

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## BioT1

### General Science

- 1) Science is a way of knowing which is based on evidence and logic. However, it is not the only way of knowing about our world. Which of the following problems is NOT addressed by science?
- A. Why predators switch to eating different prey.
  - B. The quantity of energy found in a specific food pyramid.
  - C. Why humans litter along the roadside.
  - D. The migration patterns of hummingbirds.
- 2) You want to learn about emissions from cars and how they affect the environment. You have been reading many articles on the Internet. How would you distinguish between inference and evidence in a magazine or journal article?
- A. Evidence includes information such as numeric facts and figures.
  - B. Evidence includes conclusions based on data.
  - C. An inference includes fact and/or figures without conclusions.
  - D. Inferences are conclusions that are always biased.
- 3) A theory differs from a hypothesis in that a theory is
- A. A guess that can be tested by experiments
  - B. A generalization that unifies many scientific observations
  - C. An experiment designed to provide evidence for a prediction
  - D. A scientific fact that needs no supporting evidence
- 4) The purpose of including a control in a scientific investigation is to provide
- A. A basis for comparison
  - B. A correction for experimental errors
  - C. A preliminary trial of the methods
  - D. An opportunity for repetition of the experiment

### Energy

- 5) Which of these describes a pathway of energy through the living system?
- A. Light energy --> chemical energy --> heat
  - B. Light energy --> heat --> chemical energy
  - C. Heat --> light energy --> chemical energy
  - D. Chemical energy --> heat --> light energy
- 6) Which statement most accurately describes what happens to energy as it moves through an ecosystem?
- A. It is used up by the time it reaches the third trophic level
  - B. It is returned to the environment in the form of heat
  - C. It increases as it moves through each level of the food chain
  - D. Each organism uses 50% of the energy and stores 50% to be used by other organisms

### Food Chains

- 7) In a food chain, which trophic level would have the greatest amount of available energy?
- A. First
  - B. Second
  - C. Third
  - D. Fourth
- 8) Which of the following is a complete and correctly organized food chain?
- A. alfalfa --> grasshopper --> cow --> bot fly --> barn swallow
  - B. barley --> aphid --> ladybird beetle
  - C. grass --> grasshopper --> warbler --> praying mantis
  - D. algae --> fish --> coyote --> snake

- 9) The next question refers to the food chain pictured. Choose the word or phrase that best completes the statement or answers the question. As matter and energy move from grasses to hawks, the amount of available energy...



- A. always decreases but population size at each level may increase or decrease
- B. always increases but population size at each level always decreases
- C. always decreases and population size at each level always decreases
- D. increases or decreases but population size remains the same

**Food Webs** – Use the food web to answer questions 5-32

- 10) In this food web, the hawk would be a third-level consumer if he ate
- A. Seed-eating birds
  - B. Pocket gophers
  - C. Rabbits
  - D. Snakes

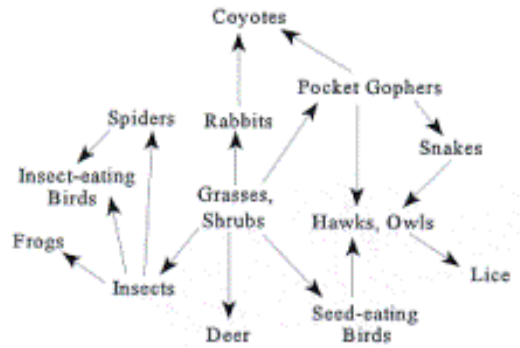
- 11) As diagrammed a fourth-level consumer is represented by the
- A. Lice
  - B. Hawks
  - C. Snakes
  - D. Frogs

- 12) The best examples of primary consumers would be
- A. Insects and seed-eating birds
  - B. Rabbits and owls
  - C. Gophers and frogs
  - D. Insects and spiders

- 13) Snakes and spiders are best classified as
- A. Producers
  - B. Primary consumers
  - C. Second-level consumers
  - D. Third-level consumers

- 14) The role of the shrubs and grasses in the food web is best described as
- A. An animal shelter
  - B. A source of seeds
  - C. A source of energy
  - D. A place for nests

