



**ST MARY'S SCIENCE
DEPARTMENT:
BIOLOGY**

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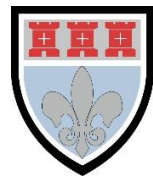
**GCSE COMBINED SCIENCE
HOMEWORK BOOK
TOPIC 5: PLANTS
STUDENT BOOK**

YOU MUST ANSWER ALL THREE SECTIONS IN EACH PART OF THE HOMEWORK TASKS

NAME	
CLASS	
TEACHER	
FORM	

TASK	MARK	GRADE
1		
2		
3		
4		
OVERALL		

**GCSE
BIOLOGY
YEAR 10
TOPIC 1**



HOMEWORK SCHEDULE

Please use the following table to ensure each homework task is completed and submitted on time.

Carrying out these homework tasks can only increase your ability to gain a high grade in the GCSE examinations.

Failure to hand in work on time will lead to sanctions to complete this work.

Task	Submission Date	Completed?	On Time?
Task 1 Plant Tissues			
Task 2 Plant Organ Systems			
Task 3 Photosynthesis			
Task 4 Photosynthesis Investigation			



SCIENCE DEPARTMENT MARKING CODE

ID = Insufficient detail in answer

W = Wrong understanding of science

IR = Irrelevant information given.

V = This is too vague to get a mark.

AQ = Answer the question asked

R = Read the question/information

M = Maths mistake

BOD = Benefit of the doubt given.

E = Explain the answer further please.

U = Wrong units used.

SF = Wrong significant figures used.

SP = Wrong spelling of a technical term

SR = Same reason given more than once.

A circle means this lost you marks

An underline means this gained you marks

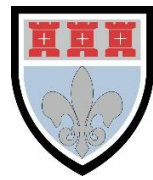
PLEASE READ

This homework booklet has made with custom selected examination questions and activities to assess your understanding in the concepts covered in class. This will increase your familiarity with the style of examination questions.

Carrying out these questions can only increase your ability to gain a high grade in the GCSE examination.

Thank you for your hard work in completing this book, and good luck.

Mr. Turnbull

**TASK 1: PLANT TISSUES****SPEC CHECK**

Content	Achieved?
<p>Students should be able to explain how the structures of plant tissues are related to their functions.</p> <p>Plant tissues include:</p> <ul style="list-style-type: none">• Epidermal tissues• Palisade mesophyll• Spongy mesophyll• Xylem and phloem• Meristem tissue found at the growing tips of shoots and roots. <p>The leaf is a plant organ. Knowledge limited to epidermis, palisade and spongy mesophyll, xylem and phloem, and guard cells surrounding stomata.</p>	

Target Setting

In this assessed piece of work, what target should I look to achieve in completing this task?
Please refer to your marking feedback for your target.

From your previous work, fill in the following boxes with your personal progress in Physics.

What Topics Do I Know Well?

What Topics Do I Need to Revise?



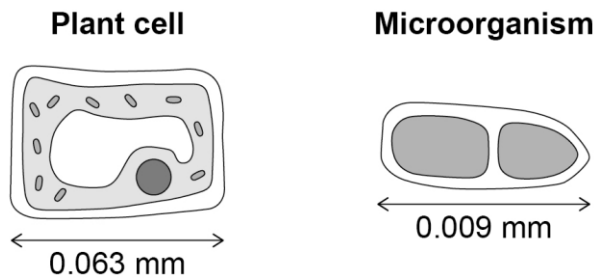
SECTION A

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. Figure 6 shows a plant cell and the microorganism that causes rose black spot.

Figure 6



Not to scale

1.1 Calculate how many times longer the plant cell is than the microorganism that causes rose black spot.

[1 mark]

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.....

Number of Times Longer =

1.2 The infected rose bush:

- Has yellow leaves
- Is not growing.

Explain why the rose bush is not growing.

[4 marks]

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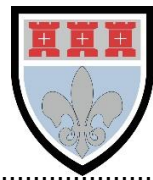
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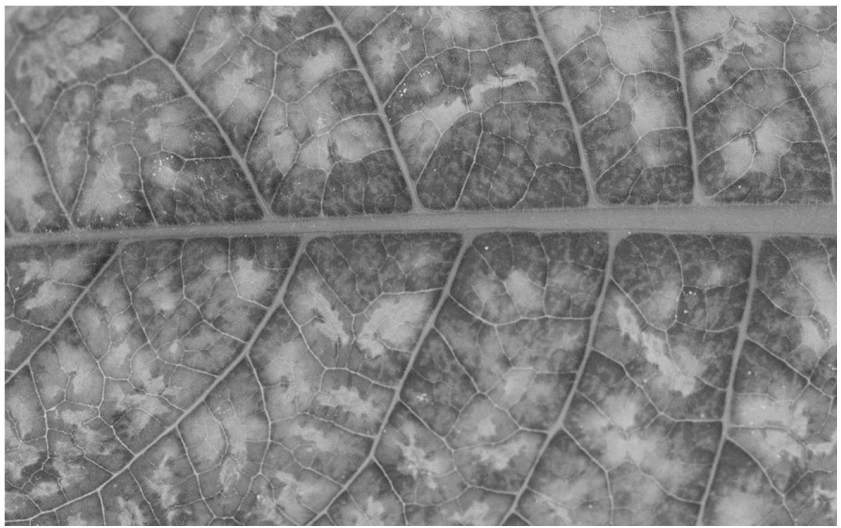
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Figure 7 shows part of a leaf from a tomato plant with a different plant disease.

Figure 7

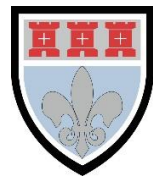


1.3 Name the plant disease shown in **Figure 7**.

[1 mark]

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.....



