

Chapter 02: Matter and Energy

1. Which of the following correctly matches each sample with its classification as macroscopic, microscopic, or particulate?

Macroscopic Microscopic Particulate

- a. Protein molecule, cat hair, plant cell
- b. Protein molecule, plant cell, cat hair
- c. Plant cell, cat hair, protein molecule
- d. Cat hair, plant cell, protein molecule
- e. Cat hair, protein molecule, plant cell

ANSWER: d

RATIONALE: Analysis: A. Incorrect. See Section 2.2, Goal 1. B. Incorrect. See Section 2.2, Goal 1. C. Incorrect. See Section 2.2, Goal 1. D. Correct E. Incorrect. See Section 2.2, Goal 1.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: Macroscopic sample is a form of matter, which can be observed with the naked eye. A microscopic sample is too small to be seen with the unaided human eye, and a particulate is a type of matter that is too small to be seen with the human eye or an optical microscope.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 4:35 AM

2. Which of the following is *not* a particulate sample of matter?

- a. An oxygen molecule
- b. A human egg cell
- c. An electron
- d. A nickel atom
- e. A hemoglobin molecule

ANSWER: b

RATIONALE: Analysis: A. Incorrect. See Section 2.2, Goal 1. B. Correct. C. Incorrect. See Section 2.2, Goal 1. D. Incorrect. See Section 2.2, Goal 1. E. Incorrect. See Section 2.2, Goal 1.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: A human egg cell is not a particulate as it can be viewed through a microscope. All others are particulates.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 4:36 AM

3. Which is the best definition of the term *model*, as it is used in chemistry?

- a. A product from a kit from which molecules can be constructed
- b. A computer image of a molecule
- c. A representation of something else
- d. A person who is photographed for scientific journals
- e. A graph that shows the relationship between two variables

ANSWER: c

RATIONALE: Analysis: A. Incorrect. See Section 2.2, Goal 2. B. Incorrect. See Section 2.2, Goal 2. C. Correct. D.

Chapter 02: Matter and Energy

Incorrect. See Section 2.2, Goal 2. E. Incorrect. See Section 2.2, Goal 2.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: A model is a representation of something. Chemists use models of atoms and molecules—tiny particulate-level entities—that are based on experimental data.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 12:27 AM

4. Why do chemists use models of atoms and molecules?

- Use of models is more convenient and less expensive than using photographs from microscopes.
- Matter at the particulate level is too small to be seen.
- Chemists follow the tradition established by Watson and Crick.
- High-powered electron microscopes create computerized models of atoms and molecules.
- To illustrate textbooks and scientific reports with more color than black-and-white photographs of the atoms and molecules.

ANSWER: b

RATIONALE: Analysis: A. Incorrect. See Section 2.2, Goal 2. B. Correct. C. Incorrect. See Section 2.2, Goal 2. D. Incorrect. See Section 2.2, Goal 2. E. Incorrect. See Section 2.2, Goal 2.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: Chemists use models of atoms and molecules as the matter at the particulate level is too small to be seen.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 5:20 AM

5. Which state of matter is illustrated below?



- Gas
- Liquid
- Solid
- Both gas and solid
- Both liquid and solid

ANSWER: b

RATIONALE: Analysis: A. Incorrect. See Section 2.3, Goal 3. B. Correct. C. Incorrect. See Section 2.3, Goal 3. D. Incorrect. See Section 2.3, Goal 3. E. Incorrect. See Section 2.3, Goal 3.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: The illustrated state is liquid as the particle spacing is close but slightly apart.

Chapter 02: Matter and Energy

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 12:31 AM

6. Which of the following characteristics does *not* relate to the gaseous state?

- a. Having the same shape as a closed container
- b. Having the volume same as a closed container
- c. Having random, independent particle movement
- d. Easily compressible
- e. All of the above

ANSWER: e

RATIONALE: Analysis: A. Incorrect. See Section 2.3, Goal 3. B. Incorrect. See Section 2.3, Goal 3. C. Incorrect. See Section 2.3, Goal 3. D. Incorrect. See Section 2.3, Goal 3. E. Correct.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: In gaseous state, the molecule occupies the shape and volume of a closed container, particle movement is random and independent, and particles are easily compressed.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 12:37 AM

7. Which of the following characteristics does *not* relate to the liquid state?

- a. Having independent particle movement below the surface
- b. Having the same shape as the bottom of the container
- c. Having constant volume
- d. Pourability
- e. All of the above

ANSWER: e

RATIONALE: Analysis: A. Incorrect. See Section 2.3, Goal 3. B. Incorrect. See Section 2.3, Goal 3. C. Incorrect. See Section 2.3, Goal 3. D. Incorrect. See Section 2.3, Goal 3. E. Correct.

