AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.4.1 PHOTOSYNTHESIS (PACK 2)

SCORE	PERCENTAGE
/239	%

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Q1.

(a) Complete the equation for photosynthesis.

$$\text{_____} + \text{_____} \xrightarrow{\text{light energy}} \text{_____} + \text{oxygen}$$

(2)

(b) Scientists investigated how temperature affects the rate of photosynthesis.
The scientists grew some orange trees in a greenhouse.
They used discs cut from the leaves of the young orange trees.

The scientists used the rate of oxygen production by the leaf discs to show the rate of photosynthesis.

(i) The leaf discs did not produce any oxygen in the dark.

Why?

_____

_____

(1)

(ii) The leaf discs took in oxygen in the dark.

Explain why.

_____

_____

_____

_____

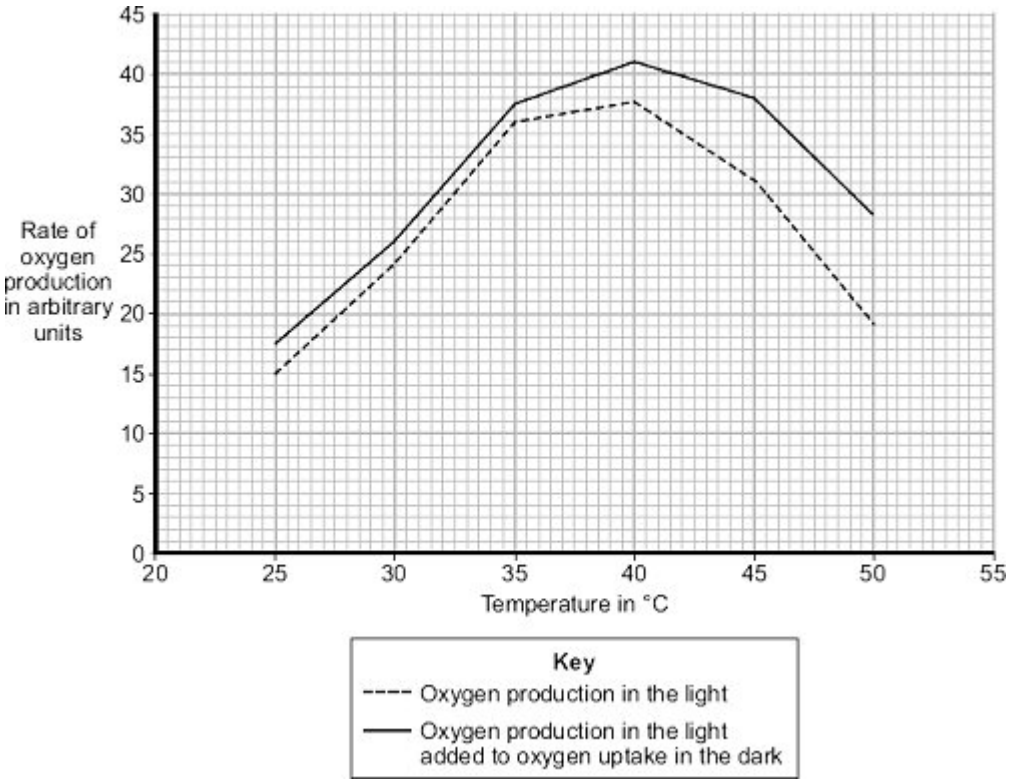
(2)

(c) In their investigation, the scientists measured the rate of oxygen release by the leaf discs in the light. The scientists then measured the rate of oxygen uptake by the leaf discs in the dark.

The graph shows the effect of temperature on

- oxygen production in the light
- oxygen production in the light added to oxygen uptake in the dark.

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Use the information from the graph to answer each of the following questions.

(i) Describe the effect of temperature on oxygen production in the light.

_____

_____

_____

_____

(2)

(ii) Explain the effect of temperature on oxygen production in the light when the temperature is increased:

from 25 °C to 35 °C

_____

_____

_____

from 40 °C to 50 °C.

_____

_____

_____

(2)

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(d) A farmer in the UK wants to grow orange trees in a greenhouse. He wants to sell the oranges he produces at a local market.
He decides to heat the greenhouse to 35 °C.

Explain why he should **not** heat the greenhouse to a temperature higher than 35 °C. Use information from the graph in your answer.

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 12 marks)

Q2.

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

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

_____

(1)

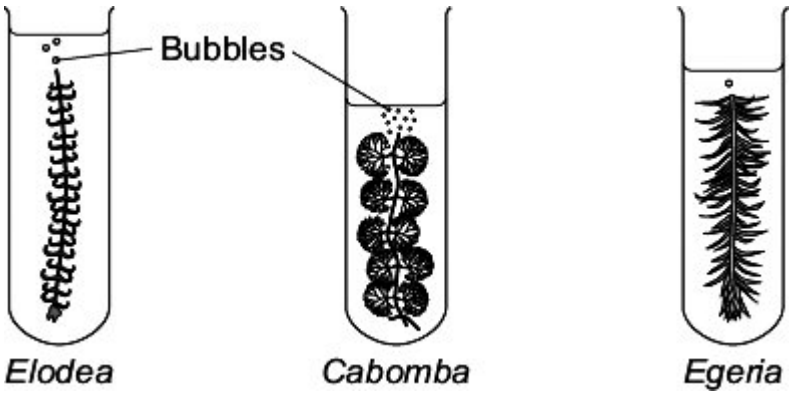
(b) A student investigated oxygen production in three different pondweeds, *Elodea*,*Cabomba* and *Egeria*.

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.

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The table shows the results.

Pondweed	Number of bubbles produced in 1 minute
Elodea	17
Cabomba	28
Egeria	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.

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The *Cabomba* plants develop yellow leaves.

Which mineral ion would stop the leaves turning yellow?

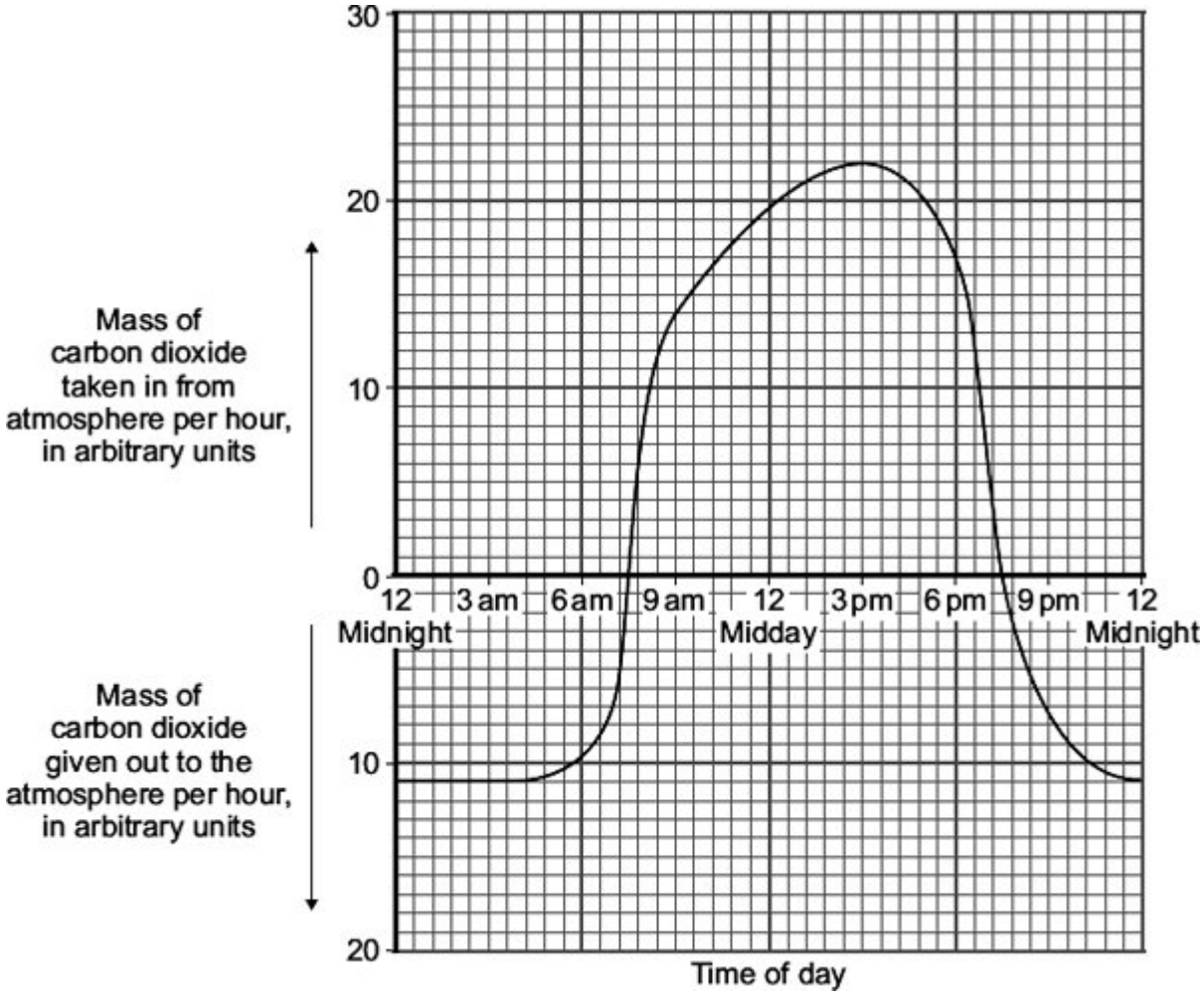
_____

(1)

(Total 6 marks)

Q3.

The graph shows the uptake of carbon dioxide and the release of carbon dioxide by a bean plant on a hot summer's day.



(a) At which **two** times in the day did the rate of photosynthesis exactly match the rate of respiration in the bean plant?

1. _____ 2. _____

(1)

(b) The bean plant respires at the same rate all through the 24 hour period.

(i) How much carbon dioxide is released each hour during respiration?

_____ arbitrary units

(1)

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(ii) How much carbon dioxide is used by photosynthesis in the hour beginning at 3 pm?

_____

_____

Answer = _____ arbitrary units

(1)

(c) Over the 24 hour period, the total amount of carbon dioxide taken in by the bean plant was greater than the total amount of carbon dioxide given out by the bean plant.

Explain, in detail, why this was important for the bean plant.

_____

_____

_____

_____

_____

_____

(2)

(Total 5 marks)

Q4.

The amount of carbon dioxide in the atmosphere is increasing.

