Questions are for both separate science and combined science students

Q1.

Photosynthesis produces oxygen.

(a) Complete the word equation for photosynthesis.

Choose answers from the box.

carbon dioxide	**fat**	**glucose**
nitrogen	**protein**	**water**

_____ + _____ → _____ + oxygen

(3)

(b) Explain how oxygen is used in cells.

_____

_____

_____

_____

(2)

A student investigated the effect of light from different coloured light bulbs on photosynthesis.

The student:

- used pondweed in a beaker of water
- used different coloured light bulbs in a lamp
- counted the number of bubbles of oxygen the pondweed produced in 2 minutes for each colour of light bulb.

(c) Give **one** hazard the student would need to consider when using the apparatus in this investigation.

Give the risk the hazard would cause.

Hazard _____

_____

Risk _____

_____

(2)

(d) The student needed to keep the temperature of the water in the beaker the same throughout the investigation.

Describe how the student could keep the temperature of the water the same.

_____

_____

(1)

(e) The beaker of water contained the pondweed.
Explain why the temperature of the water in the beaker needed to be kept the same throughout the investigation.

_____

_____

_____

_____

(2)

The table below shows the results.

Colour of light bulb	**Number of bubbles of oxygen produced in 2 minutes**
Blue	46
Green	8
Red	38
Yellow	29

(f) Which colour of light caused the highest rate of photosynthesis in the pondweed?
Tick (✓) **one** box.

Blue ☐

Green ☐

Red ☐

Yellow ☐

(1)

(g) What is the best way to display the data in the table above?

Tick (✓) **one** box.

Bar graph ☐

Line graph ☐

Scatter graph ☐

(1)

(h) The student wanted to measure the **volume** of oxygen the pondweed produced in 2 minutes.

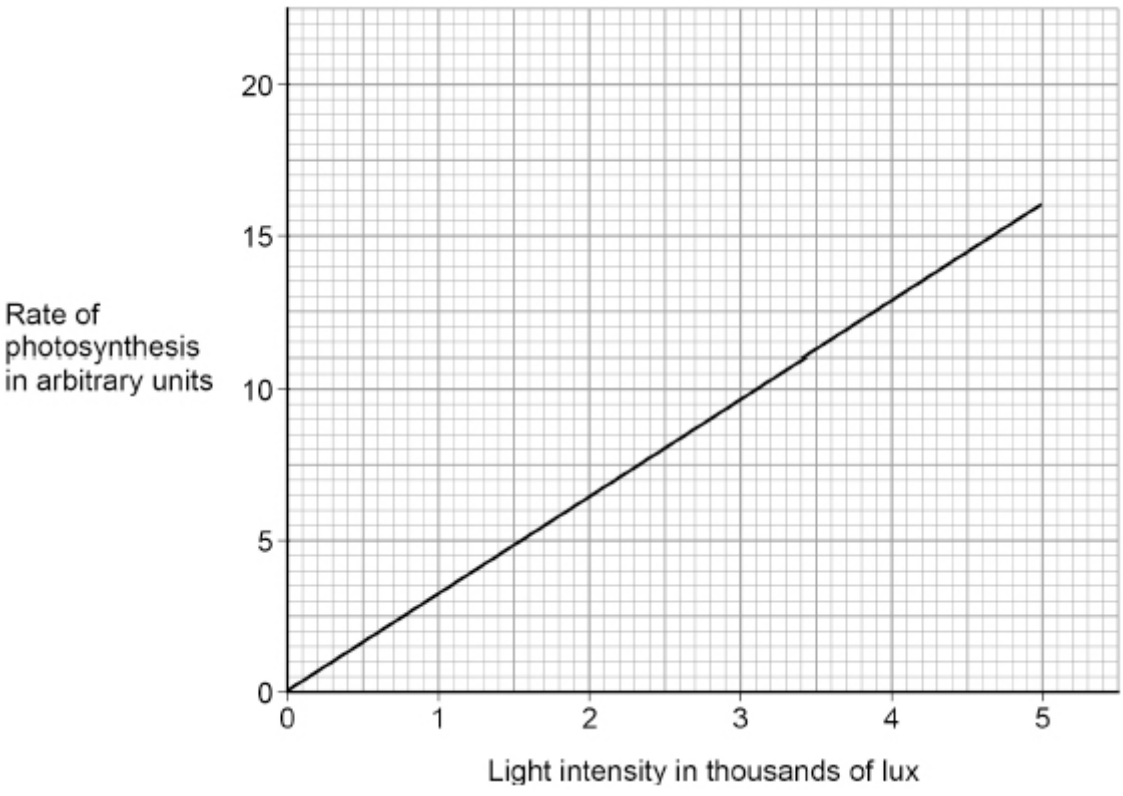
Name **one** piece of apparatus the student could use to measure the volume of oxygen.

_____

(1)

(i) Another student investigated the effect of light intensity on the rate of photosynthesis.

The figure below shows the results.



Describe what the figure shows about the relationship between light intensity and the rate of photosynthesis.

_____

_____

_____

_____

(2)

(Total 15 marks)

Q2.

A scientist investigated the rate of photosynthesis of one type of tomato plant.

The tomato plants were grown in a greenhouse.

The table below shows the results.

Percentage (%) concentration of carbon dioxide in the air	**Rate of photosynthesis in arbitrary units**
0.00	0
0.02	5
0.04	16
0.06	19
0.08	20
0.10	20
0.12	20

(a) Give **two** control variables the scientist should have used in the investigation.

1 _____

2 _____

(2)

(b) Which range of carbon dioxide concentrations caused the rate of photosynthesis to change the most?

Tick (✓) **one** box.

From 0.00% to 0.02% ☐

From 0.02% to 0.04% ☐

From 0.04% to 0.06% ☐

From 0.06% to 0.08% ☐

(1)

(c) How could the scientist have improved the validity of the results?

Tick (✓) **one** box.

Repeat each reading three times and calculate a mean.	☐
Use concentrations of carbon dioxide above 0.12%.	☐
Use different tomato plants for each concentration.	☐

(1)

(d) Explain the change in the rate of photosynthesis when the concentration of carbon dioxide increased between 0.00% to 0.08%.

_____

_____

_____

_____

(2)

(e) A farmer decided **not** to use a concentration of carbon dioxide higher than 0.08% to grow tomato plants.

Suggest **two** reasons for the farmer's decision.

Use information from above table and your own knowledge.

1 _____

_____

2 _____

_____

(2)

(Total 8 marks)