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: Potato cylinders of 3 cm length were placed in different sucrose solutions for 30 minutes. Initial a...

Q: A student investigates the effect of sucrose concentration on potato tissue. The table shows the results.

[0 marks]

Question 2 [2 marks]

Q: Calculate the percentage change in mass for the potato cylinder placed in 0.6 mol/dm³ sucrose. Use the formula: % change...

- % change = (2.34 - 2.49) ÷ 2.49 × 100 [1]
- = -0.15 / 2.49 × 100 = -6.02% (accept -6.0%) [1]

Note: Accept answers in the range -5.9% to -6.1%

[2 marks]

Question 3 [2 marks]

Q: Explain why the student calculates percentage change in mass rather than the raw change in mass.

- The potato cylinders may have slightly different initial masses [1]
- Using percentage change accounts for the different starting masses / makes the comparison fair [1]

[2 marks]

Question 4 [3 marks]

Q: Using the data in the table, determine the water potential of the potato cells. Explain your answer.

- The water potential of the potato equals the sucrose concentration at which there is no change in mass [1]
- This is approximately 0.4 mol/dm³ sucrose (0% change in mass) [1]
- At this concentration the water potential of the solution equals the water potential of the potato cells — no net movement of water [1]

[3 marks]

Question 5 [3 marks]

Q: The potato cylinder placed in 0.0 mol/dm³ (distilled water) gained mass. Explain this result in terms of osmosis.

- Distilled water has a higher water potential than the potato cell contents [1]
- Water moves into the potato cells by osmosis — from high to low water potential [1]
- Through the partially permeable cell membrane — mass increases as cells become turgid [1]

[3 marks]

Question 6 ★ Higher Tier [4 marks]

Q: Explain, using the term water potential, what happens to a potato cell placed in 0.8 mol/dm³ sucrose solution.

- The 0.8 mol/dm³ sucrose solution has a lower water potential than the potato cell contents [1]
- Water moves out of the potato cells by osmosis — from high (inside cell) to low (sucrose solution) water potential [1]
- Through the partially permeable cell membrane [1]
- The cell loses water — cell membrane pulls away from cell wall (plasmolysis) — cell becomes flaccid [1]

[4 marks]

END OF QUESTIONS — Total: 14 marks