

BIOLOGY



KS3 SCIENCE EXAM PREPARATION STUDENT BOOK

PHOTOSYNTHESIS

Please complete all of these questions in this book and store this work in your student revision files.

This will provide a useful resource for revision.

Name	
Class	
Teacher	

Revision Question Book
KS3 Science

This book is suitable for
students carrying out the KS3
Science course



In the following book there are several questions based on KS3 Science. These questions are additional to the work which you do on in your lessons.

To gain the highest grade possible in KS3 Science it is recommended that you complete these questions at home or in revision sessions outside of lessons.

This will both familiarise yourself with both the concepts found in the syllabus and the examination technique found in examinations.

The mark scheme to the questions is integrated in the book for you to use independently.

To improve competency in answering questions on KS3 Science and achieve mastery in this module, answer all of these questions independently.

When you have completed your work in this book, please store this work in your student files.

Many thanks for all of your hard work in Science.

Mr. Turnbull

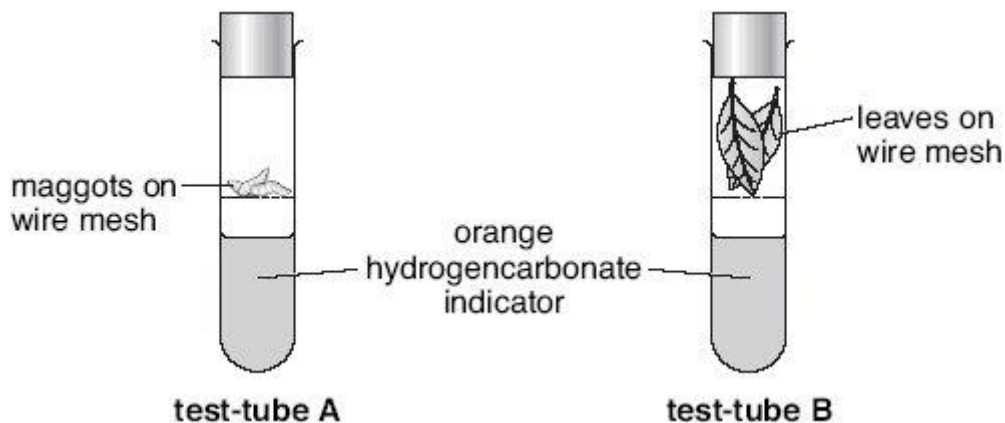


HIGHER TIER

1. The table shows how hydrogencarbonate indicator solution changes colour when the concentration of carbon dioxide in it changes.

concentration of carbon dioxide	colour change
increases	orange to yellow
decreases	orange to purple

Sunil set up the experiment shown below and put both test-tubes on a window-sill.



Use information in the table to help you answer the questions below.

The indicator in test-tube **A** changed from orange to yellow.

1.1 What process, in the cells of the maggots, caused this colour change?

[1 Mark]

.....

.....

1.2 Explain what happens in this process to cause the colour change.

[1 Mark]

.....

.....



The indicator in test-tube **B** changed from orange to purple.

1.3 What process, in the cells of the leaves, caused this colour change?

[1 Mark]

.....

.....

1.4 Explain what happens in this process to cause the colour change.

[1 Mark]

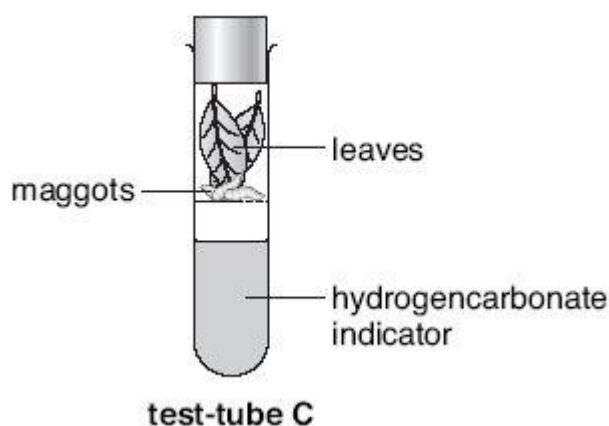
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1.5 Sunil then put two fresh leaves into test-tube C containing 30 cm³ of orange hydrogencarbonate indicator.

He added some maggots on a piece of wire mesh as shown below.

He put the test-tube on a window-sill.



The indicator remained orange. Explain why.

[1 Mark]

.....

