

1 People often grow pondweed in fishponds to *oxygenate* the water.

(a) Name the process that the pondweed uses to produce oxygen.

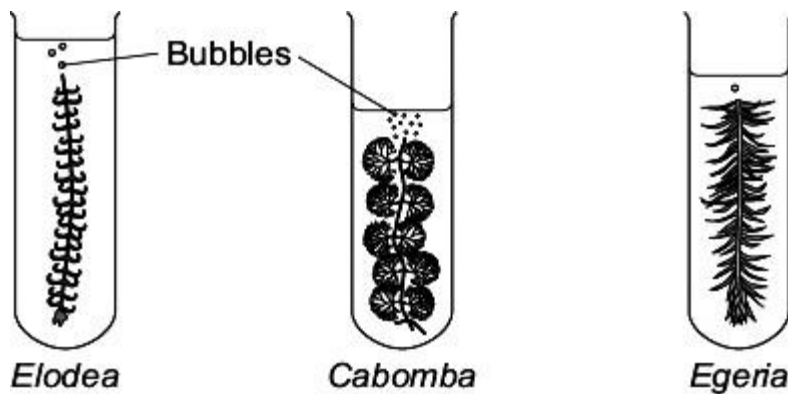
(1)

(b) A student investigated oxygen production in three different pondweeds, *Elodea*, *Cabomba* and *Egeria*.

The student:

- cut a piece of pondweed from an *Elodea* plant
- put the pondweed into a tube of water
- counted the bubbles given off in one minute
- did the experiment again using a piece of pondweed from a *Cabomba* plant
- did the experiment a third time using a piece of pondweed from an *Egeria* plant.

The diagram shows the student's investigation.



The table shows the results.

| Pondweed | Number of bubbles produced in 1 minute |
|----------------|--|
| <i>Elodea</i> | 17 |
| <i>Cabomba</i> | 28 |
| <i>Egeria</i> | 8 |

(i) The student said:

"I suggest that people grow *Cabomba* in garden ponds to oxygenate the water fastest."

Give **three** variables the student should have controlled to make sure his conclusion was valid.

Use information from the student's method and the diagram.

1. _____

2. _____

3. _____

(3)

(ii) The three pondweeds all cost about the same.

Suggest **one** other factor that people with fishponds might think about before deciding which type of pondweed to use.

(1)

(c) A person grows *Cabomba* in his pond.

The *Cabomba* plants develop yellow leaves.

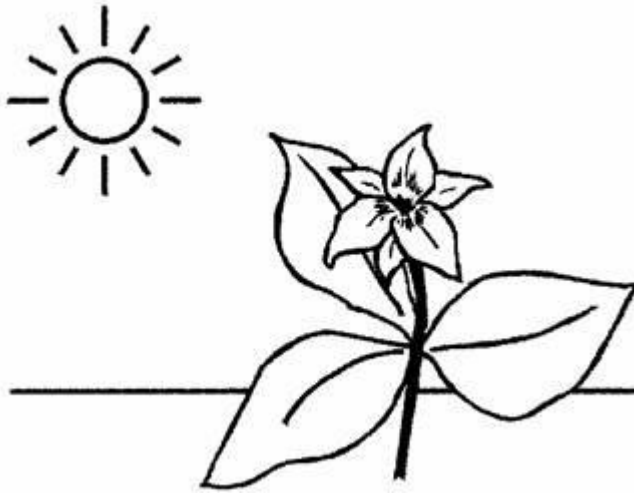
Which mineral ion would stop the leaves turning yellow?

(1)

(Total 6 marks)

2

(a) Plants make their own food by photosynthesis.



Use the following words to fill in the gaps. You can use each word once or not at all.

| | | | | |
|--------|-------------|-----------|-------|----------|
| carbon | chlorophyll | cytoplasm | light | nitrogen |
| oxygen | sound | starch | water | |

During photosynthesis _____ dioxide and _____ are converted into glucose and _____. The energy needed to do this is _____ energy which is trapped by a green pigment called

_____.

The plant can change the glucose into _____ which is insoluble so it can be stored.

(6)

(b) Which part of a plant is adapted for photosynthesis?

(1)

(c) How do the **two** raw materials for photosynthesis get into the plant?

1. _____

2. _____

(2)

(d) Describe **one** way you could speed up photosynthesis.

(1)

(Total 10 marks)

3

Paula is training for a marathon. When she runs, her heart beats faster than it does when she is resting.

