Communicable (infectious) diseases

4.3.1.1 · Infection and response · revision notes

What pathogens are, the four types of pathogen, how they spread between animals and between plants, and how their spread can be reduced. On Paper 1 this comes up as short recall questions, 'explain how this disease is spread' questions and data on the number of cases of a disease.

Key facts

- Pathogen = microorganism that causes infectious disease
- Communicable = can be passed from one organism to another
- Bacteria → toxins that damage tissues
- Vector = organism that carries a pathogen to a new host, e.g. mosquito
- Four types of pathogen: viruses, bacteria, fungi, protists
- Spread by: direct contact, water, air (also food, body fluids, vectors)
- Viruses → reproduce inside cells, damaging them
- Reduce spread: hygiene, isolation, destroying vectors, vaccination

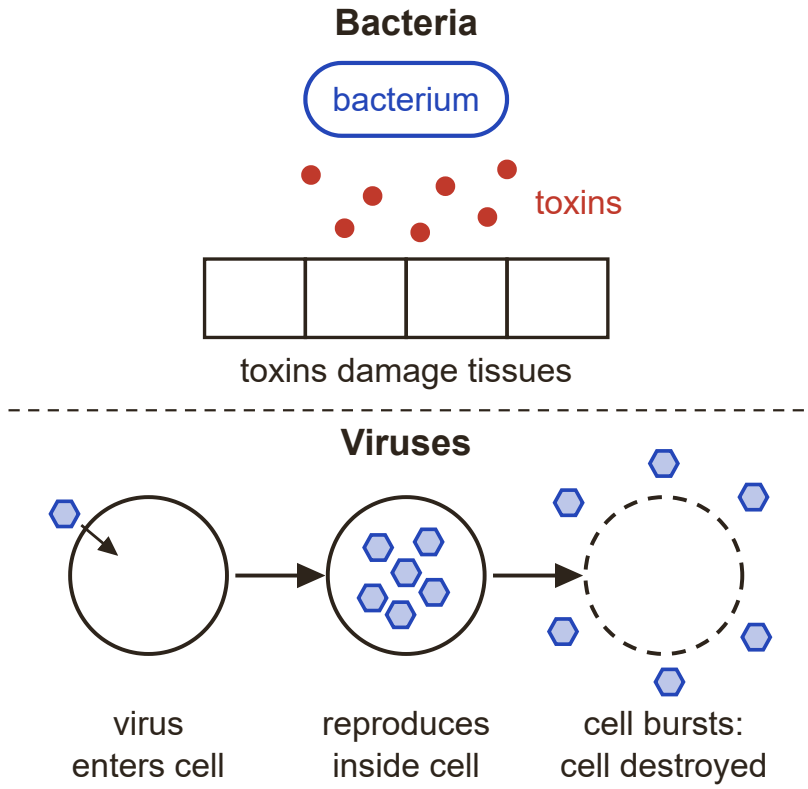
Notes

Pathogens

- A **pathogen** is a microorganism that causes infectious disease. Diseases caused by pathogens are **communicable**: they can be passed from one organism to another.
- There are four types of pathogen: **viruses**, **bacteria**, **fungi** and **protists**.
- Pathogens can infect both animals and plants.
- Non-communicable diseases, such as coronary heart disease, are not caused by pathogens, so they cannot be passed on.

How bacteria and viruses make you ill

- Bacteria and viruses can reproduce rapidly inside the body, so their numbers rise quickly after infection.
- **Bacteria** may produce poisons called **toxins**. Toxins damage tissues and make you feel ill.
- **Viruses** live and reproduce inside your cells. This damages or destroys the cells.



Bacteria damage tissues with toxins; viruses destroy the cells they reproduce in.

How pathogens spread

- **Direct contact**: touching an infected person or a contaminated surface, or sexual contact. Plants can be infected when an infected leaf touches a healthy one.
- **Water**: drinking water or eating food washed in water that contains the pathogen. Water splashes can also carry pathogens between plants.
- **Air**: breathing in droplets from an infected person's coughs and sneezes. Wind carries the spores of some plant pathogens.
- Some pathogens are carried in **food** or in **body fluids** such as blood.
- A **vector** is an organism that carries a pathogen from one host to another, e.g. mosquitoes carry the protist that causes malaria.

Reducing or preventing spread

- **Hygiene**: washing hands (after using the toilet, before handling food), disinfecting surfaces and cooking food thoroughly remove or kill pathogens. Covering the mouth and nose when coughing or sneezing stops droplets reaching other people.
- **Isolating** infected individuals stops them passing the pathogen on.
- **Destroying vectors**, e.g. stopping mosquitoes breeding, means fewer pathogens are carried to new hosts.
- **Vaccination** makes people immune, so they cannot be infected or pass the pathogen on.
- In plants: remove and destroy infected leaves or plants, and use chemicals to kill the pathogens or the insects that carry them.

How to answer each type of question

Recall: define a pathogen and name the types — 1 mark each — Grade 3

1. Learn the definition word for word: a microorganism that causes (infectious) disease.
2. Give exactly the number of answers asked for. An extra wrong answer can cancel a right one.

