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Chapter 02 - Science - Matter - and Energy

True / False

1. Because scientific theories are tentative explanations, they should not be taken seriously.
   a. True
   b. False

ANSWER: False
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1.4 - Distinguish between scientific theories and laws.

2. Once scientists have analyzed data from an experiment, they may propose a testable hypothesis to explain those data.
   a. True
   b. False

ANSWER: True
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1.1 - Outline the nine necessary steps to develop a scientific theory.

3. When a natural system gets locked into a positive feedback loop, it can reach an ecological tipping point.
   a. True
   b. False

ANSWER: True
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.4 What Are Systems and How Do They Respond To Change?
QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.4 - Describe how various systems respond to change.

4. Carbon is an element.
   a. True
   b. False

ANSWER: True
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2.1 - Distinguish between the two chemical forms of matter.

5. Logic and critical thinking are more important tools in science than imagination and creativity.
   a. True
   b. False

ANSWER: False
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.1 What Do Scientists Do?

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QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1.1 - Outline the nine necessary steps to develop a scientific theory.

6. When matter undergoes physical changes, the chemical composition also changes.
   a. True
   b. False
ANSWER: False
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

7. Hydrocarbons are organic compounds.
   a. True
   b. False
ANSWER: True
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2.3 - Distinguish the organic compounds based on their chemical formula.

8. Peer review involves scientists openly publishing details of the methods they used, the results of their experiments, and the reasoning behind their hypotheses for other scientists working in the same field to evaluate.
   a. True
   b. False
ANSWER: True
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1 - Determine how science attempts to answer questions about nature.

9. A positive feedback loop causes a system to change in the opposite direction from which it is moving.
   a. True
   b. False
ANSWER: False
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.4 What Are Systems and How Do They Respond To Change?
QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.4 - Describe how various systems respond to change.

10. When energy changes from one form to another, it always goes from a more useful to a less useful form.
   a. True
   b. False

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ANSWER: True
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3.3 - Explain the two scientific laws of thermodynamics.

11. The idea that all elements are made up of molecules is called the atomic theory.
    a. True
    b. False
ANSWER: False
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

12. Two or more different elements can combine to form isotopes.
    a. True
    b. False
ANSWER: False
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

13. Thousands of genes make up a single chromosome.
    a. True
    b. False
ANSWER: True
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2.4 - Describe the relationships among cells, genes, and chromosomes.

14. Radioactive decay occurs when the nuclei of unstable isotopes spontaneously emit fast-moving chunks of matter (alpha particles or beta particles), high-energy radiation (gamma rays), or both at a fixed rate.
    a. True
    b. False
ANSWER: True
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

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15. A scientific hypothesis must be testable.
    a. True
    b. False

ANSWER: True
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: True / False
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1 - Determine how science attempts to answer questions about nature.

Multiple Choice

16. Recall the Bormann-Likens controlled experiment in the forested valleys of New Hampshire. Which statement best describes the effects of water flowing out of deforested areas into undisturbed areas?
    a. The amount of water flowing out of the deforested valley following rain increased by 30-40%, and soil erosion increased.
    b. The amount of water flowing out of the deforested valley decreased by 10-20%, and soil erosion decreased.
    c. The flow of water did not change, but soil erosion increased.
    d. Other types of plants took the place of the trees, preventing deforestation from affecting the flow of water.
    e. Eroding soil dammed up the river, preventing the flow of water.

ANSWER: a
DIFFICULTY: BLOOM'S: Understand
REFERENCES: Core Case Study: How Do Scientists Learn about Nature? Experimenting with a Forest
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1 - Determine how science attempts to answer questions about nature.

17. The Bormann-Likens study in the Hubbard Brook Experimental Forest in New Hampshire can be described as ____.
    a. a comparison of a control site with an experimental site in nature
    b. a study using computer model simulations of a complex natural system
    c. an experiment in which too many factors were varied to draw a conclusion from the results
    d. missing a baseline for comparison, making it difficult to draw a conclusion from the results
    e. an observational study that attempted not to interfere with a natural system

ANSWER: a
DIFFICULTY: BLOOM'S: Understand
REFERENCES: Core Case Study: How Do Scientists Learn about Nature? Experimenting with a Forest
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1 - Determine how science attempts to answer questions about nature.

18. Science is ____.
    a. a field in which observations are rarely tested
    b. never investigated using statistical tools and models

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c. best described as a collection of opinions
d. supported by small amounts of evidence
e. a broad field of study focused on discovering how nature works

ANSWER: e
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1.4 - Distinguish between scientific theories and laws.

