

3.5 Population Growth and Resource Availability

Name: _____ Class: _____ Date: _____

Total: 11 marks

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

Now apply the methods above.

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

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]

3 Exam-style questions

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]

4 Go further

You are now ready for the real exam questions on this subtopic:

- work through the **3.5 Population Growth and Resource Availability** lesson on the **Learn** page;
- read the **Population Growth and Resource Availability** section of the AP Environmental Science handout on the **Know** page.

Solutions

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.