

Solutions

2.1

- Endotoxin – a wall component released at lysis, not a secreted protein ✓.

2.2

- 3 h = 9 doublings: $5 \times 2^9 = 5 \times 512 = 2560$ cells ✓.

2.3

- The capsule (unstained) – it defeats phagocytosis/opsonisation ✓.

3.1

- 2.5 h = 150 min = 6 generations of 25 min.
- $40 \times 2^6 = 40 \times 64 = 2560$ cells ✓.
- Fast doubling reaches large numbers in hours → acute 24-hour disease and cultures positive at 24–48 h.
- 20-hour generation time gives ~half a generation in 10 h → weeks-long illness and weeks-long cultures ✓.

3.2

- Toxin A: blocking protein synthesis kills quietly – distant organ failure with minimal local necrosis ✓.
- Toxin B: membrane lysis destroys locally – haemolysis on the plate mirrors tissue destruction at the wound.
- Mechanism predicts the picture: where the damage happens follows what the toxin chemically attacks ✓.