Complete the sentences, using words from the box.

| | | | |
|--------------|-----------------|-----------------------|----------------|
| blood | breathe | carbon dioxide | glucose |
| heat | nitrogen | oxygen | respire |

When she is running, Paula's muscle activity increases. To do this, her muscle cells _____ at a faster rate to give her more energy. Her muscles need to be supplied with _____ and _____ more quickly. Her heart beats faster to increase the flow of _____ which carries the products _____ and _____ away from her muscles.

(Total 6 marks)

4

Photosynthesis takes place in green plants.

(a) Name the substance that combines with water in photosynthesis.

(1)

(b) Where does water enter the plant?

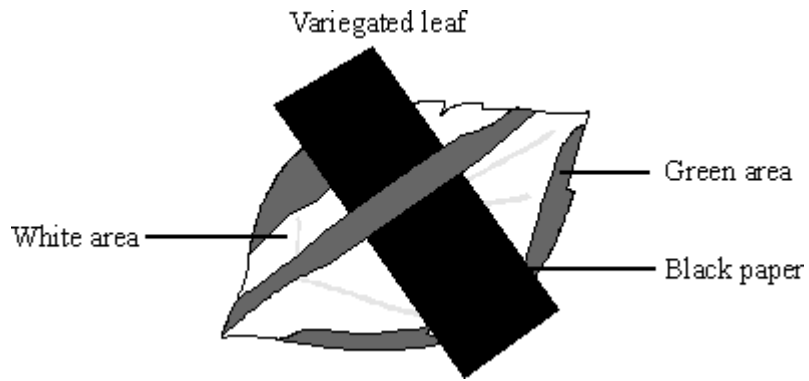
(1)

(c) Name **two** products of photosynthesis.

(2)

(d) Variegated leaves have areas that are green and areas that are white. Some students used variegated leaves to investigate photosynthesis.

- They covered a variegated leaf with a black paper shape.
- The leaf was left in a sunny place.
- They tested the leaf for starch.
- The results were compared with a leaf that was not covered.



| Area of the leaf tested | Starch present after test | |
|-------------------------|---------------------------|-----------|
| | covered | uncovered |
| Green area | no | yes |
| White area | no | no |

Explain why starch was present in only one of the tests.

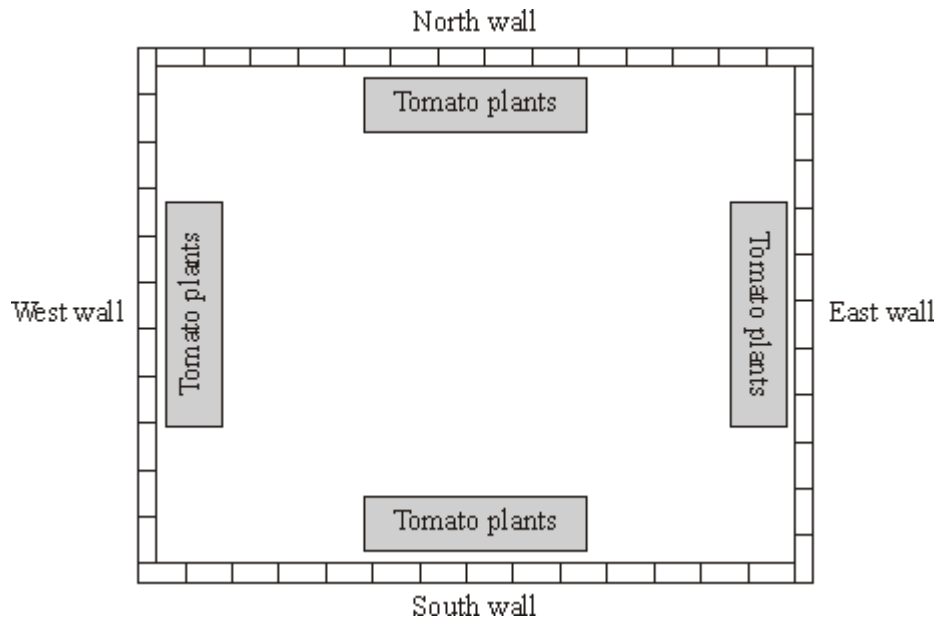
(4)
(Total 8 marks)

5

A gardener grows tomatoes.

He wants to find out how to get the biggest mass of tomatoes.

He plants different varieties of tomato against different walls in his garden.



Use these results to answer the questions.

(a) The gardener wants his test to be fair.

Name **one** condition which he should keep the same for all his tomato plants.