SECTION B

This is a question to revise understanding carried out in lesson.

You should aim to spend **10 minutes** answering this section.

1. The leaves of most plants have stomata.

1.1 Name the cells which control the size of the stomata.

[1 Mark]

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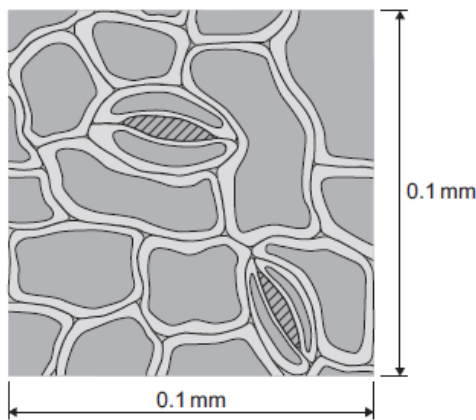
1.2 Give **one** function of stomata.

[1 Mark]

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1.3 **Figure 5** shows part of the surface of a leaf.

Figure 5



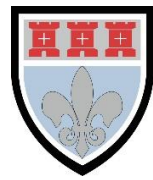
The length and width of this piece of leaf surface are both 0.1 mm.

Calculate the number of stomata per mm² of this leaf surface.

[2 Marks]

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.....
.....
.....
.....

Number of Stomata per mm = _____



1.4 A different plant species has 400 stomata per mm² of leaf surface. Having a large number of stomata per mm² of leaf surface can be a disadvantage to a plant.

Give **one** disadvantage.

[1 Mark]

.....

.....

1.5 A student investigated the loss of water from plant leaves. The student did the following:

Step 1: took ten leaves from a plant

Step 2: weighed all ten leaves

Step 3: hung the leaves up in a classroom for 4 days

Step 4: weighed all ten leaves again

Step 5: calculated the mass of water lost by the leaves

Step 6: repeated steps **1** to **5** with grease spread on the upper surfaces of the leaves

Step 7: repeated steps **1** to **5** with grease spread on both the upper and lower surfaces of the leaves.

All the leaves were taken from the same type of plant.

Table 2 shows the student's results.

Table 2

Treatment of leaves	Mass of water the leaves lost in g
No grease was used on the leaves	0.98
Grease on upper surfaces of the leaves	0.86
Grease on upper and lower surfaces of the leaves	0.01

1.6 What mass of water was lost in 4 days through the upper surfaces of the leaves?

[1 Mark]

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1.7 Very little water was lost when the lower surfaces of the leaves were covered in grease.

Explain why.

[3 Marks]

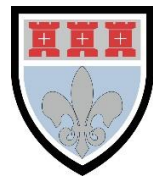
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SECTION C

This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1. A group of students were investigating the number of stomata present on different leaves on a plant. To do this they coated a section of the leaf in nail varnish. They then peeled off the varnish and examined it under the microscope.

1.1 What is the name of the cells that control the opening and closing of the stomata?

[1 Mark]

.....

.....

The results the students gained are shown in **Table 1**.

Table 1

Sample	Number of stomata in 1 mm ² view
A	7
B	8
C	10
D	1
E	9

1.2 Calculate the mean number of stomata per mm²

[2 Marks]

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One of the students made an error in his investigation. They took one of the samples from the upper surface of the leaf.

1.3 Identify which sample is from the upper surface of the leaf. Justify your answer.

[2 Marks]

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FEEDBACK SHEET

Overall Mark:	/24	<p>GRADE ACHIEVED:</p> <p>5 <input type="checkbox"/> 1 <input type="checkbox"/></p> <p>4 <input type="checkbox"/> U <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p>
Section A: Mark	/6	
Section B: Mark	/9	
Section C: Mark	/5	

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding
Strengths:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific)		<input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving	
Areas to Improve:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific)		<input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving	
Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	(your target)
Effort:	Poor	Inconsistent	Good	Excellent

To improve further you need to:

<ul style="list-style-type: none"> <input type="checkbox"/> Carry out independent revision. <input type="checkbox"/> Complete outstanding work. <input type="checkbox"/> Make corrections as indicated by the teacher. <input type="checkbox"/> Attend intervention for this topic <input type="checkbox"/> Include more information in responses. <input type="checkbox"/> Include more key words in responses. <input type="checkbox"/> Attend departmental revision sessions. <input type="checkbox"/> Read the questions carefully. <input type="checkbox"/> Explain your answers in more detail. <input type="checkbox"/> Carry out revision on Seneca Learning. 	<ul style="list-style-type: none"> <input type="checkbox"/> Revise the equations. <input type="checkbox"/> Check the units on answers. <input type="checkbox"/> Check the correct amount of sig figs on answers. <input type="checkbox"/> Check to convert values correctly. <input type="checkbox"/> Show your full working out. <input type="checkbox"/> Check your calculations. <input type="checkbox"/> Revise the science investigative skills. <input type="checkbox"/> Revise the key concepts of the topics. <input type="checkbox"/> Thoroughly check your work for mistakes. <p>Other:</p>
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Student response



TASK 2: PLANT ORGAN SYSTEMS

SPEC CHECK

Content	Achieved?
<p>Students should be able to explain how the structure of root hair cells, xylem and phloem are adapted to their functions.</p> <p>Students should be able to explain the effect of changing temperature, humidity, air movement and light intensity on the rate of transpiration.</p>	
<p>Students should be able to understand and use simple compound measures such as the rate of transpiration.</p>	
<p>Students should be able to:</p> <ul style="list-style-type: none"> • Translate information between graphical and numerical form • Plot and draw appropriate graphs, selecting appropriate scales for axes • Extract and interpret information from graphs, charts and tables. 	
<p>The roots, stem and leaves form a plant organ system for transport of substances around the plant.</p> <p>Students should be able to describe the process of transpiration and translocation, including the structure and function of the stomata.</p> <p>Root hair cells are adapted for the efficient uptake of water by osmosis, and mineral ions by active transport.</p> <p>Xylem tissue transports water and mineral ions from the roots to the stems and leaves. It is composed of hollow tubes strengthened by lignin adapted for the transport of water in the transpiration stream.</p> <p>The role of stomata and guard cells are to control gas exchange and water loss.</p> <p>Phloem tissue transports dissolved sugars from the leaves to the rest of the plant for immediate use or storage. The movement of food molecules through phloem tissue is called translocation.</p> <p>Phloem is composed of tubes of elongated cells. Cell sap can move from one phloem cell to the next through pores in the end walls.</p>	



SECTION A

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. Plant roots absorb water from the soil by osmosis.

