



B3F Infection and Response: Foundation Tier Practice

AQA 8461 · Calculator allowed · about 85 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

1 Pathogens are organisms that cause disease.

(a) Name a type of pathogen and give one disease it causes. (1)

(b) Name a different type of pathogen and give one disease it causes. (1)

(Total for Question 1 is 2 marks)

2 A student writes three simple rules to reduce spread of infection: wash hands often, cover mouth when coughing, and keep wounds covered.

(a) Explain how washing hands often reduces spread of pathogens. (1)

(b) Explain how covering the mouth when coughing reduces spread of pathogens. (1)

(c) Explain how keeping wounds covered reduces spread of pathogens. (1)

(Total for Question 2 is 3 marks)

3 Bacteria can reproduce rapidly by binary fission under ideal conditions.

(a) State what is meant by binary fission. (1)

(b) Give one condition that speeds up bacterial reproduction. (1)

(Total for Question 3 is 2 marks)

4 A doctor prescribes antibiotics for a bacterial infection but not for a cold caused by a virus.

(a) Explain why antibiotics kill bacteria but not viruses. (2)

(b) Give one reason why a doctor will avoid giving antibiotics unless necessary. (1)

(Total for Question 4 is 3 marks)

5 Vaccination helps protect people from infectious diseases.

(a) State what is given to a person during vaccination. (1)

(b) Name one benefit of vaccination. (1)

(Total for Question 5 is 2 marks)

6 White blood cells help defend the body against pathogens by making antibodies and by ingesting pathogens.

(a) State one function of white blood cells in defending the body. (1)

(b) Name the substance white blood cells make to help destroy specific pathogens. (1)

(Total for Question 6 is 2 marks)

7 A lab measured how many bacteria were present in a sample at the start and after 2 hours at a warm temperature. At time 0 there were 100 bacteria. After 2 hours there were 400 bacteria.

(a) Calculate how many times larger the bacterial population became after 2 hours. **(2)**

.....
(b) Give one reason why the population increased. **(1)**

(Total for Question 7 is 3 marks)

8 An antiseptic is used to clean a surface to reduce microbes.

(a) Describe one key difference between an antiseptic and an antibiotic. **(1)**

(b) Give one example of where an antiseptic might be used. **(1)**

(c) State whether antibiotics are effective against viruses. **(1)**

(Total for Question 8 is 3 marks)

9 A school records cases of a contagious infection across three classes over one week: Class A 4 cases, Class B 1 case, Class C 5 cases.

(a) State which class had the fewest cases. **(1)**

(b) Calculate the total number of cases recorded that week. **(1)**

.....
(Total for Question 9 is 2 marks)

10 An experiment tests how long antiseptic kills bacteria on a surface. The table shows number of colonies remaining after treatment time in minutes: 0 min 120 colonies; 1 min 30 colonies; 2 min 8 colonies.

(a) Describe the trend in the number of colonies over time. (2)

(b) Suggest one conclusion about the antiseptic's effectiveness. (1)

(Total for Question 10 is 3 marks)

11 A student investigates how temperature affects flu virus survival on a surface. They keep humidity and time constant and only change temperature. This is an investigation into variables.

(a) Identify the independent variable. (1)

(b) Identify the dependent variable. (1)

(c) Identify one control variable. (1)

(d) State why it is important to control humidity in this investigation. (1)

(Total for Question 11 is 4 marks)

12 Some diseases are spread by vectors such as mosquitoes which transfer pathogens without being infected themselves.

(a) Give one example of a disease spread by a vector. (1)

(b) State one method to reduce the spread of vector-borne diseases. (1)

(Total for Question 12 is 2 marks)

13 A medication trial measures how long a patient recovers from a bacterial infection with and without the new drug. The average recovery time without the drug is 10 days and with the drug is 6 days.

(a) Calculate the decrease in average recovery time when using the drug. (1)

(b) State whether this result supports the drug being effective. (1)

(Total for Question 13 is 2 marks)

14 A public health poster compares two methods to prevent flu spread: method 1 is vaccination; method 2 is frequent handwashing. The poster states: vaccination reduces infection by 70% in a large trial; handwashing reduces infection by 30% in observational studies.

