

2.4 Ecological Tolerance

Name: _____ Class: _____ Date: _____

Total: 9 marks**KEY WORDS** optimal range 最适范围 • range of tolerance 耐受范围 • zones of stress 胁迫区 • ecological tolerance 生态耐受

Objective

Build the skills to answer exam questions on **ecological tolerance**.

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

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ 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.

■ 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.

■ Limits set distribution

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

■ 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).

2 Practice

Now apply the methods above.

2.1 What is a range of tolerance? [1]

2.2 Where on a tolerance curve does a species thrive best? [1]

2.3 What are the regions just inside the tolerance limits called? [1]

3 Exam-style questions

3.1 A species performs best in the [1]

- **A** zone of stress
 - **B** optimal range
 - **C** area beyond its limits
 - **D** coldest conditions
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3.2 A plant tolerates soil pH from 5 to 8, with best growth at 6–7.

(a) State its optimal range. [1]

(b) Predict what happens at pH 4, and explain. [2]

3.3 Explain how a species' range of tolerance limits where it can live. [2]

Solutions

2.1 The range of a condition within which a species can survive.

2.2 The optimal range.

2.3 Zones of stress.

3.1 B — the optimal range.

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

3.3 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.