(1)

(b) The table shows the gardener's results.

| Variety of tomato plant | Sungold | Sungold | Sungold | Sungold | Nugget | Champion |
|---|---------|---------|---------|---------|--------|----------|
| Wall they were planted against | North | West | South | East | East | East |
| Mean mass of tomatoes produced in kilograms per plant | 3.5 | 3.0 | 1.2 | 2.5 | 3.2 | 2.7 |

- (i) To obtain the biggest mass of tomatoes, against which wall is it best to grow the tomato plants?

Tick () **one** box.

North wall

South wall

East wall

West wall

(1)

- (ii) To obtain the biggest mass of tomatoes, which variety of tomato plant would it be best to grow?

(1)

- (c) From the information in the table, the gardener's test was **not** fair.

Give **one** way in which the test was **not** fair.

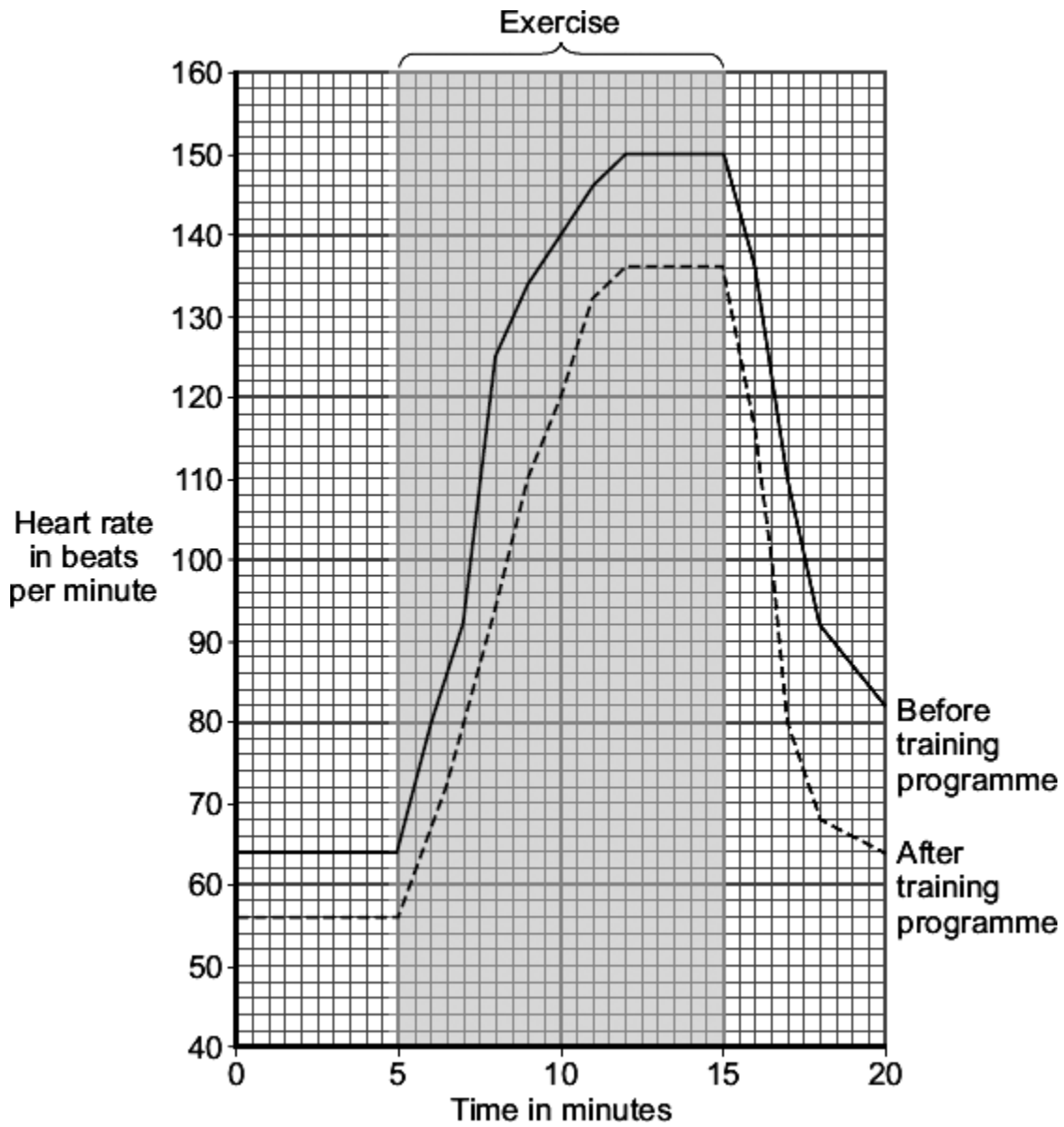
(1)

(Total 4 marks)

6

An athlete did a 6-month training programme.

