

Sustainability of Ecosystems

Unit Summary

In this Unit, you have learned about ecosystems and the processes that occur within them. You have learned about the interaction of biotic and abiotic factors within an ecosystem, including the cycling of matter through ecosystems. You have assessed the potential impacts of bioaccumulation and identified contaminants that can bioaccumulate. You have also learned the various ways in which natural populations are altered or kept in equilibrium.

Create a concept map that relates these ideas. You may use pictures, sketches, and text to show how the ideas relate to each other. Check the key ideas and vocabulary at the end of each chapter to make sure that you have included all of the major concepts in your concept map.

Many of these questions are in the style of the Science 10 Provincial Exam. The following icons indicate an exam-style question and its cognitive level.

K Knowledge **U** Understanding and Application **HMP** Higher Mental Processes

Review Key Ideas and Vocabulary

- K** 1. Which of the following biomes is characterized by low annual precipitation, small plants, and a permafrost layer?
- tundra
 - boreal forest
 - temperate grassland
 - temperate deciduous forest
- K** 2. Which of the following scenarios describes an ecosystem?
- all of the flowers in a garden
 - all of the honeybees in a hive
 - all of the living things in a pond
 - all of the living and non-living things in a meadow
- K** 3. Skunks eat bird eggs, worms, and fruit. Which type of consumer is a skunk?
- omnivore
 - carnivore
 - herbivore
 - scavenger
- K** 4. *E. coli* bacteria normally exist in the intestine of healthy humans where they feed on some of the contents of the digestive system. In return they synthesize vitamins for use by humans. Which of the following types of interactions is represented by this example?
- predation
 - parasitism
 - mutualism
 - commensalism
- K** 5. Which of the following terms refers to organisms that are able to break down organic matter into simpler substances?
- scavengers
 - autotrophs
 - heterotrophs
 - decomposers
- K** 6. Which of the following representations best illustrates the energy available in an ecosystem?
- food web
 - food chain
 - climatograph
 - ecological pyramid

- K** 7. Which of the following characteristics affect climate?

| | |
|-----|----------------------|
| I | latitude |
| II | elevation |
| III | annual precipitation |

- A. III only
B. I and II only
C. II and III only
D. I, II, and III
- K** 8. Which pair of elements is always found in organic compounds?
A. carbon and oxygen
B. carbon and nitrogen
C. oxygen and hydrogen
D. hydrogen and carbon
- K** 9. The process of nitrogen fixation occurs when
A. ammonia is converted into nitrates.
B. nitrates are broken down into nitrogen and oxygen.
C. ammonia and nitrates are converted to nitrogen gas.
D. nitrogen gas combines with hydrogen to form ammonia.
- K** 10. Which of the following groups is composed of substances that all contain phosphorus?
A. cell membranes, nucleic acids, bones
B. nucleic acids, proteins, carbohydrates
C. proteins, cell membranes, carbohydrates
D. proteins, carbohydrates, organic compounds
- K** 11. Which nutrient cycle does not have an atmospheric stage?
A. the carbon cycle
B. the oxygen cycle
C. the nitrogen cycle
D. the phosphorus cycle

- K** 12. Which of the following substances bioaccumulate?
A. PCB, lead, mercury
B. carbon, lead, nitrogen
C. phosphorus, nitrogen, carbon
D. EDCs (endocrine-disrupting compounds), potassium, calcium
13. Explain the difference between mutualism and commensalism using specific examples.
14. Name and describe the three zones that make up the biosphere.
- K** 15. Which of the following can result from deforestation?
A. increased soil erosion
B. fossil fuel production
C. increased oxygen levels
D. increased water pollution
- K** 16. Sewage is to biodegradation as PCBs are to _____.
A. biodiversity
B. biotechnology
C. bioremediation
D. bioaccumulation

Use What You Have Learned

- U** 17. Natural disasters, such as volcanic eruptions or forest fires, can result in
A. succession.
B. parasitism.
C. commensalism.
D. bioaccumulation.
- U** 18. Burning fossil fuels may cause all of the following *except*
A. deforestation.
B. global warming.
C. acid precipitation.
D. excess atmospheric carbon dioxide.
19. Use your own labelled examples to represent each level of organization within the biosphere, from the smallest level to the largest.

20. For each of the following adaptations, indicate the stage of succession (pioneer community, mid-succession, climax community) in which they are likely to exist:
- shade tolerant
 - rapidly growing
 - require rich soil
 - can grow without soil
 - tolerate temperature extremes
 - can grow in thin soil
 - can grow in the heat of full sunlight
 - drought and wind resistant
21. Create a graphic organizer to define the different types of symbiosis.
22. What is indicated by the direction of the arrows in a food chain or food web?
23. In your own words, define “top carnivore.” Illustrate your definition by using a labelled food chain for an ecosystem.
24. (a) Give two examples of biomes with high biodiversity. What factors contribute to high biodiversity in these areas?
 (b) Give two examples of biomes with low biodiversity. What factors contribute to low biodiversity in these areas?
25. Contrast the following terms:
- producer and consumer
 - food chain and food web
 - decomposer and producer
26. Copy and complete the energy pyramid in Figure 1. Place the amount of energy available and an example of an organism that would occupy each trophic level. Assume a standard transfer of 10 % to each level.

