

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.**Part A**

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

Part B

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

Part 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.

Part 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.

Part 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.

Part F

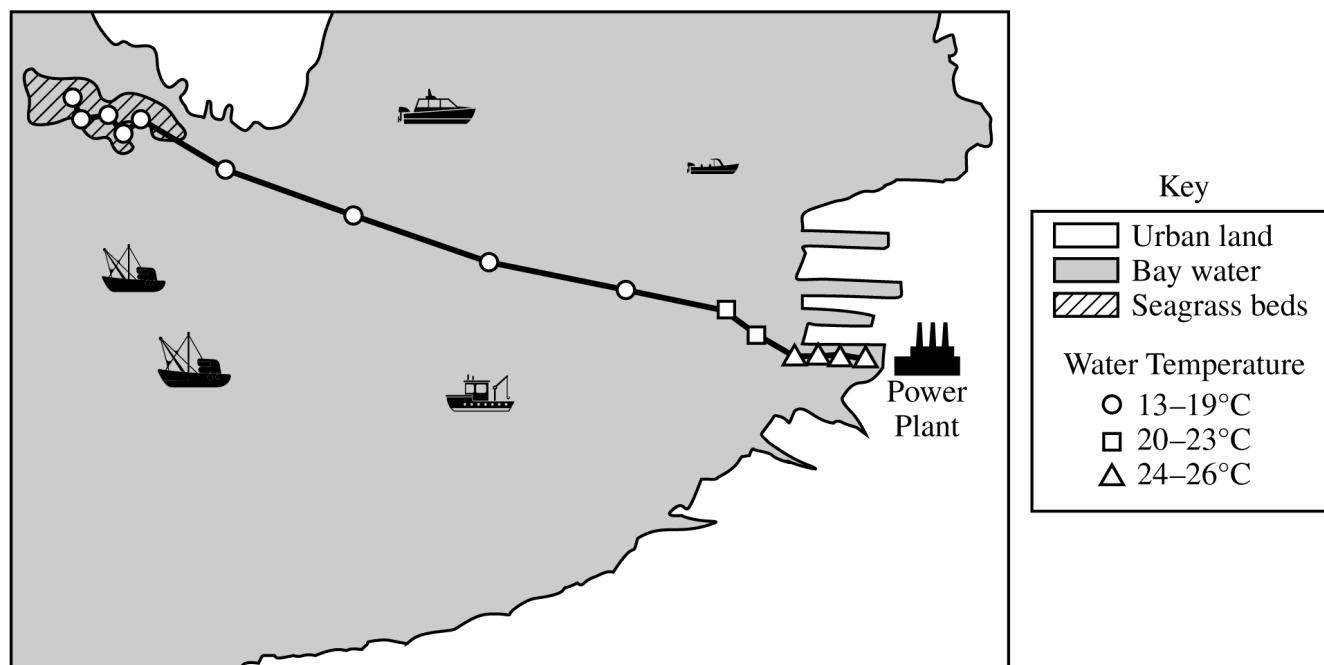
As urbanization has increased in southern Texas, motor vehicle collisions have become the main cause of death in ocelots, which poses an added threat to the remaining ocelots.

- i. **Propose** a realistic solution to reduce the number of ocelots killed by vehicles.
- ii. **Justify** the solution proposed in part F (i) by explaining an additional advantage, other than reducing the number of ocelots killed by vehicles.

STOP
END OF EXAM

2. The diagram shows the movement of one adult manatee over a 12-hour period across an active shipping channel during the winter. Manatees are large, aquatic, herbivorous mammals that primarily eat seagrass. Manatees can travel several miles to graze. Manatees mature slowly, have low biotic potential, and inhabit warm coastal waters. They cannot survive in water below 20°C for extended periods of time.

Satellite Track and Water Temperature Log of the Movement of One Adult Manatee Over a 12-Hour Period



- (a) Based on the information in the diagram, **identify** the temperature range of the water through which the majority of the adult manatee's daily movement occurs.
- (b) Large groups of manatees are often observed in shallow waters near the waste water released by the electrical power plant during the winter. Based on the information in the diagram, **identify** a characteristic of the power plant waste water that would attract the manatees.
- (c) Based on the information in the diagram, **describe** a potential negative impact of the waste water released by the power plant on other aquatic species.
- (d) Seagrass beds have declined significantly over the last several years. In 2021 manatee mortality was three times higher than the previous five-year average.
- Describe** a characteristic of the manatees that increases their vulnerability to the recent decline of seagrasses.
 - Describe** the change in energy flow through the trophic levels that occurs when there is a significant loss of seagrasses.

(e) Research has shown increased nutrient and sediment runoff can cause seagrass beds to decline.

(i) **Propose** a solution to reduce nutrient or sediment pollution in an estuary that is surrounded by urban development.

(ii) **Justify** the solution proposed in part (e)(i) by providing an additional advantage of reduced nutrients in an estuary, other than one related to manatees.

Urban areas have a heavy dependence on automobiles and often experience photochemical smog.

(f) **Describe** how summertime weather conditions can increase the frequency of photochemical smog.