(a) Give two reasons why a large trial result is stronger evidence than observational studies. (3)

(Total for Question 14 is 3 marks)

15 Mendelova is writing an exam question asking students to explain how vaccination protects a community during an outbreak. The answer should link the individual immune response and population-level protection.

Explain how vaccination protects both the vaccinated individual and the wider community during an outbreak.

(Total for Question 15 is 6 marks)

Mark scheme · B3F Infection and Response: Foundation Tier Practice

Question 1

- (a) **B1** one correct type and example, e.g. bacterium - salmonella; virus - influenza; fungus - athlete's foot; protist - malaria, oe
- (a) **Answer: Any one correct pair, e.g. bacterium - salmonella.**
- (b) **B1** a second correct type and example different from (a), oe
- (b) **Answer: Any different correct pair, e.g. virus - influenza.**

Question 2

- (a) **B1** removes microbes and dirt from skin so fewer pathogens transferred to others or to mouth/food, oe
- (a) **Answer: Washing hands removes microbes and dirt, so fewer pathogens are transferred to others or to food.**
- (b) **B1** stops droplets containing pathogens spreading into the air and onto surfaces, so fewer people inhale or touch them, oe
- (b) **Answer: It stops droplets with pathogens spreading into the air and onto surfaces, reducing transmission.**
- (c) **B1** a dressing covers the wound so pathogens cannot enter or leave easily, reducing contamination and spread, oe
- (c) **Answer: A dressing covers the wound so pathogens cannot easily enter or leave, reducing contamination.**

Question 3

- (a) **B1** a single bacterial cell divides into two identical daughter cells, oe
- (a) **Answer: A single bacterial cell divides to form two identical daughter cells.**
- (b) **B1** a correct condition, e.g. warm temperature, plenty of nutrients, or moist environment, oe
- (b) **Answer: Warm temperature (or plenty of nutrients or moist conditions).**

Question 4

- (a) **M1** states that antibiotics target structures or processes specific to bacterial cells (cell wall, bacterial enzymes) not present in viruses
- (a) **A1** antibiotics therefore do not affect viruses which replicate inside host cells and lack those bacterial targets, oe
- (a) **Answer: Antibiotics target features of bacterial cells such as cell walls or enzymes that viruses do not have; viruses replicate inside host cells and lack those targets, so antibiotics do not work on them.**
- (b) **B1** to reduce the risk of antibiotic resistance developing or to avoid unnecessary side effects, oe
- (b) **Answer: To reduce the risk of bacteria developing antibiotic resistance.**

Question 5

- (a) **B1** a small amount of weakened or dead pathogen or parts of a pathogen (antigen) that stimulates immune response, oe
- (a) **Answer: A small amount of a weakened or dead pathogen or parts of a pathogen (antigen).**
- (b) **B1** prevents the person from getting the disease or reduces severity, or gives herd immunity to protect others, oe
- (b) **Answer: It prevents the person from getting the disease or reduces the severity; it also helps protect others by herd immunity.**

Question 6

- (a) **B1** ingest and destroy pathogens (phagocytosis) or produce antibodies to target pathogens, oe
- (a) **Answer: They ingest and destroy pathogens (phagocytosis) or produce antibodies to target pathogens.**
- (b) **B1** antibodies cao
- (b) **Answer: Antibodies.**

Question 7

- (a) **M1** substitutes and calculates ratio: $400 / 100 = 4$
- (a) **A1** population became 4 times larger cao
- (a) **Answer: 4 times larger**
- (b) **B1** correct reason: warm temperature, plenty of nutrients, or moist conditions that favour faster reproduction, oe
- (b) **Answer: Because the conditions were ideal, for example the warm temperature allowed faster reproduction.**