- 15) The total weight of all the organisms in the group would be the greatest for
- A. Mice
  - B. Rabbits
  - C. Grass
  - D. Decomposers



**Producers, Consumers, Decomposers**

- 16) Which of the following statements best describes the work done by decomposers?
- A. They provide calcium for plants by taking it from the soil or water
  - B. They release carbon from dead bodies in the form of carbon dioxide
  - C. They create new sources of oxygen and release free nitrogen
  - D. They prevent the escape of energy to outer space

- 17) Which organisms are most immediately necessary for the survival of primary consumers?
- A. Producers
  - B. Decomposers
  - C. Secondary consumers
  - D. Tertiary consumers

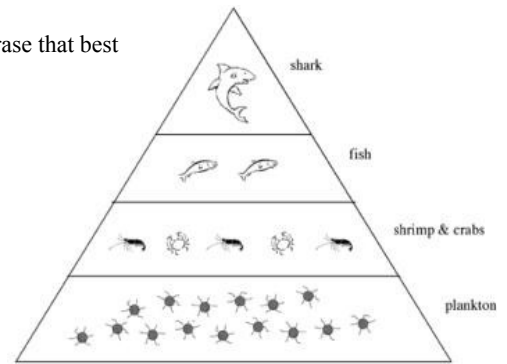
- 18) What would you predict might happen in an ecosystem if the number of organisms in the third trophic level exceeded the number of organisms in the second trophic level?
- A. Nothing would change
  - B. The number of organisms in the second trophic level would increase
  - C. The number of organisms in the third trophic level would continue to increase
  - D. The number of organisms in the third trophic level would decrease

- 19) Decomposers, such as bacteria, return which nutrient from dead plants and animals to the soil?
- A. Nitrogen
  - B. Oxygen
  - C. Carbon
  - D. Water

**Pyramids, Roles, Limiting Factors**

20) The next question refers to the diagram below. Choose the letter of the word or phrase that best completes the statement or answers the question. The diagram is an example of...

- A. Food chain pyramid
- B. Energy pyramid
- C. Biomass triangle
- D. Biomass pyramid



- 21) What happens to the amount of available energy at each level of a food chain?
- A. The amount of available energy increases at each level
  - B. The amount of available energy decreases at each level
  - C. The amount of available energy remains the same at each level
  - D. The amount changes depending on the number of organisms in the level

22) A pond is overgrown with algae. One possible method of controlling the algae calls for the introduction of a herbicide into the water. But the herbicide is known to accumulate without breaking down in fatty tissues of animals. What will be the effect of this chemical on the food chain as it enters the producer level and then moves upward through the consumer levels?

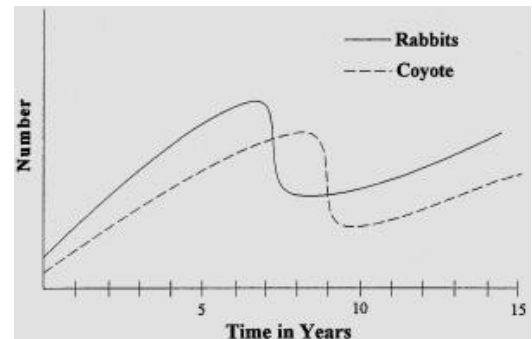
- A. it would decrease in concentration
- B. it would increase in concentration
- C. it would remain the same in concentration
- D. it would have no effect on the consumer levels

23) There is a limit to how large any given population can grow. Which of the following statements **best** explains why a population must eventually stop growing?

- A. A low female-to-male ratio develops in the population as it grows.
- B. Old individuals outnumber juveniles in the population as it grows.
- C. The resources available are fully used by the population as it grows.
- D. Natural selection changes the gene pool of the population as it grows.

24) Use this graph to answer the following question. What influences the population of the coyotes?

