

# 3.5 Population Growth and Resource Availability

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 11 marks

KEY WORDS logistic 逻辑斯蒂增长 • carrying capacity 环境容纳量

## Objective

Build the skills to answer exam questions on **population growth and resource availability**.

You must be able to:

- use the **growth-rate** formula (births – deaths, plus migration)
- calculate a percent growth rate
- link resources to exponential vs logistic growth

## 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.

### ■ Growth rate

A population's growth depends on births, deaths, and migration:

$$\text{growth rate} = (\text{births} + \text{immigration}) - (\text{deaths} + \text{emigration}).$$

### ■ Percent growth rate

As a percentage of the population:

$$\% \text{ growth} = \frac{\text{births} - \text{deaths}}{\text{population}} \times 100.$$

(For humans, often expressed per 1000 people.)

### ■ A worked calculation

A country of 1000 has 30 births and 10 deaths in a year:  $\text{growth} = 30 - 10 = 20$ ;  
 $\text{percent} = \frac{20}{1000} \times 100 = 2\%.$

### ■ Resources shape the curve

With abundant resources, growth is **exponential** (J-curve); as resources become limited, growth slows to **logistic** (S-curve), leveling at carrying capacity.

## 2 Practice

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Now apply the methods above.

**2.1** Write the percent growth-rate formula (births and deaths). [1]

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**2.2** A population of 2000 has 60 births and 20 deaths. Find the percent growth rate. [2]

**2.3** What shape is growth with unlimited resources? [1]

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### 3 Exam-style questions

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**3.1** With limited resources, population growth follows a [1]

- **A** J-shaped (exponential) curve
  - **B** S-shaped (logistic) curve
  - **C** straight line
  - **D** decreasing curve
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**3.2** A town of 5000 has 100 births, 40 deaths, 30 immigrants, and 10 emigrants in a year.

(a) Find the net population change. [2]

(b) Find the percent growth rate. [2]

**3.3** Explain why a population's growth slows as it approaches its carrying capacity. [2]

## Solutions

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**2.1**  $\% = \frac{\text{births} - \text{deaths}}{\text{population}} \times 100.$

**2.2**  $\frac{60 - 20}{2000} \times 100 = 2\%.$

**2.3** J-shaped (exponential).

**3.1 B** — an S-shaped (logistic) curve.

**3.2** (a)  $(100 + 30) - (40 + 10) = 80.$  (b)  $\frac{80}{5000} \times 100 = 1.6\%.$

**3.3** As the population nears carrying capacity, resources become limited and competition rises, so births fall and deaths rise, slowing growth.