

# Past-paper walk-through

## Population Growth and Resource Availability ■ 3.5

eXercise

## Questions in this set

- 2026 Q3
- 2025 Set 2 Q2

## Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

## Question 3

2026 ■ Q3

The following information applies to parts A, B, C, D, E, and F.

Ocelots are small wildcats that were previously found in 25 counties in Texas where shrubland is prevalent. As a result of land use changes, only 74 ocelots remain in 4 counties in Texas today. Rodents such as pocket mice are the main source of food for ocelots, but ocelots also prey on other small animals such as snakes and lizards.

**3.** Respond to parts A, B, C, D, E, and F, and all subparts.

**(a) Identify** one environmental consequence that could result from having a smaller population of ocelots.

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3. Respond to parts A, B, C, D, E, and F, and all subparts.

**(b) Calculate** the percent change in the number of Texas counties where ocelots have been found historically as compared to today. **Show** your work.

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3. Respond to parts A, B, C, D, E, and F, and all subparts.

**(c)** Researchers expect the ocelot population to grow at a constant rate of 2.8% per year. **Calculate** the number of years it will take for the ocelot population to double based on a constant rate of growth. **Show** your work.

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3. Respond to parts A, B, C, D, E, and F, and all subparts.

**(d)** Pocket mice eat plants in the shrubland, while snakes are carnivores. **Explain** why the amount of primary production energy available to ocelots would change if ocelots ate only carnivores such as snakes and not pocket mice.

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3. Respond to parts A, B, C, D, E, and F, and all subparts.

**(e)** Ocelots need 720 grams of food per day. Pocket mice weigh an average of 43 grams each. If the ocelot diet consists of 46% pocket mice by weight, **calculate** how many pocket mice an ocelot would need to consume in one day, assuming each mouse weighs the average amount. **Show** your work.



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3. Respond to parts A, B, C, D, E, and F, and all subparts.

**(f)(i)** As urbanization has increased in southern Texas, motor vehicle collisions have become the main cause of death in ocelots, which poses an added threat to the remaining ocelots.

**Propose** a realistic solution to reduce the number of ocelots killed by vehicles.

**(f)(ii) Justify** the solution proposed in part F (i) by explaining an additional advantage, other than reducing the number of ocelots killed by vehicles.

## Question 2

2025 Set 2 ■ Q2

Serengeti National Park is located in Tanzania, Africa. The park is located in a valley along a tectonic plate boundary called the East African Rift. Figure 1 shows the East African Rift and other plate boundaries near the east coast of Africa.

**Figure 1. Tectonic Plate Movement near East Coast of Africa**

[Map figure showing tectonic plates near the east coast of Africa. Labels: “Arabian Plate” (north-central), “African Plate” (west), “Indian Plate” (east), “Lake Victoria” (small lake, west, with an arrow pointing away from it/west), “Western Rift Valley” and “Eastern Rift Valley” (two branching rift lines running north-south through the African Plate), “Serengeti National Park” (marked at the point where the Western and Eastern Rift Valleys meet), “Indian Ocean” (to the east). Bold arrows show direction of plate movement: one arrow points west/away from Lake Victoria area, one arrow points southeast from the rift valley junction, and a double-headed arrow (pointing

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both directions, apart) is shown at the boundary between the Arabian Plate and the Indian Plate. A compass rose (N/E/S/W) is in the bottom right. Legend: wavy line = Plate boundaries; solid line = East African Rift; bold arrow = Direction of plate movement.]

Serengeti National Park contains a variety of tropical habitats but is dominated by wide-open lands that include a variety of grass species with scattered trees and shrubs. Most grass growth occurs after the March through May rainy season. Many of the park's herbivores, such as wildebeest and zebra, migrate through the park in an annual cycle following the growth of new grass (Figure 2).

### **Figure 2. Annual Migration of Wildebeest in Serengeti National Park**

[Circular diagram showing the annual wildebeest migration route around Serengeti National Park, with a wildebeest icon and arrows connecting labelled month boxes in a loop: June → July → August → September → October (near "Ikorongo Game

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**(a)** Based on the information in Figure 1, **identify** the type of plate boundary that runs beneath Serengeti National Park.