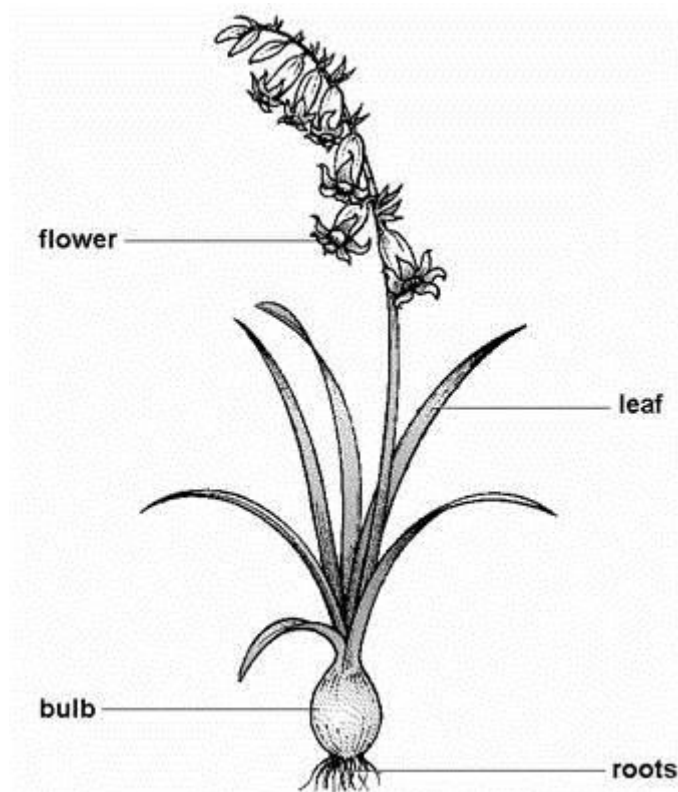
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2. The drawing shows a bluebell plant. The plant grows from an underground stem called a bulb. Each year new leaves and flowers grow from the bulb.



2.1 Describe the process by which glucose is made in the leaves.

[3 Marks]

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.....

.....

2.2 Many plants make starch from glucose.
What group of nutrients do both glucose and starch belong to?

[1 Mark]

.....

.....



2.3 In the sixteenth century bluebell bulbs were dug up to obtain a starch-like substance that was used to make collars stiff.



Digging up bluebell bulbs has caused a decrease in the number of bluebells growing in Britain. It is now against the law to dig up bluebells.

Suggest **one** other environmental reason why the number of bluebell plants has decreased in Britain.

[1 Mark]

.....

.....

2.4 Every 10 years the trees and bushes in some bluebell woods are cut down to ground level.

What effect does this have on the number of bluebells in the woods?
Explain your answer.

[1 Mark]

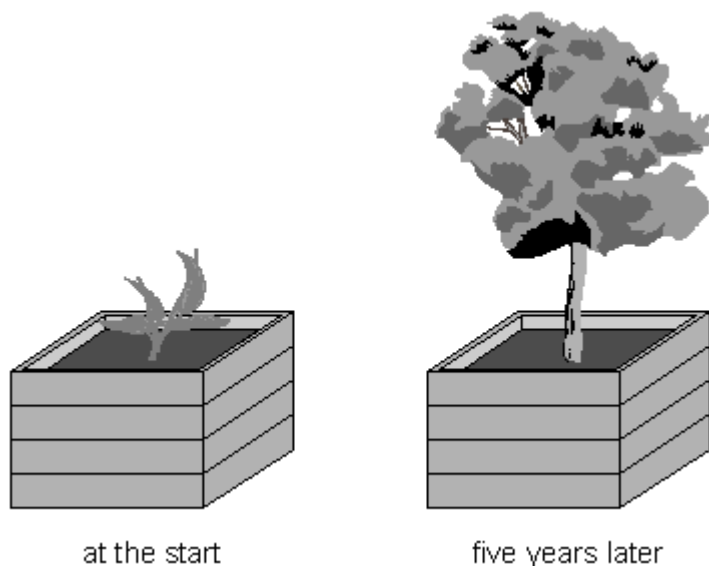
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3. In the seventeenth century a Belgian scientist, Van Helmont, planted a young willow tree in a tub of dry soil.

During the next five years he watered the plant with rain water but he did not add anything else to the tub.



not to scale

After five years Van Helmont removed the willow tree from the tub and weighed the tree. He also dried and weighed the soil. Results from Van Helmont's experiment are shown in the table.

	mass of willow tree, in kg	mass of dried soil, in kg
at the start	2.3	90.6
five years later	76.7	90.5

Van Helmont concluded that the increase in the mass of the willow tree was due only to a gain in water.