The table shows the estimated mass of carbon dioxide exchanged with the atmosphere in one year.

	Mass of carbon dioxide exchanged with the atmosphere in millions of tonnes	
	Passed out into the atmosphere	**Taken in from the atmosphere**
Plants	30	64
Animals	10	0
Microorganisms	24	0
Combustion	6	0

(a) (i) Calculate the total mass of carbon dioxide passed out into the atmosphere in one year.

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Show clearly how you work out your answer.

_____

_____

Answer _____ million tonnes

(2)

(ii) Calculate the increase in the mass of carbon dioxide in the atmosphere in one year.

You should use your answer to part (a)(i) in your calculation.

Show clearly how you work out your answer.

_____

_____

Answer _____ million tonnes

(2)

(b) Draw a ring around the correct answer to complete the sentence.

Plants use carbon dioxide in the process of

decomposition.
photosynthesis.
respiration.

(1)

(Total 5 marks)

Q5.

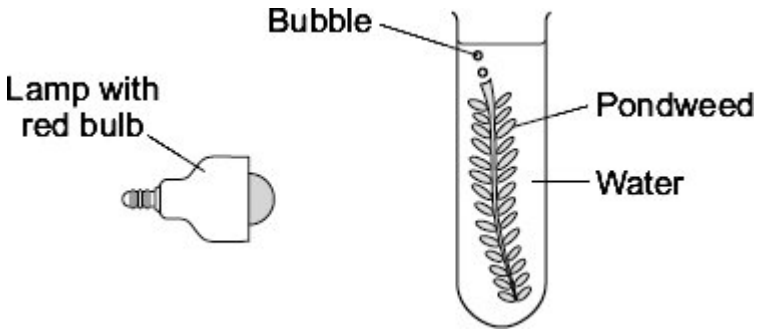
A group of pupils investigated the way in which the colour of light affects photosynthesis.

The pupils:

- put a piece of pondweed into a test tube of water
- shone light from a lamp with a red light bulb onto the pondweed
- counted the bubbles of gas produced by the pondweed every minute for three minutes.

The diagram shows the experiment.

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The pupils repeated their experiment using a yellow light bulb, a green light bulb and a blue light bulb.

(a) (i) What was the independent variable in the investigation?

_____

(1)

(ii) To make the investigation fair the pupils needed to control some variables.

Suggest **one** variable that the pupils should have controlled during their investigation.

_____

(1)

(iii) It is better to count the bubbles every minute for three minutes than to count all the bubbles in three minutes.

Why?

_____

_____

(1)

(b) The table shows the pupils' results.

Colour of bulb	Number of bubbles produced in one minute			
	1st minute	2nd minute	3rd minute	Mean
Red	24	19	21	21
Yellow	18	14	15	16
Green	6	4	3	4
Blue	32	34	32	33

Algae are tiny organisms that photosynthesise.
In natural light algae grow very quickly on the sides of a fish tank.
The algae make it difficult to see the fish.

(i) What would be the best colour of light bulb to illuminate the fish tank to reduce the growth of algae?

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Use the results in the table to help you to decide.

Draw a ring around **one** answer.

red **yellow** **green** **blue**

(1)

(ii) Explain why the colour you have chosen is the best.

_____

_____

_____

_____

(2)

(Total 6 marks)

Q6.

A gardener grows tomato plants.

The tomato plants develop yellow leaves.

(a) What would be the best way of improving the growth of these plants?

Tick (✓) **one** box.

Add mineral ions to the soil ☐

Water the plants more ☐

Add glucose to the soil ☐

(1)

(b) Most tomatoes are grown in greenhouses.

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Tomato growers alter the conditions in greenhouses to make tomato plants grow faster.

Which changes in conditions will make tomato plants grow faster?

Tick (✓) **two** boxes.

Increasing the temperature	☐
Increasing the oxygen concentration in the air	☐
Increasing the nitrogen concentration in the air	☐
Turning lights on at night	☐

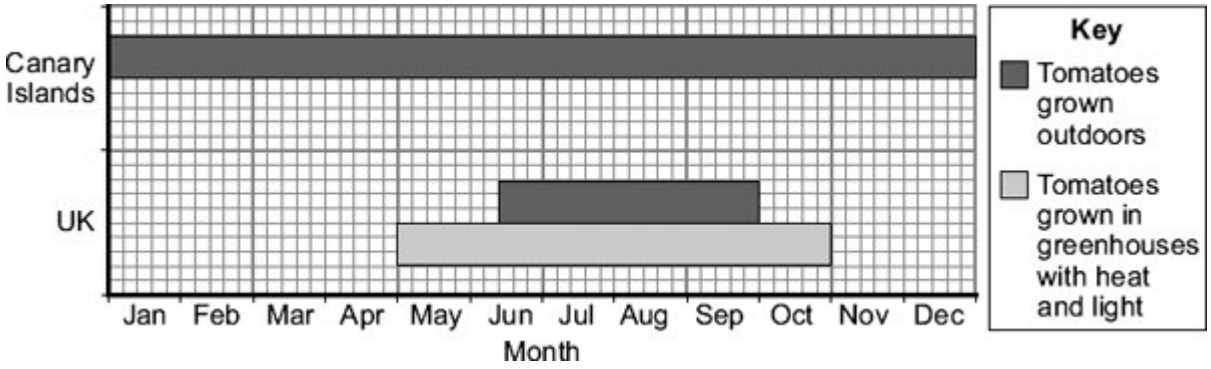
(2)
(Total 3 marks)

Q7.

Tomatoes are grown in greenhouses in the UK and outdoors in the UK and the Canary Islands.

The chart shows in which months these tomatoes can be bought in shops in the UK.

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The Canary Islands are about 3000 km from the UK.

Some people prefer to buy tomatoes grown in the UK.

What are the **advantages** and **disadvantages** of buying tomatoes grown in the UK, instead of buying tomatoes grown in the Canary Islands?

Advantages of buying tomatoes grown in the UK

_____

_____

_____

_____

Disadvantages of buying tomatoes grown in the UK

_____

_____

_____

_____

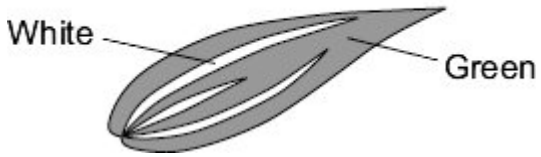
(Total 3 marks)

Q8.

Students investigated the effect of changing the carbon dioxide concentration on the rate of photosynthesis in pieces of leaf.

Diagram 1 shows the type of leaf used by the students.

Diagram 1



The students:

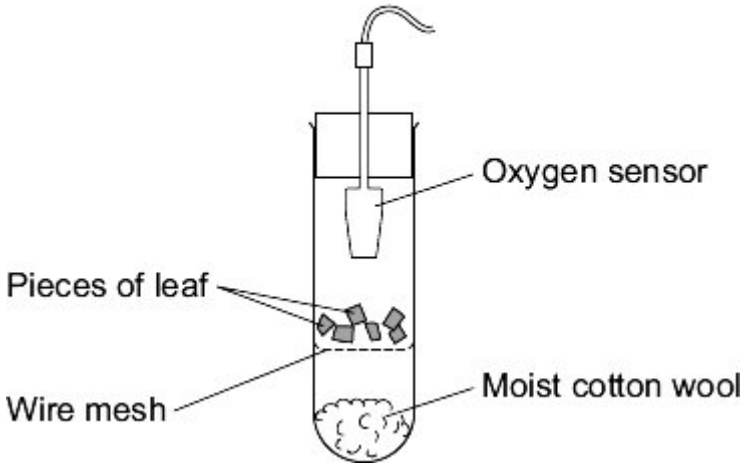
- cut pieces of leaf from the green region

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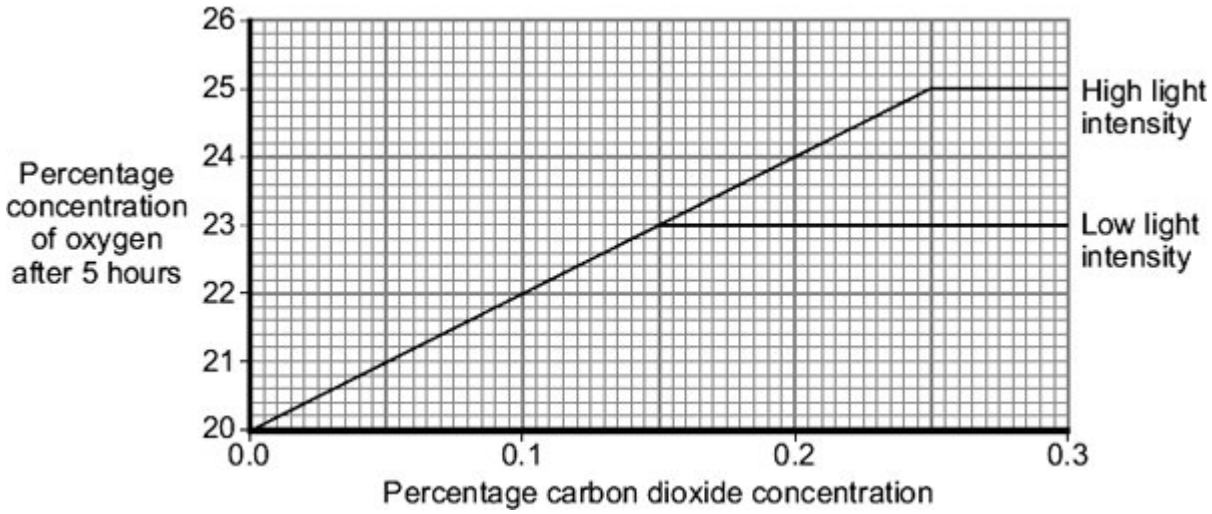
- put the pieces into tubes
- added different concentrations of carbon dioxide to each tube
- shone lights on the tubes with either high or low light intensity
- recorded the concentration of oxygen in the tubes after 5 hours.

Diagram 2 shows how each experiment was set up.

Diagram 2



The graph shows the results of the investigation.



(a) (i) Describe the effect of increasing carbon dioxide concentration on the rate of photosynthesis at low light intensity.

_____

_____

(1)

(ii) Explain the effect that you have described.

In your answer you should refer to limiting factors.

_____

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_____

_____

_____

(2)

(b) What would have been the effect on oxygen concentration over the five-hour period if a white region of the leaf had been used, instead of a green region?

Effect _____

Explain your answer.