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Respond to parts A, B, C, D, E, F, G, H, I, and J.

**(b)** Based on the information provided, **identify** the dominant biome within the Serengeti.

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2025 Set 2 ■ Q2

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Respond to parts A, B, C, D, E, F, G, H, I, and J.

**(c)** Wildebeest give birth to their young when new grasses are growing. Based on the information in Figure 2, **identify** the location in the Serengeti where wildebeest are most likely to give birth.

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2025 Set 2 ■ Q2

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Respond to parts A, B, C, D, E, F, G, H, I, and J.

**(d)** The Serengeti has two primary types of grasses: long and short. The two grass types provide similar levels of nutrition for animals. Wildebeest primarily consume long grasses, while other herbivores such as gazelle consume the short grasses. These two similar species coexist in Serengeti National Park.

**Explain** why resource partitioning allows for the coexistence of the wildebeest and the gazelle in the Serengeti.

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Respond to parts A, B, C, D, E, F, G, H, I, and J.

**(e)** The Tanzanian government plans to build a highway across the northern portion of the Serengeti, as shown in Figure 2.

**Describe** one way the planned highway shown in Figure 2 could negatively affect the wildebeest population in the Serengeti.



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Respond to parts A, B, C, D, E, F, G, H, I, and J.

**(f) Propose** a solution to the negative effect created by the planned highway described in part E.

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Respond to parts A, B, C, D, E, F, G, H, I, and J.

**(g)** Many organisms live in grasslands. One weed species, the spotted knapweed, was introduced at one location in North America in the 1890s and is currently found throughout the rangelands of the western United States. The spotted knapweed poses several environmental problems in North America. Farmers often use crop rotation to control populations of pests like the spotted knapweed. A more traditional method of controlling pests involves spraying pesticides.

**Describe** a characteristic of an invasive species, such as the spotted knapweed, that allows them to outcompete native species.

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Respond to parts A, B, C, D, E, F, G, H, I, and J.

**(h) Justify** the use of crop rotation as an environmental solution by providing an additional advantage, other than controlling pest populations.

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Respond to parts A, B, C, D, E, F, G, H, I, and J.

**(i) Describe** an environmental problem associated with controlling pest populations with large amounts of pesticide.

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Serengeti National Park is located in Tanzania, Africa. The park is located in a valley along a tectonic plate boundary called the East African Rift. Figure 1 shows the East African Rift and other plate boundaries near the east coast of Africa.

**Figure 1. Tectonic Plate Movement near East Coast of Africa**

[Map figure showing tectonic plates near the east coast of Africa. Labels: “Arabian Plate” (north-central), “African Plate” (west), “Indian Plate” (east), “Lake Victoria” (small lake, west, with an arrow pointing away from it/west), “Western Rift Valley” and “Eastern Rift Valley” (two branching rift lines running north-south through the African Plate), “Serengeti National Park” (marked at the point where the Western and Eastern Rift Valleys meet), “Indian Ocean” (to the east). Bold arrows show direction of plate movement: one arrow points west/away from Lake Victoria area, one arrow points southeast from the rift valley junction, and a double-headed arrow (pointing both directions, apart) is shown at the boundary between the Arabian Plate and the Indian Plate. A compass rose (N/E/S/W) is in the bottom right.

## Question 2

Legend: wavy line = Plate boundaries; solid line = East African Rift; bold arrow = Direction of plate movement.]

Serengeti National Park contains a variety of tropical habitats but is dominated by wide-open lands that include a variety of grass species with scattered trees and shrubs. Most grass growth occurs after the March through May rainy season. Many of the park's herbivores, such as wildebeest and zebra, migrate through the park in an annual cycle following the growth of new grass (Figure 2).

