Mark each point independently. Accept alternative correct responses. Underlined words are required. [1] per bullet point unless stated. ★ = Higher Tier only.

Question 1 [0 marks]

Context: Pondweed (Elodea) was placed in sodium hydrogen carbonate solution. A lamp was placed at different d...

Q: A student investigates the effect of light intensity on the rate of photosynthesis using pondweed. The table shows the r...

[0 marks]

Question 2 [2 marks]

Q: Describe the trend shown in the results.

- As distance from the lamp increases, the mean number of bubbles per minute decreases [1]
- The relationship is not linear — rate decreases more slowly at greater distances [1]

Note: Award 1 mark for simply stating that bubbles decrease with distance.

[2 marks]

Question 3 [2 marks]

Q: Explain why the student added sodium hydrogen carbonate solution to the water in this experiment.

- Sodium hydrogen carbonate dissolves in water and releases carbon dioxide [1]
- This ensures carbon dioxide is not a limiting factor / maintains a constant CO■ concentration throughout the experiment [1]

[2 marks]

Question 4 [2 marks]

Q: At a distance of 5 cm, the student increases the lamp power. The rate of bubbles does not increase. Suggest ONE reason w...

- Another factor is now limiting the rate of photosynthesis [1]
- Either CO■ concentration or temperature is now in shortest supply and preventing further increase in rate [1]

[2 marks]

Question 5 [2 marks]

Q: Counting oxygen bubbles is not the most accurate method for measuring the rate of photosynthesis. Suggest a more accurat...

- Collect the oxygen gas produced in a capillary tube / gas syringe and measure the volume [1]
- More accurate because bubble size varies so counting bubbles may not reflect the true volume of gas produced [1]

[2 marks]

Question 6 ★ Higher Tier [3 marks]

Q: Calculate the relative light intensity at distances of 10 cm and 20 cm from the lamp. Use the formula: relative light in...

- At 10 cm: $1 / (10)^2 = 1/100 = 0.01$ [1]
- At 20 cm: $1 / (20)^2 = 1/400 = 0.0025$ [1]
- The light intensity at 20 cm is one quarter of that at 10 cm — this follows the inverse square law [1]

[3 marks]

END OF QUESTIONS — Total: 11 marks