19. A(n) ____ is an approximate representation or simulation of a system.
a. model
b. datum
c. projection
d. experiment
e. peer review

ANSWER: a
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1 - Determine how science attempts to answer questions about nature.

20. Scientific hypotheses differ from scientific theories in that they are ____.
a. widely accepted descriptions of what we find happening over and over in nature
b. possible, but not yet well-tested, explanations of data
c. not able to be tested
d. arrived at after extensive mathematical modeling
e. facts rather than opinions

ANSWER: b
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1 - Determine how science attempts to answer questions about nature.

21. A classmate tells you that a statement heard on the news about an environmental process noted in a local ecosystem cannot be true because it has not been scientifically proven. You realize that ____.
a. this classmate is misinformed because science cannot prove anything, but it can disprove events conclusively
b. this classmate is misinformed because science cannot prove or disprove anything absolutely
c. this classmate is misinformed because the environmental process in question actually has been proven scientifically
d. this classmate is correct
e. this classmate has confused scientific theories and scientific laws

ANSWER: b

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DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1 - Determine how science attempts to answer questions about nature.

22. Which list describes the sequence scientists typically follow in the beginning stages of their investigations about how nature works?

a. analyze data → search literature → perform experiment → identify a problem → ask a question
b. ask a question → search literature → perform experiment → analyze data → identify a problem
c. search literature → ask a question → identify a problem → analyze data → perform experiment
d. identify a problem → search literature → ask a question → perform experiment → analyze data
e. ask a question → search literature → identify a problem → perform experiment → analyze data

ANSWER: d
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1.1 - Outline the nine necessary steps to develop a scientific theory.

23. Because there is often no way to measure every instance of a phenomenon around the entire world, scientists ____.

a. can do little more than guess at what's happening
b. do not even attempt to do so
c. pick one instance and assume it's perfectly representative
d. use statistical sampling and mathematical models to make estimates
e. use computer simulations instead

ANSWER: d
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1.6 - State three important limitations of science.

Narrative: (questions 9 and 10)
A tiny, tawny colored butterfly called the Carson Wandering Skipper was always known for its small and very localized populations. Typically, it was found along the western Nevada and eastern California high desert areas. It was always located close to hot springs and other wet areas that supported salt grass, the host plant it depended on.

Recently, the populations went into a steep decline, and a last hold-out area was threatened by imminent construction of a freeway bypass. Biologists became alarmed and began an intensive search for populations in locations other than the spot designated for the freeway bypass. They began their search by identifying all known locations of hot springs, in hopes of finding small populations of the Carson Wandering Skipper close by.

24. The biologists' observations that the Carson Wandering Skipper populations had declined is an example of ____.

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a. reporting a conclusion
b. identifying a problem
c. performing an experiment
d. proposing a hypothesis
e. making testable predictions

ANSWER: b
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Multiple Choice
PREFACE NAME: Narrative
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1.1 - Outline the nine necessary steps to develop a scientific theory.

25. As biologists searched for previously unknown populations of the Carson Wandering Skipper, biologists wondered if hot springs were absolutely essential to its survival. This phase of the investigation is ____.

a. finding out what is known and asking a question
b. analyzing data and asking a question
c. asking a question and testing predictions
d. accepting their hypothesis and analyzing data
e. accepting their hypothesis and asking a question

ANSWER: a
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Multiple Choice
PREFACE NAME: Narrative
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1.1 - Outline the nine necessary steps to develop a scientific theory.

26. Scientific hypotheses and results that have not undergone the rigors of peer review, or that have been discarded as a result of peer review or additional research, are considered to be ____.

a. limited but accurate
b. scientific laws
c. scientific theories
d. unreliable science
e. reliable science

ANSWER: d
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1 - Determine how science attempts to answer questions about nature.

27. Critical thinking includes ____.

a. knowing that everything you read or hear is wrong
b. only looking for information that supports your opinions
c. learning how to argue persuasively that you are right

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d. knowing what the right answer should be, and finding an explanation for any results that disagree
e. identifying and evaluating your personal assumptions, biases, and beliefs, being careful to distinguish between facts and opinions

ANSWER: e
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1.3 - List the four important steps of critical thinking.

28. A scientific law ____.
a. is a hypothesis that has been proven
b. is what a theory becomes when it passes experimental tests
c. is called that because there are consequences when it is broken
d. is a well-tested and widely accepted description of what we find happening repeatedly and in the same way in nature
e. determines the series of steps that should be followed when designing an experiment to test a hypothesis

ANSWER: d
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1.4 - Distinguish between scientific theories and laws.