Explanation _____

_____

_____

(2)

(c) Some people keep indoor plants which have variegated leaves (leaves with green and white regions).

If plants with variegated leaves are kept in dim light conditions the white areas of the leaves start to turn green.

This is an advantage to the plant.

Suggest why.

_____

_____

_____

_____

(2)

(Total 7 marks)

Q9.

Plants need mineral ions for healthy growth.

(a) Which part of a plant takes in mineral ions?

Tick (✓) **one** box.

Flower ☐

Leaf ☐

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Root ☐

(1)

(b) Leaves are usually green.

(i) What is the green substance in leaves?

Draw a ring around your answer.

chlorophyll **glucose** **starch**

(1)

(ii) The green substance in leaves is important to plants.

Explain why.

_____

_____

_____

_____

(2)

(c) A shortage of mineral ions can affect a plant.

Draw **one** line from each mineral ion to the effect of its shortage.

Mineral ion	**Effect of its shortage**
Magnesium	Yellow leaves
Nitrate	Stunted growth
	White flowers

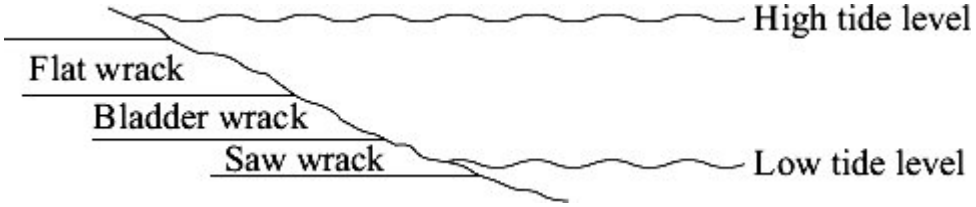
(2)

(Total 6 marks)

Q10.

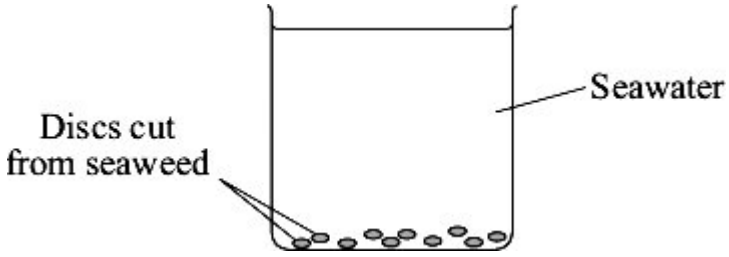
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The diagram shows where three seaweeds live on a seashore.
As the tide moves in and out, these seaweeds are covered with seawater for different lengths of time.



Some students investigated the rate of photosynthesis in these seaweeds.

- They cut ten small discs from one seaweed.
- They dropped the discs into seawater in a beaker.
- They recorded the time taken for the fifth disc to float to the surface.
- They repeated this experiment with the other two seaweeds.



(a) (i) Suggest why the discs floated to the surface.

_____

_____

(1)

(ii) Suggest the advantage of recording the time taken for the fifth disc to reach the surface, rather than for the tenth disc.

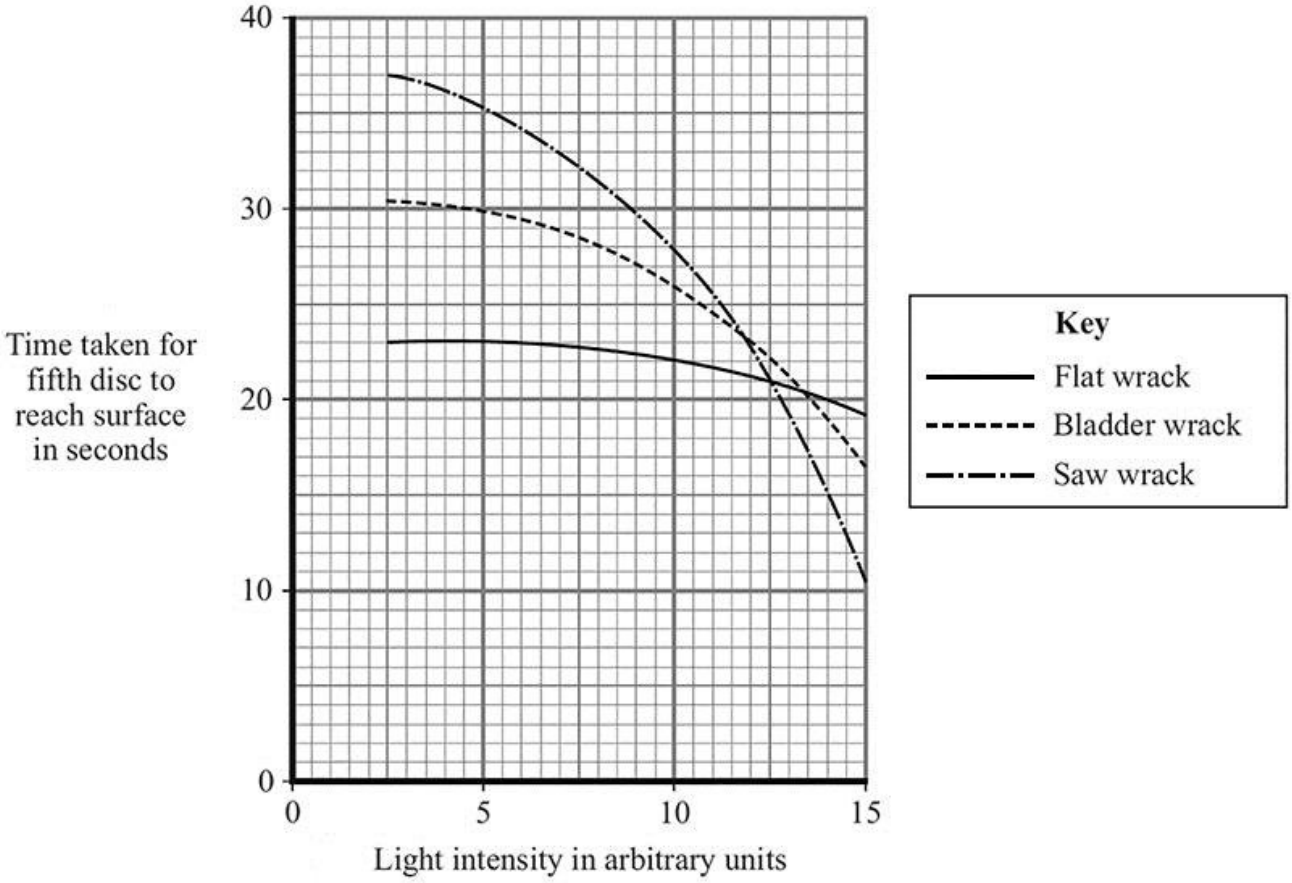
_____

_____

(1)

(b) The students carried out their experiments at different light intensities.
The graph shows the results they collected.

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(i) Compare the rate of photosynthesis for flat wrack with the rate for saw wrack at different light intensities.

_____

_____

_____

_____

(2)

(ii) Seawater absorbs light.

The growth rate of saw wrack is less than the growth rate of bladder wrack.

Suggest why.

_____

_____

_____

_____

(2)

(Total 6 marks)

Q11.

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This question is about photosynthesis.

(a) Plants make glucose during photosynthesis. Some of the glucose is changed into insoluble starch.

What happens to this starch?

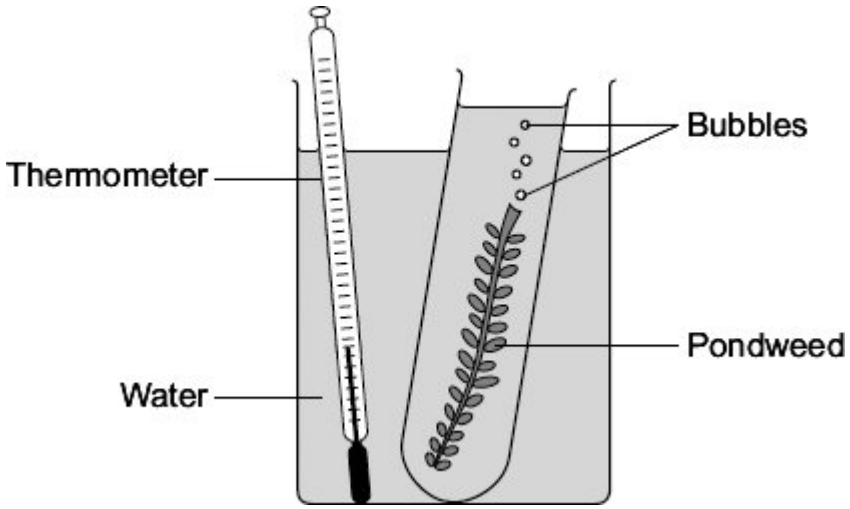
Tick (✓) **one** box.

The starch is converted into oxygen.	☐
The starch is stored for later use.	☐
The starch is used to make the leaf green.	☐

(1)

(b) A student investigated the effect of temperature on the rate of photosynthesis in pondweed.

The diagram shows the way the experiment was set up.



(i) The student needed to control some variables to make the investigation fair.

State **two** of these variables.

1. _____

2. _____

(2)

(ii) The bubbles of gas are produced only while photosynthesis is taking place.

What **two** measurements would the student make to calculate the rate of photosynthesis?