POINTS: 1

QUESTION TYPE: Multiple Choice

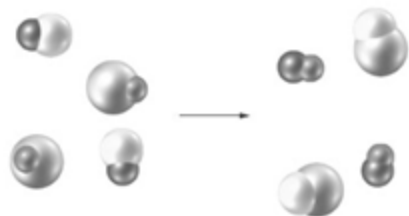
HAS VARIABLES: False

OTHER: In liquid state, the molecules occupy the shape of the container; the volume is constant; particle movement is independent beneath the surface, limited to the volume of the liquid and the shape of the container; and particle spacing is such that particle interactions are important.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 12:41 AM

8. Examine the following particulate-level representation.



Chapter 02: Matter and Energy

This change might be shown symbolically as which of the following?

- a. $\text{H}_2\text{O}_2 \longrightarrow \text{H}_2 + \text{O}_2$
- b. $\text{H}_2\text{CO}_3 \rightarrow \text{H}_2\text{O} + \text{CO}_2$
- c. $\text{AgCl} + \text{NaI} \longrightarrow \text{AgI} + \text{NaCl}$
- d. $\text{CO}_2 \longrightarrow \text{C} + \text{O}_2$
- e. $\text{Ca} + \text{Cl}_2 \longrightarrow \text{CaCl}_2$

ANSWER: c

RATIONALE: Analysis: A. Incorrect. See Section 2.4, Goal 4. B. Incorrect. See Section 2.4, Goal 4. C. Correct. D. Incorrect. See Section 2.4, Goal 4. E. Incorrect. See Section 2.4, Goal 4.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: The reactants of silver chloride and sodium iodide combine to form two compounds, silver iodide and sodium chloride as products.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 12:43 AM

9. Which of the following properties is/are classified as physical?

- i. The odor of glass cleaning solution
 - ii. The color of chlorine gas
 - iii. The electrical conductivity of copper wire
 - iv. The ability of milk to sour
 - v. Inertness of a compound with bromine
- a. i only
 - b. ii only
 - c. i and ii
 - d. i, ii, and iii
 - e. iv and v

ANSWER: d

RATIONALE: Analysis: A. Incorrect. See Section 2.4, Goal 4. B. Incorrect. See Section 2.4, Goal 4. C. Incorrect. See Section 2.4, Goal 4. D. Correct. E. Incorrect. See Section 2.4, Goal 4.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: Physical properties are defined as a characteristic feature that can be observed and measured without altering the identity of a substance. Odor, color, and electrical conductivity are a few examples of physical properties. The first three options are classified as physical, while the others are classified as chemical.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 12:45 AM

10. Which of the following properties is/are classified as chemical?

Chapter 02: Matter and Energy

- i. The taste of honey
- ii. The ability of hair to stretch
- iii. The corrosive character of hydrochloric acid
- iv. The combustibility of ethanol
- v. The softness of talc
 - a. i and ii
 - b. i, ii, and v
 - c. iii only
 - d. iv only
 - e. iii and iv

ANSWER: e

RATIONALE: Analysis: A. Incorrect. See Section 2.4, Goal 4. B. Incorrect. See Section 2.4, Goal 4. C. Incorrect. See Section 2.4, Goal 4. D. Incorrect. See Section 2.4, Goal 4. E. Correct.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: A chemical change occurs when the chemical identity of a substance is destroyed and a new substance forms. Corrosive character and combustibility are the chemical properties that induce chemical changes in a substance. The third and fourth options are classified as chemical property, while the others are classified as physical property.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 12:59 AM

11. Which of the following is a chemical property?
- a. Combustibility
 - b. Boiling point
 - c. Density
 - d. Color
 - e. Shape

ANSWER: a

RATIONALE: Analysis: A. Correct. B. Incorrect. See Section 2.4, Goal 4. C. Incorrect. See Section 2.4, Goal 4. D. Incorrect. See Section 2.4, Goal 4. E. Incorrect. See Section 2.4, Goal 4.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: A chemical change occurs when the chemical identity of a substance is destroyed and a new substance forms. Combustibility is a chemical property as it induces a chemical change to a substance. All the other options are physical properties.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 1:03 AM

