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| --- |
| **Modified True / False***Indicate whether the statement is true or false. If it is false, change the identified word(s) to make the statement true.* |

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| 1. An organism that reproduces *asexually* produces genetically variable offspring.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| 2. The scientific name for coffee is *Coffea arabica*. More specifically, the species name is *arabica*.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| 3. A falsifiable hypothesis *cannot* be tested.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| 4. Similar orders are placed in the same *class*.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| 5. If you observe a cell that contains organelles, then that cell is most likely a(n) *prokaryote*.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| 6. Changing your view of reality involves a *paradigm shift*.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| 7. The term *development* refers to all the changes that occur during the life cycle of an organism. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| 8. With *deductive* reasoning, you draw conclusions from specific observations.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| 9. The two domains of prokaryotes are Bacteria and *Fungi*.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| 10. Systems biology is also called *integrative biology*.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| **Multiple Choice***Indicate the answer choice that best completes the statement or answers the question.* |

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| 11. An organism that is neither prokaryotic nor photosynthetic, and must obtain its nutrients by secreting digestive enzymes into the environment, belongs to which group of organisms?

|  |  |  |
| --- | --- | --- |
|   | a.  | protists |
|   | b.  | Plantae |
|   | c.  | Fungi |
|   | d.  | Bacteria |
|   | e.  | Animalia |

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| 12. What is the most likely cause of a sampling error?

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| --- | --- | --- |
|   | a.  | the researcher’s knowledge of which individuals were in the experimental group |
|   | b.  | very few individuals in the control group |
|   | c.  | a malfunctioning calculator |
|   | d.  | a poorly designed hypothesis |
|   | e.  | having both an experimental and a control group |

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| 13. What is an example of a sessile organism?

|  |  |  |
| --- | --- | --- |
|   | a.  | bird |
|   | b.  | dog |
|   | c.  | snake |
|   | d.  | coral |
|   | e.  | earthworm |

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| 14. What would be the ultimate effect on an ecosystem if decomposers were eliminated?

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| --- | --- | --- |
|   | a.  | Producers would outgrow consumers due to the excess of carbon dioxide. |
|   | b.  | The consumers would have to eat twice as much. |
|   | c.  | The rate of photosynthesis would increase. |
|   | d.  | All life would eventually cease as nutrients would no longer be available. |
|   | e.  | Energy flow between producers and consumers would increase. |

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| 15. What statement best describes “biology”?

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| --- | --- | --- |
|   | a.  | The science of life |
|   | b.  | The study of natural selection |
|   | c.  | The measurement of populations |
|   | d.  | The study of how organisms are related to one another |
|   | e.  | The naming of organisms |

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| 16. What large molecules are essential in determining the structure and function of cells and tissues?

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| --- | --- | --- |
|   | a.  | RNA |
|   | b.  | genes |
|   | c.  | proteins |
|   | d.  | nucleotides |
|   | e.  | hormones |

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| 17. What represents the most basic level of chemical organization?

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| --- | --- | --- |
|   | a.  | organism |
|   | b.  | tissue |
|   | c.  | molecule |
|   | d.  | cell |
|   | e.  | atom |

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| 18. Which is a byproduct of photosynthesis?

|  |  |  |
| --- | --- | --- |
|   | a.  | water |
|   | b.  | glucose |
|   | c.  | carbon dioxide |
|   | d.  | light |
|   | e.  | oxygen |

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| 19. Which sequence represents the pattern of energy flow within an ecosystem?

|  |  |  |
| --- | --- | --- |
|   | a.  | consumers → producers → decomposers |
|   | b.  | producers → decomposers → consumers |
|   | c.  | decomposers → producers → consumers |
|   | d.  | decomposers → consumers → producers |
|   | e.  | producers → consumers → decomposers |

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| 20. What type of molecule carries the hereditary information of an organism?

|  |  |  |
| --- | --- | --- |
|   | a.  | nucleus |
|   | b.  | protein |
|   | c.  | DNA |
|   | d.  | RNA |
|   | e.  | hormone |

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| 21. Which statement represents a good hypothesis?

