10.1 Infectious diseases

Name: _____ Class: _____ Date: _____ **Total: 27 marks**

KEY WORDS pathogen • infectious disease • cholera • tuberculosis • malaria

Objective

Build the skills to answer exam questions on **infectious diseases** – the **pathogens** that cause cholera, malaria, TB and HIV, how they are transmitted, and how they are controlled.

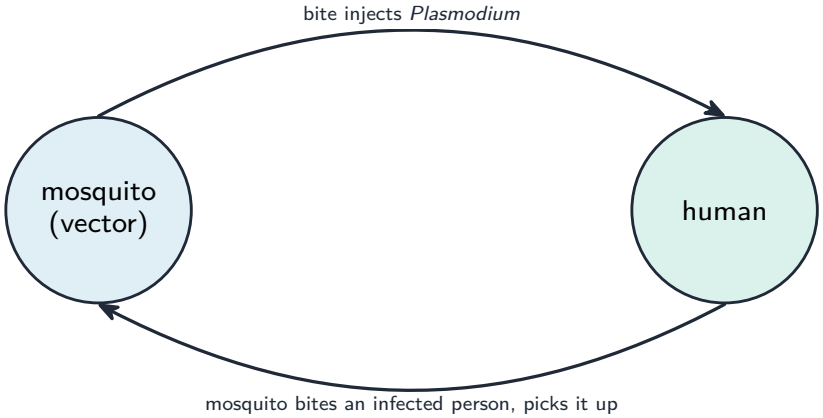
You must be able to:

- name the pathogen and type for cholera, malaria, TB and HIV/AIDS
- explain how each disease is transmitted
- discuss biological, social and economic factors in prevention and control

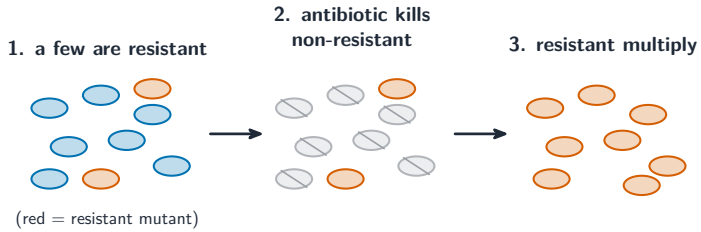
1 Key knowledge and worked examples

The four diseases

disease	pathogen (type)	transmission
cholera	*Vibrio cholerae* (**bacterium**)	water/food contaminated with faeces
malaria	*Plasmodium* (**protoctist**)	bite of an infected mosquito (**vector**); infected blood
TB	*Mycobacterium* (bacterium)	airborne **droplets** from coughs/sneezes
HIV/AIDS	HIV (**virus**)	unprotected sex; infected blood; mother to baby



Malaria needs a mosquito vector – which is why control targets the mosquito



Antibiotic resistance complicates treating infectious disease

Prevention and control

Control has **biological**, **social** and **economic** sides. Examples: cholera – clean water and sewage treatment; malaria – nets, drain still water, insecticides, drugs; TB – find and treat with antibiotics, BCG vaccine, reduce crowding; HIV – condoms, clean needles, test blood, education (no cure/vaccine yet).

2 Practice

2.1 Name the type of pathogen that causes (a) malaria and (b) HIV/AIDS. [2]

2.2 State how tuberculosis is transmitted from person to person. [1]

3 Exam-style questions

3.1 Which disease is caused by a protoctist and spread by a vector? [1]

- **A** cholera
- **B** HIV/AIDS
- **C** malaria
- **D** tuberculosis

3.2 Cholera is best prevented by: [1]

- **A** sleeping under a mosquito net
- **B** providing clean water and treating sewage
- **C** using condoms
- **D** taking a long course of antibiotics

3.3 (a) Explain why providing clean drinking water reduces the spread of cholera. [2]

(b) Discuss **one** social and **one** economic factor that make malaria hard to control in some countries. [2]

3.4 A region recorded 4000 malaria cases in 2015. After a mosquito-net programme, this fell to 1500 cases in 2020.

(a) Calculate the percentage decrease in cases. [2]

(b) Explain why targeting the mosquito reduces malaria. [2]

3.5 The table gives information about four infectious diseases.

Disease	**Pathogen**	**Type of pathogen**	**Main method of transmission**
Cholera	*Vibrio cholerae*		
Malaria		protoctist	
Tuberculosis	*Mycobacterium tuberculosis*		
HIV/AIDS		virus	

(a) Complete the table. [6]

(b) Explain why cholera is common where there is flooding or a breakdown of sanitation. [3]

(c) Explain why the malarial parasite is difficult to control by vaccination. [2]

(d) Tuberculosis is treated with a combination of antibiotics taken for at least six months. Explain why the course is so long and why more than one antibiotic is used. [3]

Solutions

Each answer shows the steps, then the **result**.

2.1

(a)

- a protoctist (*Plasmodium*)

(b)

- a virus (HIV)

2.2

- by airborne droplets from coughing/sneezing

3.1 C

- Malaria is caused by the protoctist *Plasmodium* and spread by the mosquito vector

3.2 B

- Cholera spreads via faeces-contaminated water, so clean water and sewage treatment prevent it

3.3

(a)

- the cholera bacterium spreads in water contaminated with faeces; clean water removes this route of transmission

(b)

- social, e.g. people may not use nets / lack of education; economic, e.g. cost of nets, drugs or insecticides is too high

3.4

(a)

- decrease $= 4000 - 1500 = 2500$; percentage $= \dfrac{2500}{4000} \times 100 = 62.5\%$

(b)

- the mosquito is the vector that transmits *Plasmodium*; killing mosquitoes / stopping bites breaks the transmission cycle

3.5

(a)

- Cholera – bacterium; spread in water or food contaminated with faeces. Malaria – *Plasmodium*; spread by the bite of an infected female *Anopheles* mosquito, the vector. Tuberculosis – bacterium; airborne droplets from coughing and sneezing. HIV – human immunodeficiency virus; in body fluids, i.e. unprotected sex, shared needles, infected blood, or mother to child

(b)

- Flooding mixes sewage with drinking water; the bacterium is transmitted by the faecal–oral route, so it spreads directly to anyone drinking or washing food in that water; crowded temporary shelters with no clean water or sanitation let one case infect many

(c)

- *Plasmodium* has several stages in the human host, each with different surface antigens, so an antibody against one stage does not recognise the others; its antigens also vary between and within strains, so no single vaccine gives lasting immunity

(d)

- The bacterium grows very slowly and can survive inside macrophages, so it takes months of treatment to kill every cell; if the course is stopped early the survivors – the most resistant – multiply; using several antibiotics at once makes it very unlikely that any one bacterium is resistant to all of them