12. Which of the following changes is classified as chemical?
- i. Dissolving vinegar in water
 - ii. Evaporation of rubbing alcohol
 - iii. Crushing a rock
 - iv. Fermenting apple juice
 - v. Softening a glass tube by heating it

Chapter 02: Matter and Energy

- a. i only
- b. iv only
- c. i and iv
- d. i and ii
- e. i, iv, and v

ANSWER: b

RATIONALE: Analysis: A. Incorrect. See Section 2.4, Goal 5. B. Correct. C. Incorrect. See Section 2.4, Goal 5. D. Incorrect. See Section 2.4, Goal 5. E. Incorrect. See Section 2.4, Goal 5.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: A chemical change occurs when the chemical identity of a substance is destroyed and a new substance forms. Fermentation is a chemical property as it makes a chemical change to a substance. All the other options are physical properties.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 4:46 AM

13. Which of the following changes is classified as physical?

- i. Carving a block of ice into a sculpture
 - ii. Burning wood
 - iii. Souring of cream
 - iv. Rusting of steel
 - v. Dissolving salt in water
- a. i only
 - b. v only
 - c. i and v
 - d. ii, iii, and iv
 - e. ii, iii, iv, and v

ANSWER: c

RATIONALE: Analysis: A. Incorrect. See Section 2.4, Goal 5. B. Incorrect. See Section 2.4, Goal 5. C. Correct. D. Incorrect. See Section 2.4, Goal 5. E. Incorrect. See Section 2.4, Goal 5.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

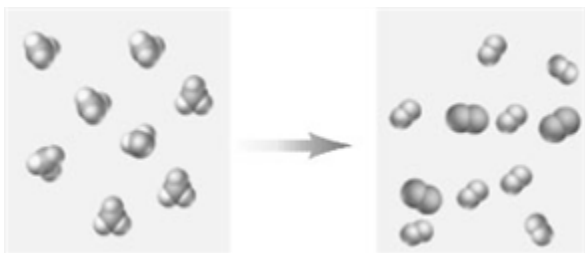
OTHER: Carving a block of ice into a sculpture is a physical change because it brings changes in size or shape, without altering the substance. Dissolving salt in water is also a physical change because it does not change the chemical identity of salt. All the other options are examples of chemical changes.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 1:31 AM

14. Consider the following image:

Chapter 02: Matter and Energy



Which of the following most accurately describes the change represented in the image?

- A chemical change which follows conservation of mass
- A physical change which does not follow conservation of mass
- A physical change which follows conservation of mass
- A chemical change which does not follow conservation of mass

ANSWER: d

RATIONALE: Analysis: A. Incorrect. See Section 2.4, Goal 5. B. Incorrect. See Section 2.4, Goal 5. C. Incorrect. See Section 2.4, Goal 5. D. Correct.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: The above image shows the space-filling model of seven molecules in the reactant side, which get diffused to form more molecules in the product side. As per the law of conservation of mass, total mass of the reactant equals the total mass of the product.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 4:48 AM

15. Which of the following can be a pure substance?

- Gold
 - Air
 - Homogenized milk
 - Sugar completely dissolved in water
 - Ice
- ii and iv
 - ii and iii
 - i and iii
 - i and v
 - ii, iii, and iv

ANSWER: d

RATIONALE: Analysis: A. Incorrect. See Section 2.5, Goal 6. B. Incorrect. See Section 2.5, Goal 6. C. Incorrect. See Section 2.5, Goal 6. D. Correct. E. Incorrect. See Section 2.5, Goal 6.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: A pure substance is a single chemical, entirely made up of one type of molecule. Gold and ice are considered to be pure substances as they have a single chemical substance and they are made up of only one type of molecule. All the other examples in the option are made up of heterogeneous compounds.

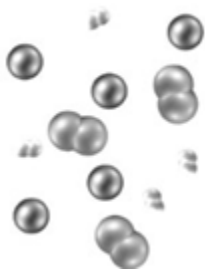
DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 1:19 AM

Chapter 02: Matter and Energy

16. Which of the following would be classified as a mixture of an element and a compound?

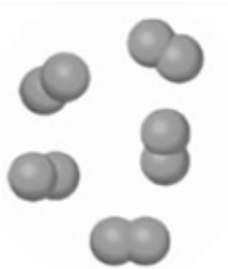
a.



b.



c.



d.



e.



