

Exercise walk-through

Bioaccumulation and Biomagnification ■ 8.8

eXercise

You must be able to

- distinguish **bioaccumulation** 生物累积 from **biomagnification** 生物放大
- explain why top predators have the highest levels
- give examples (mercury, DDT)

Method — Bioaccumulation

Bioaccumulation is the build-up of a persistent toxin **within one organism** over its lifetime, because it is taken in faster than it is removed (stored in fat).

Method — Biomagnification

Biomagnification is the **increase in concentration up the food chain**. Each predator eats many contaminated prey, so the toxin concentrates at each higher trophic level.

Method — Top predators worst affected

Because levels multiply at each step, **top predators** (and humans) end up with the **highest** concentrations — sometimes millions of times the water level.

Method — A worked example

Mercury enters water, is taken up by plankton (bioaccumulation), then concentrates through small fish → big fish → humans (biomagnification), which is why large predatory fish (tuna, shark) carry high mercury.

Practice 2.1 ■ 1 mark

Define bioaccumulation.

Solution 2.1

Worked steps

Build-up of a toxin within one organism over its life **B1**.

Practice 2.2 ■ 1 mark

Define biomagnification.

Solution 2.2

Worked steps

Increase in a toxin's concentration up the food chain **B1**.

Practice 2.3 ■ 1 mark

Which organisms have the highest toxin levels?

Solution 2.3

Method: Top predators worst affected

Worked steps

Top predators **B1**.

Exam-style 3.1 ■ 1 mark

Biomagnification describes toxins that

- A** decrease up the food chain
- B** increase in concentration up the food chain
- C** stay constant
- D** disappear

Solution 3.1

- A** decrease up the food chain
- B** increase in concentration up the food chain 
- C** stay constant
- D** disappear

Worked steps

B — increase in concentration up the food chain.

Exam-style 3.2 ■ 3 marks

Mercury is released into a lake.

- (a) Explain how it becomes concentrated in large fish.
- (b) State why humans are advised to limit eating large predatory fish.

Solution 3.2

Method: A worked example

Worked steps

(a) Mercury is taken up by plankton and accumulates; small fish eat many plankton, big fish eat many small fish, so it concentrates (biomagnifies) at each level, reaching high levels in large fish **M1 M1 A1**. (b) Large predatory fish have the highest mercury levels, which are harmful to health **B1**.

Exam-style 3.3 ■ 2 marks

Explain why a toxin must be persistent to biomagnify.

Solution 3.3

Method: Bioaccumulation

Worked steps

If the toxin broke down quickly it would not persist long enough to accumulate and pass up the chain; persistence lets it build up at each level **M1** **A1**.