

Exercise walk-through

8.12

Lethal Dose 50% (LD50)

AP Environmental Science

Persistent toxins

POPs

resist breakdown

decades and travel far.

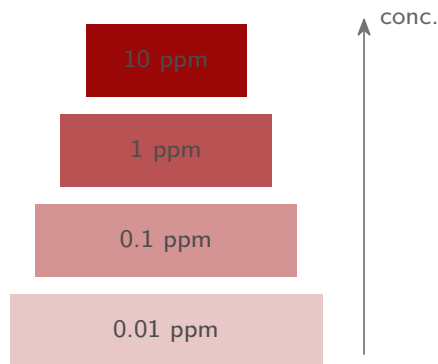
(DDT, PCBs)

, so they last

- **bioaccumulation** : builds up in one body

- **biomagnification** : rises up the food chain

Top predators (and people who eat them) carry the highest **mercury** dose.

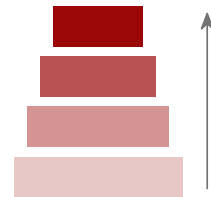


Exam tips

- Trace **eutrophication** step by step: nutrient runoff → algal bloom → decay → oxygen depletion → fish die.
- **Bioaccumulation** builds up in one organism; **biomagnification** increases up the food chain, so top predators are hit hardest.
- Read an **LD50**: a **lower** value means **more** toxic; multiply by body mass for a lethal dose.
- Order the waste hierarchy **reduce** > **reuse** > **recycle**, and the stages of sewage treatment.
- Link pathogens to contaminated water and to clean-water/sanitation defences.

Check yourself

- 1 Is farm run-off a point or nonpoint source?
- 2 What uses up the oxygen in a eutrophic dead zone?
- 3 Who carries the highest biomagnified toxin dose?
- 4 Does a lower LD_{50} mean more or less toxic?



Answers 1. nonpoint 2. bacteria decomposing dead algae 3. top predators 4. more toxic

Exercises 2.1-2.3

2.1 Define LD50.

[1]

2.2 Does a lower or higher LD50 mean more toxic?

[1]

2.3 Substance X ($\text{LD}_{50} = 2 \text{ mg/kg}$) vs Y ($\text{LD}_{50} = 200 \text{ mg/kg}$): which is more toxic? [1]

Exercises 2.1-2.3

2.1 Define LD50.

[1]

2.1

- The dose that kills 50% of a test population
-

2.2 Does a lower or higher LD50 mean more toxic?

[1]

2.2

- Lower
-

2.3 Substance X ($\text{LD}_{50} = 2 \text{ mg/kg}$) vs Y ($\text{LD}_{50} = 200 \text{ mg/kg}$): which is more toxic? [1]

2.3

- X ($\text{LD}_{50} = 2 \text{ mg/kg}$)

Exercise 3.1

3.1 A chemical with a very low LD50 is

[1]

☐

A very toxic

B not toxic

C a nutrient

D harmless

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3.1 A

- very toxic

Exercise 3.2 (a)

3.2 Two pesticides have LD50 values of 10 mg/kg and 1000 mg/kg.

(a) State which is more toxic, with a reason.

[2]

Exercise 3.2 (a)

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(a) State which is more toxic, with a reason.

[2]

(a)

- The 10 mg/kg pesticide – a lower LD50 means less is needed to be lethal, so it is more toxic

Exercise 3.2 (b)

3.2 Two pesticides have LD50 values of 10 mg/kg and 1000 mg/kg.

(b) Estimate the lethal dose for a 60 kg person from the 10 mg/kg value.

[2]

Exercise 3.2 (b)

3.2 Two pesticides have LD50 values of 10 mg/kg and 1000 mg/kg.

(b) Estimate the lethal dose for a 60 kg person from the 10 mg/kg value. [2]

(b)

- $10 \times 60 = 600 \text{ mg}$

Exercise 3.3

3.3 Explain why LD50 is measured in mg per kg of body weight rather than just mg. [2]

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3.3

- A larger animal needs more of a substance to be affected, so expressing the dose per kg of body weight makes toxicity comparable across different body sizes