ANSWER: e

RATIONALE: Analysis: A. Incorrect. See Section 2.5, Goal 6. B. Incorrect. See Section 2.5, Goal 6. C. Incorrect. See Section 2.5, Goal 6. D. Incorrect. See Section 2.5, Goal 6. E. Correct.

Chapter 02: Matter and Energy

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: A mixture is a sample of matter that consists of two or more pure substances.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 1:31 AM

17. Which of the following does *not* describes a mixture?
- Two or more pure substances that have been mixed together
 - Distinct set of physical and chemical properties
 - Components can be separated by physical changes
 - Boiling temperature of a solution will increase with time
 - All of the above describe a mixture

ANSWER: b

RATIONALE: Analysis: A. Incorrect. See Section 2.5, Goal 6. B. Correct. C. Incorrect. See Section 2.5, Goal 6. D. Incorrect. See Section 2.5, Goal 6. E. Incorrect. See Section 2.5, Goal 6.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: A mixture is a sample of matter that consists of two or more pure substances that have been mixed together. The properties of a mixture depend upon the substances in it.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 1:30 AM

18. Which of the following correctly describes a homogeneous sample?
- Uniform appearance and composition throughout
 - Visibly different parts or phases
 - A mixture of diamond and graphite, which are both forms of carbon
 - Reacts with all elements
 - Reacts with all natural elements

ANSWER: a

RATIONALE: Analysis: A. Correct. B. Incorrect. See Section 2.5, Goal 7. C. Incorrect. See Section 2.5, Goal 7. D. Incorrect. See Section 2.5, Goal 7. E. Incorrect. See Section 2.5, Goal 7.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: A homogenous mixture has a uniform appearance and composition throughout. All the other examples are considered to be non-homogeneous sample.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 1:28 AM

19. Which of the following substances is/are homogeneous?
- Mineral oil
 - A plant leaf
 - Sausage

Chapter 02: Matter and Energy

iv. Sugar

v. Freshly squeezed lemonade

- a. ii and iv
- b. i and iii
- c. ii and iii
- d. i and iv
- e. i, iv, and v

ANSWER: d

RATIONALE: Analysis: A. Incorrect. See Section 2.5, Goal 7. B. Incorrect. See Section 2.5, Goal 7. C. Incorrect. See Section 2.5, Goal 7. D. Correct. E. Incorrect. See Section 2.5, Goal 7.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: When two different mixtures are mixed, they dissolve with each other and form a solution. A solution has a uniform appearance and once properly stirred, it has a uniform composition. Mineral oil and sugar are examples of a homogeneous phase, while the sausages and a plant leaf are an example of a heterogeneous phase.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 1:33 AM

20. Which of the following is/are heterogeneous substances?

- i. Gasoline
 - ii. A gold bar
 - iii. A freshly opened can of cola
 - iv. Potato chips
 - v. A bacon strip
- a. i and ii
 - b. iii, iv, and v
 - c. i, iv, and v
 - d. i, ii, and iv
 - e. ii, iii, and v

ANSWER: b

RATIONALE: Analysis: A. Incorrect. See Section 2.5, Goal 7. B. Correct. C. Incorrect. See Section 2.5, Goal 7. D. Incorrect. See Section 2.5, Goal 7. E. Incorrect. See Section 2.5, Goal 7.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: A heterogeneous mixture consists of visibly different substances or a phase. Gasoline and a gold bar have homogeneous phase, while the others have heterogeneous phase.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 1:35 AM

21. Most methods for separating mixtures into their components depend on which of the following?

- a. Differing physical properties among the components
- b. Differing chemical properties among the components
- c. Differing electromagnetic properties among the components

Chapter 02: Matter and Energy

- d. Differing normalized properties among the components
- e. Differing spectroscopic properties among the components.

