This is the **Foundation Separate** version. Higher Tier (★) questions have been removed. All remaining questions are Foundation-level.

Types of Pathogen (4.3.1.1–5)

Specification reference: 4.3.1

Q1. Name the type of pathogen that causes each of the following: (a) malaria, (b) tuberculosis, (c) rose black spot, (d) measles.

[4 marks]

Q2. Explain how malaria is transmitted and suggest TWO methods of preventing its spread.

[4 marks]

Q3. Explain why bacterial diseases can be treated with antibiotics but viral diseases generally cannot.

[3 marks]

The Immune System (4.3.1.6)

Specification reference: 4.3.1.6

Q4. Describe THREE non-specific defences of the body against pathogens.

[3 marks]

Q5. Explain the sequence of events in the specific immune response when a new pathogen enters the body for the first time.

[5 marks]

Vaccination (4.3.1.7)

Specification reference: 4.3.1.7

Q6. Explain how vaccination protects an individual from future infection by a specific pathogen.

[4 marks]

Q7. Explain what herd immunity is and why vaccination rates must remain high to maintain it.

[3 marks]

Antibiotics and Drug Development (4.3.1.8–9)

Specification reference: 4.3.1.8

Q8. Describe how antibiotic resistance develops in bacteria, using the principles of natural selection.

[4 marks]

Q9. Describe the stages a new drug must go through before it can be prescribed. Include the purpose of each stage.

[4 marks]

Q10. Explain why a double-blind trial is used when testing a new drug.

[2 marks]

Total: 36 marks

Types of Pathogen (4.3.1.1–5)

Q1 (4 marks)

Name the type of pathogen that causes each of the following: (a) malaria, (b) tu…

- (a) Protist [1]
- (b) Bacterium [1]
- (c) Fungus [1]
- (d) Virus [1]

Q2 (4 marks)

Explain how malaria is transmitted and suggest TWO methods of preventing its spr…

- Malaria is caused by Plasmodium (a protist) [1]
- Transmitted by bites from female Anopheles mosquitoes (vector) [1]
- Prevention 1: insecticide-treated mosquito nets [1]
- Prevention 2: draining stagnant water/insecticide spraying (removes breeding sites) / antimalarial drugs [1]

Q3 (3 marks)

Explain why bacterial diseases can be treated with antibiotics but viral disease…

- Antibiotics target specific bacterial structures such as cell walls and ribosomes [1]
- Viruses use the host cell's own machinery to replicate — they lack the structures antibiotics target [1]
- Drugs that targeted viral replication would also kill host cells [1]

The Immune System (4.3.1.6)

Q4 (3 marks)

Describe THREE non-specific defences of the body against pathogens.

- Skin: physical barrier preventing pathogen entry [1]
- Mucus in airways: traps pathogens before they reach lungs [1]
- Stomach acid (pH 2): kills most pathogens ingested with food and water [1] — accept: cilia sweeping mucus away

Q5 (5 marks)

Explain the sequence of events in the specific immune response when a new pathog…

- Pathogen has antigens (proteins) on its surface [1]
- Phagocytes engulf the pathogen (phagocytosis) — non-specific [1]
- Lymphocytes detect the antigens and produce specific complementary antibodies [1]
- Antibodies bind to antigens — marking pathogen for destruction / clumping them [1]
- Memory cells remain in body — on re-exposure, antibodies are produced rapidly before symptoms develop [1]

Vaccination (4.3.1.7)

Q6 (4 marks)

Explain how vaccination protects an individual from future infection by a specif…

- Vaccine contains harmless/dead/weakened form of the pathogen or its antigens [1]
- Stimulates the immune system to produce specific antibodies [1]
- Memory cells are produced [1]
- If real pathogen enters later, memory cells produce antibodies rapidly — infection destroyed before symptoms develop [1]

Q7 (3 marks)

Explain what herd immunity is and why vaccination rates must remain high to main…

- Herd immunity: when enough people in a population are immune that the pathogen cannot spread easily [1]
- Unvaccinated individuals are indirectly protected because they are unlikely to encounter the pathogen [1]
- If vaccination rates fall below the threshold, herd immunity breaks down and outbreaks can occur [1]

Antibiotics and Drug Development (4.3.1.8–9)

Q8 (4 marks)

Describe how antibiotic resistance develops in bacteria, using the principles of…

- Random mutation gives some bacteria resistance to an antibiotic [1]
- When antibiotic is used, non-resistant bacteria die; resistant bacteria survive [1]
- Resistant bacteria reproduce and pass on the resistance allele to offspring [1]
- Over generations, the resistant allele becomes more common — eventually most bacteria are resistant [1]

Q9 (4 marks)

Describe the stages a new drug must go through before it can be prescribed. Incl…

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

Q10 (2 marks)

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

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