4.9 Antibiotics and hospital-acquired infections

Name: _____ Class: _____ Date: _____ **Total: 21 marks**

KEY WORDS bacteriostatic • bactericidal • zone of inhibition • hospital-acquired infection

Objective

Practise statements 6.13-6.15 with Core Practical 14: bacteriostatic vs bactericidal action, how resistance arises and spreads, and what cuts hospital-acquired infections.

1 Key knowledge and worked examples

■ Two words, one difference

Bacteriostatic antibiotics halt growth and division; the immune system clears the static cells. **Bactericidal** antibiotics kill outright. Immune-compromised patients need bactericidal support because they cannot finish the job.

■ Resistance is selection

A mutation giving resistance lets that cell survive exposure; it divides, and plasmids spread the gene horizontally. Incomplete courses select FOR resistance: the most resistant cells survive the half-dose.

■ Hospital-acquired infections

They exploit the meeting of vulnerable patients, invasive devices (catheters, lines) and resistant strains. Counter-measures: hand hygiene, sterile insertion procedures, isolating carriers, targeted (not blanket) antibiotics, and surveillance.

■ Worked example: reading a Kirby-Bauer plate

Zones of inhibition around each disc rank sensitivity – but only if discs carry the same antibiotic concentration and the agar is the same depth. A small zone means fewer bacteria died, not automatically "resistant": compare with a clinical break-point table.

2 Practice

2.1 State the difference between bacteriostatic and bactericidal antibiotics. [2]

2.2 Explain how antibiotic resistance spreads through a hospital ward. [3]

2.3 Give two measures that reduce hospital-acquired infections. [2]

3 Exam-style questions

3.1 A patient with a weak immune system has a bloodstream infection. Explain why a bactericidal antibiotic is preferred over a bacteriostatic one, referring to what each does to the bacteria and what the patient's immune system can and cannot do. [4]

3.2 A farm feeds low-dose antibiotics to healthy cattle. Farmers report faster growth; doctors report more resistant human infections. Explain the link between the practice and the resistance, and suggest why the practice still continues. [5]

3.3 Core Practical 14 tests three antibiotics on one bacterial species: zones of 6 mm, 15 mm and 28 mm. A student concludes the third antibiotic is strongest. Give two conditions that must hold for the comparison to be fair, and explain what a 6 mm zone (the disc's own size) actually shows. [5]