ANSWER: a

RATIONALE: Analysis: A. Correct. B. Incorrect. See Section 2.6, Goal 8. C. Incorrect. See Section 2.6, Goal 8. D. Incorrect. See Section 2.6, Goal 8. E. Incorrect. See Section 2.6, Goal 8.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: A mixture consists of two or more pure substances that have been mixed together. The properties of a mixture depend on the substances in it. Most methods for separating mixtures into their components depend on differing physical properties among those components.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:10 AM

22. Which of the following properties do *distillation* technique is based upon?

- a. Pore size of the filtration device
- b. Relative densities
- c. Inhomogeneity of the viscosities
- d. Boiling points
- e. Melting points

ANSWER: d

RATIONALE: Analysis: A. Incorrect. See Section 2.6, Goal 8. B. Incorrect. See Section 2.6, Goal 8. C. Incorrect. See Section 2.6, Goal 8. D. Correct. E. Incorrect. See Section 2.6, Goal 8.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: Distillation process is based upon the different boiling points of the components. Distillation relies on a physical change to separate one component from the other components of a mixture.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:13 AM

23. Which of the following statement is *false*?

- a. Both elements and compounds are pure substances.
- b. The properties of a compound vary.
- c. An element cannot be decomposed chemically into other pure substances.
- d. A compound can be separated into other substances by chemical means.
- e. All of the above statements are true.

ANSWER: b

RATIONALE: Analysis: A. Incorrect. See Section 2.7, Goal 9. B. Correct. C. Incorrect. See Section 2.7, Goal 9. D. Incorrect. See Section 2.7, Goal 9. E. Incorrect. See Section 2.7, Goal 9.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: In a particular type of a compound, the properties are fixed and do not vary. Also, the elements present in the compounds are fixed and are in a fixed ratio.

Chapter 02: Matter and Energy

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 5:22 AM

24. Which of the following are elements?

- i. KOH
 - ii. Ne
 - iii. CO
 - iv. Carbon tetrachloride
 - v. Calcium
- a. i, ii, and iii
 - b. iv and v
 - c. ii and iii
 - d. ii and v
 - e. ii, iii, and v

ANSWER: d

RATIONALE: Analysis: A. Incorrect. See Section 2.7, Goal 9. B. Incorrect. See Section 2.7, Goal 9. C. Incorrect. See Section 2.7, Goal 9. D. Correct. E. Incorrect. See Section 2.7, Goal 9.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: An element is defined as a chemical property of a substance that cannot be decomposed or separated into other stable pure substances. Neon and calcium are examples of elements, while the others are examples of compounds.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:18 AM

25. Which of the following particulate-level picture might be associated with the name “silver”?

a.



b.



c.

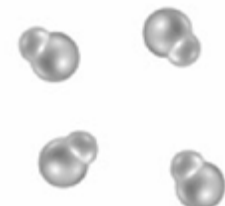


Chapter 02: Matter and Energy

d.



e.



ANSWER: b

RATIONALE: Analysis: A. Incorrect. See Section 2.7, Goal 9. B. Correct. C. Incorrect. See Section 2.7, Goal 9. D. Incorrect. See Section 2.7, Goal 9. E. Incorrect. See Section 2.7, Goal 9.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: Silver cannot be decomposed into other stable pure substances because all atoms are made up of the same elements. A particulate-level view suggests that the silver atoms are arranged in a regularly repeating pattern.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:20 AM

26. What type of pure substance can be decomposed chemically into other pure substances?

- a. A compound
- b. An element
- c. A mixture
- d. A solution
- e. Heterogeneous matter

ANSWER: a

RATIONALE: Analysis: A. Correct. B. Incorrect. See Section 2.7, Goal 9. C. Incorrect. See Section 2.7, Goal 9. D. Incorrect. See Section 2.7, Goal 9. E. Incorrect. See Section 2.7, Goal 9.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: Any pure substance that can be decomposed by a chemical change into two or more other pure substances is a compound.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:28 AM

27. Which of the following are compounds?

- i. Carbon dioxide
- ii. Silicon

Chapter 02: Matter and Energy

iii. Sodium carbonate

iv. I₂

v. Cr

- a. i, ii, and iii
- b. iv and v
- c. i and iii
- d. i, iii, and iv
- e. ii and v

ANSWER: c

RATIONALE: Analysis: A. Incorrect. See Section 2.7, Goal 9. B. Incorrect. See Section 2.7, Goal 9. C. Correct. D. Incorrect. See Section 2.7, Goal 9. E. Incorrect. See Section 2.7, Goal 9.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: Any pure substance that can be decomposed by a chemical change into two or more other pure substances is a compound. Carbon dioxide and sodium carbonate are compounds, while chromium, silicon, and iodine are elements.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:30 AM

28. Which of the following statement is *false*?

- a. IF is the formula of a compound.
- b. An elemental symbol is a capital letter, sometimes followed by a small letter.
- c. If there is only one atom of an element in a formula unit, it is indicated with a subscript “1”.
- d. H₂ is the formula of an element.
- e. The properties of compounds are always different from the properties of the elements from which they are formed.