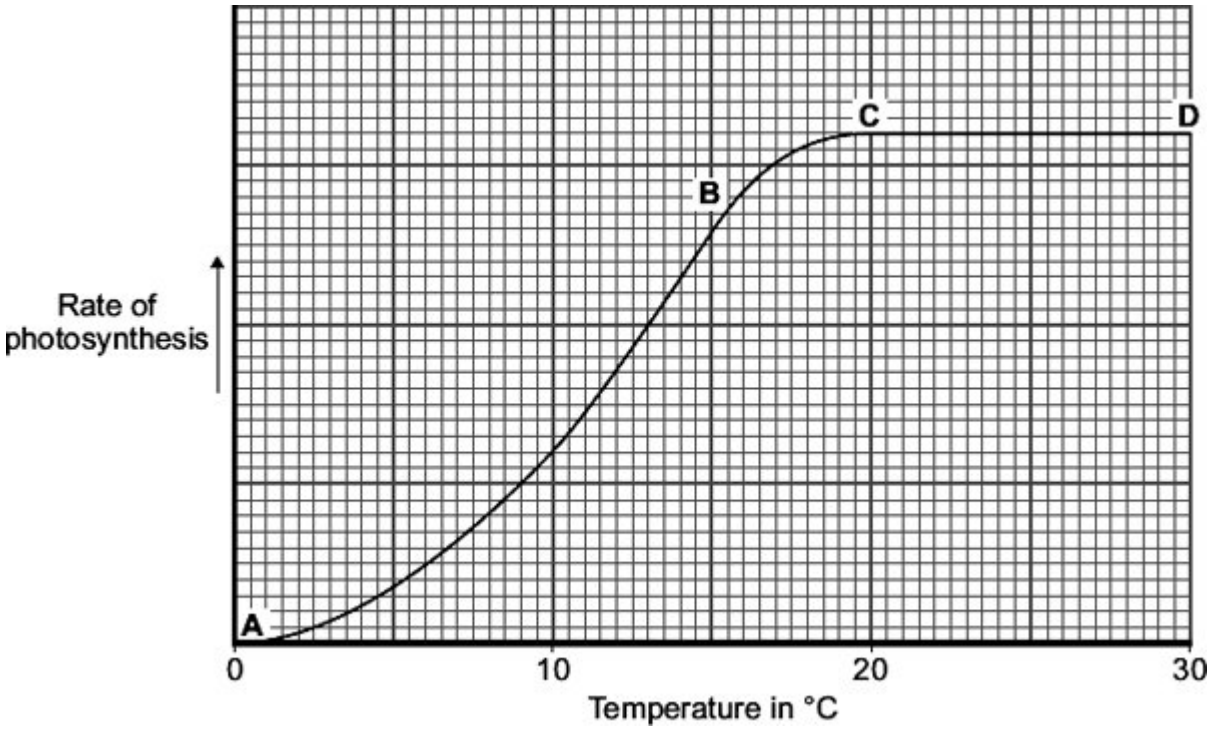
1. _____

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2. _____

(2)

(c) The graph shows the effect of temperature on the rate of photosynthesis.



(i) Name the factor that limits the rate of photosynthesis between the points labelled **A** and **B** on the graph.

_____

(1)

(ii) Suggest which factor, carbon dioxide, oxygen or water, might limit the rate of photosynthesis between the points labelled **C** and **D** on the graph.

_____

(1)

(Total 7 marks)

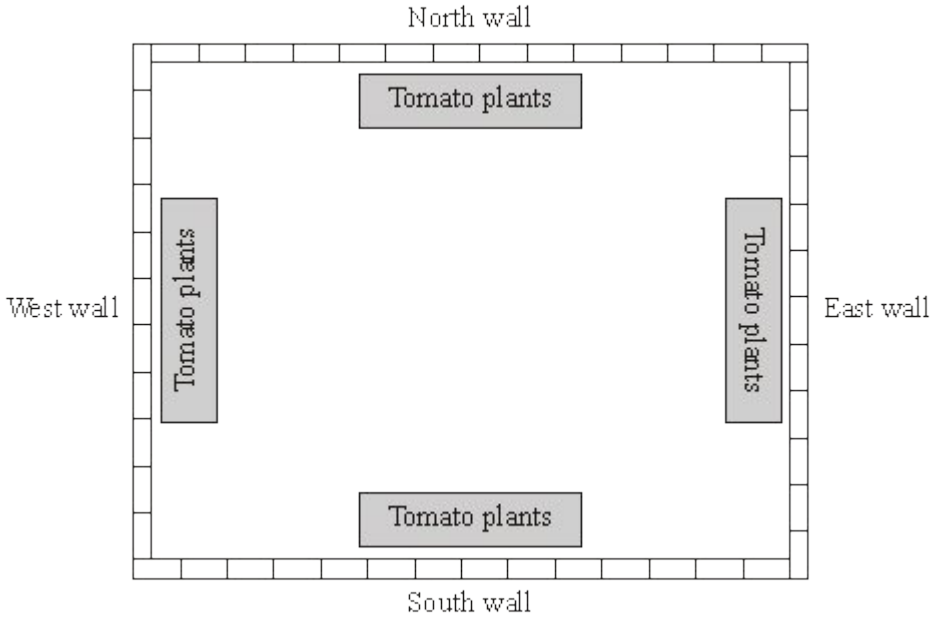
Q12.

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.

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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 ☐

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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)

Q13.

(a) (i) Complete the word equation for photosynthesis.

carbon dioxide + _____ (+ light energy) → glucose + _____

(2)

(ii) Most of the carbon dioxide that a plant uses during photosynthesis is absorbed from the air.

Give **one** other source of carbon dioxide for a plant.

Draw a ring around your answer.

the soil **respiration in the plant** **osmosis in the plant** **water**

(1)

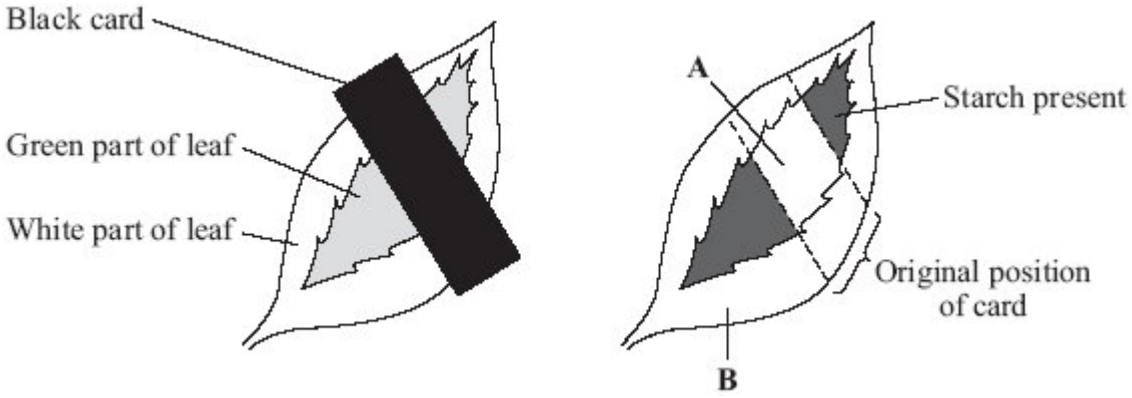
A student investigated the conditions that plants need for photosynthesis.
The leaves of the plant he used had green and white parts.

Diagram 1 shows how part of one leaf was covered in black (opaque) card.
The plant was placed in a warm, sunny area and was watered well.
Eight hours later the leaf was removed from the plant and was tested for starch.

The results of the test are shown in **Diagram 2**, the shaded parts show where starch was present.

Diagram 1 **Diagram 2**

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(b) Name the **two** independent variables in this investigation.

1. _____

_____

2. _____

_____

(2)

(c) Why was no starch found in:

(i) the part of the leaf labelled **A**

_____

_____

(1)

(ii) the part of the leaf labelled **B**?

_____

_____

(1)

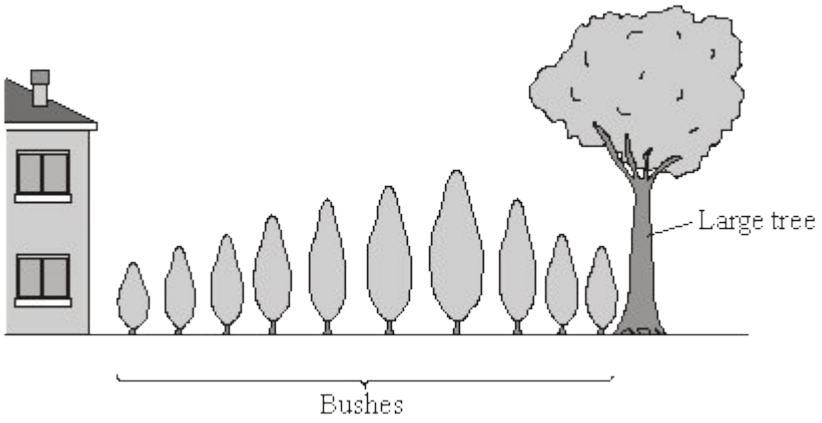
(Total 7 marks)

Q14.

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

The bushes were the same species and the same age.

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(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.

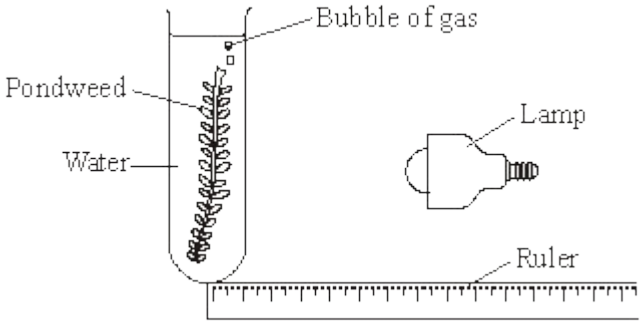
_____ + water (+ light energy) ® _____ + oxygen

(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.

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

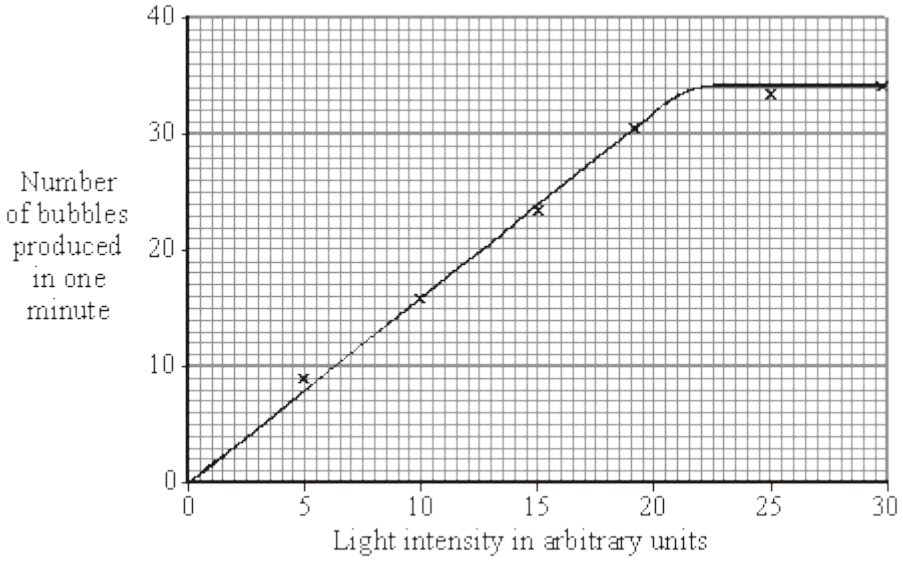
(i) Suggest how the student varied the intensity of the light received by the pondweed.