3.1 What **two** pieces of evidence did Van Helmont use to reach his conclusion?

[2 Marks]

.....

.....

.....

.....



3.2 We now know that Van Helmont's conclusion is **not** correct.
Explain why the mass of the willow tree increased by such a large amount.

[2 Marks]

.....

.....

.....

.....

3.3 Van Helmont believed that a plant would always grow faster if it was given more water.
We now know that this is **not** true.
Give **two** environmental conditions which can slow down the growth of a plant, even when it has plenty of water.

[2 Marks]

.....

.....

.....

.....

3.4 The fresh mass of a plant includes water. To measure plant growth accurately, scientists calculate the increase in the dry mass rather than the increase in the fresh mass of a plant.

Why is finding the increase in fresh mass **not** a reliable way to measure plant growth?

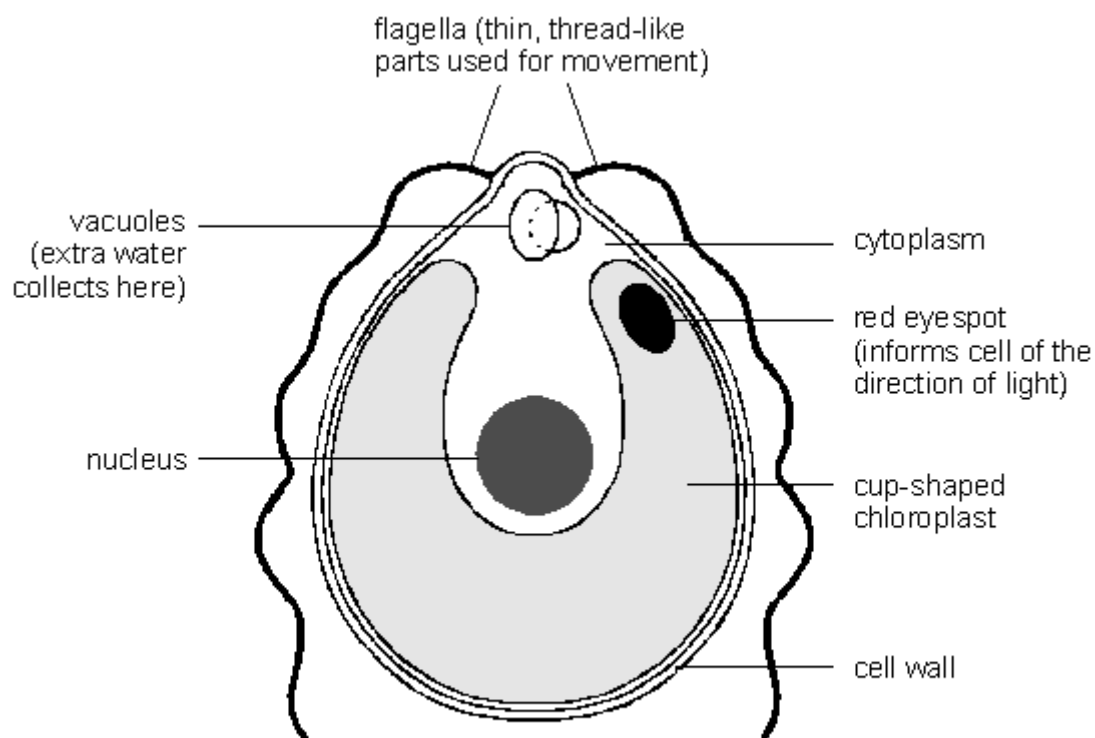
[1 Mark]

.....

.....



4. The diagram below shows details of Chlamydomonas which is a single-celled organism adapted for living in ponds and ditches.



× 1000

4.1 Explain how the eyespot, the flagella and the chloroplast enable Chlamydomonas to photosynthesise.

[3 Marks]

.....

.....

.....

.....

4.2 Water diffuses into Chlamydomonas from the pond. Water is also produced by respiration inside the cell.

Give **one** function of water inside the cell.

[1 Mark]

.....

.....



4.3 If there is too much water in the Chlamydomonas cell, the water collects in two small vacuoles.

The vacuoles can contract to get rid of the water.
What effect does extra water have on the cell?

[1 Mark]

.....

.....

4.4 Large numbers of Chlamydomonas cells are found in ponds rich in nitrates. Nitrates are a source of nitrogen.

What compound does Chlamydomonas make from nitrogen?

