ANSWER KEY.

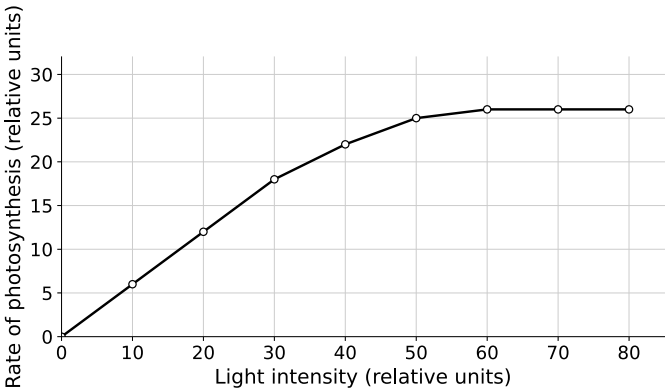
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Rates of Photosynthesis

Biology | ANSWER KEY

Show your work for calculations. Use the graphs and tables as evidence.

1. The graph shows how the rate of photosynthesis changes with light intensity (sample data).



(a) Find the percent increase in the rate when light intensity goes from 20 to 40.

(b) Where does the plateau begin? Name one factor that could be limiting there.

(a) Rate at 20 = 12, at 40 = 22. (22 − 12) ÷ 12 × 100 = **83%**

(b) **At about 60.** Another factor, such as **CO_2, temperature, or the amount of chlorophyll**, is now limiting.

2. A student moves a lamp away from a water plant and counts the oxygen bubbles for 1 minute at each distance.

Distance from lamp (cm)	10	20	30	40	50
Bubbles per minute	48	30	18	11	7

(a) Find the percent decrease in the bubble rate when the lamp moves from 10 cm to 30 cm.

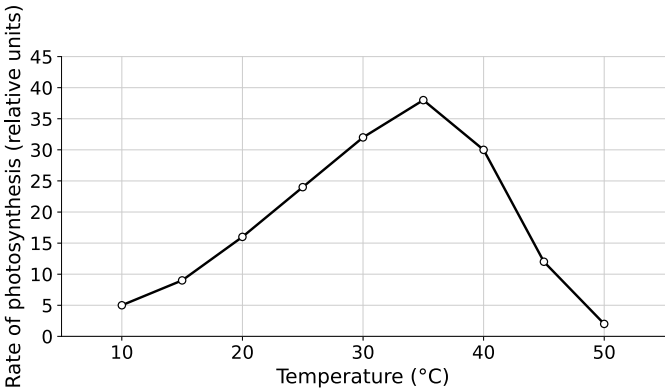
(b) Explain the trend using light intensity.

(a) (48 − 18) ÷ 48 × 100 = **62.5%**

(b) **Farther from the lamp, the light is dimmer**, so the light-dependent reactions make less ATP and NADPH and less O_2 is released.

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3. The graph shows the rate of photosynthesis at different temperatures (sample data).



(a) What is the optimum temperature, and what is the rate there?

(b) Why does the rate fall at 45 °C and 50 °C?

(a) **About 35 °C, with a rate of 38**

(b) **High temperatures change the shape of the enzymes**, so they stop working and the reactions slow down.

4. A grower doubles the CO_2 in a greenhouse (sample data).

	CO_2 = 0.04%	**CO_2 = 0.08%**
Bright light	26	42
Dim light	12	12

(a) Find the percent increase in the rate in bright light.

(b) Why did the rate not change in dim light?

(a) $(42 - 26) \div 26 \times 100 =$ **61.5%**

(b) **In dim light, light is the limiting factor**, so the plant cannot use the extra CO_2.

5. A student plans an experiment to test how temperature affects the rate of photosynthesis in a water plant.

(a) What is the independent variable? What is the dependent variable?

(b) Name one variable that must be kept the same.

(a) **Independent: temperature of the water. Dependent: rate of photosynthesis** (bubbles or mL of O_2 per minute).

(b) **Light intensity** (or CO_2 concentration, the same plant, the time counted). Any one.

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