Question 8

- (a) **B1** antiseptics are applied to surfaces or skin to kill or reduce microbes externally; antibiotics are taken into the body to kill or inhibit bacteria internally, oe
- (a) **Answer: Antiseptics are used on surfaces or skin to kill or reduce microbes externally, while antibiotics are taken to treat bacterial infections inside the body.**
- (b) **B1** example such as cleaning a wound, disinfecting a table or surgical instrument, oe
- (b) **Answer: Cleaning a wound or disinfecting a surface.**
- (c) **B1** no, antibiotics are not effective against viruses, oe
- (c) **Answer: No, antibiotics are not effective against viruses.**

Question 9

- (a) **B1** Class B
- (a) **Answer: Class B.**
- (b) **B1** total = $4 + 1 + 5 = 10$
- (b) **Answer: 10 cases**

Question 10

- (a) **M1** states that number of colonies decreases as time increases
- (a) **A1** gives an appropriate example of decrease, e.g. from 120 to 30 to 8 colonies, oe
- (a) **Answer: The number of colonies decreases as treatment time increases, for example 120 at 0 min, 30 at 1 min and 8 at 2 min.**
- (b) **B1** antiseptic reduces bacterial colonies quickly and is effective at killing or inhibiting bacteria on this surface, oe
- (b) **Answer: The antiseptic is effective and reduces bacterial colonies quickly on the tested surface.**

Question 11

- (a) **B1** temperature (it is changed by the student)
- (a) **Answer: Temperature.**
- (b) **B1** measure of virus survival, e.g. number of viable viruses or colonies after set time
- (b) **Answer: Virus survival measured as the number of viable viruses or colonies after the set time.**
- (c) **B1** one correct control such as humidity, exposure time, or surface type, oe
- (c) **Answer: Humidity (or exposure time or surface type).**
- (d) **B1** humidity can affect virus survival so if not controlled it could change results and make temperature effects unclear, oe
- (d) **Answer: Humidity affects virus survival, so controlling it ensures changes are due to temperature only.**

Question 12

- (a) **B1** correct example e.g. malaria spread by mosquitoes
- (a) **Answer: Malaria spread by mosquitoes.**
- (b) **B1** correct method such as using insect nets, removing standing water, using insect repellent, or spraying insects, oe
- (b) **Answer: Use insect nets or remove standing water where mosquitoes breed.**

Question 13

- (a) **B1** $10 - 6 = 4$ days decrease
- (a) **Answer: 4 days**
- (b) **B1** yes, the drug reduces recovery time, suggesting it is effective, oe
- (b) **Answer: Yes. Recovery time is reduced from 10 to 6 days, suggesting the drug is effective.**

Question 14

- (a) **B1** trials are usually controlled and can reduce bias by using control groups or randomisation, oe
- (a) **B1** large trials have more participants so results are more reliable and less likely due to chance, oe
- (a) **B1** observational studies can have confounding variables that are not controlled so cause and effect is less certain, oe
- (a) **Answer: Controlled trials reduce bias (e.g. randomisation or control groups), large trials are more reliable with less chance variation, and observational studies may have confounding variables so cause and effect is less certain.**

Question 15

- **Level 3** (5-6): Detailed explanation. The answer links how vaccination stimulates an immune response producing memory cells and antibodies, how this provides faster protection on exposure reducing infection or severity, and explains herd immunity where high vaccination levels reduce overall pathogen transmission protecting unvaccinated or vulnerable people; includes clear causal links and an example or consequence.
- **Level 2** (3-4): Some explanation. The answer states that vaccination stimulates immunity and reduces transmission in the population but the link between individual immunity and herd protection may be incomplete or only one example given.
- **Level 1** (1-2): Simple statements. The answer mentions vaccination helps people not get sick or that it reduces spread, with little or no explanation of how or no mention of population-level effects.
- **Indicative content:**
 - Vaccination introduces antigens so the immune system produces antibodies and memory cells without causing full disease.
 - Memory cells allow a faster, stronger immune response when the real pathogen is encountered, often preventing infection or reducing severity.
 - Fewer infected individuals mean the pathogen has fewer hosts to infect, so transmission in the community falls.
 - High vaccination coverage leads to herd immunity, protecting those who cannot be vaccinated (very young, immunocompromised).
 - An example: if most people are vaccinated against measles, outbreaks are small and vulnerable people are less likely to be exposed.