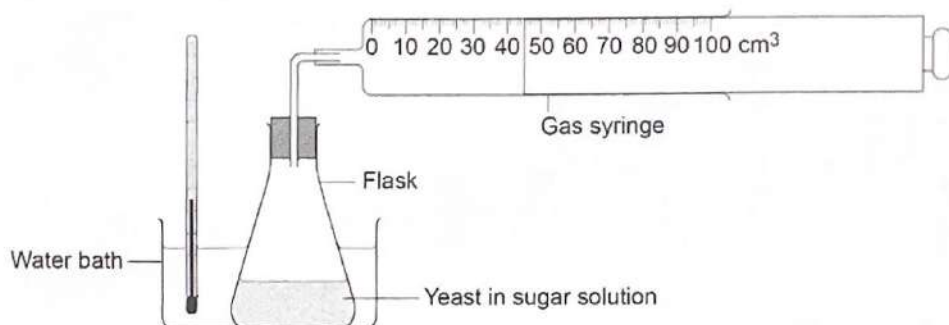
The production of carbon dioxide gas happens in the dough, ~~creation~~ making the it rise due to small bubbles of carbon dioxide in it. This results in a lighter bread.



A student investigated fermentation in yeast.

Figure 3 shows the apparatus.

Figure 3



This is the method used.

1. Mix yeast with sugar solution in a flask.
2. Put the flask in a water bath at 35 °C.
3. After 10 minutes attach a gas syringe to the flask.
4. Record the volume of carbon dioxide collected every 5 minutes for 1 hour.

0 3 . 4

What volume of carbon dioxide has been collected in the gas syringe in Figure 3?

[1 mark]

Volume of carbon dioxide = 45 cm³

That's how far the plunger has been pushed back.

0 3 . 5

Why did the student wait 10 minutes before attaching the gas syringe?

[1 mark]

Tick (✓) one box.

To allow time for the mixture to reach 35 °C
Need time for temperature to stabilise at 35°C

☒

To allow time for the sugar to dissolve
was already a sugar solution

☐

To allow time to draw a results table
should have done it prior to starting

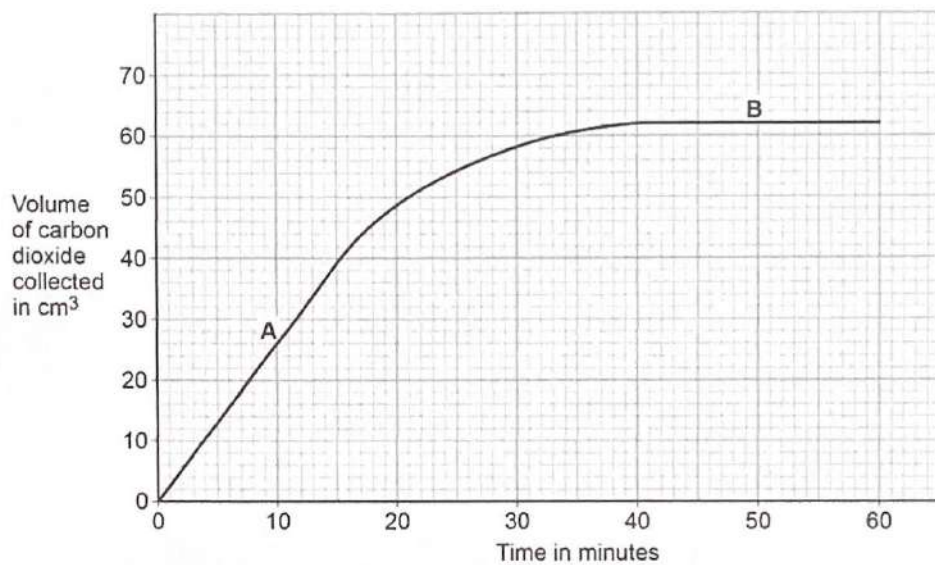
☐

Turn over ►



Figure 4 shows the results.

Figure 4



0 3 . 6 A and B are different parts of the graph in Figure 4.

Draw **one** line from each part of the graph to the description of the reaction.

[2 marks]

Part of the graph

Description of the reaction

A

Carbon dioxide is
not being produced

Carbon dioxide production is
fastest

B

Carbon dioxide production is
slowing down

Question 3 continues on the next page

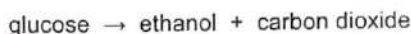
A- has a positive gradient, therefore as time passes the volume of CO_2 is increasing, hence CO_2 is being produced.

B- curve has plateaued, as time passes the volume of CO_2 does not increase with it, hence no more CO_2 is produced.

Turn over ►



The equation for fermentation is repeated here.



- 0 3 . 7 Suggest **one** reason why fermentation in the flask stopped.