Example. (a) What is a pathogen?
(b) Bacteria are one type of pathogen. Name **two** other types of pathogen.

Model answer.

(a) A microorganism that causes (infectious) disease (1)
(b) Any two from: viruses, fungi, protists (1) (1)

Explain how a disease is spread — 2 marks — Grade 4

1. Use the clues in the question, e.g. 'found in faeces' or 'carried by flies'.
2. Say how the pathogen leaves the infected person and how it reaches the next person.
3. Say how it gets into the new person: breathed in, swallowed, through the skin or by sexual contact.

Example. Cholera is a disease caused by a bacterium. The bacterium is found in the faeces of infected people.
Explain how cholera can spread in an area without a clean water supply.

Model answer. Faeces containing the bacteria get into the water supply (1). Other people drink the water, or eat food washed in it, and swallow the bacteria (1).

Describe how bacteria and viruses cause illness

2 to 3 marks | Grade 5

1. Say that both reproduce rapidly inside the body.
2. Bacteria: produce toxins that damage tissues.
3. Viruses: live and reproduce inside cells, damaging the cells.

Example. Bacteria and viruses can both cause disease.
Describe how each type of pathogen damages the body.

Model answer. Both reproduce rapidly inside the body (1). Bacteria produce toxins (poisons) that damage tissues (1). Viruses live and reproduce inside cells, which damages the cells (1).

Suggest and explain ways to reduce spread

2 to 4 marks | Grade 5

1. Pick methods that match the way this pathogen spreads.
2. For each method, give the method (1 mark) and explain how it stops the pathogen reaching a new host (1 mark).

Example. An outbreak of a disease has started on a hospital ward. The disease is caused by a bacterium that is spread by direct contact.
Suggest **two** ways staff could reduce the spread of the disease. Explain how each way works.

Model answer.

Wash hands or use hand gel between patients (1), which removes or kills the bacteria so they are not carried to the next patient (1). Isolate infected patients in a separate room (1), so that other patients cannot come into contact with them (1).
Also allow: disinfect surfaces, so bacteria on them are killed; wear disposable gloves and aprons.

Data: numbers of cases

2 to 3 marks | Grade 7

1. Percentage change = change ÷ original value × 100.
2. Show the subtraction and the division: each is usually a mark.
3. When asked for a reason, use the way the pathogen spreads.

Example. There were 60 cases of a disease in a town in week 1 and 150 cases in week 4.
(a) Calculate the percentage increase in the number of cases.
(b) The disease is spread in droplets from coughs and sneezes. Suggest why the number of cases increased quickly.

Model answer.

(a) 150 − 60 = 90 (1); 90 ÷ 60 × 100 = 150% (1)
(b) Each infected person coughs and sneezes out droplets, which can be breathed in by several other people nearby (1).

Don’t lose marks

- Mixing up how bacteria and viruses cause harm: bacteria release toxins; viruses damage the cells they reproduce inside.
- Writing 'germs' or 'bugs' instead of pathogen, bacterium or virus.
- Giving a vague answer such as 'be hygienic' without saying what to do or how it stops the pathogen reaching a new host.
- Calling the vector the pathogen: the mosquito carries the malaria pathogen, but the pathogen is a protist.
- Thinking all microorganisms are pathogens. Most bacteria are harmless or useful; only those that cause disease are pathogens.

More tips

Memory tricks

- Four pathogens: 'Big Viruses Frighten People' = Bacteria, Viruses, Fungi, Protists.
- Three main routes: contact, water, air. Then add food, body fluids and vectors.
- Match the control to the route: air → isolate and cover coughs; water → clean water; contact → hygiene; vector → kill the vector or avoid bites.
- Bacteria make toxins; viruses wreck cells from the inside.

Exam technique

- In 'explain how it spreads' answers, give the route and how the pathogen gets into the new person (breathed in, swallowed, through a cut, by sexual contact).
- If the question describes a disease you have not met, use the information given rather than writing about a disease you know.
- Show your working in percentage change calculations: the method mark is often given even if the final answer is wrong.
- For 'suggest how to reduce spread', each method you explain is usually worth 2 marks: the method and how it works.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3 — **Define a pathogen**
A pathogen is a microorganism that causes infectious (communicable) disease.

Grade 3 — **Name the four types of pathogen**
Viruses, bacteria, fungi and protists; they can infect both animals and plants.

Grade 4 — **Describe how pathogens are spread**
By direct contact, by water and by air, and also in food, in body fluids and by vectors.

Grade 5 — **Explain how bacteria and viruses make you ill**
Both reproduce rapidly in the body; bacteria release toxins that damage tissues, and viruses reproduce inside cells and damage them.

Grade 5 — **Describe ways to reduce the spread of disease**
Hygiene, isolating infected individuals, destroying or controlling vectors, and vaccination.

Grade 5 — **Explain how a control method stops spread**

Link the method to the route, e.g. washing hands removes pathogens, so they are not passed on by direct contact.

Grade 7

Interpret data on the spread of a disease

Describe trends in case numbers, calculate percentage changes and use the way the pathogen spreads to explain the pattern.

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