

Exercise walk-through

Ecological Tolerance ■ 2.4

eXercise

You must be able to

- describe a **range of tolerance** 耐受范围 and the optimal range
- read a tolerance curve
- explain how conditions limit where a species lives

Method — Range of tolerance

Every species survives only within a **range of tolerance** for each condition (temperature, pH, salinity). Within it there is an **optimal range** where the species thrives.

Method — The tolerance curve

Plotting performance (or population) against a factor gives a curve: high in the **optimal** middle, lower in the **zones of stress** on either side, and zero beyond the tolerance limits.

Method — Limits set distribution

A species cannot live where a factor is outside its tolerance. So temperature or salinity limits **where** a species is found.

Method — A worked reading

A fish thrives at 20–25°C (optimal), survives with stress at 15–30°C, and dies outside 10–35°C (tolerance limits).

Practice 2.1 ■ 1 mark

What is a range of tolerance?

Solution 2.1

Method: Range of tolerance

Worked steps

The range of a condition within which a species can survive **B1**.

Practice 2.2 ■ 1 mark

Where on a tolerance curve does a species thrive best?

Solution 2.2

Worked steps

The optimal range **B1**.

Practice 2.3 ■ 1 mark

What are the regions just inside the tolerance limits called?

Solution 2.3

Worked steps

Zones of stress **B1**.

Exam-style 3.1 ■ 1 mark

A species performs best in the

- A** zone of stress
- B** optimal range
- C** area beyond its limits
- D** coldest conditions

Solution 3.1

- A zone of stress
- B optimal range**
- C area beyond its limits
- D coldest conditions



Worked steps

B — the optimal range.

Exam-style 3.2 ■ 1 mark

A plant tolerates soil pH from 5 to 8, with best growth at 6–7.

- (a) State its optimal range.
- (b) Predict what happens at pH 4, and explain.

Solution 3.2

Method: Range of tolerance

Worked steps

(a) pH 6–7 **B1**. (b) pH 4 is below its tolerance limit (5), so the plant cannot survive there **M1** **A1**.

Exam-style 3.3 ■ 2 marks

Explain how a species' range of tolerance limits where it can live.

Solution 3.3

Method: Limits set distribution

Worked steps

A species can only survive where every condition is within its tolerance; where a factor is outside that range, the species is absent, so tolerance limits its geographic distribution **M1** **A1**.