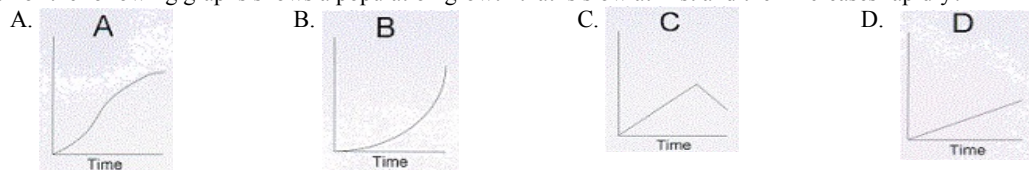
- A. the number of rabbits
- B. the number of offspring
- C. the coldness of the winter
- D. the number of hawks



25) Use this graph to answer the following question. What relationship do the rabbit and coyote populations have?

- A. they do not appear to be related
- B. when one goes up the other goes up also
- C. the coyote population follows the rabbit population
- D. the rabbit population follows the coyote population

26) Which of the following graphs shows a population growth that is slow at first and then increases rapidly?



27) Marmots hibernate when temperatures fall below 15.5 degrees Celsius. During hibernation, marmots breathe very slowly, circulation of blood is reduced, body temperature drops, and they are able to survive on their own reserves of fat. Which statement best describes the main adaptive advantage of hibernation?

- A. Temperatures in the forest drop too low for the marmot to survive the winter
- B. Hibernation allows the marmots' bodies to recover from the stress of summer
- C. Many predators are active during the winter; hibernation allows the marmot to avoid being eaten
- D. Food sources are scarce in the winter; the marmot would expend debilitating amounts of energy trying to obtain food

28) Which of the following symbiotic relationships is considered parasitic?

- A. ticks feeding on a dog
- B. bees transporting pollen from flowers
- C. pilotfish swimming under sharks
- D. birds eating the insects from the back of a hippopotamus

## Cycles

- 29) Scientists have discovered that some plants, like beans or alfalfa, have bacteria that grow with their roots and which are able to take nitrogen from the air and put it into the soil. Plants are then able to use the nitrogen as fertilizer. How can a gardener use this information?
- A. The gardener can rotate crops annually to help replenish nutrients like nitrogen in the soil.
  - B. The gardener can add nitrogen to the soil and does not need to worry about what type of crops are planted.
  - C. The gardener should stop planting beans which add bacteria to the soil, causing contamination.
  - D. Farmers can take nitrogen out of the air like the bacteria do and fertilize their crops.
- 30) Fertilizers can enable farmers to grow the same crop in a field for several years in a row. Farmers who use less fertilizer often rotate their crops by planting the crop one year and legumes, such as beans and clover, the following year. Fertilizer use and crop rotation with legumes both increase the availability of which of the following nutrients in soil?
- A. calcium
  - B. nitrogen
  - C. oxygen
  - D. protein
- 31) If carbon dioxide (CO<sub>2</sub>) were withdrawn from the biosphere, which organism would first experience negative biological effects?
- A. Third-level consumers
  - B. Second-level consumers
  - C. Producers
  - D. Primary consumers
- 32) The water cycle would **not** occur if which of the following were missing?
- A. animals
  - B. bacteria
  - C. ice caps
  - D. solar energy
- 33) What process do animals use to convert sugar and oxygen to carbon dioxide and energy?
- A. Photosynthesis
  - B. Respiration
  - C. Condensation
  - D. Denitrification
- 34) Which of the following explains why elements, such as carbon and oxygen, that are used in organic molecules are not permanently removed from the environment?
- A. They are replenished by sunlight.
  - B. They are cycled through ecosystems.
  - C. They are replaced by volcanic eruptions.
  - D. They are produced constantly from nutrients.