1.1 What is osmosis?

[3 Marks]

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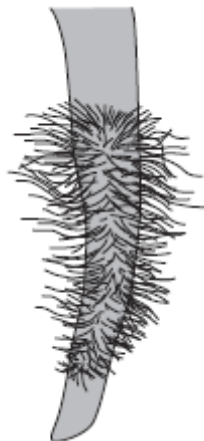
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The image below shows part of a plant root.



The plant root is adapted for absorbing water from the soil.

1.2 Use information from the diagram to explain how this plant root is adapted for absorbing water.

[3 Marks]

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SECTION B

This is a question to revise understanding carried out in lesson.

You should aim to spend **10 minutes** answering this section.

1. Substances are transported through plants.

Use the correct answer from the box to complete each sentence.

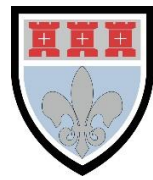
capillary	guard cells	phloem
stomata	transpiration	xylem

1.1 Water is transported from the roots to the stem of a plant in the _____.
[1 Mark]

1.2 Dissolved sugars are transported through the plant in the _____.
[1 Mark]

1.3 Movement of water through the plant is called the _____ stream.
[1 Mark]

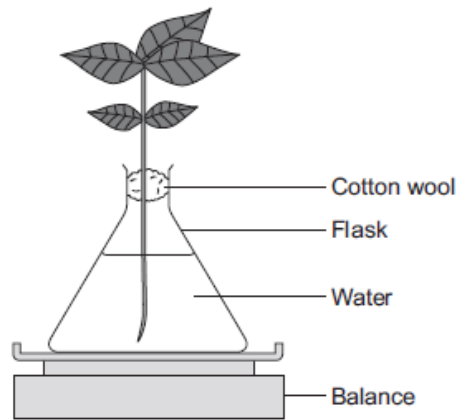
1.4 Water vapour moves out of the plant through pores called _____.
[1 Mark]



Students investigated the effect of different conditions on water loss from leaves.

The apparatus is shown in **Figure 1**.

Figure 1



The students set up four flasks, **A**, **B**, **C** and **D**.

The students:

- Used the same size plant shoot in each flask
- Recorded the mass of the flask and plant shoot at the start of each experiment
- Left each flask and plant shoot in different conditions
- Recorded the mass of each flask and plant shoot after 2 hours.

Table 1 shows the conditions that flasks **A**, **B**, **C** and **D** were left in for 2 hours.

Table 1

Flask	Temperature in °C	Fan or no fan
A	20	No Fan
B	20	Fan
C	35	No Fan
D	35	Fan

1.5 Suggest why the students used cotton wool in each flask.

[1 Mark]

.....

.....

.....



1.6 The use of the same size of plant shoot made the investigation a fair test.

Explain why.

[2 Marks]

.....

.....

.....

1.7 Table 2 shows the students' results.

Table 2

Flask	Conditions		Mass at the start in grams	Mass after 2 hours in grams	Mass of water lost in 2 hours in grams
	Temperature in °C	Fan or no fan			
A	20	No Fan	150.0	148.1	1.9
B	20	Fan	152.0	148.5	3.5
C	35	No Fan	149.0	145.9	3.1
D	35	Fan	150.0	145.5	

What mass of water was lost by the plant shoot in flask **D**?

[1 Mark]

.....

.....

.....

_____ grams

1.8 Suggest what conclusion can be made about the effect of temperature on water loss from the plant shoot.

[1 Mark]

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.....

.....



1.9 Suggest what conclusion can be made about the effect of the fan on water loss from the plant shoot.

[1 Mark]

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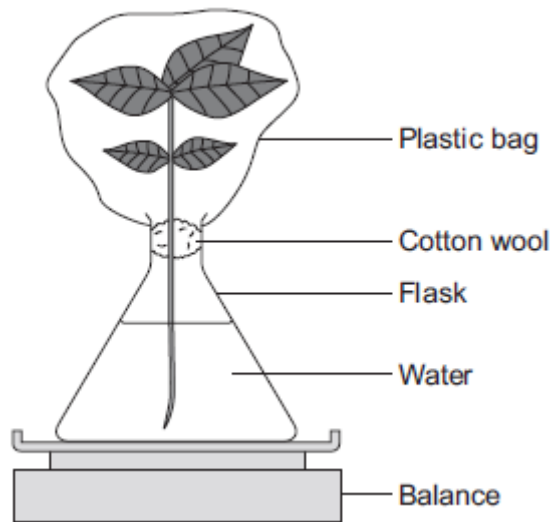
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The students carried out another experiment at 20 °C, with no fan.

The students used the apparatus in **Figure 2**.

Figure 2



In this experiment, the students:

- Recorded the mass of the flask and plant shoot before tying the plastic bag around the plant shoot
- Removed the bag after 2 hours and recorded the mass again.

1.10 What mass of water would be lost from the plant shoot in 2 hours?

Draw a ring around the correct answer.