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|   | a.  | Shoofly pie tastes good. |
|   | b.  | The swimming speed of *Artemia* increases at higher temperatures. |
|   | c.  | Hemophilia is also known as "bleeder's disease." |
|   | d.  | Sparrows, robins, hawks, and pigeons are all birds and have wings; therefore, all birds have wings. |
|   | e.  | There is life after death. |

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| 22. Suppose a particular protein is produced in excess of the cell's needs. What kind of mechanism will intervene to stop production?

|  |  |  |
| --- | --- | --- |
|   | a.  | anabolic |
|   | b.  | metabolic |
|   | c.  | growth |
|   | d.  | respiratory |
|   | e.  | homeostatic |

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| 23. Similar families of organisms are next grouped together in the same:

|  |  |  |
| --- | --- | --- |
|   | a.  | genus |
|   | b.  | order |
|   | c.  | class |
|   | d.  | phylum |
|   | e.  | kingdom |

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| 24. Which statement best describes the cell theory?

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| --- | --- | --- |
|   | a.  | All living organisms are composed of basic units called cells. |
|   | b.  | All living organisms can form a population of organisms that is able to adapt to the environment. |
|   | c.  | All living organisms respond to stimuli. |
|   | d.  | All living organisms grow and develop. |
|   | e.  | All living organisms can move from one place to another in order to find food or to escape predators. |

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| 25. In the experimental evaluation of a new drug, what is the purpose of a placebo?

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| --- | --- | --- |
|   | a.  | A placebo prevents sampling errors from compromising the results of the experiment. |
|   | b.  | A placebo removes the bias of the physician in charge of the experiment. |
|   | c.  | A placebo removes the potential psychological bias of the patient in the study. |
|   | d.  | A placebo increases the sample size. |
|   | e.  | A placebo prevents errors in recording of the data. |

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| 26. You discover an organism that is eukaryotic, unicellular, and photosynthetic. Based on this evidence, to which group would you assign this organism?

|  |  |  |
| --- | --- | --- |
|   | a.  | domain Archaea |
|   | b.  | protist group |
|   | c.  | kingdom Plantae |
|   | d.  | domain Bacteria |
|   | e.  | kingdom Fungi |

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| 27. Which scenario best describes a double-blind study?

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| --- | --- | --- |
|   | a.  | The investigator does not know if subjects are in the experimental or control group. |
|   | b.  | Neither the investigator or the subjects know if they are in the experimental or control group. |
|   | c.  | The subjects do not know if they are in the experimental or control group. |
|   | d.  | The investigator and the subjects wear blindfolds. |
|   | e.  | No one knows what is in the experimental or control group |

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| 28. Which stimuli most directly causes the Venus flytrap to catch an insect?

|  |  |  |
| --- | --- | --- |
|   | a.  | touch |
|   | b.  | scent |
|   | c.  | sound |
|   | d.  | light |
|   | e.  | gravity |

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| 29. What is a distinct characteristic of asexual reproduction?

|  |  |  |
| --- | --- | --- |
|   | a.  | fusion of egg and sperm |
|   | b.  | genes contributed by two parents |
|   | c.  | high degree of genetic variation |
|   | d.  | formation of a fertilized egg |
|   | e.  | a cell splitting into identical halves |

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| 30. A DNA molecule is made up of:

|  |  |  |
| --- | --- | --- |
|   | a.  | lipids |
|   | b.  | fatty acids |
|   | c.  | nucleotides |
|   | d.  | proteins |
|   | e.  | carbohydrates |

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| 31. What are units of hereditary information?

|  |  |  |
| --- | --- | --- |
|   | a.  | nucleotides |
|   | b.  | proteins |
|   | c.  | hormones |
|   | d.  | RNA |
|   | e.  | genes |

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| 32. During an experiment, what is the purpose of a control group?