## Environment

- 35) In areas of southern California where humans have heavily hunted sea lions, killer whales (which normally hunt sea lions) are preying on sea otters. Which statement best describes why killer whales are hunting sea otters?
- A. Sea otters are now easier to locate, hunt and kill than sea lions
  - B. Sea otters provide more nourishment than killer whales
  - C. Sea lions have evolved adaptations that protect them from killer whales
  - D. Killer whales prefer sea otters over sea lions
- 36) Which of the following statements is true regarding ecosystems?
- A. Ecosystems support a larger number of heterotrophs than autotrophs
  - B. The presence or absence of carnivores has a greater effect on ecosystems than the presence or absence of producers
  - C. There are more organisms in the third trophic level than in the second trophic level
  - D. The number of organisms decreases at each level of a food chain in an ecosystem
- 37) The development of tools which measure chemicals in the air has allowed scientists to accurately determine the amount of air pollution. What does the information show about scientific discoveries?
- A. Scientists can confirm that the amount of oxygen in the air has decreased over the past few decades.
  - B. Scientists can confirm that the amount of nitrogen in the air has decreased over the past few decades.
  - C. Scientists can confirm that the amount of carbon dioxide in the air has increased over the past few decades.
  - D. Scientists can confirm that the amount of water in the air has increased over the past few decades.

Read the following before answering the questions: The forest is calm and serene until a lumberjack presses his chain saw into the bark of a 200-year-old Douglas fir. The searing steel saw rips through the bark and past the thin cells of living tissue. In less than two minutes the noble giant succumbs and crashes to the earth. Life is extinguished as tree after tree is severed from the earth. Acre after acre is destroyed with wanton abandon. As the carnage grows, habitat for vulnerable species is lost forever.

- 38) According to the article, what consequences could continual logging cause?
- A. Depletion of habitat and increased number of species
  - B. Destruction of habitat and decreased number of species
  - C. Creation of new habitat and a continuation of existing species
  - D. Creation of new habitat and an increase in species diversity
- 39) What is the tone of the article?
- A. Antagonistic towards the lumber industry
  - B. Supportive of the lumber industry
  - C. A factual account of lumber industry practices
  - D. A neutral, and objective look at the lumber industry
- 40) According to the article, what atmospheric changes could result from increased logging?
- A. Increased atmospheric CFCs
  - B. Increased atmospheric CO<sub>2</sub>
  - C. Decreased atmospheric CO<sub>2</sub>
  - D. Decreased atmospheric CFCs
- 41) What ecological problem will result if individuals use automobiles instead of car-pooling or using scheduled public transportation?
- A. convenience in traveling when and where each individual chooses
  - B. greater air pollution than from any other cause
  - C. higher employment in automobile and fuel industries
  - D. lower accident and injury rate than in scheduled transportation
  - E. all of these

Some scientists have been concerned about the greenhouse effect. This effect occurs when carbon dioxide traps the sun's heat causing a gradual increase in the earth's temperature. Carbon dioxide is released into the atmosphere by automobiles, making cement, combustion in factories, and the burning of forests. In addition to carbon dioxide, there are other gases that seem to contribute to global warming. These include methane and chlorofluorocarbons (CFCs). Methane is produced as a waste product by animals like cows, pipeline leaks, decaying wastes in landfills, and coal mining. CFCs are found in many spray propellants, degrading agents, and refrigeration agents such as in air conditioning. These scientists worry that global warming may lead to changes in the water cycle causing drought, violent storms, famine, melting of ice caps, and flooding of coastal cities. They worry not only about human suffering, but the loss of thousands, even millions, of organisms that would become extinct because they could not adapt quickly enough.

- 42) Which of the following government regulations would NOT help reduce global warming?
- A. Reducing the movement of people to coastal cities
  - B. Increasing the miles per gallon requirements for cars and SUVs
  - C. Mandating recycling in all areas
  - D. Reforestation and sustained-tree farming
- 43) Which of the following would help to reduce the greenhouse effect the MOST?
- A. Decreasing car emissions
  - B. Planting more trees
  - C. Stop the use of spray cans
  - D. Reducing cow ranches
- 44) Which chemical compound seems to be the MOST responsible for global warming?
- A. Sodium Chloride
  - B. Methane
  - C. Chlorofluorocarbons
  - D. Carbon Dioxide
- 45) Bison are grazing animals. They travel across a prairie, eating grass. If there were too many bison in an area, there would **probably** be
- A. fewer predators of bison.
  - B. many other large grazing animals.
  - C. tall shrubs and many trees.
  - D. less grass and more bare soil

46) The greenhouse effect is caused chiefly by the presence of excess carbon dioxide in the air. This traps the heat energy of sunlight and daily activities in the earth's atmosphere. What personal choices would NOT help to reduce the amount of carbon dioxide in the atmosphere?