The graph shows the effect of the same amount of exercise on his heart rate before and after the training programme.



(a) (i) What was the maximum heart rate of the athlete during exercise before the training programme?

_____ beats per minute

(1)

- (ii) Give **two** differences between the heart rate of the athlete before and after the training programme.

After the training programme

Difference 1 _____

Difference 2 _____

(2)

- (b) Which **two** substances need to be supplied to the muscles in larger amounts during exercise?

Tick (✓) **two** boxes.

Carbon dioxide

Glucose

Lactic acid

Oxygen

Urea

(2)

(Total 5 marks)

- 7** Green plants are able to make their own food.

Complete each sentence by drawing a ring around the correct answer in the box.

- (a) Green plants make their own food during the process of

| |
|----------------|
| diffusion |
| photosynthesis |
| respiration |

(1)

(b) This process can be summarised by the equation:

carbon dioxide + water → glucose +

| |
|---------------|
| mineral salts |
| light |
| oxygen |

(1)

(c) The energy needed for this process is trapped for the plant by

| |
|-------------|
| chlorophyll |
| glucose |
| light |

(1)

(d) Some of the food made by plants is stored as insoluble

| |
|-------------|
| chlorophyll |
| glucose |
| starch |

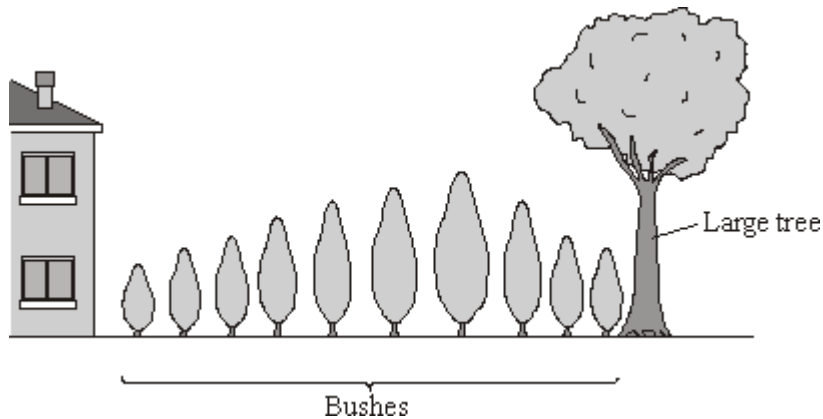
(1)

(Total 4 marks)

8

The diagram shows bushes in a hedge growing near to a house.

The bushes were the same species and the same age.



- (a) (i) The student said, "I have noticed that the short bushes grow next to the house. I think that the more light the bushes get, the faster they will grow."

Draw lines to match each of the student's statements to the correct term.

Draw only two lines.

| Statement | Term |
|---|----------------|
| The short bushes grow next to the house. | A conclusion |
| Plants will grow faster if they get more light. | A prediction |
| | An observation |

(2)

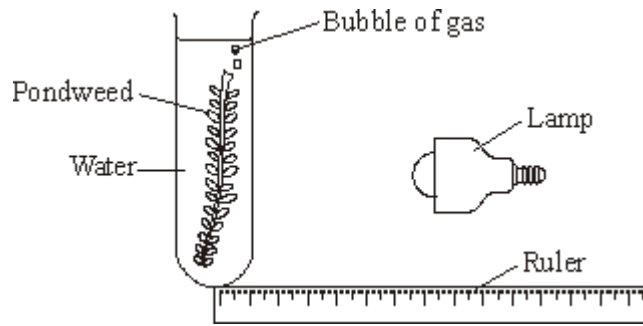
- (ii) Complete the word equation for photosynthesis.

_____ + water (+ light energy) ® _____ + oxygen

(2)

(b) The student decided to investigate the effect of light intensity on the rate of photosynthesis.

She used the apparatus shown in the diagram.