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| --- | --- | --- |
|   | a.  | To verify data |
|   | b.  | To prove the hypothesis |
|   | c.  | To compare results to the experimental group with the variable being tested |
|   | d.  | To produce replicated results of other groups |
|   | e.  | To disprove the theory |

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| 33. When tissues organize, what do they form?

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| --- | --- | --- |
|   | a.  | a cell |
|   | b.  | an organ |
|   | c.  | an enzyme |
|   | d.  | a nucleus |
|   | e.  | an atom |

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| 34. What is an end product of cellular respiration?

|  |  |  |
| --- | --- | --- |
|   | a.  | oxygen |
|   | b.  | carbon dioxide |
|   | c.  | light |
|   | d.  | glucose |
|   | e.  | sugar |

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| 35. Which is a required structure of a photosynthetic organism?

|  |  |  |
| --- | --- | --- |
|   | a.  | skeleton |
|   | b.  | neurons |
|   | c.  | chloroplasts |
|   | d.  | immune system |
|   | e.  | cellulose |

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| 36. Information in living organisms is transmitted by which mechanism(s)?

|  |  |  |
| --- | --- | --- |
|   | a.  | neurotransmitters only |
|   | b.  | hormones only |
|   | c.  | genes only |
|   | d.  | genes and hormones |
|   | e.  | genes, hormones, and neurotransmitters |

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| 37. Which statement best describes autotrophic organisms?

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| --- | --- | --- |
|   | a.  | Autotrophs depend on heterotrophs for food. |
|   | b.  | Autotrophs are exemplified by fungi. |
|   | c.  | Autotrophs are exemplified by animals. |
|   | d.  | Autotrophs cannot carry out cellular respiration. |
|   | e.  | Autotrophs synthesize complex molecules from CO2, water, and energy. |

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| 38. What is the purpose of the cilia and flagella of cells?

|  |  |  |
| --- | --- | --- |
|   | a.  | They generate the cell’s metabolism. |
|   | b.  | They generate cell signaling. |
|   | c.  | They help maintain homeostasis. |
|   | d.  | They provide movement for the cell. |
|   | e.  | They contract muscles. |

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| 39. Which organizational unit includes the fewest species of organisms?

|  |  |  |
| --- | --- | --- |
|   | a.  | class |
|   | b.  | community |
|   | c.  | biosphere |
|   | d.  | population |
|   | e.  | ecosystem |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. All of the members of the same species occupying the same area at the same time constitute a(n):

|  |  |  |
| --- | --- | --- |
|   | a.  | biosphere |
|   | b.  | population |
|   | c.  | community |
|   | d.  | ecosystem |
|   | e.  | individual |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 41. To which Phylum do humans belong?

|  |  |  |
| --- | --- | --- |
|   | a.  | *Homo sapiens* |
|   | b.  | Mammalia |
|   | c.  | Chordata |
|   | d.  | Vertebrata |
|   | e.  | Animalia |

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| 42. What is the ultimate source of genetic variation within a population?

|  |  |  |
| --- | --- | --- |
|   | a.  | A system of locomotion that allows an organism to escape environmental changes |
|   | b.  | Adaptation of a species to environmental changes |
|   | c.  | Mutations in DNA |
|   | d.  | A sensory system that can detect an environmental change |
|   | e.  | Homeostatic mechanisms that compensate for environmental changes |

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| 43. A hypothesis can best be described as a(n):

|  |  |  |
| --- | --- | --- |
|   | a.  | tentative explanation |
|   | b.  | stepwise problem-solving approach |
|   | c.  | observation |
|   | d.  | conclusion |
|   | e.  | data point |

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| 44. The primary purpose of homeostasis is to:

|  |  |  |
| --- | --- | --- |
|   | a.  | convert an organism to live in a harmful environment |
|   | b.  | provide unlimited growth within an organism |
|   | c.  | accept responses to stimuli |
|   | d.  | allow unrestricted movement of an organism |
|   | e.  | maintain a constant internal environment |