[1 Mark]

.....

.....



5. A garden centre has two types of the same plant for sale.

normal type



variegated type



normal leaf

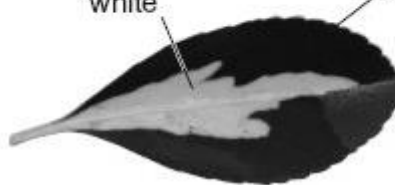
dark green



variegated leaf

white

dark green



Chlorophyll makes a plant leaf green.

At the end of the summer, the normal plants had grown more than those with variegated leaves. All the plants had been grown in the same conditions.

5.1 Explain why plants with normal leaves grow more than plants with variegated leaves.

[2 Marks]

.....

.....

.....

.....



5.2 Describe an investigation you could do to show how much more a normal plant grows **compared** with a variegated plant over a six-week period.

In your answer, you must clearly identify:

- the independent variable (IV)
- the dependent variable (DV)
- the variables to control (CV)
- how you will calculate the end result.

[4 Marks]

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5.3 What process do plants carry out in the light and in the dark to release energy?
Tick the correct box.

[1 Mark]

photosynthesis

☐

respiration

☐

absorption

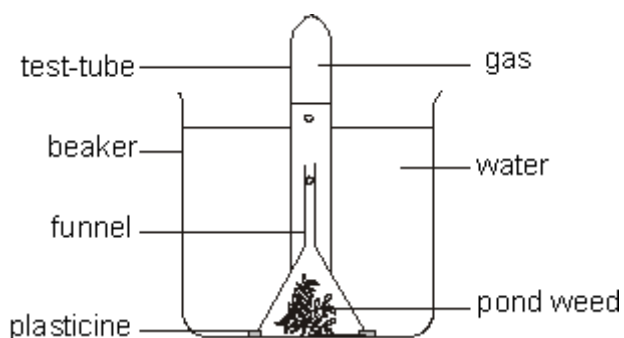
☐

dispersal

☐

**FOUNDATION TIER**

1. The drawing shows an experiment to investigate photosynthesis in weed from a pond.



Bubbles of gas produced during photosynthesis were given off from the pond weed and collected in the test tube.

1.1 Name the gas given off in photosynthesis

[1 Mark]

.....

.....

1.2 What **two** substances are taken in by the plant and used for photosynthesis?

[2 Marks]

1.

.....

.....

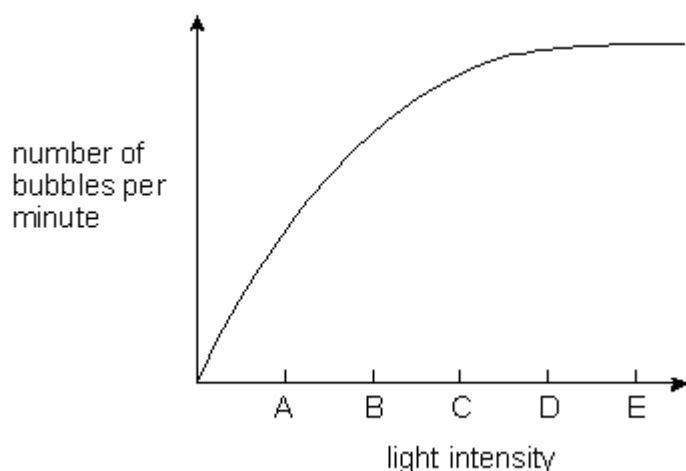
2.

.....

.....



Light of different intensities was shone onto the pond weed. The number of gas bubbles given off in one minute at each light intensity was counted. The results are shown in the graph.



1.3 Which letter on the horizontal axis shows the light intensity at which the rate of photosynthesis first reaches its maximum?

[1 Mark]

.....

Blue, green and red light were then shone, in turn, onto the pond weed. The number of bubbles of the gas given off in one minute was counted. The results are shown in the table.

colour of light	number of bubbles in one minute
blue	85
green	10
red	68

The leaves of the pond weed contain a green pigment which absorbs light for photosynthesis

1.4 Name this pigment.

[1 Mark]

.....

.....



1.5 Using the information in the table, tick a box by **one** colour of light which is strongly absorbed by the pigment.

[1 Mark]

blue ☐

green ☐

red ☐

1.6 Sugar is also produced during photosynthesis.

Give **two** ways in which the plant uses sugar.

[2 Marks]

1.

