

Model Answers: Easy

1

The correct answer is **A** because the increase in the incidence of streptomycin resistance means that it will not always be effective when used in the treatment of TB.

- TB is an infectious disease caused by the bacterium *Mycobacterium tuberculosis*
- Antibiotics like streptomycin disrupt or kill bacterial cells (usually by affecting an aspect of bacterial metabolism or growth)
- Multiple-drug-resistant forms of TB exist, making treatment difficult

B is incorrect as the rates of HIV are not increasing *Mycobacterium* infections

C is incorrect as living nearby does increase infection rates but it is not related to the loss of effectiveness of streptomycin

D is incorrect as TB is not a viral infection, it is caused by bacteria.

2

The correct answer is **B** because:

- The more an antibiotic is used, the greater the chance there is of a resistant population emerging
- If an antibiotic used to prevent bacterial infections in livestock is used in humans to treat infections, resistance may emerge and could spread via horizontal gene transfer to bacterial species that infect animals
- This would mean the antibiotic would not be effective in either setting

A is incorrect as this is an issue with all use of antibiotics but would not explain why antibiotics that are used for human infections should not be used

C is incorrect as it is not the human cells that respond to the antibiotics, as human cells are different from bacterial cells and therefore not affected by antibiotics.

D is incorrect as this would not explain why they shouldn't be used in humans as not all humans would be allergic

Remember resistance to antibiotics arises randomly as bacteria accumulate mutations quickly as a result of rapid replication and the presence of only one copy of every gene

3

The correct answer is **C** because it is important to keep the antibiotic levels at a lethal dose will kill the bacteria quickly.

A is incorrect as not keeping a lethal dose will increase the chance of resistance emerging as a result of random mutation.

B is incorrect as taking the full course will help prevent the emergence of resistant bacteria, as more bacteria are likely to be killed leaving fewer for the immune system to deal with.

D is incorrect as if the lethal dose is increased slowly then less of the bacterial population will be dealt with, allowing more to multiply and potentially rapidly increase in population size.

4

The correct answer is **C** because cholera and TB are both bacterial infections, and antibiotics are effective against bacteria as they target growth or metabolic processes that do not occur in animal cells.

Malaria is caused by the protoctists *Plasmodium falciparum*, *Plasmodium malariae*, *Plasmodium ovale* and *Plasmodium vivax* – protoctists are not bacterial cells. One type of antibiotic (doxycycline) can be taken prophylactically to prevent infection with malaria, but usually anti-malarial drugs such as quinine and hydroxychloroquine are used to treat infected individuals.

You may have seen hydroxychloroquine mentioned recently in the news due to unfounded claims that it can prevent or treat Covid-19 infections.

5

The correct answer is **B** because cholera and TB are both bacterial infections; cholera is caused by the bacterium *Vibrio cholerae* and TB by *Mycobacterium tuberculosis*.

A is incorrect as smallpox is caused by a virus.

C & D are incorrect as measles is caused by virus.