_____

_____

(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."

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Why was her conclusion incomplete?

_____

_____

(1)

(Total 8 marks)

Q15.

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)

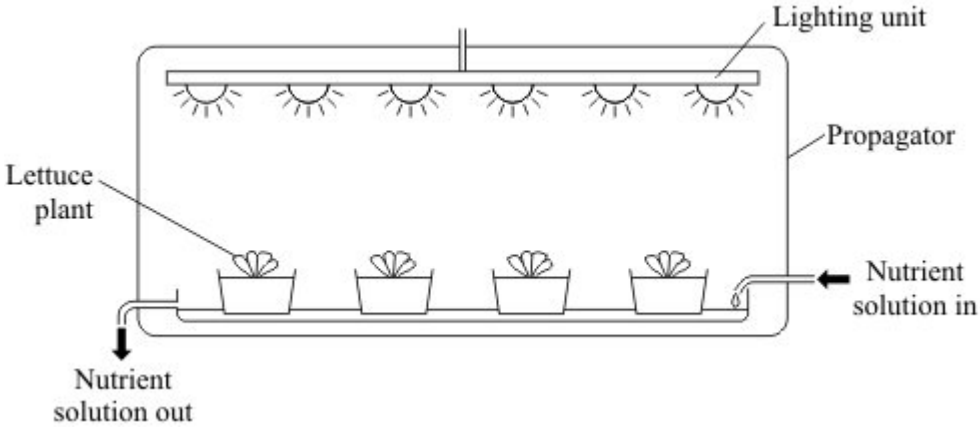
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Q16.

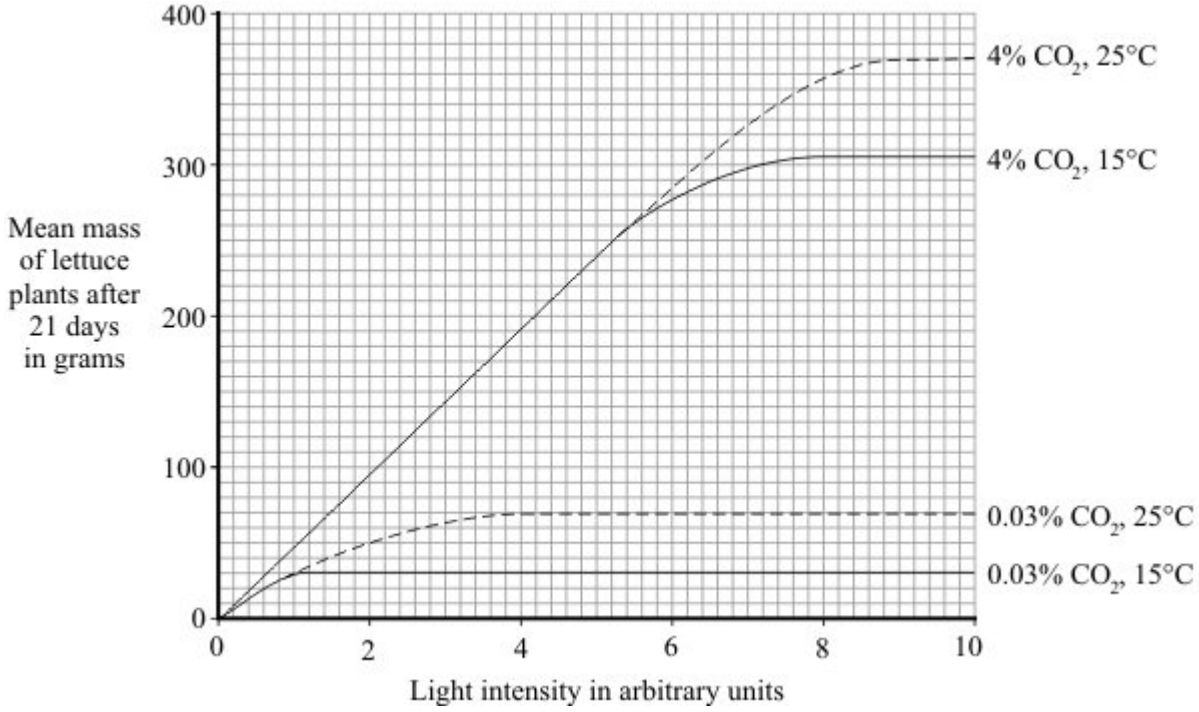
Changing the conditions in which plants grow affects how fast they grow.

The diagram shows a propagator in which scientists can control temperature, light intensity and carbon dioxide concentration.

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The graph shows the effects of changing the temperature, light intensity and carbon dioxide concentration on the growth of lettuce plants.



(a) Describe and explain the effect of increasing light intensity on the mean mass of lettuce plants at 4% carbon dioxide and 15 °C.

_____

_____

_____

_____

_____

_____

_____

(3)

(b) Growers wish to make maximum profits from their lettuces.

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What do they need to consider before making decisions about the growing conditions for their lettuces?

_____

_____

_____

_____

(2)

(c) The nutrient solution contains nitrate ions and magnesium ions.

Complete the table to show the functions of these ions in plants and their deficiency symptoms.

Ion	Function in plants	Deficiency symptoms
Nitrate	_____ _____ _____	_____ _____ _____
Magnesium	_____ _____ _____	_____ _____ _____

(4)

(Total 9 marks)

Q17.

(a) The equation describes the process of photosynthesis.

carbon dioxide + _____ + light energy $\longrightarrow$ glucose + _____

(i) Write in the names of the **two** missing substances.

(2)

(ii) Name the green substance which absorbs the light energy.

_____

(1)

(b) (i) In bright sunlight, the concentration of carbon dioxide in the air can limit the rate of photosynthesis. Explain what this means.

_____

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_____

_____

(2)

(ii) Give **one** environmental factor, other than light intensity and carbon dioxide concentration, which can limit the rate of photosynthesis.

_____

(1)

(Total 6 marks)

Q18.

The table shows the effects that two different concentrations of sulphur dioxide in the air had on the growth of rye grass plants.

Sulphur dioxide concentration in the air in micrograms per m^3	**9.0**	**191.0**
Number of leaves per plant	85.6	47.3
Total leaf area in cm^2	417.2	203.6
Dry mass of stubble in grams	0.48	0.22

(a) What human activity releases sulphur dioxide into the air?

_____

(1)

(b) (i) What effect does sulphur dioxide have on rainwater?

_____

_____

(1)

(ii) Use information from the table to describe **one** effect of sulphur dioxide on the leaves of the grass plants.

_____

_____

(1)

(c) The stubble consists of the bases of the stems of the plants and the roots left in the soil after harvesting.

Use your answer to part (b) to explain why the dry mass of the stubble was less at the higher concentration of sulphur dioxide.

_____

_____

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_____

_____

(2)

(Total 5 marks)

Q19.

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)

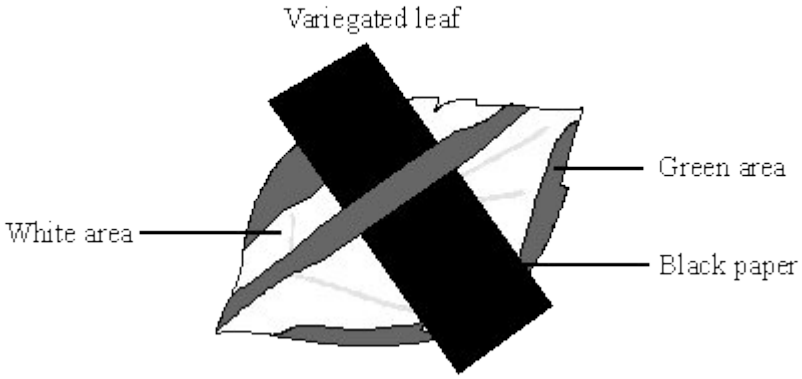
(c) Name **two** products of photosynthesis.

_____

(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	Start present after test	
	covered	uncovered
Green area	no	yes
White area	no	no

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

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_____

_____

_____

_____

_____

_____

_____

(4)

(Total 8 marks)

Q20.

(a) Complete the following sentences.

Green plants produce their own food by a process called photosynthesis. In this process the raw materials are _____ and carbon dioxide. Glucose and _____ are produced. _____ energy is absorbed by the green substance called _____ .

(4)

(b) Name **two** things that can happen in the plant to the glucose produced in photosynthesis.

1. _____

2. _____

(2)

(c) Plants need mineral salts.

(i) Through which part do mineral salts get into the plant?

_____

(1)

(ii) Explain why water is important in this process.

_____

_____

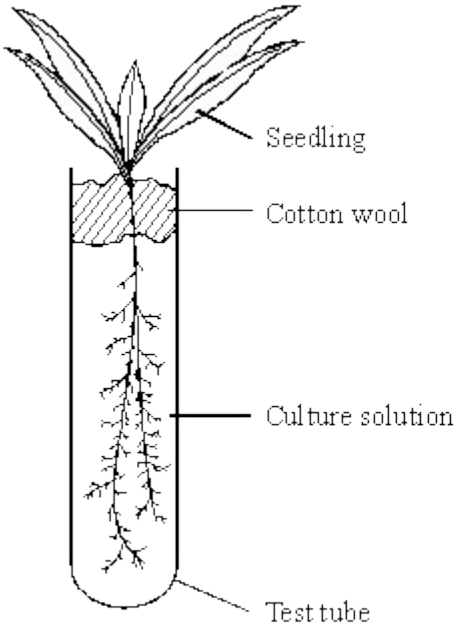
_____

_____

(2)

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Some students set up water cultures to find out how plants use nitrates.
They had two sets of nutrient solutions.
A full solution provided the plant with all the required nutrients.
The results table shows the average mass of the seedlings after 28 days of growth.



Culture solution	Average mass of seedling in g
distilled water	0.14
full solution with no nitrates	0.29
full solution	0.43

(d) (i) Give a conclusion you could make from these results.

_____

_____

(1)

(ii) Calculate the difference in average mass caused by the addition of nitrates to the culture solution.

_____

(1)

(iii) What are nitrates used for in the seedling?

_____

(1)

(iv) Some factors need to be controlled to keep this test fair. Name **two** of them.

1. _____

2. _____

(2)

(v) Suggest **one** way you could improve the experiment.