[1 mark]

The yeast may have used up all of the glucose and converted it to ethanol and carbon dioxide, so there is no more glucose to convert.

OR

Extension

- 0 3 . 8 Fermentation is controlled by enzymes.

The investigation was repeated at 2 °C and at 75 °C.

No carbon dioxide was produced at either of these temperatures.

Suggest why **no** carbon dioxide was produced at 2 °C or at 75 °C.

[2 marks]

Reason at 2 °C Temp. is too low so the movement of particles is so slow there are no successful collisions that the enzyme can catalyse.

Reason at 75 °C Temp. is too high so enzymes denatured, changing their active site, so they can no longer catalyse the reaction.

- 0 3 . 9 Anaerobic respiration also happens in animal cells.

Complete the equation for anaerobic respiration in animal cells.

Choose answers from the box.

[2 marks]

carbon dioxide

ethanol

glucose

lactic acid

water

glucose → lactic acid

Due to the lack of oxygen no carbon dioxide is produced



0 4

This question is about plant transport systems.

0 4 . 1

Which **organ** in a plant absorbs water from the soil?

[1 mark]

roots

Roots are the organ, Root hairs are ^a the tissue and root hair cells are cells making up the tissue.

0 4 . 2

The concentration of nitrate ions in the soil is lower than the concentration of nitrate ions inside a plant.

How would the nitrate ions move from the soil into the cells of this plant?

[1 mark]

Tick (✓) **one** box.

By active transport

☒

By diffusion

☐

By osmosis

☐

Transport against a concentration gradient requires energy, which is active transport.



Dissolved sugars are transported in the phloem.

0 4 . 3

What is the name of the process that moves dissolved sugars through the phloem?

[1 mark]

Tick (✓) **one** box.

Evaporation

☐

Osmosis

☐

Translocation

☒

Translocation move substances
like sugars up and down
the plant.

0 4 . 4

Give **one** use of sugars in a plant.

[1 mark]

Use in respiration to release energy for growth and
repair.

OR

Produce starch for storage

Question 4 continues on the next page

OR

Produce cellulose for structure

OR

Convert to amino acids or fats

Turn over ►

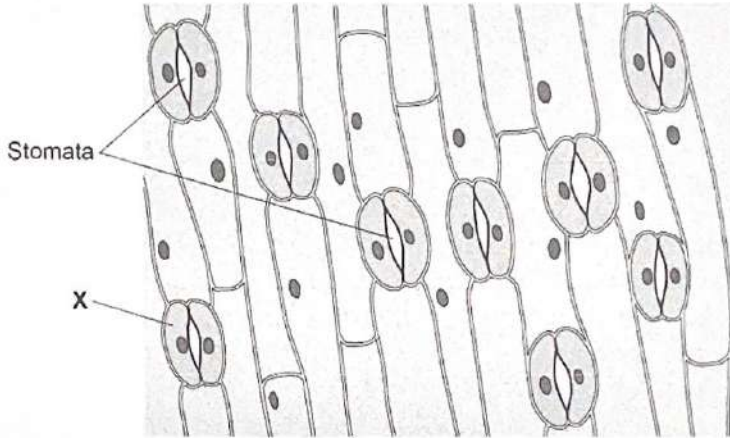


Stomata are openings on the surface of a leaf.

Stomata allow gases to move into and out of a leaf.

Figure 5 shows the surface of a leaf.

Figure 5



0 4 . 5 What is cell X?

[1 mark]

Tick (✓) one box.

Guard cell

☒

Meristem cell

☐

Palisade cell

☐

Cells found on
either side of the
stomata are known
as 'guard cells'



0 4 . 6

Why do the stomata open during the day?

[1 mark]

Tick (✓) **one** box.

To allow carbon dioxide in

☒

To allow nitrogen in

☐

To allow oxygen in

☐

Carbon dioxide needs
to move in as it's
a reactant in photosynthesis.

0 4 . 7

The area of the leaf shown in **Figure 5** is 0.25 mm^2 .Calculate the number of stomata per mm^2 for the leaf in **Figure 5**.

Use the equation:

$$\text{number of stomata per mm}^2 = \frac{\text{number of stomata}}{\text{area in mm}^2}$$

[2 marks]

$$\text{Area} = 0.25 \text{ mm}^2$$

no. of stomata counted from picture: 9

substitute values into equation

$$\text{Number of stomata per mm}^2 = 36$$

$$\text{number of stomata per mm}^2 = \frac{9}{0.25} = 36$$

No need for units as it's the number of stomata.

Question 4 continues on the next page

Turn over ►



A student investigated the number of stomata per mm^2 on the upper and lower surfaces of leaves.

The leaves were taken from the same plant.

Table 1 shows the results.

