Year 11 Science: Human-induced change in Aotearoa: soil, water and plastic

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. A new subdivision of houses and roads is built. Name the change it causes and two spheres it affects.

2. Explain why nitrate leaches through soil much more easily than phosphate.

3. A catchment was changed from pine forest to dairy farming. Nitrate in its spring water has kept rising for 15 years, although the farm has not changed since. Explain why.

4. Explain how clearing forest from steep hill country can harm an estuary downstream.

5. Discuss one implication of microplastics reaching the sea.

Try it: litter on our beaches

Litter Intelligence volunteers count every item of litter in marked areas of beach. The table gives average items per 1000 m² by region.

Region	Average litter items per 1000 m²
Wellington	558
Auckland	416
Hawke's Bay	317
Canterbury	275
Bay of Plenty	104
Gisborne	74
West Coast	27

6. How many times more litter per 1000 m² did Wellington's surveyed beaches have than the West Coast's?

7. Suggest one reason for the difference.

8. Paper and wood are only 4.5% of items, while plastic and foamed plastic are 74.9%. Explain why plastic builds up on beaches more than paper and wood.

Fix the mistake

9. Correct this statement: "The West Coast has the most erosion, so it has the worst human-induced erosion."

10. Correct this statement: "Nitrate gets into rivers mainly by fertiliser washing off the paddock surface in rain."

11. Correct this statement: "Listing more effects is how you get Excellence."

12. Correct this statement: "Plastic in the sea breaks down and disappears after a few years."

Answer key (for parents and tutors)

1. A new subdivision of houses and roads is built. Name the change it causes and two spheres it affects.
   Sealed (impervious) ground means more, faster stormwater carrying metals and litter; it affects the hydrosphere (streams, harbour) and the biosphere (stream life), and the geosphere (soil covered, metals in harbour mud).
2. Explain why nitrate leaches through soil much more easily than phosphate.
   Nitrate is very soluble and negatively charged, so soil particles do not hold it and it drains down with rainwater; phosphate binds tightly to soil particles and moves mainly when the soil itself erodes.
3. A catchment was changed from pine forest to dairy farming. Nitrate in its spring water has kept rising for 15 years, although the farm has not changed since. Explain why.
   Nitrate leaches into groundwater, which moves slowly, so water reaching the spring now may have soaked in years to decades ago; the full effect of the change to dairy has not arrived yet.
4. Explain how clearing forest from steep hill country can harm an estuary downstream.
   Without deep roots, slopes slip in heavy rain and the soil washes into rivers as sediment; in the estuary it settles, smothering seagrass and shellfish beds such as tuangi, cutting light and removing nursery habitat for fish.
5. Discuss one implication of microplastics reaching the sea.
   For example: filter feeders such as mussels take in microplastics, which pass up food webs to fish, birds and people who eat kaimoana; because plastic does not biodegrade the amount keeps building for decades, so the most effective response is stopping plastic at the source rather than cleaning it up later.
6. How many times more litter per 1000 m² did Wellington's surveyed beaches have than the West Coast's?
   558 ÷ 27 ≈ 20.7, so about 21 times as much.
7. Suggest one reason for the difference.
   Wellington has far more people, roads and stormwater drains that wash litter straight into the harbour, and the harbour traps it along the shore; the West Coast has few people.
8. Paper and wood are only 4.5% of items, while plastic and foamed plastic are 74.9%. Explain why plastic builds up on beaches more than paper and wood.
   Paper and wood biodegrade, as microbes break them down, but plastic does not; plastic also floats and lasts for decades, so currents keep carrying it ashore and it accumulates.
9. Correct this statement: "The West Coast has the most erosion, so it has the worst human-induced erosion."
   Most West Coast erosion is natural (steep, wet, rising mountains); erosion is human-induced where land use speeds it up, such as pasture on cleared hills.
10. Correct this statement: "Nitrate gets into rivers mainly by fertiliser washing off the paddock surface in rain."
    Most nitrate leaches down through the soil from urine patches and fertiliser, then reaches rivers through groundwater, often years later.
11. Correct this statement: "Listing more effects is how you get Excellence."
    Excellence needs discussion of implications: links between spheres, timescales, who is affected and which responses would work.
12. Correct this statement: "Plastic in the sea breaks down and disappears after a few years."
    Plastic breaks into microplastics but does not biodegrade, so it stays in water, sediment and animals for decades or longer.