[1 Mark]

- 0.3 g 1.9 g 3.9 g**

1.11 Give a reason for your answer to part **1.10**

[1 Mark]

.....

.....

.....



SECTION C

This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1. A student used a potometer to measure the rate of water uptake by a plant cutting.

Figure 1 shows the potometer she used.

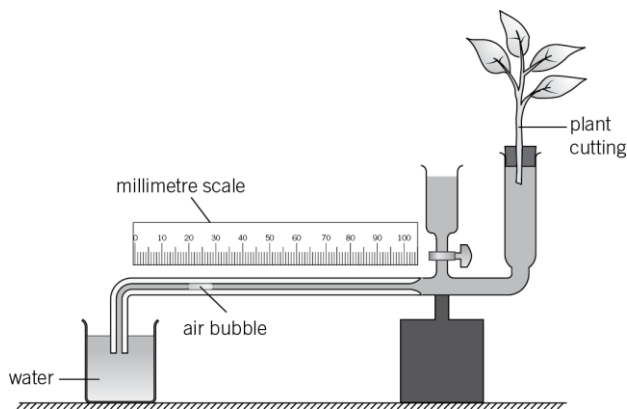


Figure 1

The student set up the potometer under three different conditions:

- A** no wind at 15 °C
- B** no wind at 25 °C
- C** wind at 25 °C

For each investigation the student measured how far the air bubble moved along the scale in 2 minutes.

1.1 State the **two** independent variables the student investigated?

[2 Marks]

Variable 1

.....

Variable 2

.....

1.2 State **two** variables that the student controlled.

[1 Mark]

.....

.....

1.3 Predict which plant, **A**, **B**, or **C**, would take up water the fastest.

[1 Mark]

.....



FEEDBACK SHEET

Overall Mark:	/22	<p>GRADE ACHIEVED:</p> <p>5 <input type="checkbox"/> 1 <input type="checkbox"/></p> <p>4 <input type="checkbox"/> U <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p>
Section A: Mark	/6	
Section B: Mark	/12	
Section C: Mark	/4	

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding
Strengths:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific)		<input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving	
Areas to Improve:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific)		<input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving	
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Student response



TASK 3: PHOTOSYNTHESIS

SPEC CHECK

Content	Achieved?
<p>Photosynthesis is represented by the equation:</p> $\text{carbon dioxide} + \text{water} \xrightarrow{\text{light}} \text{glucose} + \text{oxygen}$ <p>Students should recognise the chemical symbols: CO_2, H_2O, O_2 and $\text{C}_6\text{H}_{12}\text{O}_6$.</p> <p>Students should be able to describe photosynthesis as an endothermic reaction in which energy is transferred from the environment to the chloroplasts by light.</p>	
<p>Students should be able to explain the effects of temperature, light intensity, carbon dioxide concentration, and the amount of chlorophyll on the rate of photosynthesis.</p> <p>Students should be able to:</p> <ul style="list-style-type: none"> • Measure and calculate rates of photosynthesis • Extract and interpret graphs of photosynthesis rate involving one limiting factor • Plot and draw appropriate graphs selecting appropriate scale for axes • Translate information between graphical and numeric form 	
<p>The glucose produced in photosynthesis may be:</p> <ul style="list-style-type: none"> • Used for respiration • Converted into insoluble starch for storage • Used to produce fat or oil for storage • Used to produce cellulose, which strengthens the cell wall • Used to produce amino acids for protein synthesis. <p>To produce proteins, plants also use nitrate ions that are absorbed from the soil.</p>	



SECTION A

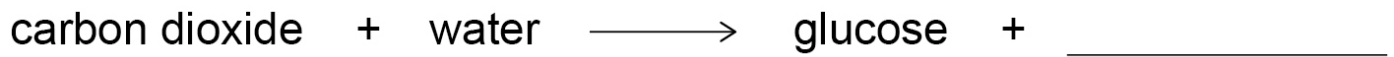
This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. Plants can photosynthesise.

1.1 Complete the word equation for photosynthesis.

[1 mark]



1.2 Light is needed for photosynthesis.

Name the green pigment that absorbs light for photosynthesis.

[1 mark]

.....
.....

1.3 Plants need carbon dioxide, water and energy for photosynthesis.

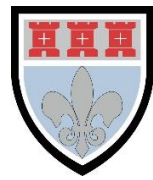
Complete the sentences.

[3 marks]

Carbon dioxide is obtained from the

Plant roots obtain water from the

The energy for photosynthesis is from the



A rose bush has a disease called rose black spot.

1.4 What type of microorganism causes rose black spot?

[1 mark]

Tick **one** box.

- Bacterium
- Fungus
- Protist
- Virus

1.5 Give **two** ways to prevent the spread of rose black spot to a different rose bush in the same area.

[2 marks]

Tick **two** boxes.

- Use a water spray to keep the leaves wet
- Move the diseased rose bush to a different area
- Remove the spotty leaves and burn them
- Treat the rose bush with antibiotics
- Give the rose bush liquid fertiliser