_____

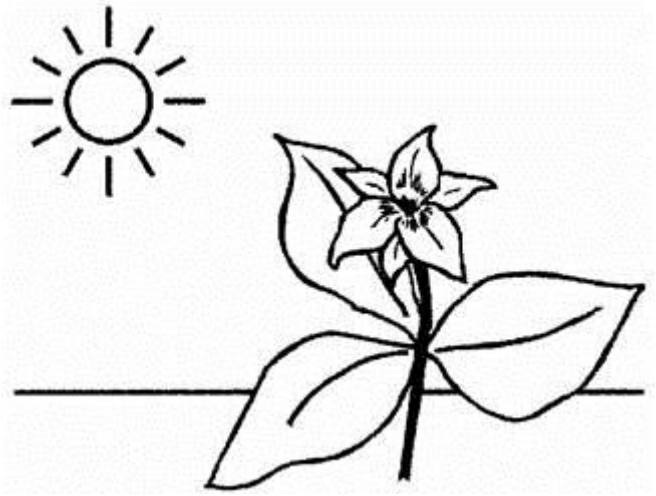
(1)

(Total 15 marks)

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Q21.

(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.

_____

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_____

(1)

(Total 10 marks)

Q22.

(a) Photosynthesis is a process that takes place in green plants.

(i) What type of energy is needed for this process?

_____

(1)

(ii) What substance in the plant absorbs this energy?

_____

(1)

(iii) In which part of the plant cell does photosynthesis take place?

_____

(1)

(iv) Write a balanced chemical equation for photosynthesis.

_____ → _____

(3)

(b) Describe **two** ways you could speed up photosynthesis.

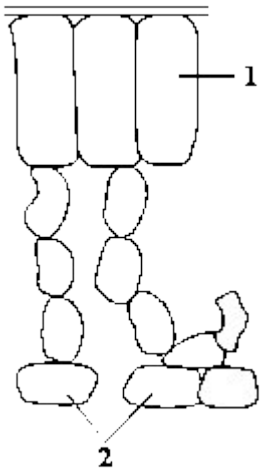
_____

_____

_____

(2)

(c) The diagram shows the outline of a cross-section of a leaf. Name cells **1** and **2** and describe how they are involved in photosynthesis.



_____

_____

_____

_____

_____

_____

_____

_____

(4)

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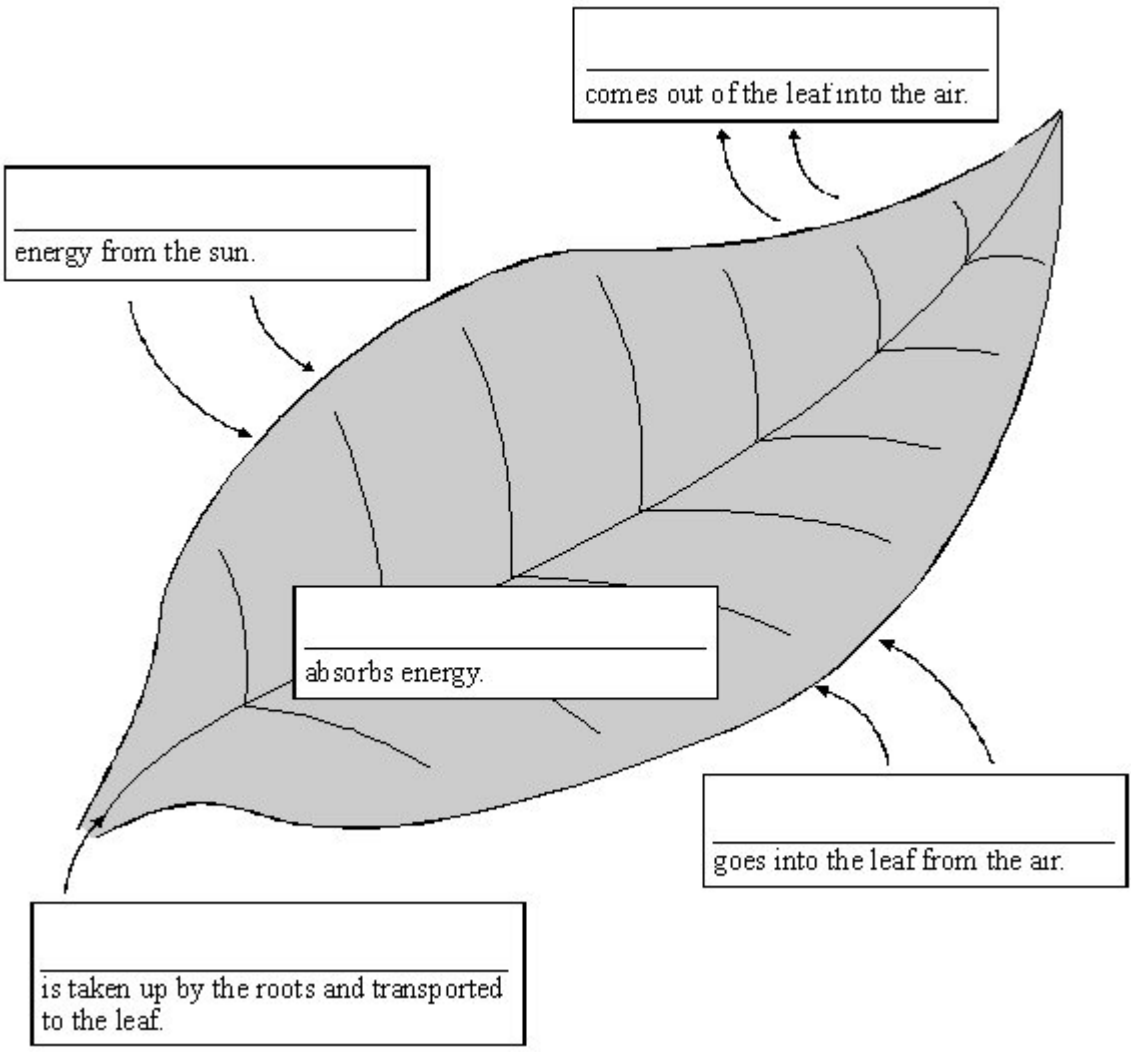
(Total 12 marks)

Q23.

The diagram shows how a leaf of a green plant makes glucose.

(a) Use words from the box to complete the labels on the diagram. You may use each word once or not at all.

carbon dioxide	chlorophyll	glucose	heat
light	oxygen	water	



(5)

(b) (i) Compete the following sentence.

Glucose in food is a type of _____ . When we eat it, it gives us energy.

(1)

(ii) The plant turns some of the glucose into starch. Why is starch useful to the plant?

_____

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_____

(1)

(iii) What does the plant do with the rest of the glucose?

_____

(1)

(c) (i) What is the name of the process outlined in the diagram?

_____

(1)

(ii) Give **one** way that leaves are adapted to do this process.

_____

(1)

(Total 10 marks)

Q24.

Photosynthesis takes place the leaves of green plants.

(a) Write a balanced chemical equation for the formation of glucose by photosynthesis.

_____

(3)

(b) Describe **two** ways that the rate of photosynthesis can be decreased without lowering the temperature.

_____

_____

_____

_____

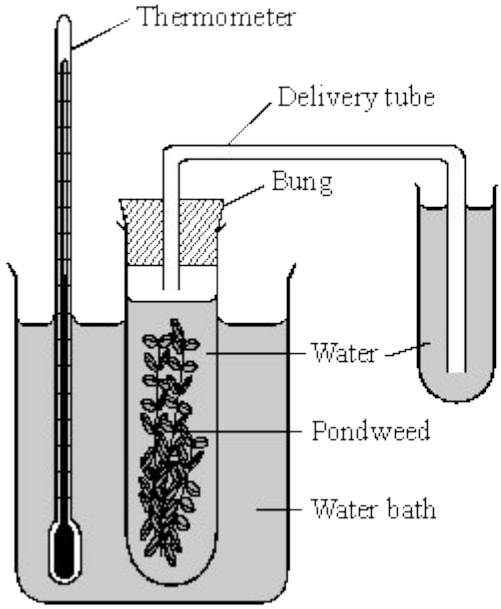
_____

(2)

(c) Some students decided to investigate the effect of temperature on the rate of photosynthesis in pond weed. They set up the apparatus and altered the temperature using ice and hot water. The counted the number of bubbles given off in a minute at different temperatures. They obtained the following results.

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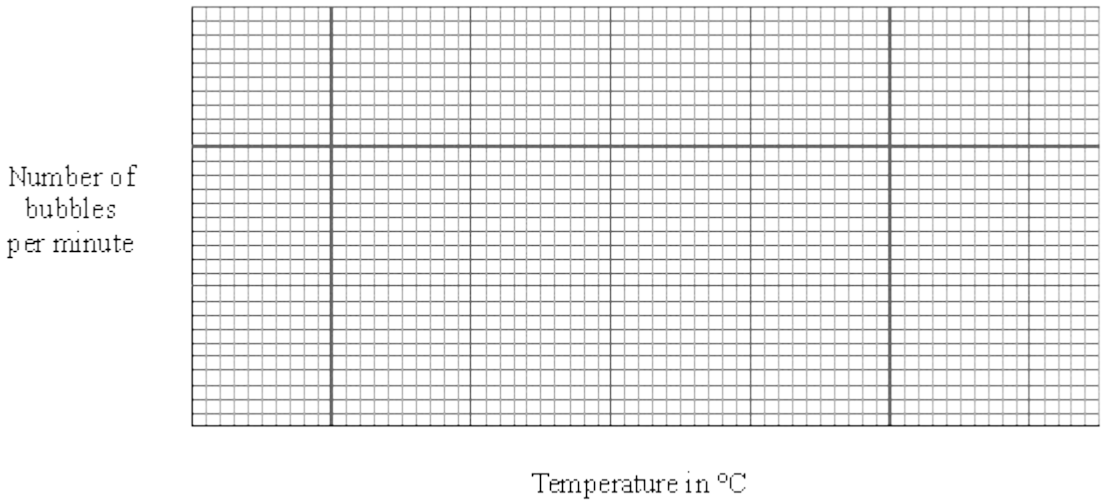
Apparatus



Results

Temperature in °C	Number of bubbles per minute
10	6
20	15
30	21
40	23
50	19

(i) Plot the points on the graph.



(3)

(ii) Use your graph to predict the number of bubbles per minute at 25 °C.

_____

(1)

(iii) Suggest a reason why the rate of photosynthesis seems to decrease in this pondweed after 40 °C.