.....

.....

2.

.....

.....



2. The drawing shows a plant called Tillandsia.



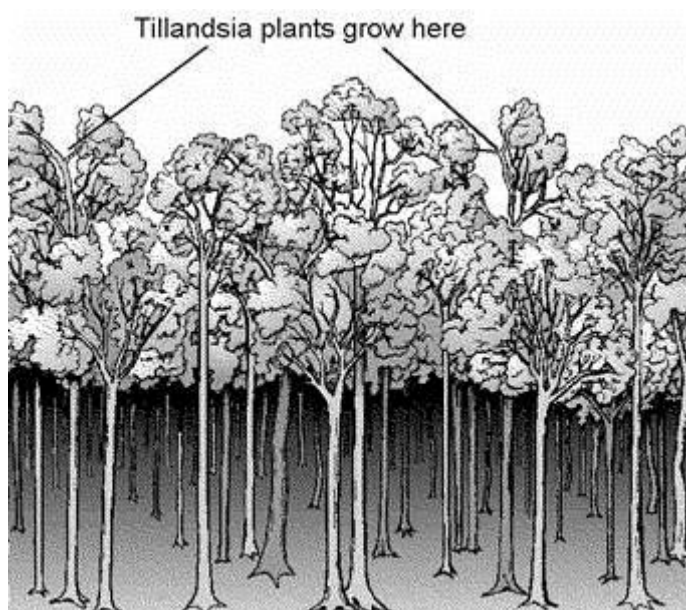
2.1 The leaves of this plant absorb light.
Why do plants need light?

[1 Mark]

.....

.....

2.2 Tillandsia plants grow on the high branches of trees in rain forests.



not to scale

These plants **cannot** grow well on the lowest branches.
Explain why.

[1 Mark]

.....

.....



2.3 Tillandsia plants do **not** have root hairs on their roots.

What **two** substances do most plants absorb through their root hairs?

[2 Marks]

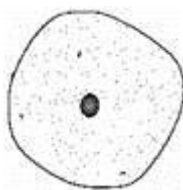
1.

2.

2.4 Which diagram below shows a root hair?

Tick the correct box.

[1 Mark]


☐

A


☐

B


☐

C


☐

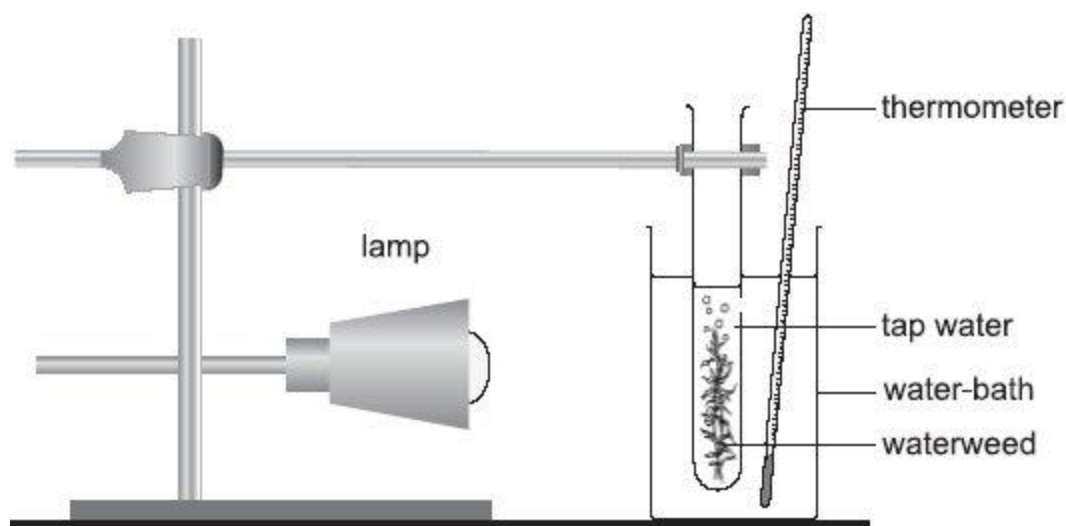
D

not to scale



3. Suzi investigated how temperature affects the number of bubbles produced by waterweed in one minute.

She set up the experiment as shown below.



When the temperature of the water was 10°C the waterweed did **not** produce bubbles.

3.1 Suzi increased the temperature of the water in the water-bath to 20°C.

The waterweed started to produce bubbles.

She waited two minutes before starting to count the bubbles.

