Viral diseases

4.3.1.2 · Infection and response · revision notes

The three viral diseases in the specification: measles and HIV in humans, and tobacco mosaic virus (TMV) in plants. Expect questions on their symptoms, how they are spread, how the spread is controlled and why TMV reduces plant growth.

Key facts

- Measles: fever and red skin rash; spread by droplets from coughs and sneezes
- HIV: flu-like illness at first, then attacks immune cells
- HIV spread: sexual contact and body fluids, e.g. blood on shared needles
- TMV: mosaic discolouration of leaves → less photosynthesis → less growth
- Most young children are vaccinated against measles
- AIDS = late-stage HIV: immune system too damaged to deal with other infections or cancers
- HIV is controlled (not cured) with antiretroviral drugs
- Antibiotics do not work on viruses

Notes

Measles

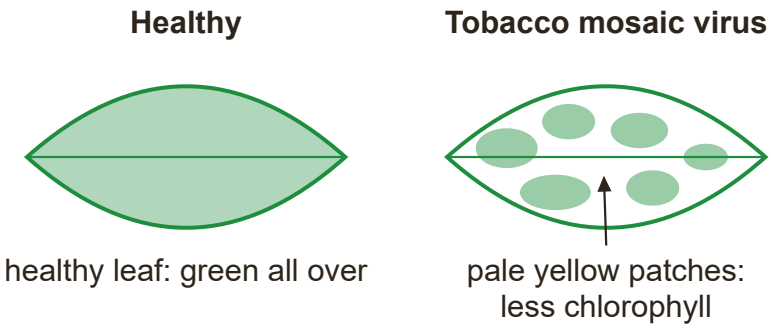
- Symptoms: **fever** and a **red skin rash**.
- Spread by breathing in (inhaling) **droplets** from an infected person's coughs and sneezes.
- Measles is a serious illness that can be fatal if complications arise, so most young children are **vaccinated** against it.

HIV and AIDS

- HIV first causes a **flu-like illness**.
- Unless it is controlled with **antiretroviral drugs**, the virus attacks the body's **immune cells** (a type of white blood cell).
- Late-stage HIV infection is called **AIDS**. It happens when the immune system is so badly damaged that the body can no longer deal with other infections or cancers.
- HIV is spread by **sexual contact** or by exchange of **body fluids** such as blood, e.g. when drug users share needles.
- To reduce spread: use condoms, do not share needles, and treat infected people with antiretroviral drugs. These drugs do not cure HIV, but they control it.

Tobacco mosaic virus (TMV)

- A widespread plant pathogen that infects many species of plants, including tomatoes.
- It causes a distinctive **mosaic pattern** of discolouration on the leaves: patches of the leaves turn pale yellow or white.



TMV: a mosaic of green areas and pale patches, so less light is absorbed.

- The discoloured patches have less chlorophyll, so less light is absorbed and there is less **photosynthesis**. The plant makes less glucose, so it grows less.
- TMV spreads by contact, e.g. between the leaves of neighbouring plants or on hands and tools. Infected plants should be removed and destroyed.

Treating viral diseases

- Antibiotics do **not** kill viruses.
- Viruses live inside cells, so it is hard to make drugs that kill them without also damaging the body's tissues.

How to answer each type of question

Give symptoms and describe how a virus spreads

1 to 3 marks | **Grade 4**

1. Learn the exact symptoms for each disease.
2. For spread, say how the virus gets from one person into the next person.

Example. Measles is caused by a virus.
(a) Give **two** symptoms of measles.
(b) Describe how the measles virus is spread.

Model answer.

(a) Fever (1); red skin rash (1)

(b) By breathing in droplets from an infected person's coughs or sneezes (1)

Suggest ways to reduce the spread of HIV 2 to 3 marks **Grade 5**

1. Think about each route: sexual contact and blood.
2. Give one method for each route, then add treatment with antiretroviral drugs.

Example. Suggest **three** ways to reduce the spread of HIV.

Model answer. Use condoms during sex (1). Drug users should not share needles / should use sterile needles (1). Treat infected people with antiretroviral drugs, so they are less likely to pass the virus on (1).

Explain why TMV reduces growth or yield 3 marks **Grade 6**

1. Start with the symptom: mosaic discolouration, so less chlorophyll.
2. Link to less light absorbed and less photosynthesis.
3. Finish with less glucose for growth (or for making fruit).

Example. Tomato plants infected with tobacco mosaic virus (TMV) produce fewer tomatoes than healthy plants.
Explain why.

Model answer. TMV causes a mosaic pattern of discoloured patches on the leaves, where there is less chlorophyll (1). So less light is absorbed and the rate of photosynthesis is lower (1). So the plant makes less glucose, which it needs for growth and to make fruit (1).

Explain why people with AIDS get other infections 3 marks **Grade 5**

1. Say what HIV attacks: the body's immune cells (white blood cells).
2. Say that in AIDS the immune system is badly damaged.
3. Link to the body being unable to destroy other pathogens or cancer cells.

Example. A person with late-stage HIV infection (AIDS) became seriously ill with tuberculosis, a disease caused by a bacterium.
Explain why people with AIDS are more likely to become seriously ill with infections like this.

Model answer. HIV attacks the body's immune cells / white blood cells (1). In AIDS the immune system is so badly damaged (1) that it can no longer destroy pathogens such as the tuberculosis bacteria, e.g. it cannot produce enough antibodies (1).

Don’t lose marks

- Saying HIV is spread by kissing, coughing or touching. It is spread by sexual contact and body fluids such as blood.

- Saying antiretroviral drugs cure HIV, or calling them antibiotics. They control the virus but do not cure the infection.
- Writing that TMV 'stops photosynthesis' or 'kills the leaves'. It reduces photosynthesis because the discoloured patches have less chlorophyll.
- Saying people 'catch AIDS'. People are infected with HIV; AIDS is the late stage of the infection.
- Saying people with AIDS die of the virus itself. They become ill with other infections or cancers that their immune system can no longer deal with.

More tips

Memory tricks

- Measles = rash and heat: red skin rash and fever. It travels through the air.
- HIV is the virus; AIDS is the late stage, when the immune system has been badly damaged.
- TMV: 'mosaic' = a patchwork of pale and green → less chlorophyll → less photosynthesis → less growth.
- Virus = no antibiotics. If a question asks how to treat a viral disease, antibiotics are always wrong.

Exam technique

- For TMV, write the whole chain: less chlorophyll → less light absorbed → less photosynthesis → less glucose → less growth. Each link can earn a mark.
- Use the key phrases examiners look for: 'inhaling droplets', 'sexual contact', 'body fluids', 'immune cells'.
- If a question asks why young children are vaccinated against measles, say that measles is serious and can be fatal if complications arise.

What each grade needs

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

Grade 3 — **Name viral diseases of humans and plants**
Measles and HIV in humans; tobacco mosaic virus (TMV) in plants.

Grade 4 — **Describe the symptoms and spread of measles**
Fever and a red skin rash; it is spread by breathing in droplets from coughs and sneezes.

Grade 4 — **Describe how HIV is spread**
By sexual contact or by exchange of body fluids such as blood, e.g. when drug users share needles.

Grade 5 — **Describe how measles and HIV are controlled**
Measles: vaccinating young children; HIV: condoms, not sharing needles and antiretroviral drugs.

Grade 5 — **Explain how HIV leads to AIDS**
HIV attacks immune cells; when the immune system is badly damaged, the body cannot deal with other infections or cancers.

Grade 6 — **Explain why TMV reduces plant growth**
The discoloured parts of the leaves have less chlorophyll, so there is less photosynthesis and less glucose for growth.

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