Table 1

Leaf	Number of stomata per mm^2	
	Upper surface	Lower surface
1	0	37
2	1	36
3	2	30
4	1	32
5	1	35
Mean	1	X

0 4 . 8 Calculate mean value X in Table 1.

[2 marks]

$$\text{Mean} = \frac{\text{total number of stomata on all leaves}}{\text{number of leaves}}$$

$$\text{Mean} = \frac{37 + 36 + 30 + 32 + 35}{5} = \underline{\underline{34}}$$

$$X = \underline{\underline{34}}$$



0 4 . 9

Water vapour is lost through stomata.

Explain the difference in the number of stomata on the upper and lower surfaces of the leaves.

~~in relation to water loss~~

Use Table 1.

[3 marks]

There are fewer stomata on the upper surface than on the lower surface. The upper surface is more exposed to light and wind, so will be warmer and drier. As there is less stomata on the upper surface less water will be lost.

13

Turn over for the next question

Turn over ►



0 5

Plants absorb light for photosynthesis.

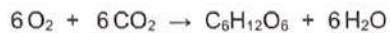
0 5 . 1

Which is the equation for photosynthesis?

[1 mark]

Tick (✓) **one** box.☐☒

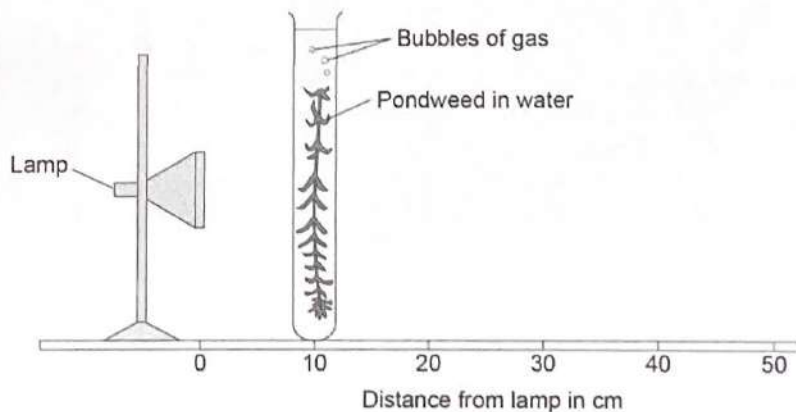
6 carbon dioxide + 6 water
→ glucose + 6 oxygen

☐☐

A student investigated the effect of light intensity on the rate of photosynthesis.

Figure 6 shows the apparatus.

Figure 6



This is the method used.

1. Set up the apparatus as shown in **Figure 6**.
2. Place the pondweed 10 cm away from the lamp.
3. Switch on the lamp.
4. Record the number of bubbles of gas produced in 5 minutes.
5. Repeat steps 2 to 4 with the pondweed at different distances from the lamp.

0 5 . 2 What was the independent variable in this investigation?

[1 mark]

Tick (✓) **one** box.

Distance of the pondweed from the lamp

☒

Length of the piece of pondweed

☐

Number of bubbles of gas produced

☐

Time taken to collect the gas

☐

*This is the variable
that is getting
changed
between treatments.*

Question 5 continues on the next page

Turn over ►



The lamp gets warm when it is on. This causes the temperature of the water to increase.

- 0 5 . 3 Explain how an increase in temperature would affect the results of this investigation. [2 marks]

Photosynthesis is controlled by enzymes, so in increased temperature they will work faster, leading to a faster rate of photosynthesis. So, more bubbles will be produced.

~~Could mean change in treatment is not only due to distance from the lamp (light intensity and heat)~~

- 0 5 . 4 Suggest one way the investigation could be improved so the temperature of the water does not increase. [1 mark]

Either place a beaker of water between the lamp and the tube or place the tube inside a temperature controlled beaker.

- 0 5 . 5 Suggest two improvements to the investigation so the results would be more valid. Do not refer to controlling the temperature of the water. [2 marks]

- 1 Carry out repeats, so ~~a mean~~ anomalies can be identified and excluded and mean can be calculated.
- 2 Use the same lamp ~~so it~~ and bulb so it produces the same light intensity

OR

Have a controlled amount of carbon dioxide concentration in the tube available to the pondweed to use.

OR

Measure the exact volume of gas produced as bubbles may have different ~~sizes~~ volumes.



Table 2 shows the results.

Table 2

Distance of pondweed from the lamp in cm	Number of bubbles of gas produced in 5 minutes
10	120
20	56
30	31
40	16
50	10

- 0 5 . 6 Calculate the rate of photosynthesis when the pondweed was 40 cm from the lamp.

Give the rate of photosynthesis as the number of bubbles of gas produced per minute.

