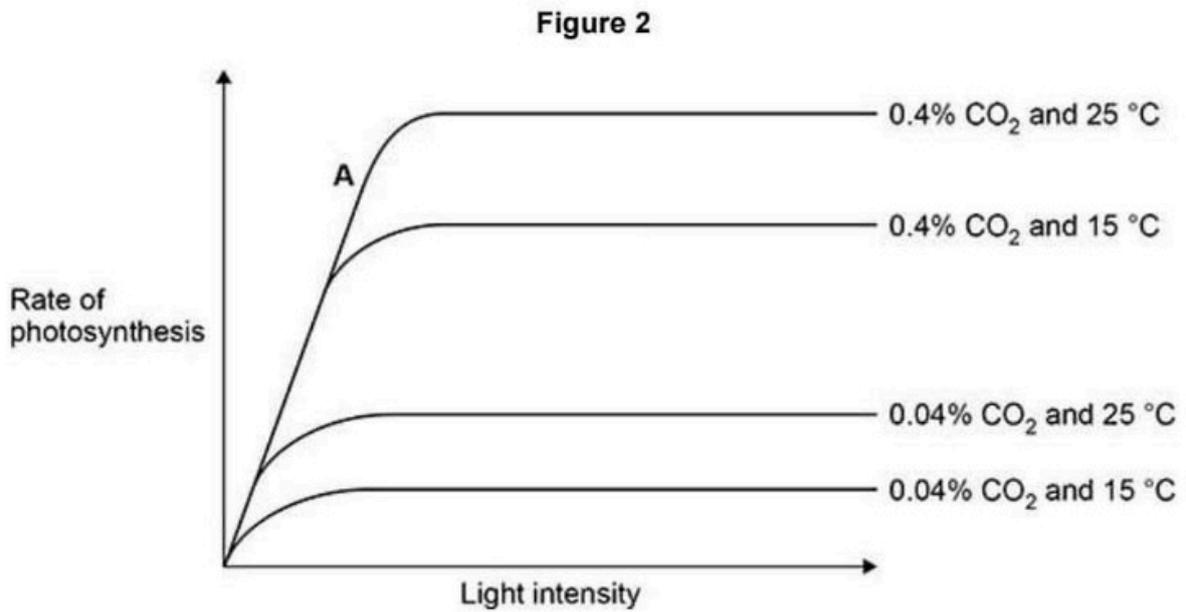


Light, carbon dioxide and temperature are limiting factors of photosynthesis.

**Figure 2** shows how the rate of photosynthesis is affected by light, carbon dioxide and temperature.



(g) At point **A** on **Figure 2**, light is a limiting factor.

What is meant by a 'limiting factor'? **(HT only)**

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**(1)**

- (h) Explain the effect of increasing temperature and increasing carbon dioxide concentration on the rate of photosynthesis shown in **Figure 2. (HT only)**

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(4)

- (i) Photosynthesis investigations often use a light source.

The spreading out of light from a source obeys the inverse square law.

The inverse square law links light intensity to distance from the light source.

Which of the following shows the inverse square law? **(HT only)**

Tick (✓) **one** box.

light intensity  $\propto \frac{1}{\text{distance}^2}$

light intensity  $\propto \text{distance}^2$

$\frac{1}{(\text{light intensity})^2} \propto \text{distance}^2$

$\frac{1}{(\text{light intensity})^2} \propto \frac{1}{\text{distance}^2}$

(1)

**Q2.**

This question is about photosynthesis.

(a) Complete the symbol equation for photosynthesis.

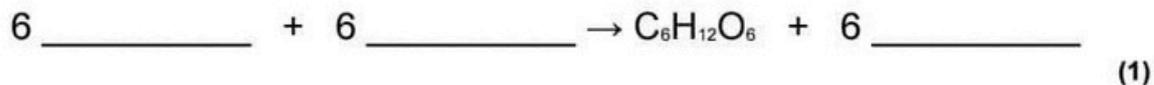
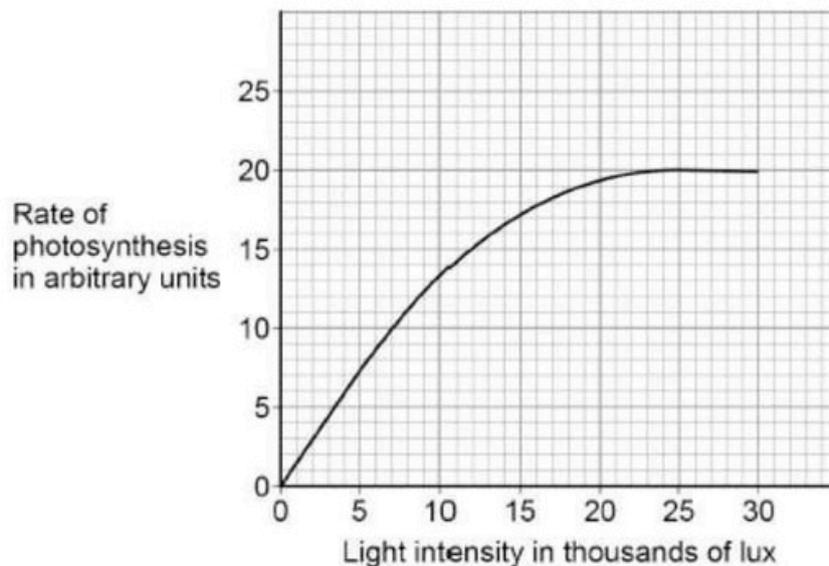


Figure 1 shows how the rate of photosynthesis changes with light intensity.

**Figure 1**



(b) Which part of the graph could be represented by the equation  $y = mx + c$  ?

Tick (✓) **one** box.

- From 0 to 5 000 lux
- From 10 000 to 15 000 lux
- From 15 000 to 20 000 lux
- From 20 000 to 25 000 lux

(1)

(g) (a factor that) if increased would increase the rate (of a reaction)  
**or**

(a factor that) prevents the rate (of a reaction) increasing

*allow answers in terms of (a) named factor(s)*

*allow (a factor that) prevents the maximum rate (of a reaction) being reached*

1

(h) increasing temperature while keeping the carbon dioxide (concentration) constant increases the rate (of photosynthesis)

*allow increasing the carbon dioxide (concentration)*

*while keeping temperature constant increases the rate (of photosynthesis)*

1

increasing the temperature increases the movement of the molecules / particles / substrate

**or**

increasing the temperature increases the rate of enzyme activity

*allow increasing the temperature increases the kinetic energy of the molecules / particles / substrate*

*allow increasing the temperature increases the frequency of collisions between molecules / particles*

1

increasing carbon dioxide concentration increases (the concentration of) substrate / reactants

1

all rates plateau at a certain point due to another factor being limiting

*allow all rates plateau at a certain point due to chlorophyll being limiting*

*do **not** accept all rates plateau at a certain point due to light being limiting*

1

(i)

$$\text{light intensity} \propto \frac{1}{\text{distance}^2}$$

1

**Q2.**

(a) (*lhs*)  $\text{H}_2\text{O} + \text{CO}_2$   
*in either order*

**and**

(*rhs*)  $\text{O}_2$

1

(b) from 0 to 5 000 lux

1