### **Figure 2. Annual Migration of Wildebeest in Serengeti National Park**

[Circular diagram showing the annual wildebeest migration route around Serengeti National Park, with a wildebeest icon and arrows connecting labelled month boxes in a loop: June → July → August → September → October (near “Ikorongo Game Reserve”) → November (near “Loliondo”) → December (near “Ngorongoro Conservation Area”) → January → February → March → April (near “Maswa Game Reserve”) → May → back to June. “Grumeti Game Reserve” is labelled near June/July. A dashed line labelled “Proposed location for new

## Question 2

highway” crosses the northern part of the park near August/September. A solid line marks the “Serengeti National Park boundary.” A compass rose (N/E/S/W) is in the bottom right.

Legend: arrow = Wildebeest migration route; wildebeest icon = Wildebeest; dashed line = Proposed location for new highway; solid line = Serengeti National Park boundary.]

Respond to parts A, B, C, D, E, F, G, H, I, and J.

**(j) Propose** a solution to controlling pests, other than pesticides or crop rotation.

## Solution 2

(a)

### Mark scheme

- Divergent (boundary) - the plate boundary running beneath Serengeti National Park (part of the East African Rift) is a divergent boundary. 1 point for identifying it as divergent.



## Solution 2

(b)

### Mark scheme

- The dominant biome within the Serengeti is savanna (tropical grassland). 1 point for identifying savanna/tropical grassland.

## Solution 2

(c)

### Mark scheme

- Wildebeest are most likely to give birth in the Grumeti Game Reserve, i.e. the west/northwestern side/edge of Serengeti National Park, where new grasses are growing (per Figure 2). 1 point for identifying this location.

## Solution 2

(d)

### Mark scheme

- Resource partitioning allows wildebeest (which eat long grasses) and gazelle (which eat short grasses) to coexist because it reduces the negative impact of competition for limited resources - each species uses the shared, limited resource (grass) in a different way (different grass types), so they are not competing directly for the exact same food source. 1 point for explaining this reduced-competition mechanism.

## Solution 2

(e)

### Mark scheme

- One way the planned highway could negatively affect the wildebeest population: building the highway would fragment/destroy habitat, food, or resources; the highway could prevent, reduce, or disturb migration; wildebeest could be hit/killed by vehicles; or noise pollution from the highway could cause stress or change migratory routes. 1 point for any one valid negative effect.

## Solution 2

### (f) Mark scheme

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- A realistic solution must correspond to the problem identified in part E. If habitat fragmentation/destruction was described: construct a habitat corridor over/under the highway, construct the highway over/above the habitat, relocate the highway north/outside the migratory path, or expand the national park/create additional protected habitat. If migration disturbance or vehicle strikes was described: relocate the highway north/outside the migratory path, or construct a habitat corridor over/under the highway. If noise pollution/stress was described: install a sound barrier to mitigate noise pollution, or relocate the highway north/outside the migratory path. 1 point for a solution that logically addresses the specific problem given in part E.

## Solution 2

(g)

### Mark scheme

- A characteristic of an invasive species (such as spotted knapweed) that allows it to outcompete native species: it has many offspring/reproduces quickly/matures early/invests minimal energy per offspring (tends to be r-selected); it can feed on/use many different types of resources; or it can survive in conditions outside its normal habitat/has a wide tolerance range (tends to be a generalist). 1 point for any one valid characteristic.

## Solution 2

(h)

### Mark scheme

- An additional advantage of crop rotation (besides pest control): improved soil fertility/soil structure/soil quality; increased nutrient cycling/reduced need for fertilizer; reduced soil erosion; increased food security/crop yield; or increased biological activity in the soil. 1 point for any one valid additional advantage.

## Solution 2

(i)

### Mark scheme

- An environmental problem from controlling pests with large amounts of pesticide: pesticides can harm/kill nontarget species, or pests can develop resistance to the pesticide (leading to a pesticide treadmill). 1 point for either problem.



## Solution 2

(j)

### Mark scheme

- A solution to controlling pests other than pesticides or crop rotation: use biocontrol/intercropping/natural predators; trap insects/use mechanical controls to eliminate pests; or use genetically modified crops that are pest resistant. 1 point for any one valid alternative solution.