- A. Reduce the use of aerosols
- B. Carpool instead of driving alone
- C. Recycle plastics, aluminum, and paper
- D. Cutting down trees to make farms

47) A protective layer of gas called ozone, positioned in the upper atmosphere, acts as a protective shield for the earth and its inhabitants. Scientists estimate for every one percent drop in the concentration of the ozone in the upper atmosphere, there will be a six percent increase in the incidence of skin cancer in humans. How does this scientific knowledge impact human life?

- A. There is no impact on human life since humans don't have to worry about skin cancer until the ozone is completely gone.
- B. Humans are encouraged to limit exposure to the sun and use sunscreens with high protective numbers to reduce their risk.
- C. Harmful bacteria will be destroyed from the ultraviolet light, this will reduce the amount of skin cancer in humans.
- D. Good bacteria will be destroyed from the ultraviolet light, this will increase the amount of skin cancer in humans.

48) Which of the following is an environmental factor that causes alteration in genes and chromosomes?

- A. alcohol abuse
- B. electrophoresis
- C. radiation
- D. direct injection

49) Which of the following symbiotic relationships is considered parasitic?

- A. ticks feeding on a dog
- B. bees transporting pollen from flowers
- C. pilotfish swimming under sharks
- D. birds eating the insects from the back of a hippopotamus

50) From year to year, farmers rotate different crops in the fields to improve soil nutrients. Why is crop rotation also an effective pest management method?

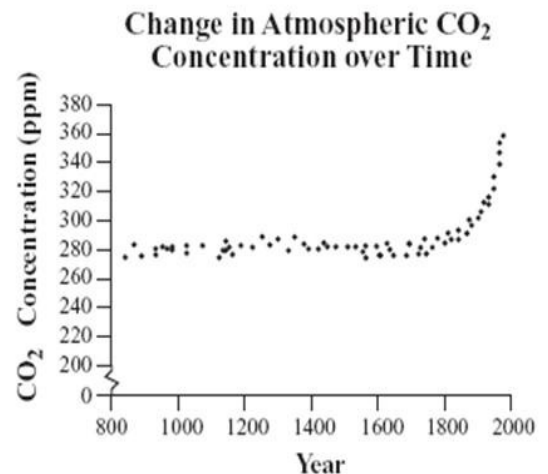
- A. It allows chemicals to kill more pests.
- B. It creates crops that are pest-resistant.
- C. It interrupts the life cycles of pests.
- D. It allows pests to overpopulate.

51) What happens when human populations increase?

- A. species diversity has decreased
- B. ecosystem habitat has been lost
- C. non-native species have been introduced
- D. ecosystems have become simplified
- E. all of these have occurred

52) A graph of atmospheric carbon dioxide concentration over time is shown. Scientists are investigating the cause of the large increase in atmospheric carbon dioxide concentration since about 1800. Which of the following provides the **best** explanation for the increase?

- A. eruptions of large volcanoes
- B. use of fossil fuels by humans
- C. natural fluctuations of climate
- D. photosynthesis by phytoplankton



53) The marsh willow herb is a plant native to the northeastern United States. It grows best in damp habitats. Which of the following environmental changes would **most likely** cause a decrease in the marsh willow herb population in an area?

- A. a rainstorm lasting several weeks
- B. a drought lasting twelve months
- C. unusually low temperatures during the month of July
- D. unusually high temperatures during the month of January

54) A rabbit population has increased noticeably in the past ten years. Which of the following is a reasonable hypothesis for this population growth?

- A. Competition for food has increased among rabbits.
- B. The rabbit's main predator has been eliminated by human development.
- C. Abnormal weather conditions have decreased water levels of the local ponds.
- D. An organism that relies on similar food sources has migrated into the area.