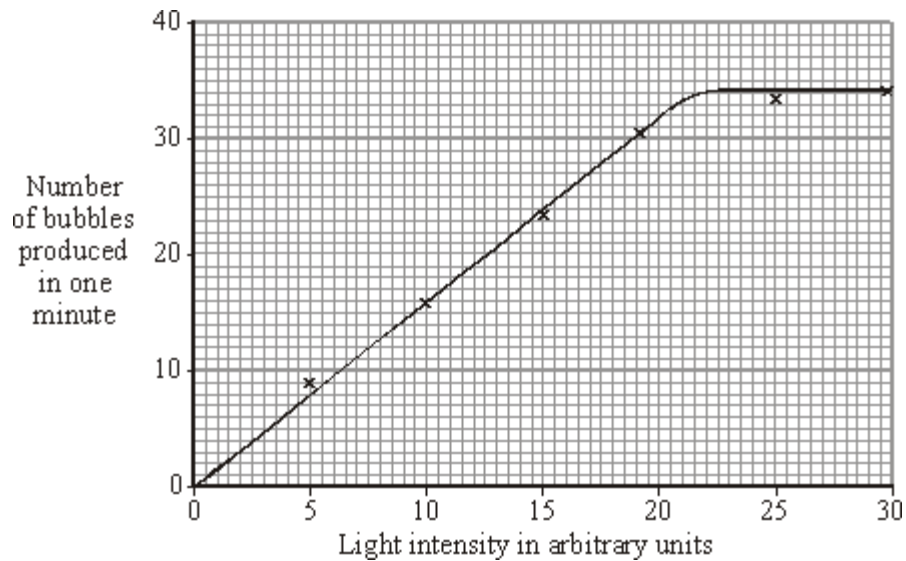


She measured the rate of photosynthesis by counting the number of gas bubbles given off each minute.

(i) Suggest how the student varied the intensity of the light received by the pondweed.

(1)

(ii) The student's results are shown on the graph.



Describe the pattern shown on the graph.

(2)

(iii) This is what the student wrote for her conclusion.

“Increasing the light intensity increases the rate of photosynthesis of the pondweed.”

Why was her conclusion incomplete?

(1)

(Total 8 marks)

9

Muscles need energy during exercise.

Draw a ring around the correct answer in parts (a) and (b) to complete each sentence.

(a) (i) The substance stored in the muscles and used during exercise is

glycogen.
lactic acid.
protein.

(1)

(ii) The process that releases energy in muscles is

digestion.
respiration.
transpiration.

(1)

(b) The table shows how much energy is used by two men of different masses when swimming at different speeds.

| Speed of swimming in metres per minute | Energy used in kJ per hour | |
|--|----------------------------|-----------|
| | 34 kg man | 70 kg man |
| 25 | 651 | 1155 |
| 50 | 1134 | 2103 |

(i) When the 34 kg man swims at 50 metres per minute instead of at 25 metres per minute,

the extra energy he uses each hour is

36 kJ.
483 kJ.
948 kJ.

(1)

- (ii) When swimming at 50 metres per minute, each man's heart rate is faster than when swimming at 25 metres per minute.

A faster heart rate helps to supply the muscles with more

carbon dioxide.
glycogen.
oxygen.

(1)

- (iii) During the exercise the arteries supplying the muscles would

constrict.
dilate.
pump harder.

(1)

- (c) When a person starts to swim, the breathing rate increases.

Give **one** way in which this increase helps the swimmer.

(1)

(Total 6 marks)

Mark schemes

1

(a) photosynthesis

*do **not** accept other additional processes*

1

(b) (i) any **three** from, eg:

ignore time / apparatus

- mass of pondweed
type of pondweed = max 2
accept amount / volume / length / size
ignore number / surface area of leaves / pondweed unqualified
- volume of water
accept amount
- other reasonable features of the water
- light intensity
accept distance between light source and tube / pondweed
- light colour
accept light if neither colour nor intensity is given
- carbon dioxide
- temperature
- pH

3

(ii) any **one** idea from, eg:

ignore reference to cost

- how much oxygen they give off
- is pondweed poisonous to fish
- will fish eat pondweed
- is pondweed harmful to environment
- how long the pondweed lives
- growth rate / size of pondweed
- reference to appearance / aesthetics
- availability

1

- (c) magnesium / Mg
accept iron / Fe
ignore ion and + or -
ignore nitrate

1

[6]

2

- (a) carbon
water
oxygen

light

chlorophyll

starch

1 mark each

6

- (b) leaf (**or** named part of leaf)
or
chloroplasts

accept anywhere green

do not credit chlorophyll unless qualified

1

- (c) water through the roots
or
root hairs
or
by osmosis

do not credit where the candidate is unclear about which is which

1

CO₂ through the leaf

or

stomata

or

by diffusion

1

(d) any **one** point:

increased CO₂ concentration

increased water supply

increased temperature (up to a point)

increased light (intensity)