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| 45. Which best describes a result of sexual reproduction?

|  |  |  |
| --- | --- | --- |
|   | a.  | The offspring obtain genes only from one parent. |
|   | b.  | Two sex cells combine to form a fertilized cell. |
|   | c.  | One cell divides to produce two identical cells. |
|   | d.  | The only source of variation is mutation. |
|   | e.  | Clones of the original cell are produced. |

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| 46. In living organisms, chemical reactions responsible for growth, repair, and nutrition are collectively referred to as:

|  |  |  |
| --- | --- | --- |
|   | a.  | metabolism |
|   | b.  | homeostasis |
|   | c.  | development |
|   | d.  | genetics |
|   | e.  | adaptation |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. Which is a benefit of sexual reproduction over asexual reproduction?

|  |  |  |
| --- | --- | --- |
|   | a.  | There is less variation from generation to generation. |
|   | b.  | More offspring can be produced. |
|   | c.  | Evolution will occur at a slower rate when there are two parents. |
|   | d.  | The offspring are all identical to the parents. |
|   | e.  | The interaction of the genes from both parents brings about genetic variation. |

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| 48. Which process is most directly associated with the theory of evolution?

|  |  |  |
| --- | --- | --- |
|   | a.  | Populations changing over time |
|   | b.  | Mutations changing the gene pool |
|   | c.  | Sexual reproduction producing variation in a population |
|   | d.  | Competition between members of a population for limited resources |
|   | e.  | Production of large numbers of offspring |

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| 49. An organism that is eukaryotic is by definition:

|  |  |  |
| --- | --- | --- |
|   | a.  | possesses organ systems |
|   | b.  | belongs to domain Bacteria |
|   | c.  | is a protist |
|   | d.  | is unicellular |
|   | e.  | possesses a nucleus |

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| 50. Consider the statement “biological systems interact.” What does this mean?

|  |  |  |
| --- | --- | --- |
|   | a.  | Structure and function are not interrelated. |
|   | b.  | Every organism is in conflict with other organisms. |
|   | c.  | Biological organisms are interdependent. |
|   | d.  | Systems combine to reproduce. |
|   | e.  | Biological organisms are not interdependent. |

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| 51. How does a prokaryotic cell differ from a eukaryotic cell?

|  |  |  |
| --- | --- | --- |
|   | a.  | A prokaryotic cell has DNA. |
|   | b.  | A prokaryotic cell has a plasma membrane. |
|   | c.  | A prokaryotic cell has no membrane-enclosed organelles. |
|   | d.  | A prokaryotic cell has a nucleus. |
|   | e.  | A prokaryotic cell contains organelles. |

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| 52. Using the Linnaean system of nomenclature, corn is named *Zea mays*. What is the specific epithet in this name?

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|   | a.  | *mays* |
|   | b.  | *Quercus* |
|   | c.  | *Zea mays* |
|   | d.  | corn |
|   | e.  | *Zea* |

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| 53. In the deductive approach to scientific thought processes, we begin with \_\_\_\_ and make \_\_\_\_ based on that information.

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| --- | --- | --- |
|   | a.  | premises; observations |
|   | b.  | observations; inductions |
|   | c.  | observations; conclusions |
|   | d.  | premises; conclusions |
|   | e.  | observations; premises |

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| 54. Suppose we want to examine the effect of a fertilizer on the size of zucchini produced, and therefore, we need to establish the experimental and control groups. The control group for this experiment would be defined under which conditions?