_____

_____

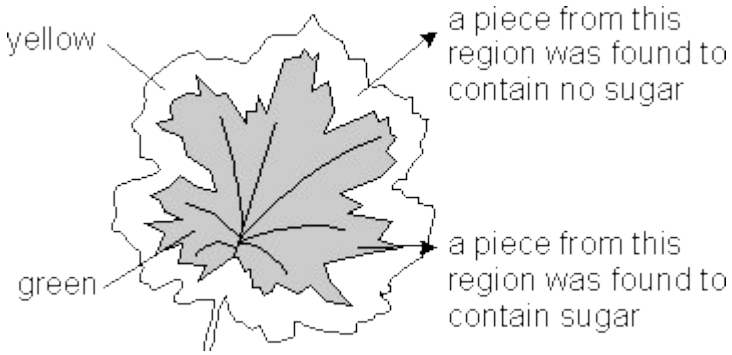
(1)

(Total 10 marks)

Q25.

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A plant with variegated (two-coloured) leaves was left in sunlight for several hours. Pieces of one of its leaves were then detached (removed) and tested for sugar. The diagram below shows the results.



Explain, as fully as you can, why the yellow region of the leaf had not produced sugar.

_____

_____

_____

_____

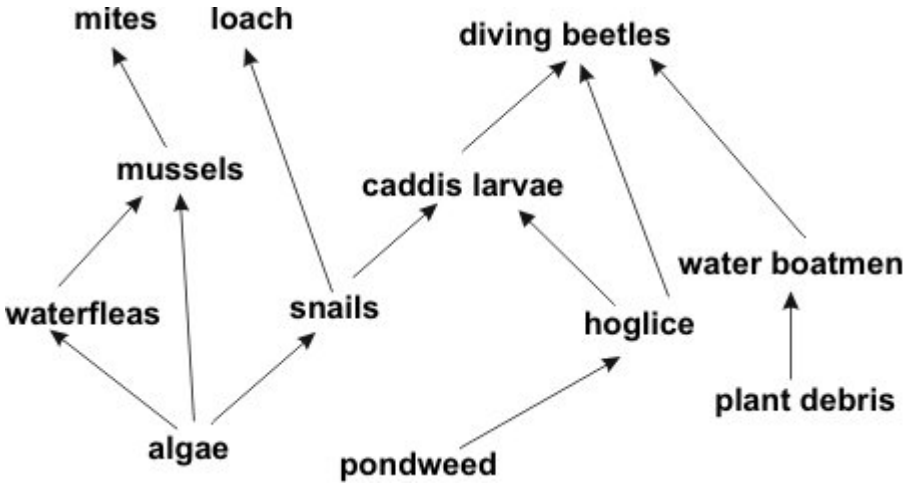
_____

_____

(Total 2 marks)

Q26.

The diagram below shows a food web for some of the organisms which live in a pond.



(a) (i) Name **one** secondary consumer in this food web.

_____

(1)

(ii) The algae are small green plants.

Give **three** conditions needed by green plants to produce sugars.

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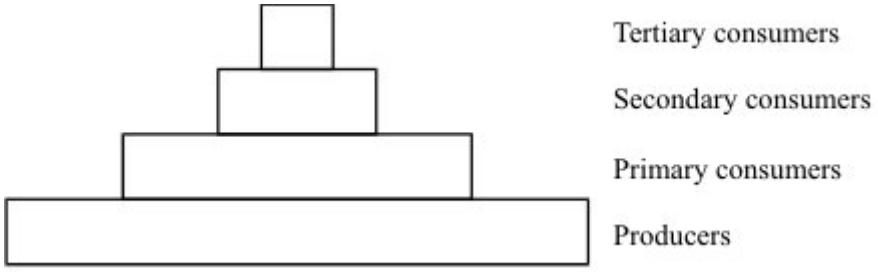
1. _____

2. _____

3. _____

(3)

(b) This is a pyramid of biomass for the organisms in the aquarium.



Some of the biomass of the producers is **not** transferred to the tertiary consumers.

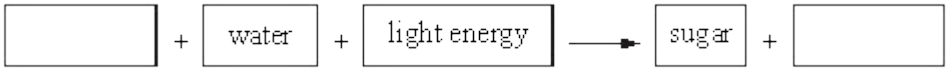
Explain, as fully as you can, what happens to this biomass.

(6)

(Total 10 marks)

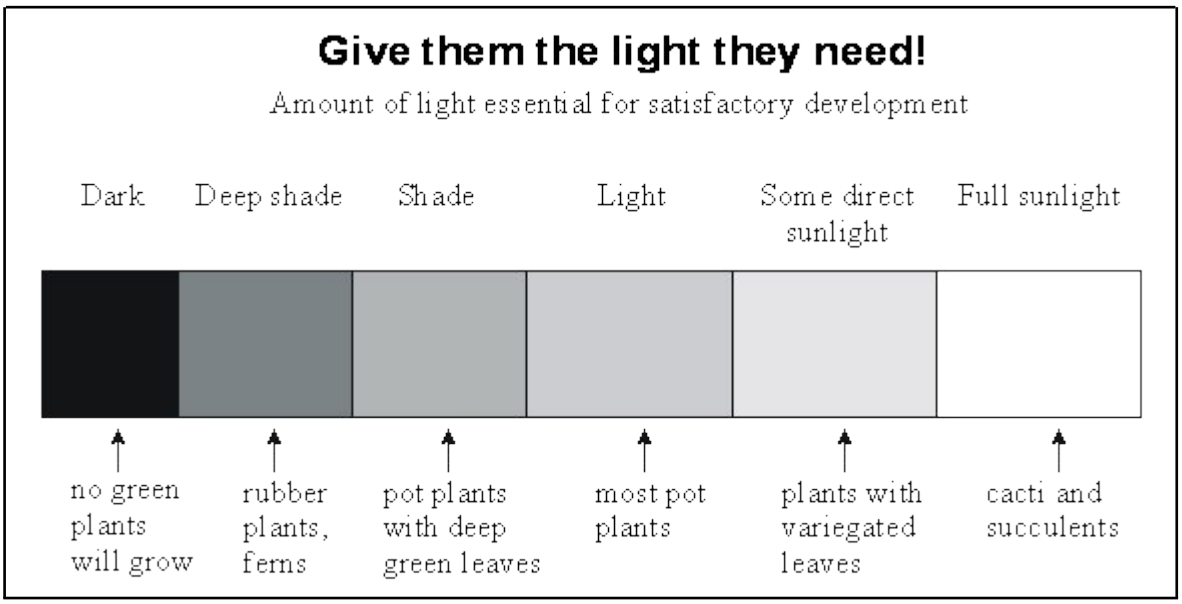
Q27.

(a) Complete the equation for photosynthesis.



(2)

(b) The diagram below is printed in a plant care manual.



Use information from the diagram to answer the following questions.

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(i) Name **one** type of plant which could live on the floor of a dense forest in the middle of summer.

_____

(1)

(ii) Explain the reason for your answer to (i) above.

_____

_____

(1)

(iii) The drawing shows one type of plant with variegated leaves.



The manual says that these plants need direct sunlight.

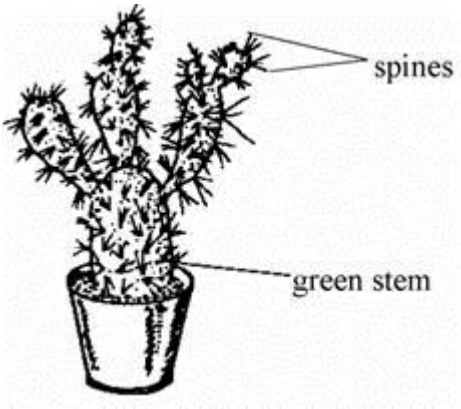
Suggest and explain why this plant needs 'some direct sunlight' in order to develop satisfactorily.

_____

_____

(2)

(iv) The drawing shows a cactus.



Suggest and explain why cacti can only develop satisfactorily if they receive full sunlight.

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_____

_____

_____

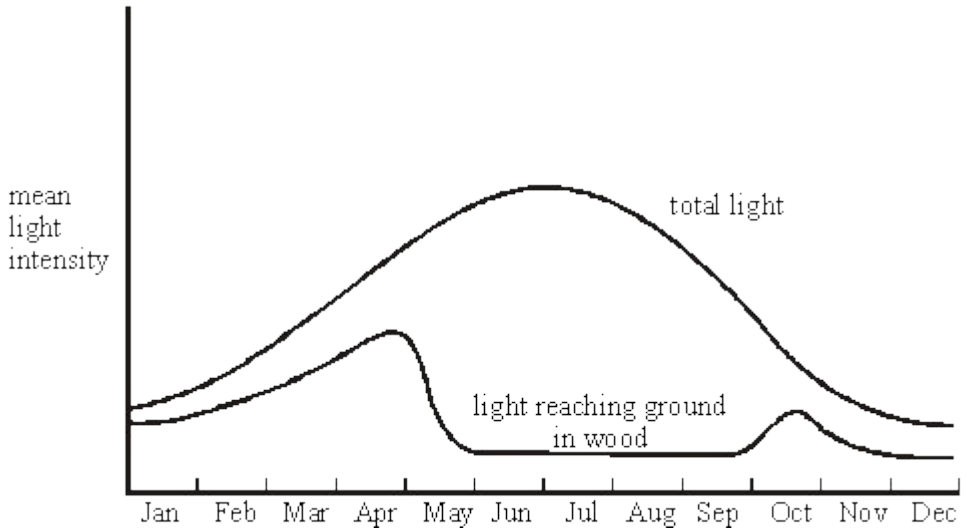
_____

(2)

(Total 8 marks)

Q28.

The graph shows the mean light intensity at different times of the year in an oak wood.



(a) (i) In which month would you expect the rate of photosynthesis in the oak trees to be greatest?

_____

(1)

(ii) There are plants living on the ground in the wood. In which month would you expect their rate of growth to be fastest?

_____

Explain your answer.

_____

_____

_____

_____

(3)

(b) Name **two** factors, other than light intensity, that would affect the rate of photosynthesis in the oak trees.

