

8.3 Population Ecology

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS population 种群 • logistic 逻辑斯蒂 • logistic growth 逻辑斯蒂增长 • carrying capacity 环境容纳量
• exponential 指数

Objective

Build the skills to answer exam questions on **population ecology** — growth models.

You must be able to:

- distinguish **exponential** 指数 from **logistic** 逻辑斯蒂 growth
- explain **carrying capacity** 环境容纳量 K
- read a growth curve

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.

■ Exponential growth

With unlimited resources, a population grows **exponentially** — a **J-shaped** curve that keeps steepening. Rare in nature except briefly (e.g. new habitat).

■ Logistic growth

With limited resources, growth **slows** as the population rises, leveling off at the **carrying capacity** K — an **S-shaped** curve.

■ Carrying capacity

K is the **maximum** population the environment can support long-term. Near K , births $\approx$ deaths and growth stops.

■ A worked reading

An S-curve that flattens at 500 individuals has a carrying capacity of 500. Growth is fastest in the middle of the curve, not at the top.

2 Practice

Now apply the methods above.

2.1 What shape is an exponential growth curve? [1]

2.2 What does carrying capacity mean? [1]

2.3 What shape is a logistic growth curve? [1]

3 Exam-style questions

3.1 Logistic growth levels off at the [1]

- **A** origin
 - **B** carrying capacity
 - **C** exponential phase
 - **D** zero point
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3.2 A population grows and then levels off at 1200 individuals.

(a) State the carrying capacity. [1]

(b) Explain why growth slows as the population approaches this value. [2]

3.3 Explain the difference between exponential and logistic growth in terms of resources. [2]

Solutions

2.1 J-shaped.

2.2 The maximum population the environment can support long-term.

2.3 S-shaped.

3.1 B — the carrying capacity.

3.2 (a) 1200. (b) As the population grows, resources (food, space) become limited and competition rises, so births fall and deaths rise, slowing growth toward K .

3.3 Exponential growth assumes unlimited resources, so it keeps accelerating; logistic growth accounts for limited resources, so it slows and levels off at the carrying capacity.