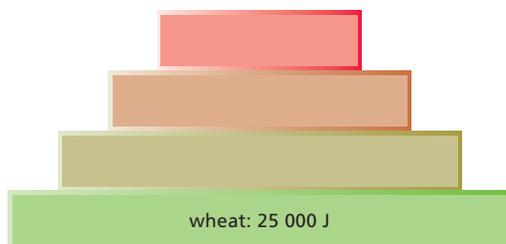


Figure 1

27. What two abiotic factors determine whether a specific region of Earth will be tundra or tropical rainforest?
28. What factors are responsible for creating variation between different locations within a single biome?
- U** 29. Which of the following processes are part of the carbon cycle?

| | |
|-----|---------------------------|
| I | photosynthesis |
| II | weathering |
| III | formation of fossil fuels |

- I and II
 - I and III
 - II and III
 - I, II, and III
30. How are the movements of energy and the movement of nutrients through ecosystems different?
31. Students in an earlier grade are learning about photosynthesis and cellular respiration. You have been asked to make a visual study guide for them in the form of a table or an illustration. Make sure to include the raw materials and products for each process, as well as the types of organism involved and what is needed for the processes to occur.
32. Explain why farmers might want to use pesticides that are soluble in water and also remain active for an extended period of time.
- U** 33. Which of the following practices illustrates the use of TEKW?
- using drift nets to catch fish
 - using aerial sightings to locate animals to hunt
 - using depth sounders to locate schools of fish before dropping nets
 - using the location of breathing holes in Arctic ice to hunt ringed seals

Think Critically

34. What is the benefit of using models like food webs, food pyramids, and ecological pyramids? What are the limitations of these models?
35. Some plant species are pollinated by a single species. Explain how this relationship can be an advantage and a disadvantage to the plant.
36. What types of adaptations would be useful to a plant in an area in the early stages of succession?
37. Bromothymol blue turns from blue to yellow in the presence of acids. Carbon dioxide gas reacts with water and forms carbonic acid. In the experiment in Figure 2 bromothymol blue was added to each of the four test tubes.

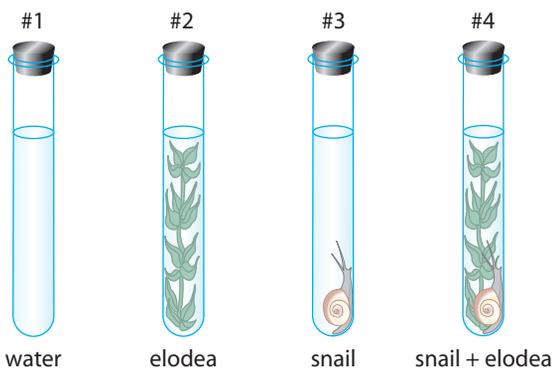


Figure 2

The test tubes were then kept at the same temperature and placed near a window. Table 1 shows the observations at the beginning of the experiment and after two weeks.

Table 1

| Test tube | Initial colour of water plus indicator | Final colour of water plus indicator |
|-----------|--|--------------------------------------|
| 1 | Dark blue | Dark blue |
| 2 | Dark blue | Dark blue |
| 3 | Dark blue | Yellow |
| 4 | Dark blue | Light blue |

- (a) Using your knowledge of the carbon cycle, explain why test tube #3 changed colour but test tube #2 did not change.
- (b) Why is there little change in test tube #4?
- (c) Predict what the results might be if the test tubes were kept in a dark cupboard. Give reasons for your predictions.

38. When a nutrient is in short supply it can slow down or stop the growth of organisms in certain ecosystems. The nutrient is called a limiting factor. Explain how a nutrient can be a limiting factor in certain ecosystems.
39. Why are coastal areas usually more polluted than other parts of the ocean?
40. The 1989 *Exxon Valdez* oil spill in ocean water off Alaska killed an estimated 250 000 seabirds. Approximately 250 bald eagles also died as a result of the oil spill. Which of the following explain why bald eagles were also killed?

| | |
|-----|--|
| I | Bald eagles prey on seabirds. |
| II | Bald eagles swam in the oil-covered ocean. |
| III | Bald eagles ate fish from the ocean. |
| IV | Bald eagle eggshells were weakened by the oil. |

- A. I only
- B. I and II only
- C. I and III only
- D. I, II, III, and IV

Reflect on Your Learning

41. Different cultures often look at the relationships among living organisms and their ecosystems differently. Use the Internet to research the following:
 - (a) Using the extinction of the B.C. sea otter population as an example, explain how the views of First Nations people and early European explorers were different.
 - (b) What evidence is there that the attitudes of modern Canadians toward ecosystems differ from those of the early settlers?
 - (c) Have your own views toward ecosystems and the environment changed after this unit? If yes, describe the changes. If no, explain why.

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