

Supplemental Material

CBE—Life Sciences Education

Chen *et al.*

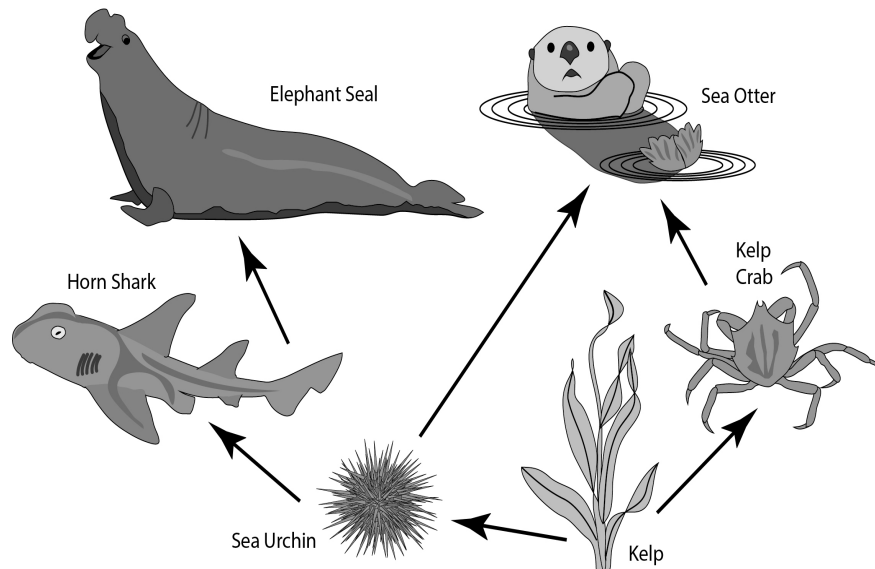
LIFE SCIENCE SURVEY TEST

Please answer all of the questions on this test using a #2 pencil. In some cases, there may be more than one correct answer. However, each question has only one best answer. Choose the single best answer from the five choices for each question. Mark your answer sheet by completely filling in the circle on the sheet that matches your choice. If you change an answer, be sure to thoroughly erase your original choice.

- Which of the following human body parts are made of cells?
 - The brain and lungs, but not the skin.
 - The lungs and skin, but not the brain.
 - The brain and skin, but not the lungs.
 - The brain, lungs and skin.
 - None are made of cells.
- Horses, cows and apple trees are all living organisms. In which of the following would you expect to find DNA?
 - Only horses.
 - Only cows.
 - Only apple trees.
 - Only horses and cows.
 - Horses, cows and apple trees.
- Blindness can result from damage to:
 - cells in the eye.
 - tissues in the spinal cord.
 - the brain as an organ.
 - either cells in the eye or the brain.
 - either tissues in the spinal cord or the brain.
- You drink a glass of tart lemonade, but the pH in your stomach changes very little. This is an example of how your body:
 - maintains homeostasis.
 - maintains organization.
 - adapts to its environment.
 - is immune to acid.
 - has evolved over time.
- Julie began life as a single fertilized cell. Today, at age 15, she is made up of billions of cells. As a product of mitosis, each of her body cells has:
 - its own unique genetic information unlike the original fertilized cell.
 - the same genetic information as her mother, but different genetic information from her father.
 - the same genetic information as her father, but different genetic information from her mother.
 - the same genetic information as the original fertilized cell.
 - the same genetic information as her brothers and sisters.
- Plants get energy from:
 - air.
 - water.
 - sunlight.
 - fertilizer.
 - soil.

GO TO QUESTION 7 >>

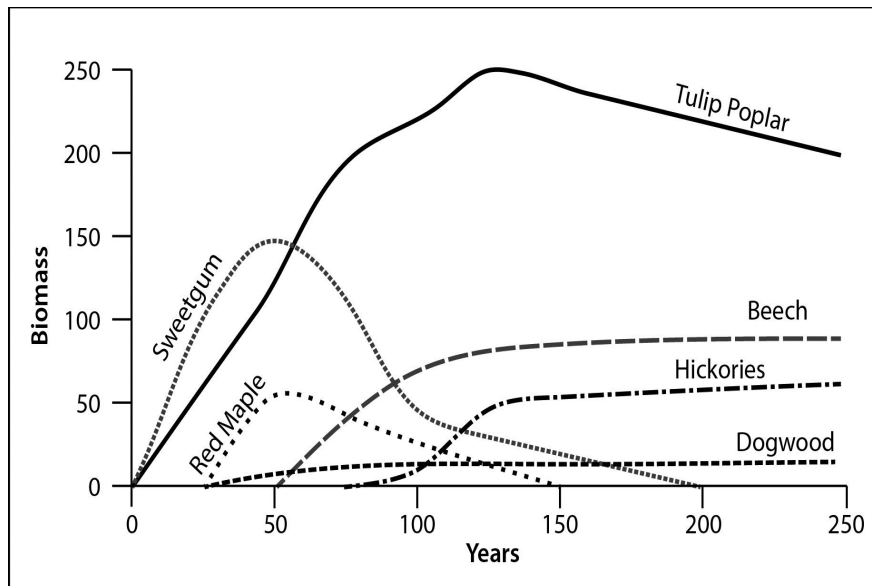
7. In photosynthesis, green plants make sugar molecules and then convert them into starch. This means that sugar molecules are:
- combined with other things to make starch.
 - turned into bread, potatoes and pasta.
 - linked together in long chains to make starch.
 - broken down to make starch.
 - made up of many starch molecules.
8. Which of the following things do plants take up and use from the soil?
- Only minerals.
 - Only sugar.
 - Only water.
 - Both minerals and water.
 - Minerals, sugar, and water.
9. After consuming medicine laced with cyanide, patients died experiencing shortness of breath. Doctors found that victims of this crime had above normal levels of oxygen and sugar in their blood, but damaged mitochondria with low levels of ATP. The victims died because:
- they couldn't breathe in enough oxygen.
 - they couldn't absorb enough oxygen into their blood.
 - they didn't eat enough sugar.
 - their blood vessels couldn't transport oxygen.
 - their cells couldn't respire.
10. Look at the kelp forest food web below. The population of California sea otters has declined in recent years, possibly because of disease. What could happen to the kelp population if the population of sea otters is greatly reduced?