ANSWER: c

RATIONALE: Analysis: A. Incorrect. See Section 2.7, Goal 10. B. Incorrect. See Section 2.7, Goal 10. C. Correct. D. Incorrect. See Section 2.7, Goal 10. E. Incorrect. See Section 2.7, Goal 10.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: A formula is a combination of the symbols of the elements and subscript numbers. The subscript numbers show the number of atoms of each element in a formula unit. The formula of most elements is the same as the symbol of the element.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 5:22 AM

29. Consider the particulate-level illustration:



Which is the best classification of this particle?

- a. Atom

Chapter 02: Matter and Energy

- b. Crystalline solid
- c. Molecule
- d. Mixture
- e. Heterogeneous mixture

ANSWER: c

RATIONALE: Analysis: A. Incorrect. See Section 2.7, Goal 11. B. Incorrect. See Section 2.7, Goal 11. C. Correct. D. Incorrect. See Section 2.7, Goal 11. E. Incorrect. See Section 2.7, Goal 11.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: In the above model, two atoms are bound together. A group of atoms that are bound together is called a molecule.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:32 AM

30. Consider the particulate-level illustration:



Which is the best classification of this particle-level illustration?

- a. Molecule
- b. Element
- c. Solid
- d. Crystalline solid
- e. Atom

ANSWER: d

RATIONALE: Analysis: A. Incorrect. See Section 2.7, Goal 11. B. Incorrect. See Section 2.7, Goal 11. C. Incorrect. See Section 2.7, Goal 11. D. Correct E. Incorrect. See Section 2.7, Goal 11.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: The classification of the particle represents that the atoms are arranged in a regular or ordered form are called crystalline solids.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:35 AM

31. The formula of most elements is the same as the symbol of the element. This indicates that the element is stable as a single (i), the smallest unit particle of the element. Other elements exist as stable, distinct, and independent (ii), which are made up of two or more atoms.

- a. (i) molecule; (ii) particles
- b. (i) molecule; (ii) crystalline solids

Chapter 02: Matter and Energy

- c. (i) crystalline solid; (ii) molecules
- d. (i) atom; (ii) mixtures
- e. (i) atom; (ii) molecules

ANSWER: e

RATIONALE: Analysis: A. Incorrect. See Section 2.7, Goal 11. B. Incorrect. See Section 2.7, Goal 11. C. Incorrect. See Section 2.7, Goal 11. D. Incorrect. See Section 2.7, Goal 11. E. Correct.

POINTS: 1

QUESTION TYPE: Multiple Choice





HAS VARIABLES: False

OTHER: The formula of most elements is the same as the symbol of the element. This indicates that the stable, particulate-level composition of the element is single atoms. Other elements that exist in nature have stable, distinct, and independent molecules that consist of two or more atoms chemically bonded to one another.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:36 AM

32. Which of the following correctly represents electrostatic forces?

- a. 
- b. 
- c. 
- d. 
- e. All of the above are correct.

ANSWER: a

RATIONALE: Analysis: A. Correct. B. Incorrect. See Section 2.8, Goal 13. C. Incorrect. See Section 2.8, Goal 13. D. Incorrect. See Section 2.8, Goal 13. E. Incorrect. See Section 2.8, Goal 13.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: An object that acquires an electrical charge that does not move over a distance. It is a static, or unmoving, charge. The electrical force is known as static electricity. The force is also called an electrostatic force.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:37 AM

33. Which of the following is a *false* statement?

- a. Two objects, both having positive charge, repel each other.
- b. Two objects having unlike charges attract each other.
- c. Electrostatic forces are responsible for the energy absorbed or released in chemical changes.
- d. The region in space where magnetic or electrostatic forces are effective is called a force field.
- e. All of the above are true.

ANSWER: e

RATIONALE: Analysis: A. Incorrect. See Section 2.8, Goal 13. B. Incorrect. See Section 2.8, Goal 13. C. Incorrect.

