Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

Gram-positive bacteria have a thick peptidoglycan wall

it traps the crystal violet–iodine dye

Gram-negative walls are thin with an outer membrane that alcohol damages, so the dye washes out and they take up pink safranin

2.2

A: *Staphylococcus aureus*

B: *Streptococcus pyogenes* (group A streptococcus)

C: *Neisseria meningitidis*

2.3

antibiotics can kill the bacteria in the sample, giving a false negative

two sites help tell a skin contaminant (one bottle) from true infection (both sets)

2.4

an **acid-fast (Ziehl–Neelsen)** stain

M. tuberculosis has a waxy mycolic acid wall that does not take up the Gram stain

3.1

(a) *Streptococcus pneumoniae*

(b) a partial, green colour around the colonies

(c) every hour of delay in sepsis raises the risk of death; broad antibiotics start after cultures are taken and are narrowed when results come

(d) **MALDI-TOF**

(e) **sensitive**: the MIC, 0.03 mg/L, is below the breakpoint of 0.06 mg/L

3.2

(a) **A**

(b) the antibiotic spreads out into the agar; bacteria cannot grow where its concentration is above the MIC

(c) drugs spread through agar at different rates, for example because of molecule size; each drug has its own breakpoint, so each zone is read against that

3.3

(a) **bacterial**: many neutrophils, high protein and low glucose

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(b) *Neisseria meningitidis*

(c) **PCR**: it finds bacterial DNA even when the bacteria are dead

(d) to clear the bacteria from their throats and prevent more cases

(e) bacteria and white cells use up glucose, and less glucose is carried into the CSF