29. Matter is best described as ____.
a. thermodynamic
b. something that has the capacity to do work
c. positively charged
d. something that can produce change
e. anything that has mass and takes up space

ANSWER: e
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter And What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

30. Atomic theory, the idea that all elements are made of up atoms, ____.
a. is a scientific theory
b. is a scientific law
c. is tentative science
d. is no longer considered to be correct
e. violates the law of conservation of matter

ANSWER: a

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DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.2 What Is Matter And What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1.4 - Distinguish between scientific theories and laws.

31. The atomic number of an element is the number of ____.
    a. atoms in a molecule
    b. protons in an atom
    c. nuclei in a molecule
    d. electrons in an atom
    e. protons and neutrons in an atom

ANSWER: b
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter And What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

32. Protons, neutrons, and electrons are all ____.
    a. forms of energy
    b. equal in mass
    c. subatomic particles
    d. negative ions
    e. charged particles

ANSWER: c
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2.2 - Describe the three building blocks of matter.

33. An atom's mass number is equal to the total number of ____.
    a. neutrons and isotopes
    b. neutrons and electrons
    c. neutrons and protons
    d. protons, neutrons, and electrons
    e. protons only

ANSWER: c
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

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34. An element ____.

a. can combine with protons to make an atom
b. is made up of compounds
c. can combine with one or more other elements to make a compound
d. is defined by the number of electrons it has
e. can only be organic

ANSWER: c
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

35. The most common form of the carbon atom is sometimes referred to as ^{12}C. An isotope of this atom is called ^{14}C. ^{14}C must have a different number of ____ than ^{12}C.

a. ions
b. protons
c. atoms
d. neutrons
e. electrons

ANSWER: d
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

36. Ions are atoms or groups of atoms that have ____.

a. gained or lost electrons
b. gained or lost protons
c. gained or lost neutrons
d. undergone radioactive decay
e. different numbers of protons and neutrons in the same atom

ANSWER: a
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

37. Which list of items contains only ions?

a. CO_2, H_2O, Na^+, H^-

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b. Na^+, H^-, Pb, Hg

c. Pb, Hg, CO_2,NaCl

d. Cl^-, Na^+, Ca^{2+}, NO_3^-

e. NaCl, NO, CO, NaOH

ANSWER: d
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

38. An acidic solution would have ____.

a. more hydroxide ions than hydrogen ions and a pH greater than 7
b. more hydrogen ions than hydroxide ions and a pH greater than 7
c. more hydroxide ions than hydrogen ions and a pH less than 7
d. more hydroxide ions than hydrogen ions and a pH of 7
e. more hydrogen ions than hydroxide ions and a pH less than 7

ANSWER: e
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

39. All organic compounds are characterized by the presence of ____.

a. carbon
b. hydrogen
c. oxygen
d. nitrogen
e. phosphorus

ANSWER: a
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2.3 - Distinguish the organic compounds based on their chemical formula.

40. The compound represented by the formula CH_4 is ____.

a. calcium carbonate
b. carbon dioxide
c. methane, a hydrocarbon
d. sodium chloride
e. glucose, a simple carbohydrate

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ANSWER: c
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

41. Which of the following contains all of the others?
    a. chromosomes
    b. genes
    c. cells
    d. DNA molecules
    e. cell nuclei

ANSWER: c
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2.4 - Describe the relationships among cells, genes, and chromosomes.

42. ____ are the fundamental structural and functional units of life.
    a. Ions
    b. Atoms
    c. Compounds
    d. Molecules
    e. Cells

ANSWER: e
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2.4 - Describe the relationships among cells, genes, and chromosomes.

43. Simple organic molecules called monomers can be linked together by chemical bonds to form ____.
    a. chromosomes
    b. lipids
    c. polymers
    d. hydrocarbons
    e. elements

ANSWER: c
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

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44. Genes are composed of sequences of ____.
    a. ions
    b. chromosomes
    c. cells
    d. nucleotides
    e. proteins

ANSWER: d
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2.4 - Describe the relationships among cells, genes, and chromosomes.

45. The law of conservation of matter states that whenever matter undergoes a physical or chemical change, ____.
    a. atoms can be created
    b. atoms can be destroyed
    c. atoms cannot be created or destroyed
    d. atoms can be destroyed if we compost them
    e. atoms can be created by reactions between organic compounds

ANSWER: c
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2.6 - State the law of conservation of matter.

