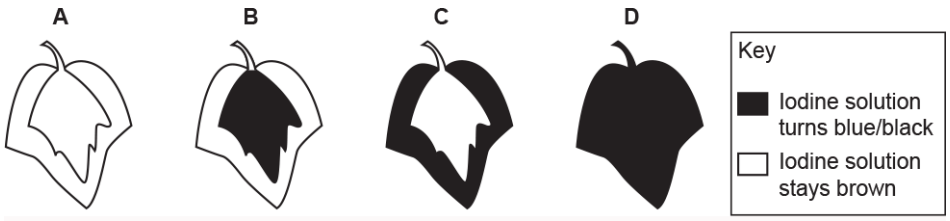
Photosynthesis (F)

1. The diagram shows a variegated leaf.

Which diagram shows the correct starch test results for the variegated leaf?



Your answer ☐ **[1]**

2. Fig. 16.1 shows a plant that grows in South America called stevia.

Fig. 16.1

i. Write down the number of trophic levels in this food web.

---

[1]

ii. What is the source of energy for this food web?

---

[1]

iii. Septoria fungus is a parasite of stevia.

Explain what is meant by the term **parasite**.

---

[2]

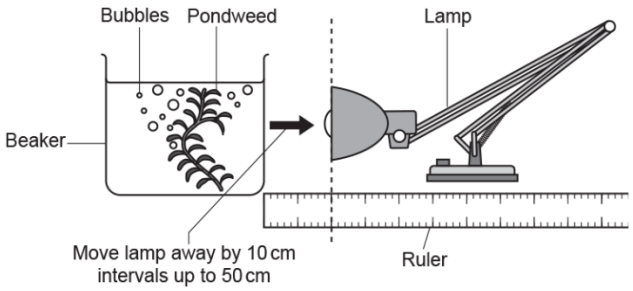
3 (a). Two students investigate photosynthesis. Look at the notes from their investigation.

Aim of the experiment

To use pondweed to see how light intensity affects the rate of photosynthesis.

Method

1. Set up the apparatus as in the diagram.
2. Leave the pondweed for five minutes so it can adjust to the new light intensity.
3. Count the number of bubbles given off by the pondweed in one minute.
4. Move the lamp 10 cm further away from the beaker.
5. Leave the pondweed for five minutes so it can adjust again.
6. Count the number of bubbles given off by the pondweed in one minute.
7. Repeat by moving the lamp further away from the beaker by 10 cm intervals until 50 cm is reached.



What is the **independent** variable in their investigation?

_____ **[1]**

(b).

i. Explain why counting the number of bubbles will not give an **accurate** measure of the rate of photosynthesis.

_____

_____

_____ **[2]**

ii. Describe how the students could develop their investigation to improve the **accuracy** of their results.

_____

_____

_____

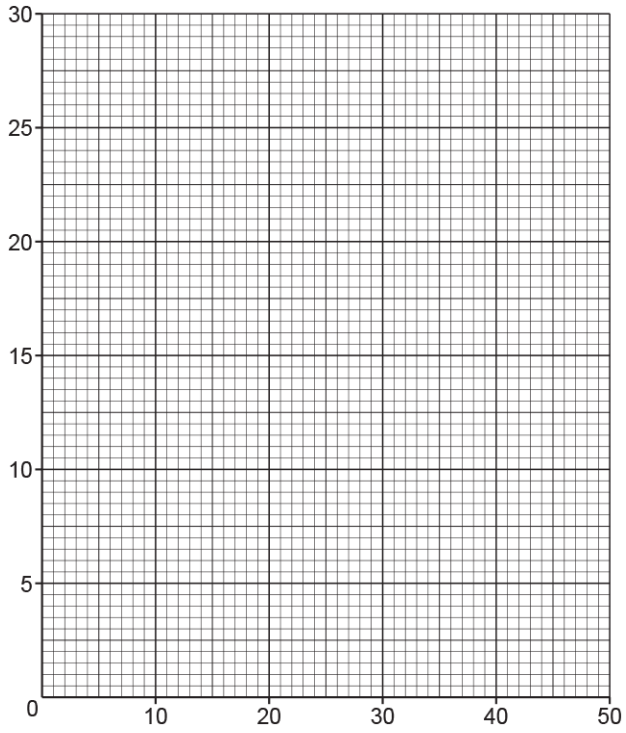
_____ **[2]**

(c). The table shows the results.

