Higher Tier — Separate Science

Full Higher Separate content. ★ = Higher Tier. ◆ = Separate Science only.

Q1. Describe how antibiotic resistance in bacteria develops through natural selection.

[4 marks]

Q2. Describe the stages of drug development for a new medicine. Include the purpose of each stage.

[4 marks]

Q3. Explain why a double-blind trial is important when testing a new drug.

[2 marks]

Total: 10 marks

Q1 (4 marks)

Describe how antibiotic resistance in bacteria develops through natural selection.

- Random mutation gives some bacteria resistance to the antibiotic [1]
- Antibiotic kills non-resistant bacteria but resistant bacteria survive (selection) [1]
- Resistant bacteria reproduce rapidly, passing on the resistance allele [1]
- Over many generations, resistant allele becomes more common — population is now resistant [1]

Q2 (4 marks)

Describe the stages of drug development for a new medicine. Include the purpose of each st…

- Preclinical: tested on cells and animals — assess toxicity, dosage, mechanism [1]
- Phase 1 clinical: small group of healthy volunteers — safety in humans [1]
- Phase 2 clinical: patients with disease — effectiveness [1]
- Phase 3: large-scale double-blind placebo-controlled trial — confirm safety/effectiveness vs existing treatments [1]

Q3 (2 marks)

Explain why a double-blind trial is important when testing a new drug.

- Neither patients nor doctors know who receives real drug or placebo [1]
- Prevents bias: doctors cannot unconsciously treat groups differently; patients cannot experience placebo effect [1]