46. If a carbon atom combines with oxygen atoms to form CO_2, this would be described as ____.
    a. a physical change
    b. a chemical change
    c. both a physical and chemical change
    d. first a physical change, but then it becomes a chemical change
    e. neither a physical change or a chemical change, but a scientific change

ANSWER: b
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

47. Energy can be formally defined as the ____.
    a. velocity of any moving object
    b. heat generated by atoms losing electrons
    c. capacity to do work
    d. displacement of heat from the sun to the earth

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e. process of moving objects

ANSWER: c
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3 - Discuss energy and the laws that govern it.

48. Most forms of energy can be classified as either ____.
a. chemical or physical
b. kinetic or mechanical
c. potential or mechanical
d. chemical or kinetic
e. potential or kinetic

ANSWER: e
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3.1 - Given its properties, classify the forms of energy into kinetic energy or potential energy.

49. Kinetic energy is energy associated with ____.
a. chemical reactions
b. motion
c. food
d. coal
e. elevation differences

ANSWER: b
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3.1 - Given its properties, classify the forms of energy into kinetic energy or potential energy.

50. An example of potential energy is ____.
a. electricity flowing through a wire
b. the chemical energy in a candy bar
c. a bullet fired at high velocity
d. the falling of a leaf from a tree
e. the flowing of water

ANSWER: b
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice

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LEARNING OBJECTIVES: ENVS.MLSP.16.2.3.1 - Given its properties, classify the forms of energy into kinetic energy or potential energy.

51. Which statement best describes the first law of thermodynamics?
    a. Atoms cannot be created or destroyed.
    b. Energy can neither be created nor destroyed.
    c. Heat is a form of kinetic energy.
    d. Solar energy is converted into chemical energy in living systems.
    e. When energy is used up, it's gone.

ANSWER: b
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3.3 - Explain the two scientific laws of thermodynamics.

52. Wind farms are viable options for supplying more of our energy needs in the future because ____.
    a. high-speed wind is a form of medium-quality energy
    b. high-speed wind is a form of high-quality energy
    c. high-speed wind is a form of low-quality energy
    d. wind continuously moves at great speeds around the globe
    e. wind is potential energy

ANSWER: b
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3.2 - Contrast high-quality to low-quality energy.

53. The second law of thermodynamics says that whenever energy is converted from one form to another in a physical or chemical change, ____.
    a. more energy will be present in the second form
    b. heat is absorbed
    c. light is produced
    d. we end up with lower-quality or less useable energy than we started with
    e. the second form of energy will always be kinetic

ANSWER: d
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3.3 - Explain the two scientific laws of thermodynamics.

54. ____ is a measure of the amount of energy available to do useful work.
    a. Energy quality
    b. Energy effectiveness

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c. Energy conservation
d. Energy efficiency
e. Energy radiation

ANSWER: a
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3.2 - Contrast high-quality to low-quality energy.

55. Which of the following energy forms is low-quality?
a. the energy released by burning coal
b. the heat dispersed in the ocean
c. concentrated sunlight
d. high-speed wind
e. the energy released by burning wood

ANSWER: b
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3.2 - Contrast high-quality to low-quality energy.

56. A positive feedback loop ____.
a. increases a change to a system
b. always results in a beneficial change to a system
c. decreases a change to a system
d. never results in a beneficial change to a system
e. stabilizes a system

ANSWER: a
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.4 What Are Systems and How Do They Respond To Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3 - Discuss energy and the laws that govern it.

57. A thermostat set to 62 °F turns on the furnace when a house cools below that temperature, and shuts the furnace off when a house warms above that temperature. This is an example of a simple ____.
a. positive feedback loop
b. negative feedback loop
c. system loop
d. tipping point
e. thermodynamic loop

ANSWER: b
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.4 What Are Systems and How Do They Respond To Change?

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QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3 - Discuss energy and the laws that govern it.

58. A form of kinetic energy that travels in the form of a wave as a result of changes in electrical and magnetic fields is ____.
    a. wind
    b. electromagnetic radiation
    c. waterfalls
    d. electricity
    e. heat energy

ANSWER: b
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3 - Discuss energy and the laws that govern it.

59. Which form of electromagnetic radiation has the shortest wavelength?
    a. infrared radiation
    b. radio waves
    c. visible light
    d. ultraviolet (UV) radiation
    e. microwaves

ANSWER: d
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3 - Discuss energy and the laws that govern it.