Distance from lamp to beaker (cm)	Number of bubbles given off (per minute)
10	30
20	14
30	6
40	2
50	0

i. One student started to draw a graph but did not finish.

Complete the graph using the results in the table and draw a curve of best fit.



[4]

ii. Write down what the students could conclude from their investigation.

Include data from the results table in your answer.

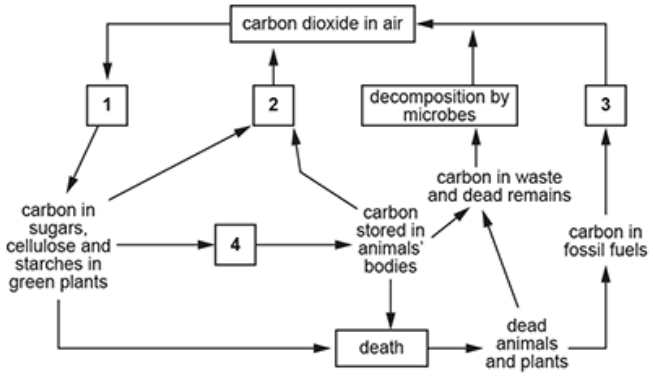
_____

_____

_____

_____ **[2]**

4. The diagram shows the carbon cycle.



Scientists investigated if crops can be grown on the planet Mars.

They used a soil that was similar to the soil found on Mars. The soil contained some minerals but no living organisms.

i. The scientists managed to grow crops in the soil. However on Mars, the minerals in the soil would soon run out.

Explain why.

---

[2]

ii. Living organisms could be added to the soil but there is no air on Mars. The plants would need to be grown in an enclosed structure.

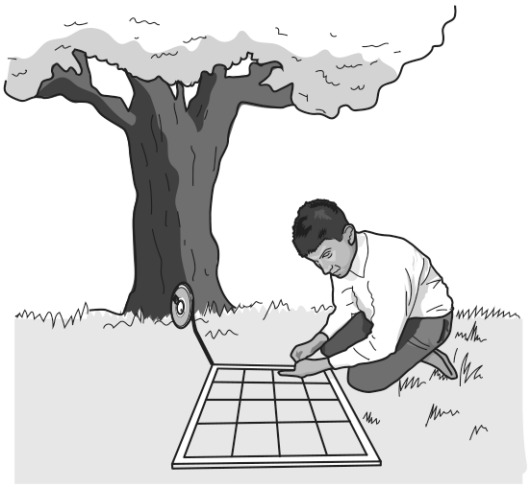
At first, air would need to be added, but after a while the organisms in the soil and the plants would supply each other with the gases they need.

Explain how this would happen.

---

[2]

5. A student investigates plants growing underneath a tree.



He lays out a tape measure on the ground, starting at the tree. He then places a quadrat on the ground.

He measures the percentage of the ground in the quadrat that is covered by plants. He repeats this every metre away from the tree.

The table shows his results.

Distance from the tree (m)	Percentage of ground covered by plants (%)
1	10
2	15
3	18
4	22
5	50
6	58
7	62
8	64

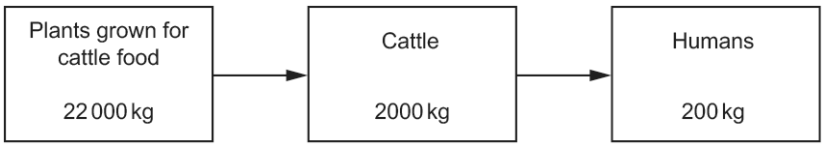
The student thinks that shade from the tree is affecting the plants.

Explain how the student's results show this.

---

[4]

6. The diagram shows the flow of biomass through an agricultural food chain.



The plants grown for cattle food often have their leaves eaten by insects.

Scientists have produced genetically modified (GM) plants that make insecticide in their leaves.

i. Explain why these GM plants would make more biomass available to humans.

In your answer use the diagram of the agricultural food chain and ideas about photosynthesis.