[1 mark]

no. of bubbles in 5 min = 16

no. of bubbles in 1 min = $\frac{\text{no. of bubbles in 5 min}}{5} = \frac{16}{5} = 3.2 \Rightarrow 3$

Rate = 3 bubbles of gas produced per minute

Round to 3 as cant have 0.2 bubbles.

- 0 5 . 7 Give one conclusion that can be made from Table 2.

[1 mark]

~~As light intensity decreases distance from the lamp~~

A light intensity decreases the rate of photosynthesis decreases. So light intensity has a direct effect on photosynthesis.

~~light intensity? or distance?~~

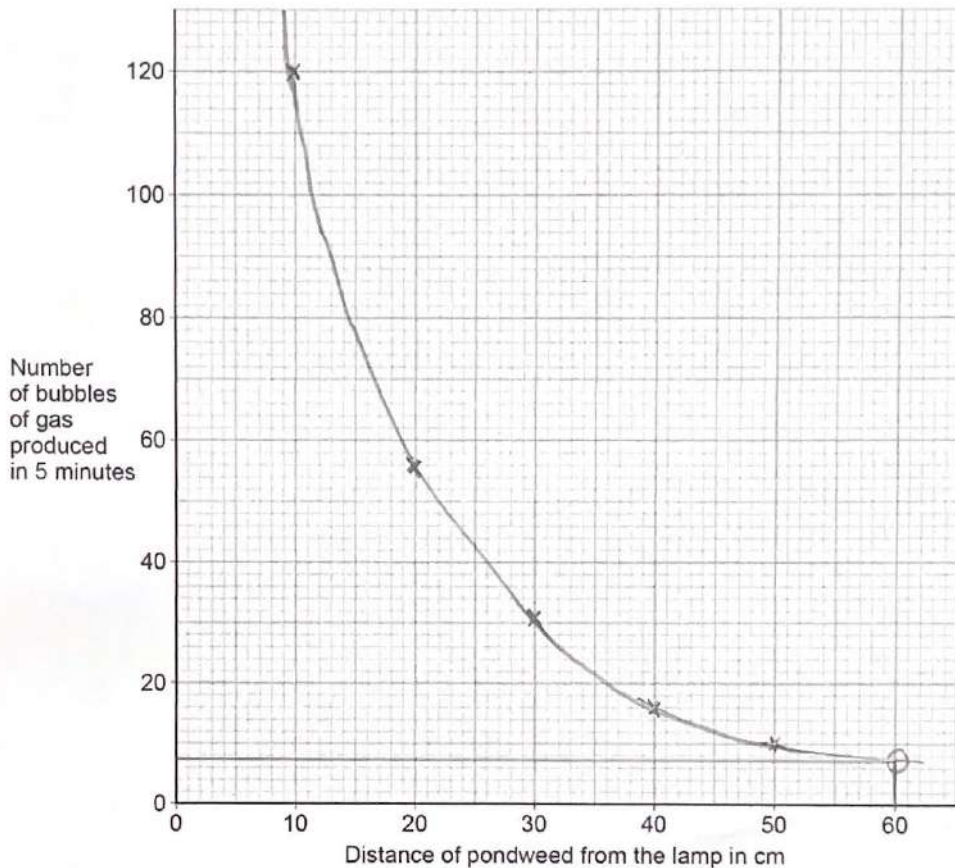


0 5 . 8 Plot the data from Table 2 on Figure 7.

Draw a line of best fit.

[3 marks]

Figure 7



0 5 . 9 Predict the number of bubbles that would be produced in 5 minutes if the pondweed was 60 cm from the lamp.

Use Figure 7.

[1 mark]

Number of bubbles produced in 5 minutes = 8

13

Extend graph line and read off at 60

Turn over ►



0 6

Describe how to test a sample of food for protein, starch and sugar.

Give the colours that would be seen if the food sample contained protein, starch and sugar.

[6 marks]

Biuret's Iodine Benedict's

To test for protein

For all 3 test the food sample has to be grinded up so it can be mixed with each reagent.

- For protein, Biuret's reagent needs to be added to the food sample. This is a light blue solution that will turn purple/lilac if protein is present.
- For starch, iodine solution is added to the sample. If starch is present the orange/brown iodine will turn blue/black.
- For sugars we need to use Benedict's reagent. The food sample is grinded food sample is mixed with water and Benedict's reagent is added to it. The mixture needs to be heated (to above 65°C) in a water bath. If sugar is present the light blue Benedict's reagent will change colour to green to yellow to orange to brick red. The more sugar is present the more red will the colour be.

6

END OF QUESTIONS



Question number	Additional page, if required. Write the question numbers in the left-hand margin.
02.8	<p>OR</p> <p>Wear new gloves for each client or disinfect hands between clients.</p> <p><i>Prose?</i></p>
03.7	<p>The high level level of ethanol produced got to high for the yeast so it died.</p>