1. _____

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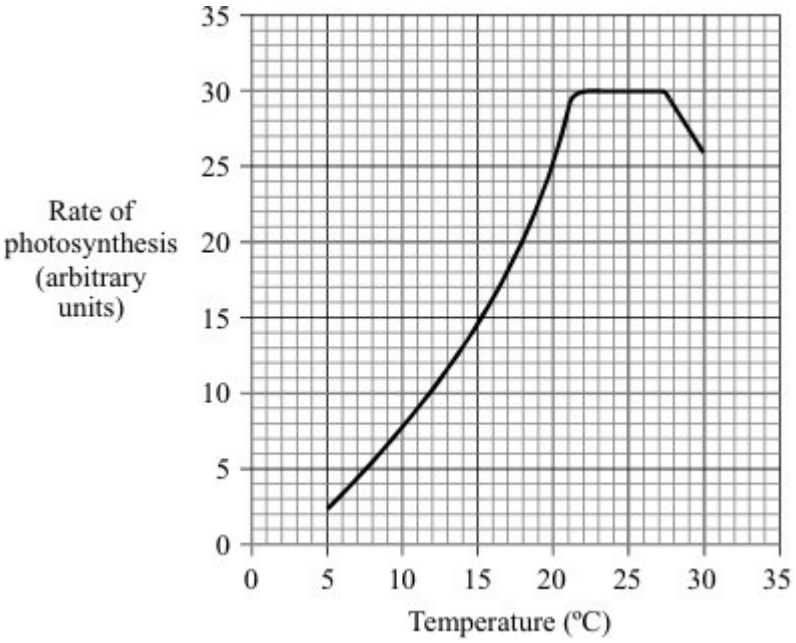
2. _____

(2)

(Total 6 marks)

Q29.

The graph shows the effect of temperature on photosynthesis.



(a) Between which temperatures is the rate of photosynthesis fastest?

_____ and _____ °C

(1)

(b) Suggest why the rate of photosynthesis stays the same between these two temperatures.

_____

_____

_____

_____

(2)

(c) A greenhouse owner wants to grow lettuces as quickly and cheaply as possible in winter.

At what temperature should he keep his greenhouse in order to grow the lettuces as quickly and cheaply as possible?

_____ °C

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Explain your answer.

_____

_____

_____

_____

(3)

(Total 6 marks)

Q30.

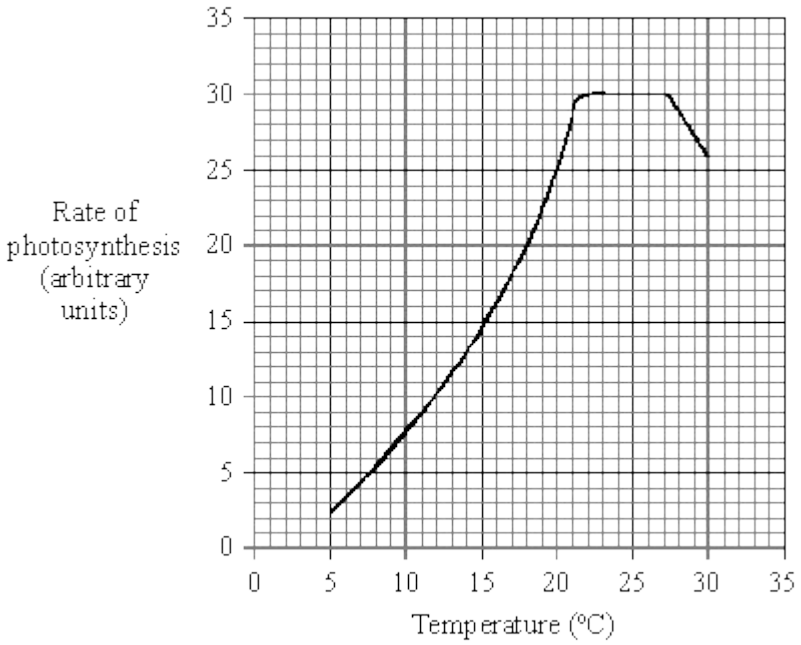
Green plants make food in their leaves.

(a) From where do the leaves get the energy that they need to make food?

_____

(1)

(b) The graph shows the effect of temperature on the rate of photosynthesis.



(i) Between which temperatures is the rate of photosynthesis fastest?

_____ and _____ °C

(1)

(ii) Suggest why the rate of photosynthesis stays the same between these two temperatures.

_____

_____

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_____

_____

(2)

(iii) A greenhouse owner wants to grow lettuces as quickly and cheaply as possible in winter.

At what temperature should he keep his greenhouse in order to grow the lettuces as quickly and cheaply as possible?

_____ °C

Explain your answer.

_____

_____

_____

_____

(3)

(Total 7 marks)

Q31.

Busy lizzie plants produce flowers with many different colours.



A gardener wants to produce busy lizzie plants to fill a flower bed in her garden.
She decides to grow them from cuttings rather than seeds.

(a) Give **one** condition that she should supply to the new cuttings so that they grow well.

_____

(1)

Busy Lizzie plants can produce flowers which are white, pink or red.
A gardener wants to grow a display containing all three colours of flowers.

(b) Give **one** advantage and **one** disadvantage to the gardener of growing Busy Lizzie plants from cuttings rather than seeds.

Advantage _____

Disadvantage _____

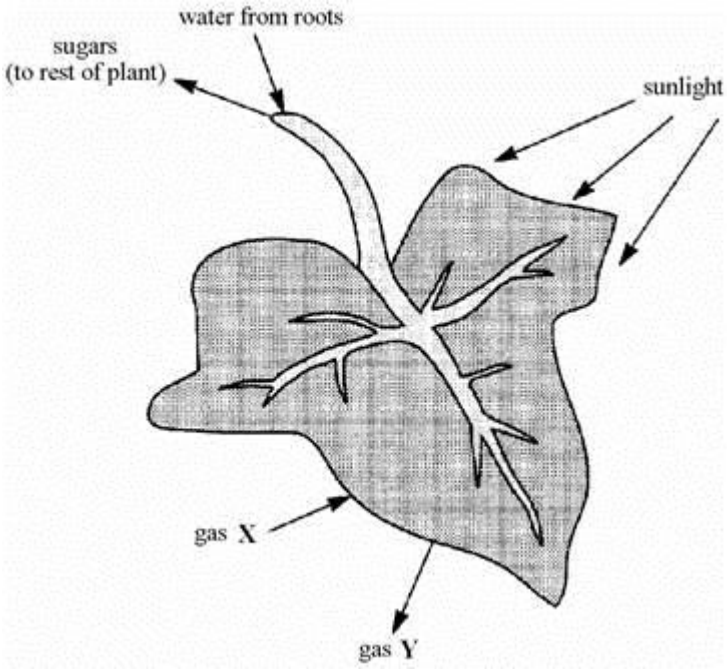
(2)

(Total 3 marks)

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Q32.

The diagram shows a plant leaf during photosynthesis.



(a) Name:

(i) gas **X**; _____

(ii) gas **Y**. _____

(2)

(b) Why is sunlight necessary for photosynthesis?

_____

_____

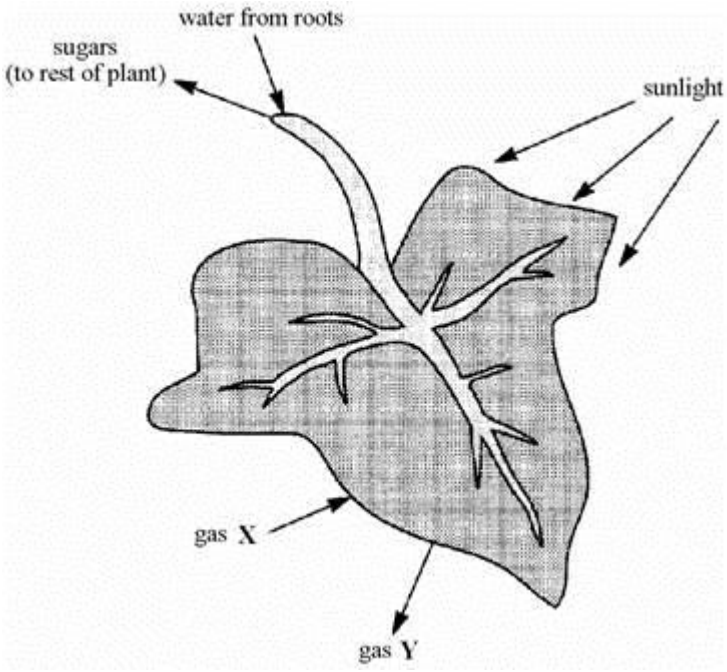
(1)

(Total 3 marks)

Q33.

The diagram shows a plant leaf during photosynthesis.

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(a) Name:

(i) gas **X**; _____

(ii) gas **Y**. _____

(2)

(b) Why is sunlight necessary for photosynthesis?

_____

_____

(1)

(c) Some of the sugars produced by photosynthesis are stored as starch in the roots. Explain, as fully as you can, why it is an advantage to the plant to store carbohydrate as starch rather than as sugar.

_____

_____

_____

_____

_____

_____

(3)

(Total 6 marks)

Q34.

Low light intensity is one factor that limits the yield of a crop.

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In Britain, many tomato growers use artificial lights to increase the yield of tomato crops.

The table shows the amount of natural daylight and artificial lamplight received by a tomato crop grown in a greenhouse.

Month	Natural daylight received by tomato plant		Artificial lamplight given to tomato plant		Total light energy received by plant per day in J/cm²	Percentage increase in growth resulting from artificial light
	Day length in hours	Light energy received by plant per day in J/cm²	Hours of light given per day	Light energy received by plant per day in J/cm²		
January	8.1	239	18	492	731	206
February	9.9	492	18	492	984	100
March	11.9	848	12	328	1176	39
April	13.9	1401	2	55	1456	4
May	15.5	1786	0	0	1786	0
June	16.6	1960	0	0	1960	0
July	16.2	1849	0	0	1849	0
August	14.7	1561	0	0	1561	0
September	12.8	1064	2	55	1119	5
October	10.6	614	11	301	915	49
November	8.8	288	18	492	780	171
December	7.6	183	18	492	675	269

(a) Describe the pattern for the amount of light energy received from natural daylight by a tomato plant during the day.

_____

_____

_____

_____

_____

_____

(3)

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(b) A tomato plant needs 600 J of light energy per cm^2 each day to grow and produce tomatoes.

Use this information and data from the table to suggest an explanation for the pattern of the artificial light given to the tomato plants.

_____

_____

_____

_____

_____

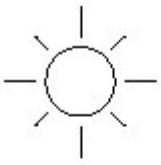
_____

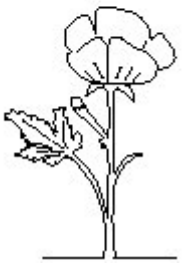
(2)

(Total 5 marks)

Q35.

Energy for living organisms comes from the Sun.





Complete the sentences by using the correct words from the box.

animals	**carbohydrates**	**carbon dioxide**	**oxygen**	**plants**	**water**

Light energy is captured by green _____ .

They use this energy to make _____ .

To do this, they also use _____ .

(Total 3 marks)

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