

Exercise walk-through

8.7

Persistent Organic Pollutants (POPs)

AP Environmental Science

Pollutants that do not go away

Persistent organic pollutants

Persistent organic pollutants resist breakdown, dissolve in fat and so bioaccumulate – DDT, PCBs, dioxins.

Biomagnification

Each trophic level concentrates what it eats, so top predators carry the highest burden.

Algal blooms

Algal blooms follow nutrient runoff; when the algae die, decomposition strips the oxygen and the fish suffocate.

Disease and water

Contaminated water spreads cholera and dysentery; crowding spreads **tuberculosis (TB)** – both are pollution problems as much as medical ones.

Persistence, solubility in fat, and trophic position. Those three predict where a toxin ends up.

Where solid waste actually goes

sanitary land-fills

buried in lined cells to limit **leachate** ; takes land and can still leak

incinerators

burning cuts the *volume* sharply but emits air pollutants and leaves toxic ash

composting

organic waste returned to soil – the cheapest diversion there is

e-waste

phones, computers, televisions – small in volume, but loaded with **toxic metals**

garbage patches

ocean-dumped plastic gathered by currents into vast floating fields far out at sea

The hierarchy is **reduce**, **reuse**, **recycle** – and reducing is best because waste you never make needs no disposal at all.

Worked example – reading a BOD result

A river below a sewage outfall has high BOD and almost no fish. Explain the link.

- BOD = the oxygen **decomposer bacteria** use to break down organic waste.
- Sewage feeds the bacteria $\Rightarrow$ they multiply and **respire hard**.
- Dissolved oxygen **crashes** $\Rightarrow$ fish suffocate and only tolerant species survive.
- Further downstream the waste runs out $\Rightarrow$ oxygen recovers $\Rightarrow$ **a classic oxygen sag curve**.

High BOD = dirty water: it means a big oxygen demand, not a lot of oxygen. Fish die of **suffocation**, not poisoning.

Exercises 2.1-2.3

2.1 State two properties of POPs.

[2]

2.2 Give one example of a POP.

[1]

2.3 Why can POPs reach remote places like the Arctic?

[1]

Exercises 2.1-2.3

2.1 State two properties of POPs. [2]

2.1

- Any two: persistent, bioaccumulate, travel long distances, toxic
-

2.2 Give one example of a POP. [1]

2.2

- Any one: DDT, PCBs, dioxins
-

2.3 Why can POPs reach remote places like the Arctic? [1]

2.3

- They persist and are carried long distances by air and water

Exercise 3.1

3.1 POPs are especially dangerous because they

[1]

☐

A break down instantly

B persist and bioaccumulate in food chains

C stay only where used

D are harmless

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3.1 B

- persist and bioaccumulate in food chains

Exercise 3.2 (a)

3.2 DDT was widely used decades ago and is still found in wildlife.

(a) Explain why it is still present.

[2]

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(a) Explain why it is still present.

[2]

(a)

- DDT is persistent – it does not break down quickly, so it remains in the environment and in animals' tissues for decades

Exercise 3.2 (b)

3.2 DDT was widely used decades ago and is still found in wildlife.

(b) State one harmful effect on wildlife.

[1]

Exercise 3.2 (b)

3.2 DDT was widely used decades ago and is still found in wildlife.

(b) State one harmful effect on wildlife.

[1]

(b)

- Eggshell thinning in birds of prey (or reproductive harm)

Exercise 3.3

3.3 Explain why POPs reach their highest concentrations in top predators.

[2]

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3.3

- POPs bioaccumulate and biomagnify – they concentrate up each trophic level – so top predators, which eat many contaminated prey, accumulate the highest levels