

Unit 2 — Pathogens and Diseases: Lesson Plan

How to use this document: this Lesson Plan is a delivery guide for the classroom — timing, activities, and materials. It assumes you and your learners already have the companion Topic Note (or your own notes covering the same content) as the actual subject-matter reference; this plan does not repeat that content in full.

On timing: lessons below are planned as standard 80-minute double periods (two 40-minute periods), which is the common secondary model. Confirm against your own school timetable and the Curriculum Framework's periods-per-week allocation for Biology, since this can vary by school — adjust the number of periods per lesson if your timetable gives Biology fewer or more periods per week.

Unit overview

Subject	Biology
Class	Secondary 3 (S3)
Unit	Unit 2 — Pathogens and Diseases
Sections covered	2.1 Pathogens and transmission · 2.2 Disease-causing organisms · 2.3 Identifying bacteria · 2.4 Communicable and non-communicable diseases
Total lessons	6 double periods (12 standard periods)
Prerequisite	Unit 1 — Classification of living things (the five kingdoms)

Materials needed across this unit

- Plain flour or fine chalk dust (Lesson 1 demonstration)
- A raw potato (or pawpaw/liver) and hydrogen peroxide solution (Lesson 4 experiment) — available cheaply from a local pharmacy
- Cooking oil mixed with chalk dust or glitter, soap, and water access (Lesson 5 experiment)
- Hand lens or school microscope if available (useful but not essential for Lesson 3)
- Two clear containers for water samples — one stagnant, one flowing (Lesson 3 experiment)
- Chart paper or the chalkboard for group diagrams
- Copies of the Topic Note or equivalent notes, one set of the four diagrams (chain of infection, virus cycle, starch test, disease pathways) drawn or projected for reference

Every experiment in this unit was chosen to use materials realistically available in a low-resource school — none requires a stocked laboratory.

Assessment across the unit

Each lesson below ends with a short formative check drawn from the Topic Note's leveled practice questions (easy/medium/hard). Save the "hard" multi-step reasoning question from each section for a short written unit test once all six lessons are complete, and set the Research and Discussion prompts as take-home work throughout — they need no internet access to complete.

Lesson 1 of 6 — Pathogens and Their Mode of Transmission

Section reference	2.1
Duration	1 double period (80 minutes)

Learning objectives — by the end of this lesson, learners should be able to:

- Define pathogen and distinguish obligate, opportunistic and accidental pathogens.
- Name and describe the four modes of pathogen transmission (direct contact, food/water, air, vector).
- Explain why breaking one link in a chain of infection can stop a disease from spreading.

Key vocabulary to introduce

pathogen, host, reservoir, vector, obligate pathogen, opportunistic pathogen

Lesson structure

Stage	Teacher activity	Learner activity
Starter (10 min)	Ask learners to recall the five kingdoms from Unit 1 on the board, then ask: "Can something that is not even a full cell still make you sick?" — leading toward viruses without naming them yet, to spark curiosity for section 2.2.	Respond, recall prior lesson/unit links, share initial ideas.
Development (35 min)	Introduce the definition of pathogen and walk through the chain-of-infection diagram (Fig. 2.1 in the Topic Note) on the board, step by step: reservoir, portal of exit, mode of transmission, portal of entry, new host. Then present the three pathogen categories (obligate/opportunistic/accidental) with one quick example of each, and the four modes of transmission with a locally relevant example for each one.	Follow explanation, take notes, ask questions, contribute to board work/diagrams.
Demonstration: The Flour-Hand Chain (25 min)	Coat one volunteer's palms with flour. Learners form a line and shake hands once down the chain. Afterwards, everyone checks their palms under light and the class counts how many people ended up with visible flour, even though only one person touched it directly. Discuss as a class where the chain could have been broken.	Work in groups to carry out the activity, record observations, discuss results.
Plenary (10 min)	Ask two or three learners to state, in their own words, which link of the chain of infection the flour demonstration represented, and name one everyday habit that breaks that same link.	Answer questions aloud or in pairs; identify one thing they are still unsure about.

Homework / take-home task

Set the Easy and Medium leveled questions from Topic Note section 2.1 as written homework. Assign the first Research and Discussion prompt (asking a relative how drinking water was made safe before piped water) for discussion at the start of the next lesson.

Lesson 2 of 6 — Viruses and Bacteria

Section reference	2.2 (Part A)
Duration	1 double period (80 minutes)

Learning objectives — by the end of this lesson, learners should be able to:

- Describe the basic structure of a virus and explain why it cannot reproduce without a host cell.
- Sequence the five general stages of a virus life cycle.
- Compare how cholera and tuberculosis are transmitted and why their control measures differ.
- Name at least four pathogenic bacteria and the diseases they cause.