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| --- | --- | --- |
|   | a.  | soil, fertilizer, water, sun, and zucchini seeds |
|   | b.  | soil, water, and sun |
|   | c.  | soil, water, sun, and no zucchini seeds |
|   | d.  | soil, fertilizer, water, sun, but no zucchini seeds |
|   | e.  | soil, water, sun, and zucchini seeds |

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| 55. One of the conclusions drawn from Darwin's theory of evolution is that:

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|   | a.  | genetic information can pass from organism to organism by means of DNA |
|   | b.  | organisms living today descended with modifications from previously existing forms |
|   | c.  | living organisms contain substances produced by cells |
|   | d.  | living organisms are composed of basic units called cells |
|   | e.  | existing organisms can adapt to environmental changes |

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| 56. Identify three of the five basic themes in biology:

|  |  |
| --- | --- |
| I. | The cellular composition of life |
| II. | The evolution of life |
| III. | The interactions of living systems |
| IV. | The mechanisms of disease |
| V. | The transmission of information |

|  |  |  |
| --- | --- | --- |
|   | a.  | II, III, and V |
|   | b.  | I, II, and III |
|   | c.  | II, III, and IV |
|   | d.  | I, IV, and V |
|   | e.  | III, IV, and V |

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| 57. Which statement concerning a scientific theory is FALSE?

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|   | a.  | It is supported by many observations. |
|   | b.  | It is based on a number of hypotheses. |
|   | c.  | It is unchangeable. |
|   | d.  | It predicts new facts. |
|   | e.  | It may suggest practical applications. |

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| 58. Which is a characteristic of a good hypothesis?

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|   | a.  | It represents important conclusions. |
|   | b.  | It is a statement of fact. |
|   | c.  | It can be proven to be true. |
|   | d.  | It is falsifiable. |
|   | e.  | It can only be tested once. |

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| **Matching** |

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| *Match the organism to the role it plays in the energy cycle:*

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| --- | --- |
| a.  | primary producer |
| b.  | primary consumer |
| c.  | secondary consumer |
| d.  | decomposer |

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| 59. Bird |

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| 60. Plant |

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| 61. Caterpillar |

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| 62. Fungi |

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| *Match the group of organisms with the correct phrase or example.*

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| a.  | protists |
| b.  | plants |
| c.  | fungi |
| d.  | bacteria |
| e.  | animals |

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| 63. bread mold |

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| 64. unicellular eukaryotes |

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| 65. chimpanzee |

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| 66. prokaryotes |

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| 67. oak tree |

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| **Subjective Short Answer** |

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| 68. Explain the importance of information transfer in living systems. Include three specific examples. |

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| 69. Using the characteristics that define life, compare and contrast a plant, a bacterium, and a salt crystal. |

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| 70. Identify two adaptations in different living organisms and use natural selection to explain how each may have logically evolved. |

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| **Essay** |

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| 71. You place equal numbers of dark and light varieties of feeder crickets into a terrarium containing a species of lizard. After two days, you notice that the dark variety of the crickets was less common than the light variety. What process is taking place on a small scale within the terrarium? Design an experiment in which you would try to determine if color or taste is the primary factor responsible for the selective feeding of the lizards. |

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| 72. Design a complete ecosystem that would sustain a number of living organisms for several years in a sealed container. The only thing that can be added is sunlight. Explain why you have selected each organism. |

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| 73. On a scientific expedition into new territory, you discover a previously undescribed organism living within the very hot environment of a geyser. This organism has a cell wall, is single celled, heterotrophic, and has no true nucleus. In what kingdom would you most likely place this organism and why? |

**Answer Key**

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| 1. False - sexually |

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| 2. False - *Coffea arabica* |