60. Most living systems can be described as having inputs, ____, and outputs.
    a. thermodynamics
    b. positive transfers
    c. throughputs
    d. kinetics
    e. creations

ANSWER: c
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.4 What Are Systems and How Do They Respond To Change?
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3 - Discuss energy and the laws that govern it.

Matching

Match items with their appropriate chemical description.

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a. NH_4^+
b. molecule
c. electron
d. proton
e. neutron
f. pH
g. Ca
h. P
i. mass number
j. NO^{3-}
k. $C_6H_{12}O_6$

DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Matching
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.
ENVS.MLSP.16.2.2.2 - Describe the three building blocks of matter.

61. The chemical symbol for the element calcium
ANSWER: g

62. A subatomic particle with no net electrical charge
ANSWER: e

63. The nitrate ion
ANSWER: j

64. The chemical symbol for the element phosphorus
ANSWER: h

65. The total number of protons and neutrons in an atom's nucleus
ANSWER: i

66. Subatomic particle with a positive charge
ANSWER: d

67. The ammonium ion
ANSWER: a

68. The scale used to measure acidity
ANSWER: f

69. The chemical formula for glucose
ANSWER: k

70. Subatomic particle with a negative charge

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ANSWER: c

71. Two or more atoms held together by chemical bonds
ANSWER: b

Completion

72. In a scientific investigation, one of the groups involved in the investigation has a chosen variable changed in a known way. This group is designated as the _____group.
ANSWER: experimental
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1 - Determine how science attempts to answer questions about nature.

73. A well-tested and widely accepted scientific hypothesis or a group of related hypotheses is called a(n) _____.
ANSWER: scientific theory
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1 - Determine how science attempts to answer questions about nature.

74. A possible and testable explanation that needs further investigation is called a(n) _____.
ANSWER: hypothesis
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1 - Determine how science attempts to answer questions about nature.

75. Matter that is near the earth's surface, that is highly concentrated, and that has great potential for use as a resource, is referred to as _____.
ANSWER: high-quality, high quality, high-quality energy, high quality energy
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

76. A(n) _____ is a type of matter that has a unique set of properties and that cannot be broken down into simpler substances by chemical means.
ANSWER: element
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Completion

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LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

77. A chemical that is a combination of two or more different elements is called a(n) _____.
ANSWER: compound
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

78. An atom or group of atoms with one or more net positive or negative charges is called a(n) _____.
ANSWER: ion
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

79. The pH of a solution is a measure of _____ ions and _____ ions in that solution.
ANSWER: hydrogen; hydroxide
hydroxide; hydrogen
DIFFICULTY: Moderate
QUESTION TYPE: Completion

80. The _____ ion, studied by Bormann and Likens, is an essential nutrient for plant growth.
ANSWER: nitrate
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

81. A simple carbohydrate that plants and animals use to obtain energy is _____.
ANSWER: glucose
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

82. _____ occurs when two isotopes of light elements are forced together at extremely high temperatures until they fuse to form a heavier nucleus.

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ANSWER: Nuclear fusion
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

83. _____ occurs when the nuclei of certain isotopes with large mass numbers are split apart into lighter nuclei and release energy when struck by a neutron.
ANSWER: Nuclear fission
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

84. Flowing water is an example of _____ energy.
ANSWER: kinetic
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3.1 - Given its properties, classify the forms of energy into kinetic energy or potential energy.

85. Organic compounds always contain _____ atoms.
ANSWER: carbon
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2.3 - Distinguish the organic compounds based on their chemical formula.

86. Within some DNA molecules are certain sequences of nucleotides called
ANSWER: genes
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2.4 - Describe the relationships among cells, genes, and chromosomes.

87. Macromolecules formed from a number of monomers are called _____.
ANSWER: polymers
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16. 2.2.2 - Describe the three building blocks of matter.

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88. The law of _____ of matter states that whenever matter undergoes a physical or chemical change, no atoms are created or destroyed.

ANSWER: conservation
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.2.6 - State the law of conservation of matter.

89. A(n) _____ is a set of components that function and interact in some regular way.

ANSWER: system
DIFFICULTY: BLOOM'S: Remember
REFERENCES: 2.4 What Are Systems and How Do They Respond To Change?
QUESTION TYPE: Completion
LEARNING OBJECTIVES: ENVS.MLSP.16.2.4 - Describe how various systems respond to change.

Subjective Short Answer

90. Give an example of a way you can convert potential energy into kinetic energy.

ANSWER: *Sample answers:*
- Eat food to keep body working.
- Drop an object.
- Burn wood for heat.

