

**Science 20F – Ecosystems Review
Answer Key**

Multiple Choice

- | | | |
|------|-------|-------|
| 1. B | 9. D | 17. D |
| 2. A | 10. A | 18. C |
| 3. B | 11. D | 19. C |
| 4. A | 12. C | 20. B |
| 5. D | 13. B | 21. A |
| 6. C | 14. C | 22. D |
| 7. B | 15. A | 23. B |
| 8. A | 16. C | 24. B |

Fill in the Blank

1. eutrophication
2. cellular respiration
3. carbon dioxide
4. Denitrifying
5. acid precipitation
6. plants
7. carrying capacity
8. intraspecific

Matching

- | A | B |
|---|--|
| <ul style="list-style-type: none">• process used by green plants to make carbohydrates• role of green plants in an ecosystem• role of animals in an ecosystem• network of links that channel energy and materials through the organisms in an ecosystem• continual movement of elements between the living and non-living parts of the environment• process by which pollutants become more concentrated as they move along• total area of land that is required to support a human population at a given level if resource consumption | <ul style="list-style-type: none">• photosynthesis• producers• consumers• food web
• nutrient cycle
• bioaccumulation
• ecological footprint |

Extended Answer

1. carbon dioxide + water + energy \longrightarrow carbohydrate (glucose) + oxygen
2. The combustion of fossil fuels adds large amounts of carbon to the air. This carbon has been stored in below Earth's surface for millions of years. Such large amounts of carbon can't be recycled quickly enough through the ecosystem.
3. Human activities that release excessive amounts of nitrogen into the biosphere that can be recycled have an impact on the nitrogen cycle. Two such activities are the development of artificial fertilizers and the burning of fossil fuels. Both have resulted in nitrogen overload.
4. The carrying capacity of an area is affected by available nourishment, competition, population niche, and population density. Answers will vary:
 - populations are limited by the amount of energy, water, and nutrients available to them
 - competition between organisms for food, space, and mates limits the number of organisms that can occupy a habitat
 - populations are limited by the relative size of populations at other trophic levels or feeding levels that constitute their food supply
 - excessive population density that produces overcrowding can result in starvation, disease, increases in aggression among competitors, and extinction of populations
5. Humans depend on areas beyond those they live in for resources such as water, wood and paper, fossil fuels, electrical power, food, waste disposal, and most consumer goods.
6. Carrying capacity represents the largest population of a species that an environment can support. Factors that affect carrying capacity are those that limit population size, such as nourishment and space, competition, and population niche and density.
7. The size of the population of an organism at one trophic level is limited by the size of populations in the trophic levels below it. A population increase at the first trophic level could increase the food supply for organisms at the second trophic level, thereby increasing their population sizes (and, later, competition for food and space). Similarly, a decrease in the population of organisms in one trophic level could correspond to a decrease in the food supply for species in the next and successive trophic levels, leading to a decrease in the population of species in the higher trophic levels.
8. Students might suggest that carbon dioxide and/or water moisture could be added to the air in a greenhouse to increase plant growth. A higher concentration of carbon dioxide or water moisture can increase the rate of photosynthesis and, therefore, plant growth.
9. Among advantages of using insect predators for pest control rather than chemical sprays are that no pollutants are added to the air, soil, and water. No toxic bioaccumulation that can result in human diseases and cancers. An additional food supply is provided for predators of insect predators (so their population can be regulated naturally). It is healthier for the environment.

10. (a) extirpated (b) endangered (c) endangered
11. (a) Poor reproductive success means that less new members are being added to the population. Assuming mortality rates stay more or less the same, this will lead to a decrease in population size. If it continues long enough, the species could become extinct.
(b) When a new species enters an ecosystem, there is competition over food and space. In this competition, the weaker population is typically reduced in size because of deaths suffered. If the competition is fierce enough, or goes on long enough, the weaker species may be entirely wiped out in an area.
(c) Human hunters may kill a certain species indiscriminately while hunting. If not strictly regulated, they might end up killing off a population entirely (much like the buffalo or beaver in the early days of Canadian settlement by Europeans).
12. Biodiversity is a measure of the number of different species in an ecosystem.
13. (a) Species 2 initially has a much more rapid rate of growth than Species 1. Eventually, the population of Species 1 levels off, as does that of Species 2. The population of Species 1 remains more or less constant, but the population of Species 2 begins to drop off towards the end.
(b) In Beaker C, the population of Species 2 decreases significantly when the population of Species 1 increases.
(c) At first, Species 2 had the larger population and was growing rapidly. Species 1 slowly began to increase in size. Once Species 1 reached a certain size, the two species began to compete for space and food. Species 1 was the more successful species, and so the population of Species 2 began to decline sharply.
14. (a) see graph paper
(b) Site 2 may have had a greater supply of food, more space available, less competition from other species, etc.
(c) Based on the evidence provided in the table, it seems reasonable to assume that changes in the blackbird population are linked to changes in the amount of rainfall for a given year. In wet years, the population increases. In dry years, it decreases.