3.1 Communicable diseases and pathogens

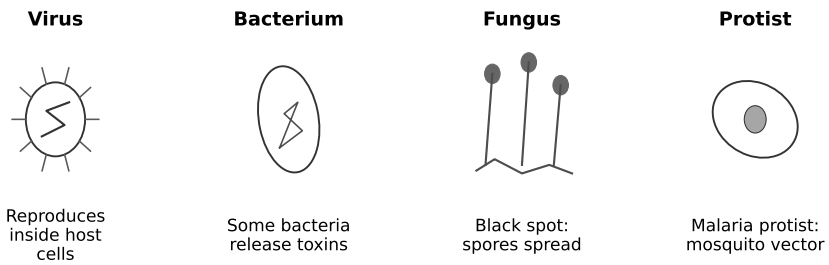
Name: _____ Class: _____ Date: _____ **Total: 19 marks**

KEY WORDS Pathogens • toxins

Objective

Name the four pathogen types and how diseases spread; recite the named-disease table with control measures. Original questions for spec statements 4.3.1.1–4.3.1.5.

1 Key knowledge and worked examples



Teacher schematic examples, not to scale; mosquito = vector, not pathogen.

Pathogen means a microorganism causing infectious disease: viruses, bacteria, protists or fungi. A **vector** carries a pathogen; malaria's mosquito is the vector and its protist is the pathogen. The teacher drawings above are schematic examples, not to scale. Virus shapes and genetic material vary.

Choose controls by transmission route: reduce inhalation of infected droplets; use hygiene to prevent food contamination; use clean water; reduce exchange of infected body fluids; avoid vector bites and breeding. Bacteria may release toxins that damage tissue. Viruses reproduce inside host cells, causing damage.

Disease	Type / transmission	Effect and control
Measles	virus; inhaled cough/sneeze droplets	fever, red rash; vaccinate
HIV	virus; sexual contact, infected blood/shared needles	immune-cell damage, late-stage AIDS; antiretroviral treatment, condoms, avoid shared needles
TMV	virus; plant contact	mosaic leaves, less photosynthesis/growth; hygiene, resistant varieties
Salmonella	bacterium; contaminated food	fever, cramps, vomiting, diarrhoea; food hygiene, UK poultry vaccination
Gonorrhoea	bacterium; sexual contact	discharge, pain urinating; condoms, effective antibiotics; penicillin resistance is a concern
Rose black spot	fungus; spores in water/wind	spots, yellowing and early leaf fall; fungicide, remove/destroy affected leaves
Malaria	protist; mosquito vector	recurrent fever, can be fatal; nets, prevent mosquito breeding

Original 2025 Q01.1/.2/.4 [1 each]: virus → inhalation of droplets from coughs/sneezes → fever or red rash. Unqualified "direct contact" is not a precise measles route. **Original 2023 Q05.1 [1]:** an organism transmitting a pathogen is a *vector*.

Worked symptom mechanism (original 2023 Q03.1 [1]): Salmonella *bacteria release toxins*. The scheme ignores "toxins" alone: state who produces them.

Worked spread/control (sheet Q3.1 [4], teacher rubric): bacteria are swallowed in contaminated food; poor food hygiene permits contamination; UK poultry are vaccinated; fewer infected animals mean fewer bacteria reach human food. Symptoms alone do not explain spread or control. Original 2023 Q03.2 [4] additionally requires specific antibodies/rapid secondary response in the animal and a link to less contaminated human food; see the immunity section.

Worked growth chain (sheet Q3.2 [3]): TMV reduces functioning chlorophyll-containing leaf area → less photosynthesis → less glucose for respiration and making biomass → less growth. Black spot also reduces photosynthesis when leaves are damaged or lost.

Worked resistance (sheet Q3.3 [4]): random mutation produces resistant variants → penicillin kills susceptible bacteria → survivors reproduce/pass on resistance → repeated selection raises the resistant proportion. Bacteria do not learn resistance or

mutate because they need it.

Worked vector control (sheet Q1.3): mosquito is the vector [1]; nets or preventing mosquito breeding is a suitable control [1]. Teacher explanation: nets reduce infectious bites; fewer breeding sites reduce the number of vectors.

2 Practice

2.1 Name the four pathogen types. [4]

2.2 State two ways the spread of measles can be reduced. [2]

2.3 Name the vector of malaria and one control measure. [2]

3 Exam-style questions

3.1 Explain how Salmonella is spread and how the UK controls it. [4]

3.2 TMV causes a mosaic pattern of discolouration on tomato leaves. Explain why infected plants grow poorly. [3]

3.3 A doctor reports a rise in gonorrhoea that no longer responds to penicillin. Explain why this happened. [4]

Solutions

2.1 Viruses, bacteria, protists, fungi.

2.2 Vaccination of children; covering coughs/sneezes, hygiene, isolating cases.

2.3 The mosquito; mosquito nets / preventing mosquito breeding.

3.1 Bacteria are ingested in contaminated food; poor food hygiene permits contamination of food; the UK vaccinates poultry against Salmonella; fewer infected animals mean fewer bacteria reach human food. Teacher-authored rubric: symptoms do not answer the spread/control demand.

3.2 The discolouration reduces the chlorophyll-containing leaf area; so photosynthesis is reduced; less glucose is available for respiration and making new biomass, reducing growth.

3.3 Random mutations created resistant strains; the antibiotic killed only non-resistant bacteria, giving resistant strains a survival advantage; resistant bacteria reproduced and spread; repeated penicillin use selected for resistance each generation – natural selection.