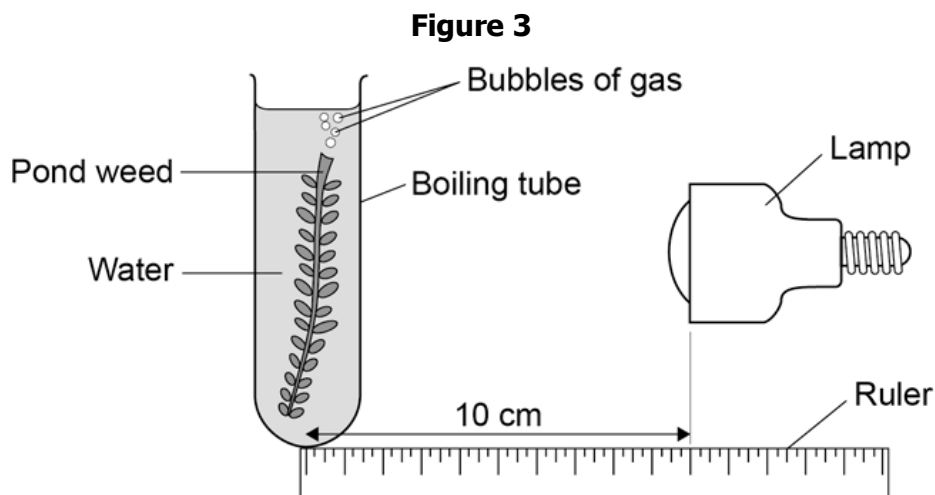
SECTION B

This is a question to revise understanding carried out in lesson.

You should aim to spend **10 minutes** answering this section.

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

Figure 3 shows the apparatus the student used.



This is the method used.

- 1.** Set up the apparatus as shown in **Figure 3**.
 - 2.** Place the lamp 10 cm from the pondweed.
 - 3.** Turn the lamp on and count the number of bubbles produced in one minute.
 - 4.** Repeat with the lamp at different distances from the pondweed.
- 1.1** Complete the hypothesis for the student's investigation.

[1 mark]

'As light intensity increases,

.....

.....



1.2 What was the independent variable in this investigation?

[1 mark]

Tick **one** box.

- Light intensity
- Number of bubbles produced
- Temperature
- Time

1.3 The teacher suggests putting the boiling tube into a beaker of water during the investigation. Suggest why this would make the results more valid.

[1 mark]

Table 1 shows the student's results.

Table 1

Distance of lamp from pondweed in cm	Number of bubbles produced per minute			
	Trial 1	Trial 2	Trial 3	Mean
10	67	66	69	67
20	61	64	62	62.3
30	53	51	52	X
40	30	32	31	31
50	13	15	15	14

1.4 Calculate value **X** in **Table 1**.

[1 mark]

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X = bubbles per minute



1.5 State **one** error the student has made when completing the results at 20 cm.

[1 mark]

1.6 What evidence in **Table 1** shows that the data is repeatable?

[1 mark]

Tick **one** box.

The number of bubbles decreases as distance decreases.

The numbers of bubbles at each distance are similar.

The student calculated a mean for each distance.

The student did the experiment three times.

Another student investigated the effect of the colour of light on the rate of photosynthesis.

The results are shown in **Table 2**.

Table 2

Colour of light	Rate of photosynthesis in arbitrary units
Blue	24
Green	4
Red	17
Yellow	8