Explain why she waited for two minutes before she started to count the bubbles.

[1 Mark]

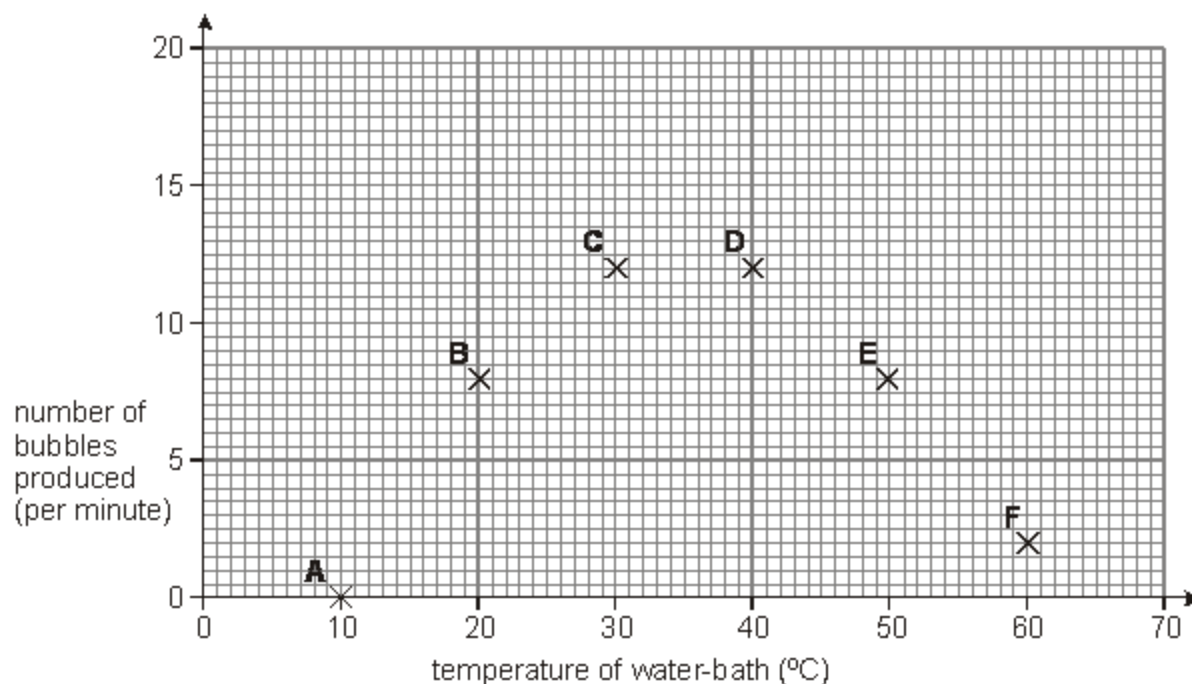
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.....



Suzi counted the number of bubbles produced at six different temperatures.

Her results are shown on the graph below.



3.2 Draw a smooth curve on the graph.

[1 Mark]

3.3 Use your curve to find the temperature of water which produced the most bubbles per minute.

[1 Mark]

.....°C

3.4 Suzi predicted that the higher the temperature the more bubbles would be produced.

Which points on the graph support Suzi's prediction?

[1 Mark]

.....
.....

3.5 Suzi's data does **not** show clearly the exact temperature at which most bubbles were produced.

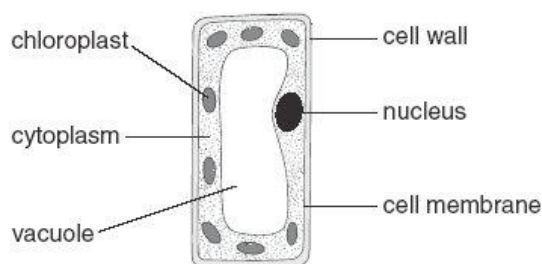
How could she improve the data she collects to find this temperature?

[1 Mark]

.....
.....



4. The diagram below shows a plant cell.



4.1 In which part of a plant would you find this type of cell?

[1 Mark]

.....

.....

4.2 Give the function of the nucleus.

[1 Mark]

.....

.....

4.3 Give the function of the chloroplasts.

[1 Mark]

.....

.....

4.4 Give the function of the cell wall.

[1 Mark]

.....

.....

4.5 Give the names of **two** labelled parts that are **not** present in animal cells.

[2 Marks]

1.

.....

2.

.....