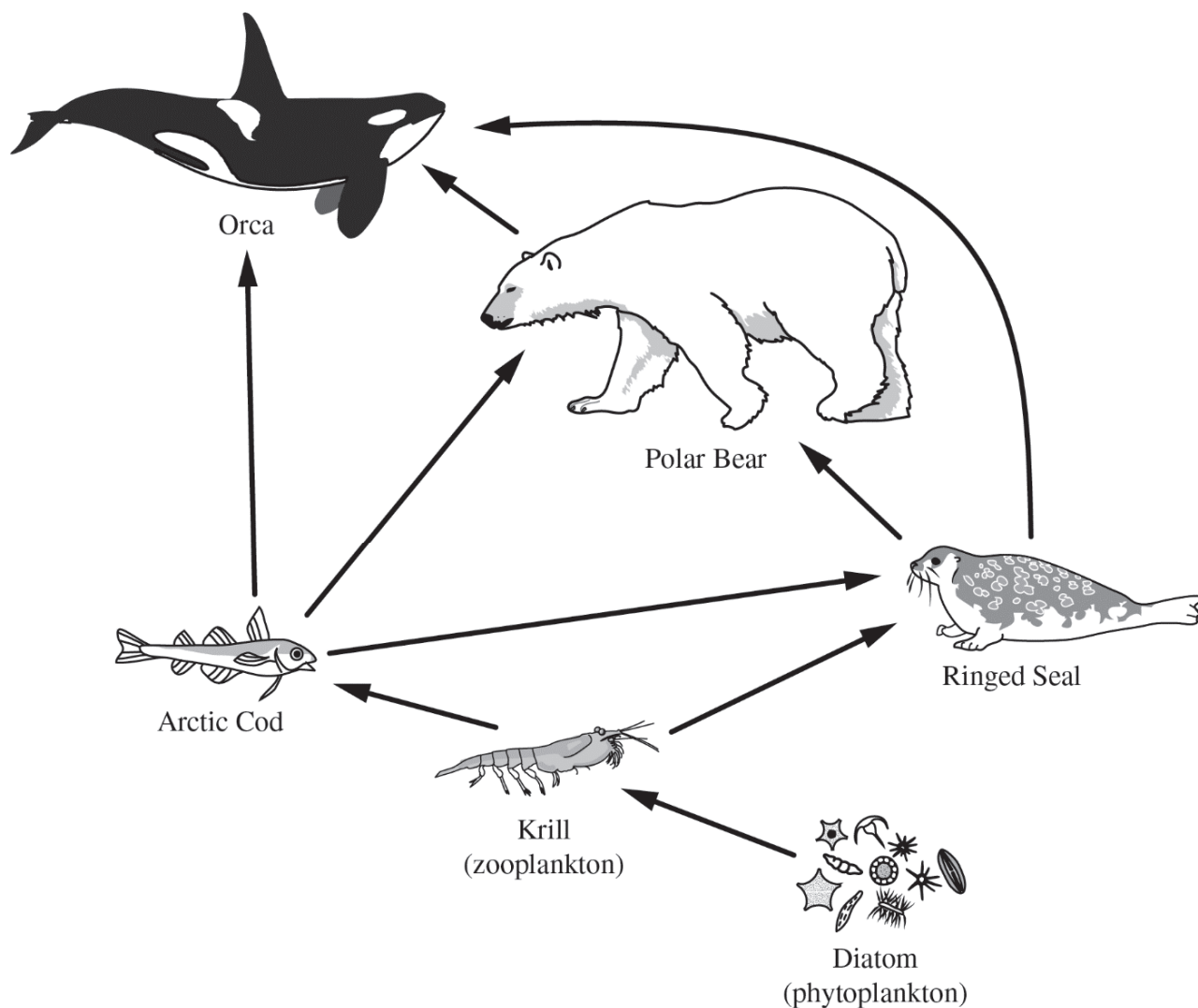
(g) **Identify** one ecological problem that results from exposure to photochemical smog.

A potential solution to reduce photochemical smog in urban areas with high automobile traffic is to replace gasoline-powered cars with cars powered by hydrogen fuel cells.

(h) **Describe** a potential disadvantage of using hydrogen fuel cells to power automobiles.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

3. An Arctic food web includes the following organisms.



Note: Figures not drawn to scale.

(a) Refer to the food web above to complete the following table.

	Organism from Arctic food web
(i) Identify a primary producer	
(ii) Identify a primary consumer	
(iii) Identify a secondary consumer	

(b) Other than showing which organisms are consumed by other organisms, **describe** what is indicated by the direction of the arrows in the diagram.

As the amount of sea ice has decreased, larger expanses of the Arctic Ocean are now completely free of sea ice for several weeks each summer. Ringed seals, the preferred prey of polar bears, come to holes in the sea ice to breathe.

- (c) **Describe** how the change in sea ice habitat is affecting polar bears' ability to hunt and feed.
- (d) **Explain** how melting sea ice leads to a feedback loop that increases Arctic warming.
- (e) Many species, including some whales and birds, will travel thousands of kilometers during annual migrations.
 - (i) **Provide** one reason a species may migrate a long distance.
 - (ii) The North Atlantic right whale migrates between subtropical and polar waters annually. Nearly 50 percent of right whale deaths are due to human activities. **Describe** one commercial activity, other than whaling, that may result in the death of right whales.
 - (iii) **Describe** one strategy that could reasonably be implemented to decrease right whale deaths caused by the commercial activity you described in part (ii).