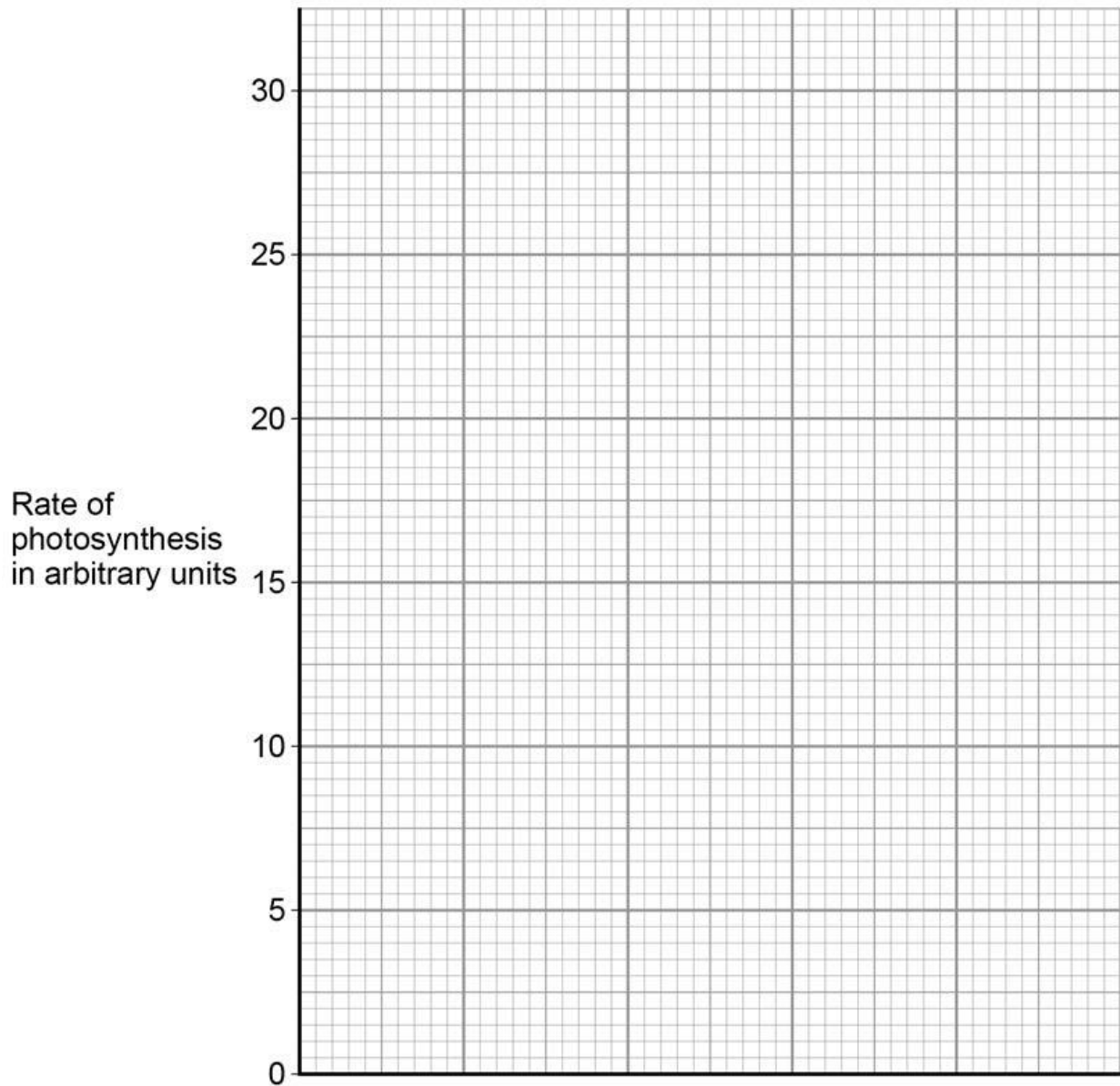


1.7 Plot the data from **Table 2** on **Figure 4**.

You should label the x-axis.

[3 marks]

Figure 4



1.8 Give **two** conclusions from your graph in **Figure 4**.

[2 marks]

Conclusion 1

.....
.....

Conclusion 2

.....
.....



1.8 The glucose produced in photosynthesis can be converted into amino acids to make new proteins for the plant.

Complete the sentences.

[3 marks]

The glucose produced in photosynthesis can also be used in other ways.

Glucose can be used in respiration to release

Glucose can be converted to cellulose to strengthen the

Glucose can be stored as



SECTION C

This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1. Gardeners use greenhouses to help their plants grow faster.

A gardener uses a heater to control the temperature of their greenhouse. The heater gives off carbon dioxide.

1.1 State how the heater helps to increase the growth of the plants.

[2 Marks]

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1.2 If the heater is left on for too long, the plants will die.

Explain why.

[2 Marks]

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1.3 State **one** adaptation of a leaf and describe how this adaptation helps a plant to photosynthesise.

[2 Marks]

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FEEDBACK SHEET

Overall Mark:	/28	<p>GRADE ACHIEVED:</p> <p>5 <input type="checkbox"/> 1 <input type="checkbox"/></p> <p>4 <input type="checkbox"/> U <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p>
Section A: Mark	/8	
Section B: Mark	/14	
Section C: Mark	/6	

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding
Strengths:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific)		<input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving	
Areas to Improve:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific)		<input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving	
Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	(your target)
Effort:	Poor	Inconsistent	Good	Excellent

To improve further you need to:

<ul style="list-style-type: none"> <input type="checkbox"/> Carry out independent revision. <input type="checkbox"/> Complete outstanding work. <input type="checkbox"/> Make corrections as indicated by the teacher. <input type="checkbox"/> Attend intervention for this topic <input type="checkbox"/> Include more information in responses. <input type="checkbox"/> Include more key words in responses. <input type="checkbox"/> Attend departmental revision sessions. <input type="checkbox"/> Read the questions carefully. <input type="checkbox"/> Explain your answers in more detail. <input type="checkbox"/> Carry out revision on Seneca Learning. 	<ul style="list-style-type: none"> <input type="checkbox"/> Revise the equations. <input type="checkbox"/> Check the units on answers. <input type="checkbox"/> Check the correct amount of sig figs on answers. <input type="checkbox"/> Check to convert values correctly. <input type="checkbox"/> Show your full working out. <input type="checkbox"/> Check your calculations. <input type="checkbox"/> Revise the science investigative skills. <input type="checkbox"/> Revise the key concepts of the topics. <input type="checkbox"/> Thoroughly check your work for mistakes. <p>Other:</p>
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Student response



TASK 4: PHOTOSYNTHESIS INVESTIGATION

SPEC CHECK

Content	Achieved?
<p>Photosynthesis is represented by the equation:</p> $\text{carbon dioxide} + \text{water} \xrightarrow{\text{light}} \text{glucose} + \text{oxygen}$ <p>Students should recognise the chemical symbols: CO_2, H_2O, O_2 and $\text{C}_6\text{H}_{12}\text{O}_6$.</p> <p>Students should be able to describe photosynthesis as an endothermic reaction in which energy is transferred from the environment to the chloroplasts by light.</p>	
<p>Students should be able to explain the effects of temperature, light intensity, carbon dioxide concentration, and the amount of chlorophyll on the rate of photosynthesis.</p> <p>Students should be able to:</p> <ul style="list-style-type: none"> • Measure and calculate rates of photosynthesis • Extract and interpret graphs of photosynthesis rate involving one limiting factor • Plot and draw appropriate graphs selecting appropriate scale for axes • Translate information between graphical and numeric form 	
<p>The glucose produced in photosynthesis may be:</p> <ul style="list-style-type: none"> • Used for respiration • Converted into insoluble starch for storage • Used to produce fat or oil for storage • Used to produce cellulose, which strengthens the cell wall • Used to produce amino acids for protein synthesis. <p>To produce proteins, plants also use nitrate ions that are absorbed from the soil.</p>	



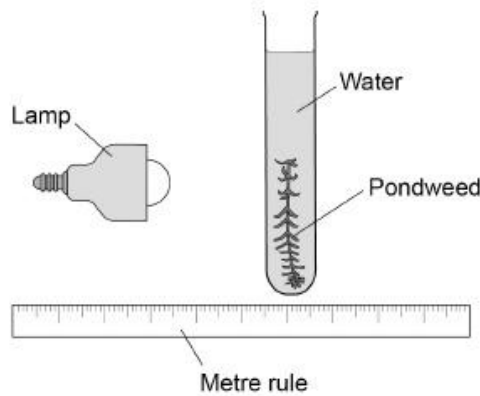
SECTION A

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. Students investigated the effect of light intensity on the rate of photosynthesis in pondweed.

The diagram shows the equipment the students used.