4.6 Tick **one** box in each row to show whether the statement is true for photosynthesis **or** for respiration.

[2 Marks]

statement	photosynthesis	respiration
carbon dioxide is produced		
light is needed		
it occurs in plants and animals		
oxygen is produced		



MARK SCHEME HIGHER

1.1 respiration

1 (L7)

1.2 carbon dioxide is produced

accept 'maggots breathe out carbon dioxide'

1 (L7)

1.3 photosynthesis

1 (L7)

1.4 any **one** from

- carbon dioxide is used up
- carbon dioxide reacts with water in the plant
accept 'the carbon dioxide reacts with water'
'carbon dioxide is absorbed' is insufficient
*do **not** accept 'the carbon dioxide reacts with water in the tube'*

1 (L7)

1.5 any **one** from

- carbon dioxide produced by respiration was used up in photosynthesis
- carbon dioxide produced by the maggots is used in photosynthesis
- carbon dioxide produced by the maggots was used by the leaves
answers must refer either to respiration
***or** maggots **and** photosynthesis or leaves*
'the concentration of carbon dioxide remains unchanged' is insufficient

1 (L7)
[5]



2.1 any **three** from

- by photosynthesis
- carbon dioxide and water used
- oxygen produced

*accept for two marks the second and third marking points in a word **or** symbol equation, for example 'carbon dioxide + water → glucose + oxygen'*

- chlorophyll **or** chloroplasts absorb solar energy **or** sunlight
- accept 'solar energy transferred to chemical energy'*

3 (L7)

2.2 carbohydrates

1 (L6)

2.3 any **one** from

- loss of habitat
- use of herbicides **or** weedkillers

accept 'more buildings'

- climate change

accept 'global warming'

- competition with other plants
- do **not** accept 'growing populations' as this answer is too vague*

1 (L7)

2.4 it increases
because there is more light **or** there is more photosynthesis
both the answer and the explanation
are required for the mark

1 (L6)
[6]



3.1 only water was added

1 (L7)

the mass of the soil did not go down much

1 (L7)

3.2 any **two** from

- photosynthesis took place

accept 'the plant uses light to make food'

*do **not** accept 'the plant made food'*

- biomass was produced

*accept for biomass 'carbohydrate' **or** 'protein' **or** 'fat'*

***or** 'carbon compounds' **or** appropriate, named examples*

- the tree took in carbon dioxide

*do **not** accept 'the plant took in minerals **or** nitrates'*

2 (L7)

3.3 any **two** from

- not enough light

*accept 'the amount of light' **or** 'no light'*

- not enough carbon dioxide

*accept 'the CO₂ level' **or** 'no carbon dioxide'*

- not enough minerals

accept 'the availability of nutrients'

- too cold **or** temperature too low

accept 'the temperature'

*accept 'pH' **or** 'quality of soil' **or** 'acid rain'*

*accept 'overcrowding' **or** 'space'*

2 (L7)

3.4 any **one** from

- the fresh mass of a plant depends on the availability of water

- water can be lost as a result of evaporation

- the water content can vary from day to day

- dry mass is due to the manufacture of compounds

or named carbon compound **or** biomass

- water is not part of the biomass

1 (L7)

[7]



4.1 light is detected by the eyespot

1

the flagella are used to move towards light

1

the chloroplast absorbs light

accept 'the photosynthesis takes place in the chloroplast'

1

4.2 any **one** from

- it is a solvent
 - for photosynthesis
 - it maintains the shape of the cell
 - it provides a medium for chemical reactions to take place
 - it is a constituent of cytoplasm
- accept 'it is part of cytoplasm'*

1

4.3 it dilutes the cytoplasm

*accept 'it makes the cell swell up' **or** 'it makes the cell turgid'*

1

4.4 any **one** from

- protein
 - amino acids
 - enzymes
- accept any correct nitrogen-containing compound*

1

[6]



5.1 • absorb **more light **or** have a larger green area**

accept 'they have more chlorophyll'

*do **not** accept 'attract more light'*

accept 'the variegated leaves have less chlorophyll'

'catch more light' is insufficient

'absorb more Sun' is insufficient

• make more food **or photosynthesise more**

*accept 'make more glucose **or** starch **or** sugar **or** protein'*

2 (L7)

5.2 • variegated and normal (leaved plants) (IV)

accept 'both types of plant'

a full description of the investigation can be awarded the full marks e.g. 'take both types of plant, count the leaves, give them the same amount of water, repeat the measurement at the end of the experiment and see how much the plants grew'

1 (L7)

• named factor which can be measured (DV)

*e.g. weight of the plant **or** height of the plant **or** number of leaves*

accept 'size of leaves'

*accept 'weight **or** mass of plant'*

1 (L7)

• named condition(s) for a fair test (CV) e.g.

