Unit 25 · Human Population

ANSWER KEY · FOR TEACHERS

Full marks 29

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. natality
2. carrying capacity
3. environmental resistance
4. emigration
5. J-shaped
6. census
7. vital index
8. tubectomy

K · 4

Each carries 0.5 mark.

2 Multiple choice

i. **b.** an arithmetic progression — K · 1

Malthus said population grows in a **geometric** progression (1, 2, 4, 8…) and food only in an **arithmetic** one (1, 2, 3, 4…).

ii. **a.** the first stage — K · 1

In the **first stage** (high stationary) both are high, so the population stays nearly stationary. In the fourth both are low; in the fifth births are below deaths.

iii. **c.** stationary phase — U · 1

In the **stationary phase** the population has reached the carrying capacity: births and deaths balance, and it stays about the same size. In the lag and log phases births are ahead of deaths.

iv. **c.** a falling death rate — U · 1

A **falling death rate**, with births still high, makes a population grow. Unemployment, deforestation and water shortages are among the consequences of rapid growth.

v. **c.** vasectomy — A · 1

In a **vasectomy** each vas deferens is cut and tied, so semen carries no sperms; it is meant to be permanent. The others are temporary or natural methods.

3 Short answers

a. MARKING SCHEME — K · 2

- ✓ Positive checks raise the death rate, with an example.
- ✓ Preventive checks lower the birth rate, with an example.

b. MARKING SCHEME — U · 2

- ✓ Many people are about to enter the reproductive age group.
- ✓ So many parents give more births than deaths even with small families.

c. MARKING SCHEME — A · 2

- ✓ Population change also depends on immigration and emigration.
- ✓ Net emigration from Nepal cancels the natural increase.

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d. ANSWER U · 3

Any three:

J-shaped curve	S-shaped curve
exponential curve	sigmoid or logistic curve
two phases: lag and log	three phases: lag, log and stationary
almost no environmental resistance	resistance grows as the population nears K
growth at the biotic potential, then a sudden crash	growth slows and levels off at the carrying capacity
e.g. insects in the rainy season, algal blooms	e.g. yeast in sugar solution, bacteria in culture

MARKING SCHEME

✓ A first correct difference.
✓ A second correct difference.
✓ A third correct difference.

4 Numerical problem

ANSWER A · 4

- Birth rate = 880 ÷ 40,000 × 1000 = **22 per 1,000**; death rate = 240 ÷ 40,000 × 1000 = **6 per 1,000**.
- Natural increase = 22 − 6 = **16 per 1,000**, or **1.6%** a year.
- Density = 40,000 ÷ 50 = **800 per km^2**.
- Doubling time ≈ 70 ÷ 1.6 ≈ **44 years**.

MARKING SCHEME

✓ Birth rate 22 and death rate 6 per 1,000.
✓ Natural increase 16 per 1,000 (1.6%).
✓ Density 800 per km^2.
✓ Doubling time about 44 years.

5 Long answer

ANSWER U · 4

The **demographic cycle** is the course a population follows through the change from high to low birth and death rates.

1. **High stationary:** high birth and death rates; the population hardly changes (Nepal 1911–1930).
2. **Early expanding:** the death rate falls fast while the birth rate stays high; fast growth (Niger, Chad).
3. **Late expanding:** the birth rate falls too but stays above the death rate; still growing (Nepal, India, Bangladesh).
4. **Low stationary:** low birth and death rates; little growth, an older population (Sweden, Norway).
5. **Declining:** the birth rate below the death rate; the population shrinks (Japan, Italy, Germany).

MARKING SCHEME

✓ Definition, and the high stationary stage.
✓ Early expanding: deaths fall, births high, fast growth.
✓ Late expanding: births fall but stay above deaths.
✓ Low stationary and declining stages.

6 Think

ANSWER

With **no predators** and plenty of lichen there was little **environmental resistance**, so the herd grew near its **biotic potential**, exponentially (a J-shaped curve).

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It **overshot** the island's **carrying capacity**: it ate the lichen faster than it could grow back. When the hard winter came there was not enough food, and the population **crashed**.

MARKING SCHEME

- ✓ Little environmental resistance, so growth near the biotic potential (J-shaped).
- ✓ The herd overshot the carrying capacity, eating its food supply bare.
- ✓ The food ran out in the hard winter and the population crashed.

7 Activity: Your family's three generations

(not marked)

WHAT STUDENTS SHOULD FIND

Most classes find grandparents had about **5–7** children, parents about **2–4**, and today's families about **2**, like Nepal's fall from about 6 children per woman in 1950 to about 1.9 in 2025. The **birth rate has fallen** after the death rate did, but births still exceed deaths: the **late expanding (third) stage**, moving towards the fourth.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	8	11	7	3	**29**

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