

**2017 AP® ENVIRONMENTAL SCIENCE FREE-RESPONSE QUESTIONS**

2. Populations of large terrestrial animals, such as African elephants and snow leopards, are in decline around the world. Many of these large animals are now on the verge of extinction.

ESTIMATED AFRICAN  
ELEPHANT POPULATION  
ON THE AFRICAN  
CONTINENT

Year	Population
1970	2,000,000
1980	1,300,000
1990	600,000
1995	550,000
2000	400,000
2005	550,000
2010	650,000
2015	600,000

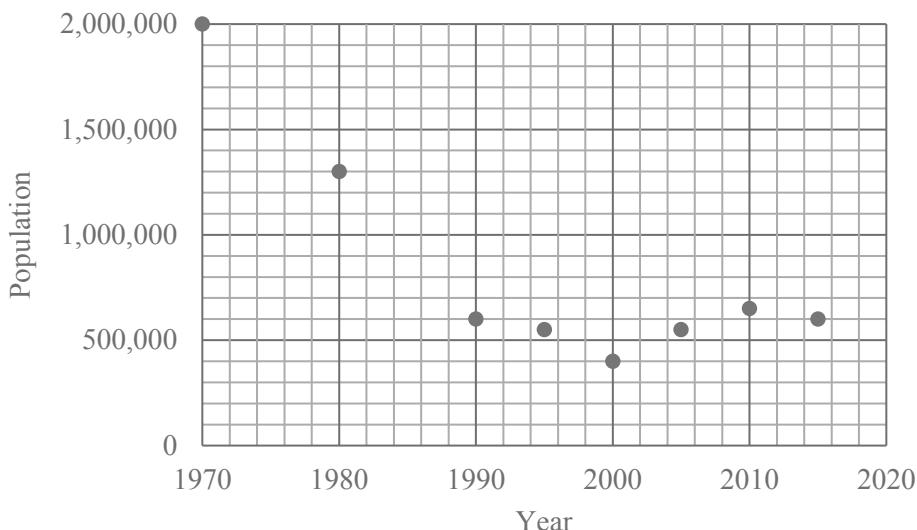
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**Question 2**

Populations of large terrestrial animals, such as African elephants and snow leopards, are in decline around the world. Many of these large animals are now on the verge of extinction.

- (a) Using the data provided in the table above, **plot** the elephant population data as points on the grid below, placing the independent variable on the *x*-axis. Clearly **label** the axes.

*(2 points: 1 point for correctly labeled and scaled axes and 1 point for correct plotting of data with no more than one error.)*



- (b) **Calculate** the percent loss of elephants in Africa from 1970 to 2000. **Show all work.**

*(2 points: 1 point for the correct setup and 1 point for the correct answer.)*

$$2,000,000 - 400,000 = 1,600,000$$

$$1,600,000 / 2,000,000 \times 100 = 80\%$$

$$2 \times 10^6 - 4 \times 10^5 = 1.6 \times 10^6$$

$$(1.6 \times 10^6 / 2 \times 10^6) \times 100 = 80\%$$

- (c) The International Union for Conservation of Nature (IUCN) estimates that the elephant population will decline by 20 percent between 2015 and 2022. Use this estimate to **calculate** how many elephants will be left in Africa in 2022. **Show all work.**

*(2 points: 1 point for the correct setup and 1 point for the correct answer.)*

$$0.80 \times 600,000 = 480,000 \text{ elephants}$$

$$0.80 \times (6 \times 10^5) = 480,000 \text{ elephants}$$

OR

$$(0.20 \times 600,000 = 120,000), \text{ then } 600,000 - 120,000 = 480,000 \text{ elephants}$$

$$(0.20 \times (6 \times 10^5) = 1.2 \times 10^5), \text{ then } 6 \times 10^5 - 1.2 \times 10^5 = 4.8 \times 10^5 \text{ elephants}$$

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**Question 2 (continued)**

- (d) Most large terrestrial mammals are K-strategists. **Identify** one characteristic of a K-strategist and **explain** how the characteristic you identified can make these mammals prone to extinction.

*(2 points: 1 point for a correct identification of a characteristic of a K-strategist and 1 point for an explanation of how this characteristic makes mammals prone to extinction.)*

<b>Characteristic of a K-strategist</b>	<b>Explanation</b>
Few offspring (per event/year/lifetime) OR Low reproductive rate	<ul style="list-style-type: none"><li>Difficult recovery from population decline</li><li>Unable to adapt to changing environments or human-induced ecosystem changes</li><li>Fewer opportunities for reproduction to pass on genes</li></ul>
High parental care and protection of offspring	<ul style="list-style-type: none"><li>Loss of parent = loss of offspring</li><li>Offspring vulnerable to predation</li></ul>
Long gestation period	<ul style="list-style-type: none"><li>Fewer opportunities for reproduction</li></ul>
Late age for first reproduction/long maturation period	<ul style="list-style-type: none"><li>Difficult recovery from population decline</li><li>Unable to adapt to changing environments or human-induced ecosystem changes</li><li>Fewer opportunities for reproduction to pass on genes</li></ul>

- (e) **Identify** and **discuss** TWO conservation strategies that could be implemented to prevent the extinction of large terrestrial mammals, such as the African elephant or snow leopard.

*(2 points: 1 point for each correct discussion of a conservation strategy that was identified.)*

- More laws limiting hunting → less poaching, greater animal survival
- Better enforcement of animal or habitat protection laws → less poaching, greater animal survival
- Laws restricting or prohibiting trade of these species or their parts → no market, less poaching
- Establishment/expansion of preserves/parks → safe habitat in which to live and reproduce, reduce poaching
- Education about ecological value of animals → increased public support
- Development of ecotourism industry → creation of market for tourism, less poaching
- Tusk dyeing (elephants), horn removal (rhinos) → devalue animal parts, less poaching
- Captive breeding programs aimed at reintroduction → increased population or genetic diversity
- Armed protection (guards) for animals → less poaching
- Movement of threatened species to new location → greater survival, increased genetic diversity