This is the method used.

- 1.** Place the lamp 50 cm from the pondweed.
- 2.** Count the number of bubbles of gas released in two minutes.
- 3.** Repeat steps **1–2** with the lamp at different distances from the pondweed.

1.1 The students could not make a firm conclusion because their method did not control enough variables.

Give **two** variables the students have **not** controlled that would affect the rate of photosynthesis.

[3 Marks]

Variable **1**

.....
.....

Variable **2**

.....
.....



The table shows the students' results.

Distance of lamp from the pondweed in cm	Number of bubbles released in two minutes				
	1	2	3	4	Mean
50	5	8	6	5	6
40	10	8	9	4	9
30	12	12	15	17	14
20	25	17	23	24	24
10	22	34	31	31	X

1.2 Calculate the mean rate of bubbles produced per minute when the lamp was 10 cm from the pondweed.

[3 Marks]

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Mean Rate = _____ bubbles per minute

1.3 The mean number of bubbles released when the lamp was 30 cm away from the plant was greater than when the lamp was 50 cm away.

How many times greater?

[1 Mark]

.....

.....

Number of Times Greater = _____



1.4 The students wanted to find out if different wavelengths of light affect the number of bubbles released. Describe how the method could be adapted to find the effect of different wavelengths of light.

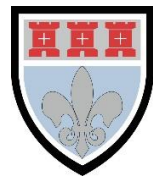
[2 Marks]

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SECTION B

This is a question to revise understanding carried out in lesson.

You should aim to spend **10 minutes** answering this section.

1. A student carried out the following investigation using a plant with variegated leaves. A variegated leaf has green and white stripes.

The student:

- 1.** Left the plant in the dark for 3 days to remove the starch
- 2.** Fixed two pieces of card to a leaf on the plant
- 3.** Left the plant in the light for 2 days
- 4.** Removed the leaf from the plant
- 5.** Tested the leaf for starch.

Figure 3 shows how the two pieces of card were attached to the leaf.

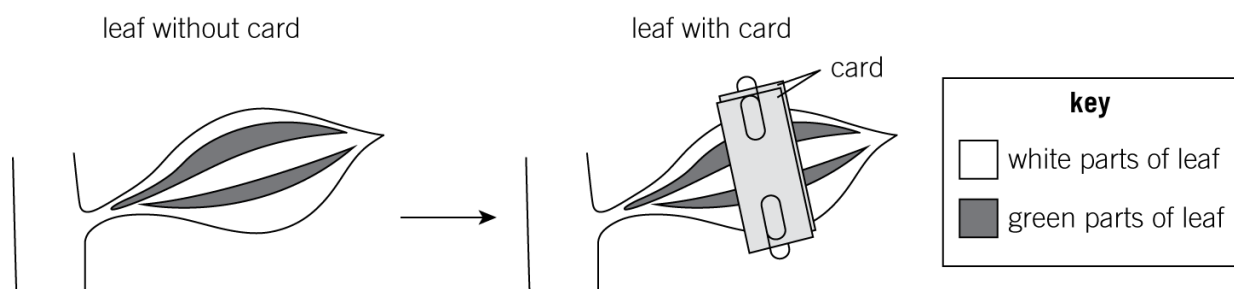


Figure 3

Figure 4 shows the same leaf after 2 days in the light.

The leaf has been tested for starch.

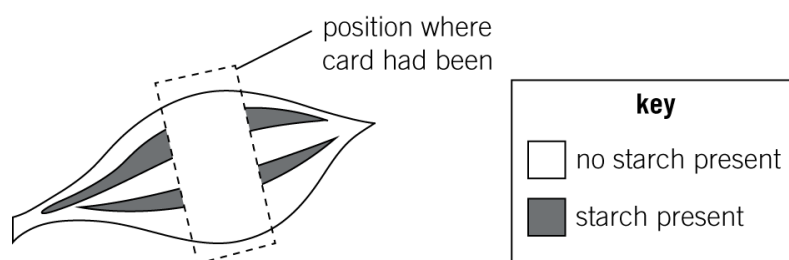
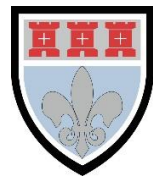


Figure 4



1.1 Give **two** conclusions from this investigation.

Tick **two** boxes.

[2 Marks]

- Carbon dioxide is needed for photosynthesis.
- Chlorophyll is needed for photosynthesis.
- Light is needed for photosynthesis.
- Water is needed for photosynthesis.

Scientists investigated the effect of light intensity on the rate of photosynthesis.

Figure 5 shows the scientists' results.

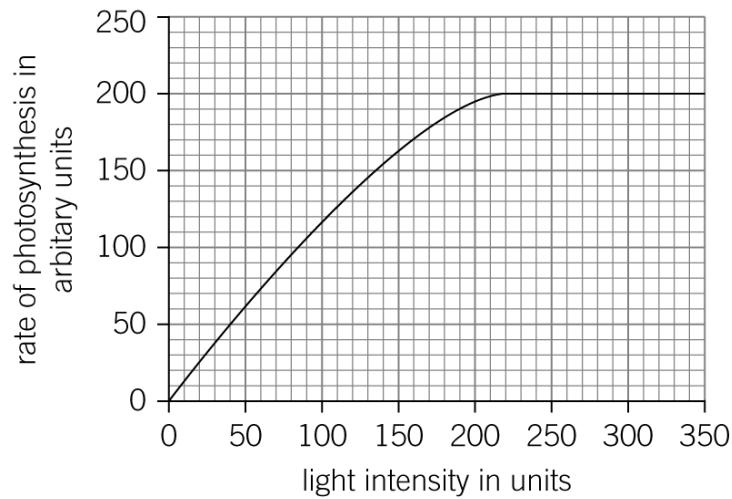


Figure 5

1.2 Describe the effect of increasing light intensity on the rate of photosynthesis.

You should include numbers from **Figure 5** in your description.