*temperature **or** amount of water **or** same*

*species of plant **or** ambient conditions such as*

*light **or** same size plant at the beginning **or** same age of plant*

'the same place' is insufficient for the CV

'time' is insufficient as it is given in the question

1 (L7)

• calculate (percentage) change for each type of plant

*accept 'measure both (groups of) plants at the start **and** measure both (groups of) plants at the finish'*

accept 'record how much each plant grew over 6 weeks and compare results'

1 (L7)

5.3 • respiration ✓

if more than one box is ticked, award no mark

1 (L6)

[7]



FOUNDATION

1.1 oxygen

1

1.2 carbon dioxide

*do **not** accept light*

1

water

*do **not** accept chlorophyll*

1

1.3 D

if more than one letter is given award no mark

1

1.4 chlorophyll

1.5 blue ✓ **or** red ✓

*if blue and red are both ticked award the mark,
but if green is ticked award no mark*

1

1.6 any **two** from

- as an energy source **or** for respiration

*accept 'for energy' **or** 'for food'*

- to make starch

*accept 'for growth' **or** 'as a starting*

- to make cellulose material for other compounds'

2

[8]



2.1 any **one** from

- to make food or glucose or sugar or starch
- photosynthesis
accept 'for growth'

1 (L3)

2.2 any **one** from

- there is not enough light
accept 'no light' or 'no Sun'
- there is less light
accept 'light cannot reach them'
*do **not** accept 'because plants need light'*

1 (L3)

2.3 any **two** from

- oxygen
- water
- minerals **or** nutrients
accept a named mineral such as 'nitrate'
accept for two marks two named minerals such as 'nitrates'
and 'phosphates'

2 (L4)

2.4 B ✓

if more than one box is ticked, award no mark

1 (L4)
[5]



3.1 any one from

- to make sure the water in the boiling tube had reached the required temperature

accept 'time for the water in the test-tube to heat up'

- to make sure the rate stabilised or adjusted to the new temperature

accept 'let it settle first'; 'the bubbles reach a steady pace';

'to get rid of bubbles from the liquid';

'to get rid of trapped bubbles'

1 (L5)

3.2 a smooth curve through all six points

1 (L6)

3.3 a temperature from 32 to 38

accept any reading consistent with the maximum point on the drawn curve

1 (L6)

3.4 any one from

- A, B, C

accept 'A, B, C and D'

- the first three readings

- between 10°C and 30°C

accept 'between 10°C and 40°C'

accept '10°C, 20°C and 30°C' or '10, 20, 30'

- between A and C

accept 'between A and B' or 'between A and D'

or 'between B and D'

*do **not** accept 'between C and D'*

1 (L6)

3.5 any one from

- use smaller intervals of measuring the temperature

accept an example of specific intervals such as

'do it at intervals of 2°C'

- use temperatures between 30°C and 40°C

accept 'take more measurements'

accept 'take a reading at 35°C'

answers must refer to the collection of data rather than to the presentation of data *'repeat the test' is insufficient but may be accepted with additional measurements*

1 (L6)
[5]



4.1 • leaf

*accept 'stem' **or** 'stalk'*

1 (L5)

4.2 • it controls the cell **or cell's activities**

accept 'it tells the cell what to do'

'it is the brain of the cell' is insufficient

*accept 'it contains **or** passes on (genetic) information **or** genes **or** DNA'*

1 (L5)

4.3 any **one from**

- absorbs light **or** Sun's energy

*accept 'traps **or** catches light'*

*do **not** accept 'it attracts light'*

- photosynthesis

*accept 'it makes food **or** glucose **or** sugar **or** starch **or** carbohydrate'*

'it produces oxygen' is insufficient

1 (L6)

4.4 any **one from**

- gives the cell its shape

'it protects the cell' is insufficient

- supports the cell

1 (L6)

4.5 any **two from**

- cell wall

accept 'wall'

- vacuole

- chloroplast

2 (L6)

**4.6**

<i>photosynthesis</i>	<i>respiration</i>
	✓
✓	
	✓
✓	

if **all four** answers are correct, award two marks

if **two or three** answers are correct, award one mark

if more than one box is ticked in any row, do not credit that row

2 (L6)
[8]



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 KS3 Science Specification.