---

[6]

ii. Suggest **two** reasons why some people are against this type of genetic engineering.

1 ---

---

2 ---

---

[2]

7 (a). Photosynthesis takes place inside chloroplasts.

i. Complete the chemical equation for photosynthesis.

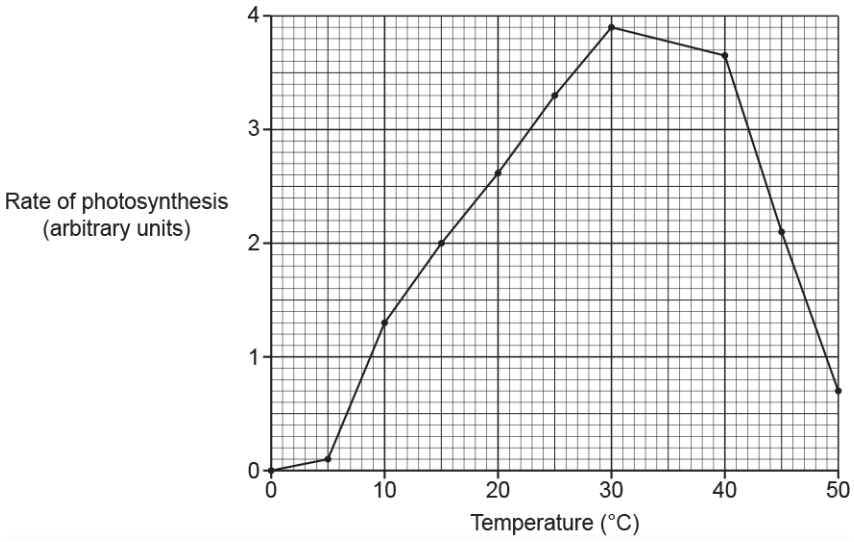
$6CO_2$ + _____ → $C_6H_{12}O_6$ + _____ **[2]**

ii. Energy is taken in from the surroundings for photosynthesis to take place.

What name is used to describe reactions that take in energy?

_____ **[1]**

(b). The graph is from an experiment to show the effect of temperature on the rate of photosynthesis.



i. What is the optimum temperature for photosynthesis in this experiment?

_____ **[1]**

ii. The rate of photosynthesis was recorded in 5°C intervals.

The experiment could be improved to get a more **precise** value for the optimum temperature.

Explain how.

_____

_____

_____ **[2]**

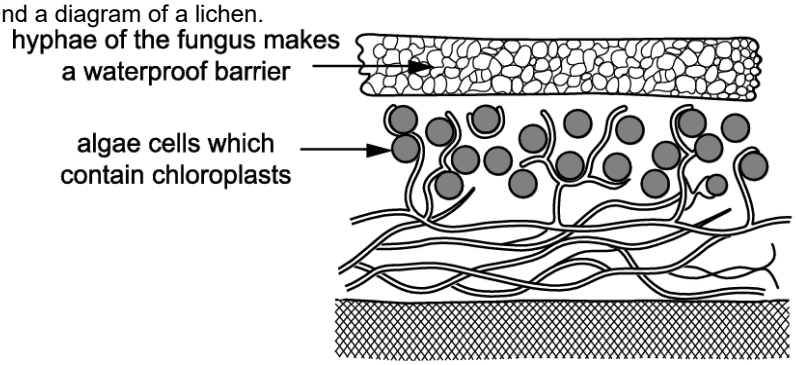
8. Some students are investigating lichens.

Lichens are often studied because they are sensitive to pollution.

Lichens are made up of two different organisms: fungi and algae.

Both the fungus and the algae gain from living together.

The students find a diagram of a lichen.



Using the information from the diagram suggest what the algae and fungi each gain from their relationship.

algae

---

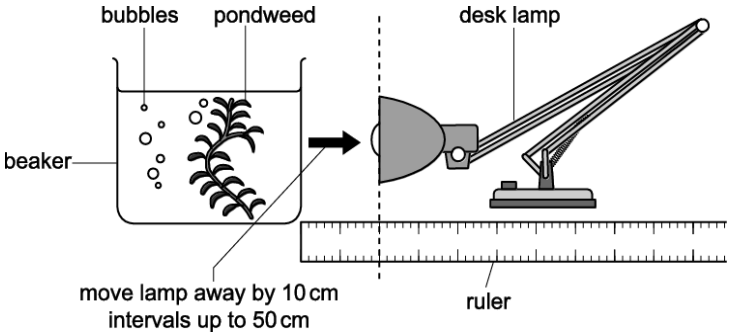
fungus

---

[2]

9 (a). Puj investigates how light intensity affects the rate of photosynthesis in pondweed.