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| 3. False - can |

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| 4. True |

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| 5. False - eukaryote |

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| 6. True |

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| 7. True |

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| 8. False - inductive |

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| 9. False - Archaea |

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| 10. True |

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| --- |
| 11. c |

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| 12. b |

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| --- |
| 13. d |

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| --- |
| 14. d |

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| --- |
| 15. a |

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| --- |
| 16. c |

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| 17. e |

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| --- |
| 18. e |

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| --- |
| 19. e |

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| --- |
| 20. c |

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| --- |
| 21. b |

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| --- |
| 22. e |

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| --- |
| 23. b |

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| --- |
| 24. a |

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| 25. c |

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| 26. b |

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| 27. b |

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| 28. a |

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| 29. e |

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| 30. c |

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| 31. d |

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| 32. c |

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| 33. b |

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| 34. b |

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| 35. c |

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| 36. e |

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| 37. e |

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| 38. d |

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| 39. d |

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| 40. b |

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| 41. c |

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| 42. c |

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| 43. a |

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| 44. e |

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| 45. b |

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| 46. a |

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| 47. e |

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| 48. a |

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| --- |
| 49. e |

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| --- |
| 50. c |

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| --- |
| 51. c |

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| 52. a |

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| 53. d |

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| 54. e |

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| 55. b |

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| 56. a |

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| --- |
| 57. c |

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| --- |
| 58. d |

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| 59. c |

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| 60. a |

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| 61. b |

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| 62. d |

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| 63. c |

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| 64. a |

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| 65. e |

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| 66. d |

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| --- |
| 67. b |

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| 68. Information transfer occurs when 1) traits are passed to the next generation, 2) when one individual communicates with another, 3) when one portion of a cell communicates with another portion, and 4) when one part of a multicellular organism communicates with another part.For example, in sexual reproduction the genetic information from the parents is transmitted to the offspring. The information in those genes is then used to determine what proteins are made and consequently how that cell develops. Lastly, a cell may produce a hormone or a neurotransmitter that provides information of various kinds to other cells. |

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| 69. **Cellular in structure:** A plant (eukaryote) and a bacterium (prokaryote) are cellular, but a salt crystal is not.**Grow and develop:** A plant grows by increasing the size and number of cells in its multicellular body; a bacterium grows by increasing in size and then dividing to produce additional bacteria. Both plants and bacteria develop as they age. A salt crystal can increase in size only by adding additional crystals and does not “develop” in the biological sense of the word.**Regulate their metabolic processes:** Plants and bacteria can regulate their metabolism; a salt crystal lacks metabolic processes.**Respond to stimuli:** In bacteria (unicellular) the whole organism responds; in plants (multicellular) various parts can usually respond in different ways. A salt crystal cannot respond.**Reproduce:** Plants and bacteria usually can reproduce both sexually and asexually. A salt crystal cannot reproduce unless one accepts the breaking apart of a crystal as a type of reproduction.**Evolve and adapt:** Plants and bacteria can do both; salt crystals cannot. |

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| 70. Example 1: The long, flexible tongue of a frog is an adaptation for catching insects. In a population of frogs much genetic variation would exist with respect to tongue length. However, those frogs having longer tongues would be able to catch more insects than the short-tongued frogs which might be weak and even starve. Over many generations frogs having long tongues would most likely thrive and produce more offspring than frogs having short tongues, and consequently the long-tongue trait would become more and more prevalent in the population.Example 2: The thick coat of the polar bear is an adaptation for surviving low temperatures. In a population of polar bears much genetic variation would exist among coat thickness. However, those bears having a thinner coat would be more adversely affected by the low temperatures, for example they might be sickly, be less fertile, and even die. Over many generations, bears having thicker coats would most likely thrive and produce more offspring than thin-coated bears, and consequently the thick-coated trait would become more and more prevalent in the population. |

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| 71. **Concepts to Consider:** Natural selection, correct experimental design, and hypothesis testing. |

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| 72. **Concepts to Consider:** Include producers (plant), consumers (animal), and decomposers (heterotrophic bacteria and fungi); plants convert sunlight to organic energy, animals consume the plants, and decomposers recycle nutrients within the dead plants and animals; animal and bacterial wastes are taken up by plants. |

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| 73. **Concepts to Consider:** Characteristics of this organism indicate it is a prokaryote; its habitat may indicate that it belongs to the kingdom Archaebacteria. |