- It could slowly increase.
- It could quickly increase.
- It could decrease.
- It could remain the same.
- It could become extinct.

GO TO QUESTION 11 >>

11. Several students disagreed about the transformation of energy in living things. Sarah says some living things transform solar energy into chemical energy. Rachel thinks living things transform chemical energy into heat energy. Leah says living things don't transform energy; they use the energy they have. What would a scientist say?
- Only Sarah and Rachel are right.
 - Only Sarah is right.
 - Only Rachel is right.
 - Only Leah is right.
 - None of them is right.
12. Which types of organisms play a role in a food web?
- Only producers.
 - Only consumers.
 - Only decomposers.
 - Producers and consumers, but not decomposers.
 - Producers, consumers and decomposers.
13. Where could a carbon atom in your body have previously been?
- In the atmosphere, but not in a plant or another human.
 - In a plant, but not in the atmosphere or another human.
 - In another human, but not in a plant or the atmosphere.
 - Both in a plant or another human, but not in the atmosphere.
 - In the atmosphere, a plant or another human.
14. According to this graph, which of these types of trees is a classic example of an early succession species?



- Hickories
- Dogwood
- Tulip poplar
- Beech
- Sweetgum

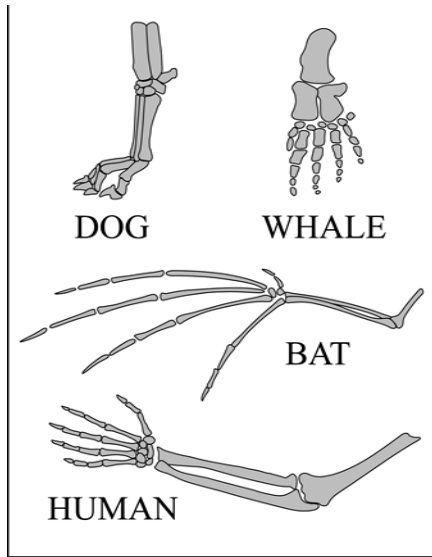
GO TO QUESTION 15 >>

15. Which of the following can cause destruction of habitats?

- a) Forest fires, but not floods or planting of trees from other parts of the world.
 - b) Floods, but not forest fires or planting of trees from other parts of the world.
 - c) Planting of trees from other parts of the world, but not forest fires or floods.
 - d) Forest fires or floods, but not planting of trees from other parts of the world.
 - e) Forest fires, floods, or planting of trees from other parts of the world.
16. Many bird species form social groups known as flocks that provide certain advantages for the group and enhance their survival. However, flocking may also be a disadvantage because:
- i. a flock is larger and more visible to a predator than an individual and therefore more vulnerable.
 - ii. a flock is subject to contagious diseases that spread more quickly in birds that congregate together.
 - iii. a flock dissipates (or releases) heat more quickly than an individual so it is more vulnerable in winter.
- a) i, ii and iii.
 - b) i and ii, but not iii.
 - c) i and iii, but not ii.
 - d) ii and iii, but not i.
 - e) Only i.
17. Genes are found in:
- a) all cells in your body.
 - b) most cells in your body.
 - c) only in sex cells in your body.
 - d) only in blood cells in your body.
 - e) only in sex cells and in blood cells.
18. Andre and Monica have a daughter, Alyssa. What do scientists know about the chromosomes in all of Alyssa's cells?
- a) All of Alyssa's chromosomes come from Monica.
 - b) Most of Alyssa's chromosomes come from Monica.
 - c) Each of Alyssa's chromosomes contains information from Andre and Monica.
 - d) Half of Alyssa's cells contain chromosomes from Andre and half contain chromosomes from Monica.
 - e) Half of Alyssa's chromosomes come from Andre and half come from Monica.
19. Studies have shown a higher correlation in IQ between identical twins than between fraternal twins, even when identical twins are raised apart and fraternal twins are raised together. A scientist might conclude that:
- a) this correlation is more likely to be due to genetic factors than environmental factors.
 - b) this correlation is more likely to be due to environmental factors than genetic factors.
 - c) this correlation is more likely to be due to neither genetic factors nor environmental factors.
 - d) IQ cannot be determined scientifically.
 - e) one cannot predict why this occurs.