Key vocabulary to introduce

virus, host cell, toxin, droplet infection, dormant

Lesson structure

Stage	Teacher activity	Learner activity
Starter (10 min)	Return to the question left open in Lesson 1 — "can something that is not even a full cell make you sick?" — and introduce the virus as the answer: genetic material in a protein coat, with no cell machinery of its own.	Respond, recall prior lesson/unit links, share initial ideas.
Development (35 min)	Walk through Fig. 2.2 (the five-stage virus cycle) on the board, using HIV as the running example for transmission and effect on the immune system. Move to bacteria: contrast <i>Vibrio cholerae</i> (fast, waterborne, toxin-driven) with <i>Mycobacterium tuberculosis</i> (slow, airborne, can lie dormant). Introduce the bacterial disease summary table from the Topic Note, focusing on transmission route and one key sign per organism rather than memorising every detail in one sitting.	Follow explanation, take notes, ask questions, contribute to board work/diagrams.
Guided activity: Sequencing cards (25 min)	In groups, learners receive the five virus life-cycle stages written on separate cards or paper strips (in scrambled order) and must arrange them correctly, then explain their reasoning to another group for a quick peer check.	Work in groups to carry out the activity, record observations, discuss results.
Plenary (10 min)	Cold-call two groups to justify their card order aloud, correcting any mix-ups as a class before moving on.	Answer questions aloud or in pairs; identify one thing they are still unsure about.

Homework / take-home task

Topic Note section 2.2 Easy and Medium questions as written homework. Learners should come to the next lesson ready to name one disease from this lesson that is spread by a vector, ready for Lesson 3.

Lesson 3 of 6 — Protozoa and Parasitic Worms

Section reference	2.2 (Part B)
Duration	1 double period (80 minutes)

Learning objectives — by the end of this lesson, learners should be able to:

- Describe the malaria life cycle, including the role of the Anopheles mosquito.
- Describe the bilharzia life cycle, including the roles of the intermediate host (snail) and definitive host (human).
- Distinguish a vector-borne disease from one transmitted by direct skin contact with contaminated soil or water.

Key vocabulary to introduce

protozoa, intermediate host, definitive host, vector-borne disease

Lesson structure

Stage	Teacher activity	Learner activity
Starter (10 min)	Ask learners to name the vector-borne disease they identified for homework, and list on the board every vector-borne disease covered so far in the unit (malaria expected here).	Respond, recall prior lesson/unit links, share initial ideas.
Development (35 min)	Present the malaria life cycle narrative from the Topic Note, emphasising the mosquito's role and why the fever comes in waves (red blood cells bursting). Contrast this with the bilharzia life cycle, carefully distinguishing intermediate host (the snail) from definitive host (the human), since learners often confuse these two terms. Briefly mention hookworm as a simpler, vector-free contrast.	Follow explanation, take notes, ask questions, contribute to board work/diagrams.
Experiment: Comparing Microbial Life in Still and Flowing Water (25 min)	In groups, learners examine a pre-collected still-water sample and a flowing-water sample under a hand lens or microscope (or simply against strong light if neither is available), count visible moving specks for one minute in each, and record which sample shows more activity.	Work in groups to carry out the activity, record observations, discuss results.
Plenary (10 min)	Ask groups to share their counts and discuss as a class why stagnant water is treated as a greater health risk than flowing water, linking back to the idea of a reservoir from Lesson 1.	Answer questions aloud or in pairs; identify one thing they are still unsure about.

Homework / take-home task

Topic Note section 2.2 Hard question (the bilharzia washing-point reasoning question) as written homework, plus the second Research and Discussion prompt on rainwater containers around the home.

Lesson 4 of 6 — Identifying Bacteria Using Biochemical Tests

Section reference	2.3
Duration	1 double period (80 minutes)

Learning objectives — by the end of this lesson, learners should be able to:

- Explain why two bacteria that look identical under a microscope may still need to be told apart chemically.
- Explain the principle behind the catalase test and the starch hydrolysis test.
- Interpret a simple glucose/lactose fermentation result to decide whether an organism is more likely to be a harmless gut organism or a serious pathogen.

Key vocabulary to introduce

biochemical test, enzyme, fermentation, hydrolysis

Lesson structure

Stage	Teacher activity	Learner activity
Starter (10 min)	Ask: "If two bacteria look exactly the same under a microscope, how would you ever tell them apart?" and take a few guesses before introducing biochemical testing as the answer.	Respond, recall prior lesson/unit links, share initial ideas.
Development (35 min)	Explain the catalase test (hydrogen peroxide → water + oxygen bubbles) and the starch hydrolysis test (iodine turns unreacted starch dark; hydrolysed starch leaves a clear zone), using Fig. 2.3 from the Topic Note. Then walk through the glucose/lactose fermentation logic at a simple level: an organism that can also use the larger lactose supply keeps the whole sample acidic, while one that cannot switches to breaking down protein instead.	Follow explanation, take notes, ask questions, contribute to board work/diagrams.
Experiment: Does Cooking Destroy Catalase? (25 min)	In groups, learners add a few drops of hydrogen peroxide to a piece of raw potato and a piece of boiled, cooled potato at the same time, then observe and record which one bubbles and for how long.	Work in groups to carry out the activity, record observations, discuss results.
Plenary (10 min)	Ask groups to explain, in their own words, why the cooked sample behaved differently, linking this to what an enzyme actually is.	Answer questions aloud or in pairs; identify one thing they are still unsure about.