*accept altered light quality by less green **or** increasing other colours*

accept increased duration of exposure to light

*do **not** credit sun **or** sunshine*

accept CO₂ from respiration

1

[10]

3 (a) respire

1

oxygen / glucose

glucose / oxygen

} each once only

2

blood

1

carbon dioxide / heat

heat / carbon dioxide

} each once only

2

[6]

4 (a) carbon dioxide/CO₂

1

(b) through the roots/root hairs

*do **not** accept leaves*

1

(c) oxygen

1

sugar/glucose/other named sugar/starch/carbohydrate

1

(d) award one mark for each mark point

n.b. accept chloroplast for chlorophyll

*n.b. credit the candidate who answers **in** terms of the white areas of the leaf*

chlorophyll is green

e.g. green areas have chlorophyll

1

chlorophyll/green is needed for photosynthesis

e.g. it is only in green areas that photosynthesis can take place

after this point do not penalise a candidate if they do not refer to photosynthesis

1

light is needed

*e.g. it does not happen in the dark
do **not** accept sunshine/sun*

1

photosynthesis produces/makes starch

e.g. starch is made

so

e.g. 'you need light to make starch' scores 3rd and 4th marking points

'you need chlorophyll and light for photosynthesis' scores on the 2nd and 3rd marking points

'photosynthesis makes starch and you need green leaves and light for it to work' scores

on the 2nd, 3rd and 4th marking points

1

[8]

5

(a) any **one** from:

- (type of / amount of) soil / minerals / nutrients / pH
- amount of water / time of watering
- space between plants / plants and wall
- time for growth

list principle

ignore carbon dioxide / same number of plants / food

*do **not** allow temperature / light / exposure to wind*

1

(b) (i) North wall

1

(ii) nugget

list principle

1

(c) has not tested all varieties / nugget / champion against all walls

*do **not** allow repeat experiment*

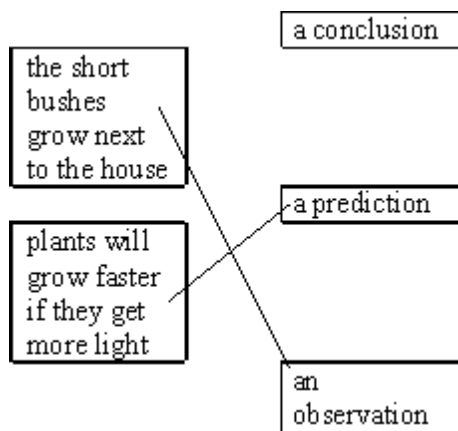
1

[4]

| | | | |
|----------|--|---|------------|
| 6 | (a) (i) 150 | 1 | |
| | (ii) any two from: <i>accept correct use of numbers</i> <i>accept pulse rate</i> | | |
| | <ul style="list-style-type: none"> • lower resting rate • lower rate during exercise • recovers faster after exercise | | |
| | | 2 | |
| | (b) glucose | 1 | |
| | oxygen | 1 | [5] |
| 7 | (a) photosynthesis | 1 | |
| | (b) oxygen | 1 | |
| | (c) chlorophyll | 1 | |
| | (d) starch | 1 | [4] |

8

(a) (i)



both correct = 2 marks

one correct = 1 mark

extra line from a statement cancels the mark

2

(ii) 1st space: carbon dioxide

allow CO₂ (ignore superscript)

*do **not** allow CO alone*

1

2nd space: glucose / sugar / starch / carbohydrate

1

(b) (i) any **one** from:

- move lamp or change distance between lamp and plant

ignore measure the distance

- change wattage / power of (light) bulb

*do **not** accept just "change bulb"*

- change voltage / power supply to the (light) bulb

- change the number of lamps

- put translucent material between lamp and plant

accept examples, eg tracing paper / filters

*do **not** accept coloured filters*

1

(ii) rises

1

levels off

ignore numbers

1

(iii) idea that it levels off

or

does not increase at all light intensities

or

it only increases to a certain amount

*answers should relate to photosynthesis and **not** to bubbling*

1

[8]

9

(a) (i) glycogen

1

(ii) respiration

1

(b) (i) 483 kJ

1

(ii) oxygen

1

(iii) dilate

1

(c) supplies more / a lot of oxygen **or** removes more carbon dioxide
or release more energy / faster respiration

1

[6]