GO TO QUESTION 20 >>

20. Dogs, whales, bats and humans share a similar set of upper body bones (see pictures below). To scientists, these similarities suggest that these living things:



- a) live in similar environments.
- b) eat similar food.
- c) share a common ancestor.
- d) walk the same way.
- e) are equally strong.

21. Which of the following peacocks, shown in the table below, would be considered the most evolutionarily successful?

Peacock	Body Type	Coat	Mates	Offspring
1	small male	dull feathers	rarely	2
2	small male	bright feathers	often	5
3	large male	bright feathers	occasionally	3

- a) Only peacock 1.
- b) Only peacock 2.
- c) Only peacock 3.
- d) Peacocks 2 and 3 are equally successful.
- e) All three peacocks are equally successful.

GO TO QUESTION 22 >>

22. In Blue Moon Butterflies that are infected with a parasite, only 1% of males survive. Within ten generations, the male population increases to 40%. How can this be explained by natural selection?

- a) The parasite disappeared.
 - b) New male butterflies migrated in from another region.
 - c) The parasite began to attack female embryos instead of male embryos.
 - d) Male offspring of those who survived the infection became more abundant.
 - e) Changes in the environment allowed males to become resistant to the parasite.
23. Which of the following factors strongly influences the rate of natural selection within a species population?
- i. Competition between individuals of the same species.
 - ii. Genetic variation among individuals of the same species.
 - iii. Limited resources in the environment that are required for survival.
- a) Only i.
 - b) Only ii.
 - c) Only iii.
 - d) Both i and ii.
 - e) i, ii, and iii.
24. In a population of urban birds, average wingspan has become much shorter in the last two decades. What is likely the cause of there being more birds with shorter wings?
- a) Individual birds developed shorter wings in response to environmental pressures.
 - b) Babies with longer wings survived to adulthood.
 - c) Adult birds taught baby birds to grow shorter wings.
 - d) Individual birds with shorter wings survived and had more babies.
 - e) Birds needed to have shorter wings, so they did not grow them as long.
25. Over several generations, farmers in parts of India cultivated rice plants that withstood regular flooding conditions accompanying the wet monsoon season. Tolerance to wet conditions was passed from one generation to the next, and most likely came about when:
- a) farmers watered their rice plants too much.
 - b) genetic changes enabled some plants to survive and flourish while others died out.
 - c) individual strong, healthy plants became tolerant to wet conditions and thrived in the new conditions.
 - d) plants became more tolerant so they could prepare future generations for wetter conditions.
 - e) water intolerant rice plants moved into drier areas.
26. Which of the following types of organisms can undergo speciation?
- a) Animals, but not plants or micro-organisms.
 - b) Plants, but not animals or micro-organisms.
 - c) Micro-organisms, but not animals or plants.
 - d) Both animals and plants, but not micro-organisms.
 - e) Animals, plants, and micro-organisms.
27. Which of the following would a scientist say most accurately describes extinction?
- a) It is a natural process.
 - b) It is caused only by humans.
 - c) It occurs rarely.
 - d) It only occurred in the past.
 - e) It is occurring now, but at a slower rate than in the past.
28. Biodiversity is the result of what two processes?
- a) Photosynthesis and respiration.
 - b) Breeding and ecotourism.
 - c) Speciation and extinction.
 - d) Farming and climate change.
 - e) Primary and secondary successions.
- GO TO QUESTION 29 >>**
29. In the United States, how does urbanization affect local biodiversity?
- a) By decreasing the number of pests such as mosquitoes, flies and ticks.
 - b) By decreasing the habitats of many prairie, forest, and wetland dwelling creatures.

- c) It does not significantly affect biodiversity as the animals that lived there will move elsewhere.
 - d) By increasing the habitat for the human species.
 - e) By increasing the number of animals that thrive in cities, such as mice, rats and raccoons.
30. What best describes your mother's or female guardian's highest level of education?
- a) Did not finish high school.
 - b) High school graduate.
 - c) Attended college, but no degree.
 - d) College degree (Associate's or Bachelor's).
 - e) Graduate degree (Master's or Doctorate).
31. What best describes your father's or male guardian's highest level of education?
- a) Did not finish high school.
 - b) High school graduate.
 - c) Attended college, but no degree.
 - d) College degree (Associate's or Bachelor's).
 - e) Graduate degree (Master's or Doctorate).
32. Are you of Hispanic or Latino origin?
- a) Yes
 - b) No
33. What is your race/ethnicity?
- a) White
 - b) Black or African-American
 - c) Asian
 - d) Native American or Pacific Islander
 - e) Other (including multiracial)