DIFFICULTY: BLOOM'S: Apply
REFERENCES: 2.3 What Is Energy and What Happens When It Undergoes Change?
QUESTION TYPE: Subjective Short Answer
LEARNING OBJECTIVES: ENVS.MLSP.16.2.3.1 - Given its properties, classify the forms of energy into kinetic energy or potential energy.

91. What does it mean to say that scientific knowledge advances in a "self-correcting way"?

ANSWER: Scientists continually question and check the data and hypotheses of their peers, such that errors are usually uncovered and corrected.
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Subjective Short Answer
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1 - Determine how science attempts to answer questions about nature.

92. Give an example of a positive feedback loop.

ANSWER: Examples could include:
Hubbard Brook experiments, where removing vegetation from a stream valley caused soil erosion and losses of nutrients, which caused more vegetation to die.
A stock market crash, in which falling stock values cause investors to sell, which lowers values further.
DIFFICULTY: BLOOM'S: Apply
REFERENCES: 2.4 What Are Systems and How Do They Respond To Change?
QUESTION TYPE: Subjective Short Answer

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LEARNING OBJECTIVES: ENVS.MLSP.16.2.4 - Describe how various systems respond to change.

93. What are the physical states and chemical forms of matter?

ANSWER: Matter has three physical states: solid, liquid and gas. It has two chemical forms: elements and compounds.

DIFFICULTY: BLOOM'S: Understand

REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?

QUESTION TYPE: Subjective Short Answer

LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

Essay

94. Explain why the Bormann-Likens scientific investigation of clear-cutting forest watersheds is considered reliable science.

ANSWER: It has been subjected to peer review, and other scientists have repeated the study and produced similar results. Reliable science consists of data, hypotheses, models, theories, and laws that are widely accepted by all or most of the scientists who are considered experts in the field under study.

DIFFICULTY: BLOOM'S: Apply

REFERENCES: 2.1 What Do Scientists Do?

QUESTION TYPE: Essay

LEARNING OBJECTIVES: ENVS.MLSP.16.2.1.5 - Differentiate among tentative, reliable, and unreliable science.

95. List an example of each of the following terms: element, compound, ion, organic compound, simple carbohydrate.

ANSWER: *Possible answers:*
Element — carbon
Compound — carbon dioxide
Ion — nitrate ion
Organic compound — hydrocarbons
Simple carbohydrate — glucose

DIFFICULTY: BLOOM'S: Apply

REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?

QUESTION TYPE: Essay

LEARNING OBJECTIVES: ENVS.MLSP.16.2.2 - Explain what matter is made of and the law governing changes in matter.

96. Explain how genes, traits, and chromosomes are related.

ANSWER: Traits, or characteristics, are encoded in units of genetic information called genes. Chromosomes are long strings of thousands of genes present in the nucleus of a cell.

DIFFICULTY: BLOOM'S: Understand

REFERENCES: 2.2 What Is Matter and What Happens When It Undergoes Change?

QUESTION TYPE: Essay

LEARNING OBJECTIVES: ENVS.MLSP.16.2.2.4 - Describe the relationships among cells, genes, and chromosomes.

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97. Why do scientists not talk about "proof" when discussing scientific research?

ANSWER: Scientists cannot prove or disprove anything absolutely, because there is always some degree of uncertainty in scientific measurements, observations, and models.
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Essay
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1 - Determine how science attempts to answer questions about nature.

98. Explain why it is incorrect to say that scientific theories are unreliable because they are not scientific laws.

ANSWER: Scientific laws are descriptions of what we find happening repeatedly and in the same way in nature, such as the law of gravity. A scientific theory is a well-tested and widely accepted scientific hypothesis or group of related hypotheses. Theories cannot become laws.
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Essay
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1.4 - Distinguish between scientific theories and laws.

99. Describe three limitations of science in general (as well as environmental science).

ANSWER: 1. Scientists cannot prove or disprove anything absolutely because there is always some degree of uncertainty in scientific measurements, observations and models.

2. Scientists are humans and thus are not totally free of bias about their own results and hypotheses.

3. Many systems in the natural world involve a huge number of variables with complex interactions.
DIFFICULTY: BLOOM'S: Understand
REFERENCES: 2.1 What Do Scientists Do?
QUESTION TYPE: Essay
LEARNING OBJECTIVES: ENVS.MLSP.16.2.1.4 - Distinguish between scientific theories and laws.

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