Homework / take-home task

Topic Note section 2.3 Easy and Medium questions as written homework. Learners who can, should ask at home or at a shop what strength of hydrogen peroxide is sold locally, ready for the Research and Discussion prompt.

Lesson 5 of 6 — Controlling Communicable Diseases

Section reference	2.4 (Part A)
Duration	1 double period (80 minutes)

Learning objectives — by the end of this lesson, learners should be able to:

- Classify a given prevention method by which link of the chain of infection it breaks.
- Explain, using at least two examples, why no single prevention method works for every communicable disease.

Key vocabulary to introduce

communicable disease, immunisation, hygiene

Lesson structure

Stage	Teacher activity	Learner activity
Starter (10 min)	Show the chain-of-infection diagram from Lesson 1 again and ask learners to suggest, without looking at their notes, one thing a person could do to "break" each of the five links.	Respond, recall prior lesson/unit links, share initial ideas.
Development (35 min)	Work through the prevention-methods table from Topic Note section 2.4(a) — natural barriers, water treatment, hygiene, food preservation, drug therapy, immunisation, avoiding overcrowding — matching each one explicitly to the link in the chain of infection it interrupts, correcting or extending what learners suggested in the starter.	Follow explanation, take notes, ask questions, contribute to board work/diagrams.
Experiment: Which Handwashing Method Removes the Most "Germs"? (25 min)	Learners coat one hand with the oil-and-chalk-dust mixture, rinse with water only, and check the residue; then repeat with soap and water and compare. Groups record and discuss which method left less residue and why.	Work in groups to carry out the activity, record observations, discuss results.
Plenary (10 min)	Ask learners to name one prevention method from today's lesson that they do not currently practise regularly, and one small change they could realistically make this week.	Answer questions aloud or in pairs; identify one thing they are still unsure about.

Homework / take-home task

Topic Note section 2.4 Easy question as written homework. Ask learners to observe the handwashing facilities at home or school ready for the second Research and Discussion prompt.

Lesson 6 of 6 — Non-Communicable Diseases

Section reference	2.4 (Part B)
Duration	1 double period (80 minutes)

Learning objectives — by the end of this lesson, learners should be able to:

- Distinguish diabetes mellitus from diabetes insipidus in terms of cause.
- Explain how uncontrolled cell division leads to a tumour, and distinguish benign from malignant tumours.
- List at least four risk factors for cancer and one corresponding prevention measure for each.

Key vocabulary to introduce

non-communicable disease, insulin, tumour, benign, malignant

Lesson structure

Stage	Teacher activity	Learner activity
Starter (10 min)	Ask: "Can you catch diabetes from a friend who has it, the way you could catch a cold?" and use the answer to draw out the communicable/non-communicable distinction from the previous lesson.	Respond, recall prior lesson/unit links, share initial ideas.
Development (35 min)	Explain insulin's role in blood glucose regulation and contrast diabetes mellitus (insulin problem) with diabetes insipidus (a different hormone, unrelated to insulin, affecting the kidneys). Move to cancer: explain mutation and uncontrolled mitosis leading to a tumour, then the benign/malignant distinction, then walk through the risk factor list (smoking, alcohol, radiation, certain viral infections, heredity) pairing each with a realistic prevention measure.	Follow explanation, take notes, ask questions, contribute to board work/diagrams.
Demonstration: Modelling Uncontrolled Division (25 min)	Give each group a small pile of dried beans or seeds. One learner doubles a starting pile of two beans a fixed number of times under normal "rules" (stop doubling after 4 rounds, representing normal, controlled mitosis), while a second learner keeps doubling without stopping to show how quickly an uncontrolled process outgrows the first pile.	Work in groups to carry out the activity, record observations, discuss results.
Plenary (10 min)	Ask groups to describe, using the bean piles, why a malignant tumour becomes dangerous faster than the body can compensate for.	Answer questions aloud or in pairs; identify one thing they are still unsure about.

Homework / take-home task

Topic Note section 2.4 Medium and Hard questions as written homework, to be reviewed at the start of the unit test. Remind learners to bring their answers to both Research and Discussion prompts from this section for a short class discussion before the test.