The diagram shows how he sets up his investigation.



Puj places the lamp at distances 10 cm, 30 cm, 50 cm, 70 cm and 90 cm from the beaker.

At each distance he counts how many bubbles of oxygen gas the pondweed gives off in 1 minute.

i. Puj counts the number of bubbles to get a measure of the amount of gas given off in photosynthesis.

Why is counting bubbles **not** an accurate way of measuring the amount of gas given off?

---

[2]

ii. Bob's teacher says that collecting the gas, for example in a gas syringe, would give a more accurate measurement.

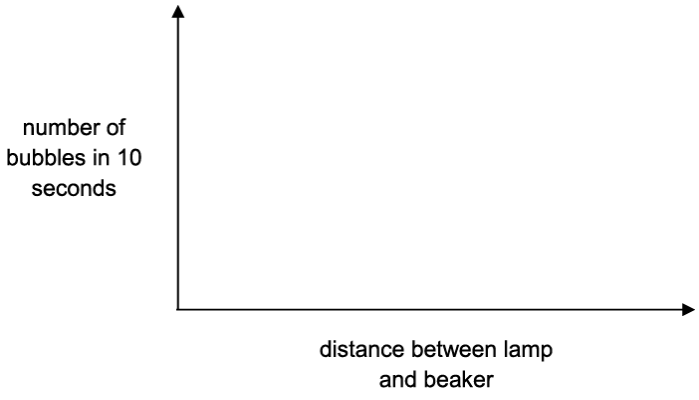
Explain why.

---

[1]

(b).

i. Sketch a line on the axes below to show the results you would expect.



[2]

ii. Explain the shape of the graph. **Two** explanations are required.

---

[2]

(c).

i. Describe how and where oxygen is produced in photosynthesis.

---

[3]

ii. Explain why the amount of oxygen gas given off is **not** a true measure of the rate of photosynthesis.

---

[2]

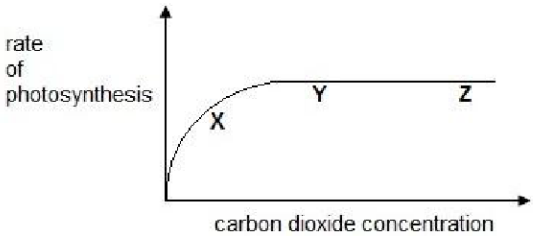
10. The inverse square law in relation to light intensity (i) and distance (d) from the light source is shown by:

A. $i \propto d^2$
B. $i \propto 1/d^2$
C. $i^2 \propto 1/d$
D. $i^2 \propto d$

Your answer ☐

[1]

11. The graph shows the effect of carbon dioxide concentration on the rate of photosynthesis.



Where on the graph is carbon dioxide a limiting factor?

A. **X** only
B. **X** and **Y**
C. **Z** only
D. **Y** and **Z**

Your answer ☐

[1]

12 (a). What is the gas given off in photosynthesis?

_____ **[1]**

(b). Explain why the amount of this gas given off is **not** a true measure of the rate of photosynthesis.

_____

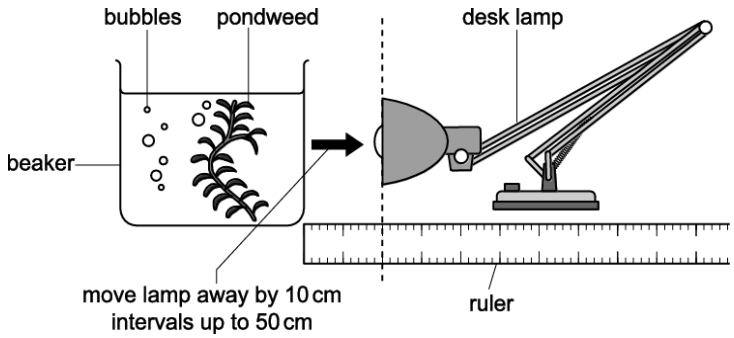
_____

_____

_____ **[2]**

(c). Puj investigates how light intensity affects the rate of photosynthesis in pondweed.

