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: Three antibiotic discs (X, Y, Z) were placed on agar plates containing bacteria. After 48 hours at 2...

Q: A student grows bacteria on agar plates and places antibiotic discs to investigate which antibiotic is most effective. T...

[0 marks]

Question 2 [2 marks]

Q: Using the results, state which antibiotic is most effective against the bacteria. Explain your reasoning.

• Antibiotic X is most effective [1]

• Because it has the largest mean zone of inhibition (24.0 mm) — the largest clear area where bacteria were killed/prevented from growing [1]

[2 marks]

Question 3 [2 marks]

Q: Antibiotic Z produced no zone of inhibition. What conclusion can you draw about the bacteria and antibiotic Z?

• The bacteria are resistant to antibiotic Z [1]

• The antibiotic has no effect on the growth of the bacteria — they are able to grow right up to the disc [1]

[2 marks]

Question 4 [2 marks]

Q: The student incubated the plates at 25°C. Explain why 25°C is used rather than 37°C (body temperature) in school experim...

• At 37°C harmful pathogens could grow more rapidly / dangerous bacteria (including pathogens that thrive at body temperature) could proliferate [1]

• 25°C reduces this risk — it is safer for a school setting [1]

[2 marks]

Question 5 [3 marks]

Q: Describe THREE techniques the student should use to prevent contamination of the agar plates during the experiment.

• Work near a lit Bunsen burner to create upward convection currents that keep microorganisms away from the work area [1]

• Flame all metal tools (inoculation loop / glass spreader) before and after use [1]

• Only briefly open the agar plate lid at an angle — never fully remove it [1]

• Tape the lid shut with two pieces of tape but not all the way round — to allow gas exchange without contamination [1] — any three

[3 marks]

Question 6 ★ Higher Tier [3 marks]

Q: A student calculates the area of the zone of inhibition for antibiotic X using the formula $A = \pi \times (d/2)^2$. Calculate the...

• Radius = 24.0 / 2 = 12.0 mm [1]

• Area = $\pi \times 12^2 = \pi \times 144$ [1]

- = 452 mm² (accept 452 to 453 mm²) [1]

[3 marks]

END OF QUESTIONS — Total: 12 marks