



## Factors Affecting the Rate of Photosynthesis

1 Discuss how the level of chlorophyll affects plant growth, and why the level of chlorophyll may vary

- Chlorophyll is the pigment in chloroplasts that absorbs light
- So if chlorophyll levels drop so does the amount of photosynthesis
- Which means that less glucose is made and the plant grows less well
- Chlorophyll levels may drop due to lack of nutrients such as magnesium or water
- Or due to disease such as Tobacco Mosaic Virus

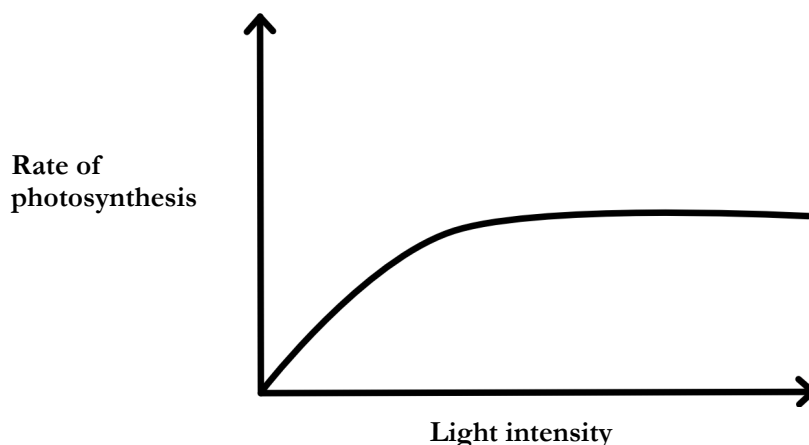
[ 4 marks ]

2 Name three factors other than chlorophyll that affect the rate of photosynthesis

- Light intensity; carbon dioxide concentration; temperature

[ 3 marks ]

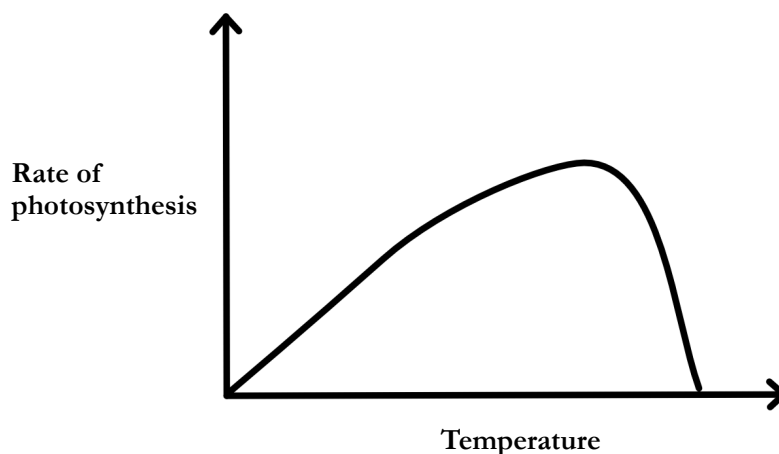
3 Describe and explain the shape of the below curve



- Initially as light intensity increases so does the rate of photosynthesis
- Because light energy is being used to drive the reaction of photosynthesis
- But as light intensity continues to increase, the rate of photosynthesis plateaus, because something else becomes the limiting factors
- Such as carbon dioxide concentrations or temperature

[ 4 marks ]

4 Describe and explain the shape of the below curve



- Initially as temperature increases so does the rate of photosynthesis
- Because higher temperature increases the energy of the molecules and the functioning of the enzymes that catalyse the reaction of photosynthesis
- But as temperature continues to increase, the rate of photosynthesis decreases
- As the enzymes involved denature

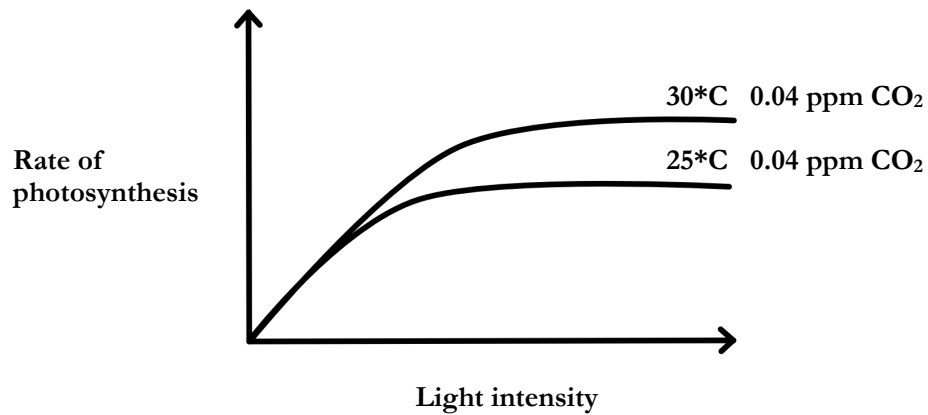
[ 4 marks ]

*End here if foundation tier*

[ Total 15 marks ]

## Higher Tier

6 What is the limiting factor in the bottom curve of the below graph? Explain your answer



- Temperature
- As the light intensity and carbon dioxide concentrations are the same in both curves
- So the different rates of photosynthesis must be accounted for by the temperature

[ 3 marks ]

7 A farmer wants to grow tomatoes plants in northern England. Discuss how he could control the environment of his tomato crops to ensure that he gets a good yield (lots of tomatoes).

- Green house
  - To increase temperature by trapping heat energy from the sun's light rays
  - To keep out pests and disease
- Use pesticides etc to reduce disease
- Use fertilisers to provide essential minerals
- Use artificial light so that photosynthesis can continue for longer
- Etc - 1 mark for a point, and 1 mark for explanation

[ 6 marks ]

8 Controlling the tomato plants environment did increase the yield, but it also increased the cost. How could the farmer decide if the new expenses were worthwhile?

- He could try changing one variable at a time and calculating the change in yield and how much that increased his revenues
- And compare that to the increased cost of the intervention

[ 2 marks ]

[ Total 26 marks ]

*These answers should only be taken as a guide, they are not the only correct answers, or verified by an exam board.*