

1.2 Pathogens and viruses

Name: _____ Class: _____ Date: _____

Total: 22 marks

KEY WORDS pathogen • protein coat • parasitic

Objective

Understand pathogens (1.4): which groups can cause disease, and the structure and named examples of viruses. Original IGCSE-level practice for specification 4BI1 Section 1(b).

1 Key knowledge and worked examples

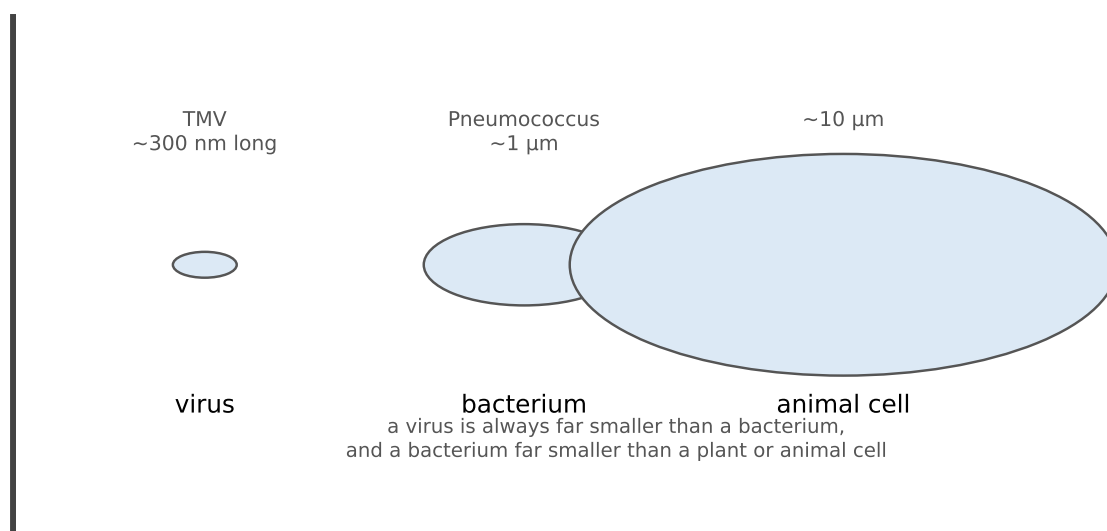
■ A pathogen is a disease-causing organism or particle

Fungi, bacteria, protoctists **or viruses** – all four can be pathogens. Named cases to recall: *Pneumococcus* (bacterium, pneumonia), *Plasmodium* (protoctist, malaria), and the three viruses.

■ Viruses are not alive

They are **small particles, smaller than bacteria; parasitic; reproduce only inside living cells; have no cellular structure** – a **protein coat** around **one type of nucleic acid (DNA or RNA)**. They infect every type of living organism.

Virus	Disease	Effect
Tobacco mosaic virus	discoloured tobacco leaves	prevents chloroplasts forming
Influenza virus	flu	–
HIV	AIDS	–



2 Practice

2.1 Define the term pathogen, listing the four groups the specification allows. [2]

2.2 Give three reasons why a virus is not classified as a living organism. [3]

2.3 State what is found inside a virus particle, and what surrounds it. [2]

2.4 Name the virus that attacks tobacco plants and describe the appearance of an infected leaf. [2]

3 Exam-style questions

3.1 A student writes: “Bacteria are the smallest pathogens and always cause disease.”
Correct both errors. [3]

3.2 Explain why a virus cannot reproduce on a glass surface, referring to its structure. [3]

3.3 *Plasmodium*, *Pneumococcus* and HIV all cause disease. Identify the group of each pathogen and one named disease symptom or effect for one of them. [4]

3.4 A particle seen with an electron microscope measures 200 nm across, shows a protein coat surrounding RNA, and has no cytoplasm. Deduce whether it is a virus or a bacterium, giving two reasons from your observations. [3]

Solutions

Original-task marking: B1 reasoning point per mark unless shown.

2.1 A pathogen is a disease-causing organism or particle; it may be a fungus, bacterium, protoctist or virus.

2.2 No cellular structure; can reproduce only inside living cells; carries out no life processes – no nutrition, respiration or excretion – by itself.

2.3 One type of nucleic acid – DNA or RNA; surrounded by a protein coat.

2.4 Tobacco mosaic virus; discoloured (mosaic-patterned) leaves, because chloroplasts fail to form.

3.1 Viruses, not bacteria, are the smallest pathogens – a virus is smaller than any bacterium; some bacteria are harmless or useful (e.g. *Lactobacillus* in yoghurt), not all cause disease.

3.2 A virus has no cellular structure – no cytoplasm, no enzymes, no ribosomes – only a protein coat and nucleic acid; reproduction requires the cell's machinery to copy the nucleic acid and build new protein coats; a glass surface provides no living cell, so nothing can be built.

3.3 *Plasmodium* – protoctist; *Pneumococcus* – bacterium; HIV – virus; any one effect: *Plasmodium* causes malaria with recurrent fever episodes (or TMV-like detail: *Pneumococcus* causes pneumonia; HIV causes AIDS).

3.4 It is a virus. Reason 1: 200 nm is far smaller than any bacterium (bacteria are about 1 μm = 1000 nm). Reason 2: it has a protein coat around nucleic acid and no cytoplasm – no cellular structure – whereas a bacterium has cytoplasm, a cell membrane and a cell wall.