[3 Marks]

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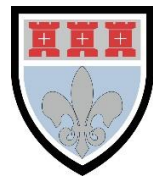
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1.3 At a light intensity of 250 units, light is **not** a limiting factor of photosynthesis.

What is the evidence for this in **Figure 5**?

[1 Mark]

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.....

1.4 Give **two** factors that could be limiting the rate of photosynthesis at a light intensity of 250 units.

[2 Marks]

Factor 1:

Factor 2:



SECTION C

This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1.1 Use the correct word to complete each sentence.

[2 Mark]

carbohydrase cellulose chlorophyll chloroplast

Photosynthesis transfers energy from the Sun into energy stored in glucose. The energy is absorbed by a green pigment called.....

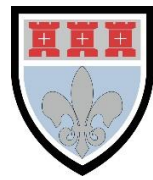
enzymes genes hormones

The rate of photosynthesis is affected by temperature. This is because the reaction is controlled by

A scientist investigated the effect of temperature on the rate of photosynthesis in one type of plant. The results are shown in **Table 1**.

Table 1

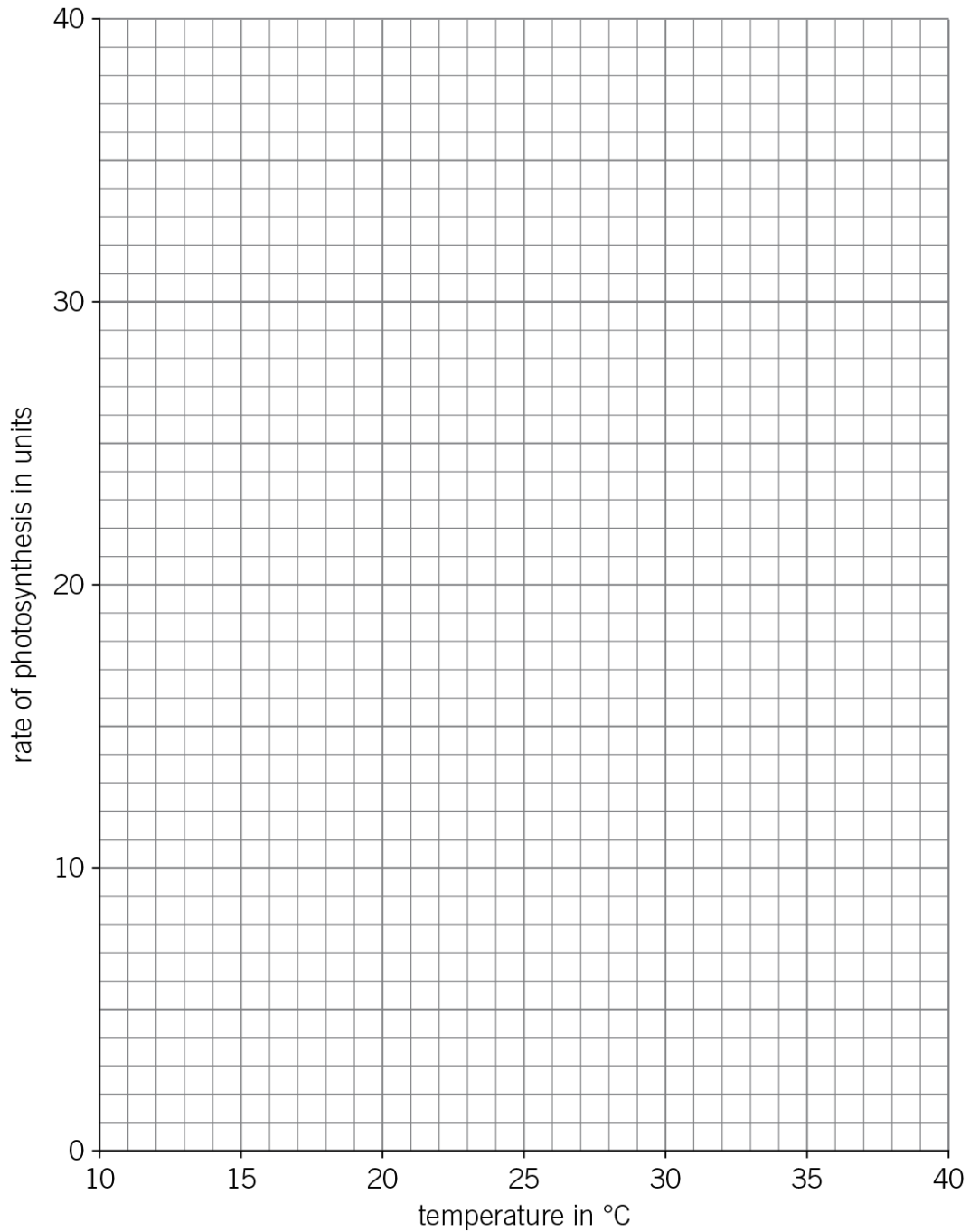
Temperature in °C	Rate of photosynthesis in units
10	3
15	4
20	9
25	29
30	34



1.2 Plot the results on the graph axes provided below.

Draw a line of best fit for your graph.

[3 Marks]



1.3 Use the graph to find the optimum temperature for photosynthesis in this plant.

[1 Mark]

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FEEDBACK SHEET

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Section A: Mark	/9	
Section B: Mark	/8	
Section C: Mark	/6	

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Student response



Acknowledgements

This document has been produced by Mr J Turnbull.

All relevant information has been credited in the document.

This document has been produced for educational purposes only.

This document has been produced for the AQA GCSE Science Specification.