The diagram shows how he sets up his investigation.



Puj plans to place the lamp at distances 10 cm, 15 cm and 20 cm from the beaker.

Puj plans to measure how much gas the pondweed gives off in 10 seconds.

Puj counts the number of bubbles to get a measure of the amount of gas given off in photosynthesis.

Give **two** reasons why counting bubbles is **not** an accurate way of measuring the amount of gas given off.

_____

_____

_____

_____ **[2]**

(d). His teacher says he could improve his plan.

Write down two improvements he could make to his plan.

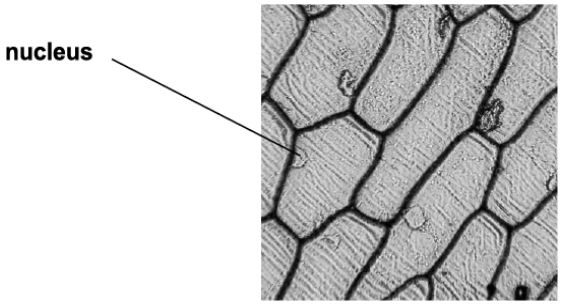
_____

_____

_____

_____ **[2]**

13. Look at the image below of some onion cells.



i. Explain how the contents of the nucleus allow it to carry out its function.

_____

_____

_____ **[2]**

ii. Explain why there are **no** chloroplasts in these onion cells.

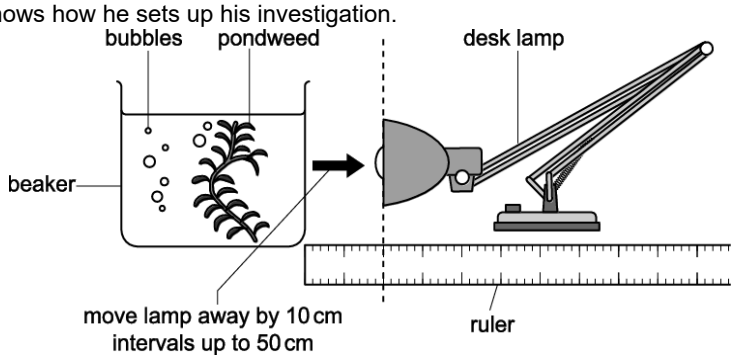
_____

_____

_____ **[2]**

14. Puj investigates how light intensity affects the rate of photosynthesis in pondweed.

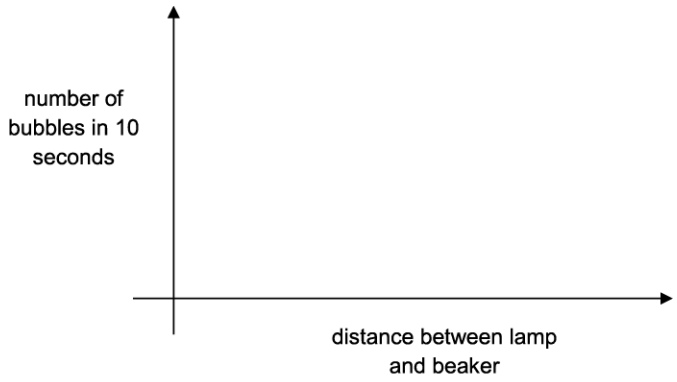
The diagram shows how he sets up his investigation.



Puj plans to place the lamp at distances 10 cm, 15 cm and 20 cm from the beaker.

Puj plans to measure how much gas the pondweed gives off in 10 seconds.

i. Sketch a line on the axes below to show the results you would expect.



[2]

ii. Explain the shape of the graph. **Two** explanations are required.

---

[2]

15. What type of reactions are photosynthesis and respiration?

	photosynthesis	**respiration**
A	endothermic	endothermic
B	endothermic	exothermic
C	exothermic	endothermic
D	exothermic	exothermic

Your answer ☐

[1]

END OF QUESTION PAPER