Chapter 02: Matter and Energy

See Section 2.8, Goal 13. D. Incorrect. See Section 2.8, Goal 13. E. Correct.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: If two objects gain a positive charge and are suspended close to one another, they repel each other. If two objects have opposite charges, they attract each other. An electrostatic force plays a vital role in energy absorption or release during a reaction. Force fields are the positions in space.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 5:23 AM

34. In which of the following pairs of substances will there be a net attractive electrostatic force?

- a. Two positively charged table tennis balls
- b. A negatively charged piece of dust and a positively charged piece of dust
- c. A positively charged sodium ion and a positively charged potassium ion
- d. A negatively charged chloride ion and a negatively charged bromide ion
- e. Two negatively charged pith balls

ANSWER: b

RATIONALE: Analysis: A. Incorrect. See Section 2.8, Goal 13. B. Correct. C. Incorrect. See Section 2.8, Goal 13. D. Incorrect. See Section 2.8, Goal 13. E. Incorrect. See Section 2.8, Goal 13.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: Two objects of unlike charges attract each other and create a net attractive electrostatic force between them.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:43 AM

35. Identify the following reactants and products in the equation $\text{H}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2 \text{HCl}$.

- a. Reactants: H_2SO_4 and HCl Products: BaCl_2 and BaSO_4
- b. Reactants: BaCl_2 and BaSO_4 Products: H_2SO_4 and HCl
- c. Reactants: BaSO_4 and HCl Products: H_2SO_4 and BaCl_2
- d. Reactants: H_2SO_4 and BaCl_2 Products: BaSO_4 and HCl
- e. Reactants: H and Ba Products: SO_4 and Cl

ANSWER: d

RATIONALE: Analysis: A. Incorrect. See Section 2.9, Goal 14. B. Incorrect. See Section 2.9, Goal 14. C. Incorrect. See Section 2.9, Goal 14. D. Correct. E. Incorrect. See Section 2.9, Goal 14.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: The formulas of the original substances, called reactants, are written to the left of an arrow. It points to the formulas of the new substances formed called products. The products are written on the right of the arrow. The reactants are sulfuric acid and barium chloride and the products formed are barium sulfate and hydrochloric acid.

DATE CREATED: 2/26/2020 9:43 AM

Chapter 02: Matter and Energy

DATE MODIFIED: 2/29/2020 2:45 AM

36. Examine the apparatus shown in the following image.



This apparatus would be useful in which of the following separations?

- a. Oxygen from nitrogen dioxide
- b. Sand from a mixture of sand and water
- c. Rubbing alcohol from a mixture of rubbing alcohol and water
- d. Iron filings from cereal
- e. Hydrogen and oxygen from water

ANSWER: c

RATIONALE: Analysis: A. Incorrect. See Section 2.6, Goal 8 B. Incorrect. See Section 2.6, Goal 8. C. Correct. D. Incorrect. See Section 2.6, Goal 8. E. Incorrect. See Section 2.6, Goal 8.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: Distillation process is based upon different boiling points of components. Distillation relies on a physical change to separate one component from the other components of a mixture.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 5:07 AM

37. Identify the product(s) that is/are (a) compound(s) in the equation $\text{Zn} + \text{CoCl}_2 \rightarrow \text{ZnCl}_2 + \text{Co}$.

- a. CoCl_2
- b. ZnCl_2
- c. CoCl_2 and ZnCl_2
- d. ZnCl_2 and Co
- e. Zn and CoCl_2

ANSWER: b

RATIONALE: Analysis: A. Incorrect. See Section 2.9, Goal 14. B. Correct. C. Incorrect. See Section 2.9, Goal 14. D. Incorrect. See Section 2.9, Goal 14. E. Incorrect. See Section 2.9, Goal 14.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: The formulas of the original substances, called reactants, are written to the left of an arrow. It points to the formulas of the new substances formed called products. The products are written on the right

Chapter 02: Matter and Energy

of the arrow. Zinc chloride is a major product of the above reaction.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:49 AM

38. Which of the following changes is endothermic for the underlined object?

- i. Baking a potato
 - ii. A person being burned by a pan
 - iii. A wood log burning
 - iv. A lit light bulb shining
 - v. A person digesting food
- a. iii only
 - b. iii and iv
 - c. iii and iv
 - d. i and iv
 - e. i and ii

ANSWER: e

RATIONALE: Analysis: A. Incorrect. See Section 2.9, Goal 15. B. Incorrect. See Section 2.9, Goal 15. C. Incorrect. See Section 2.9, Goal 15. D. Incorrect. See Section 2.9, Goal 15. E. Correct.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: An endothermic reaction is a chemical change that removes energy from the surroundings. Baking a potato and a person being burned by a pan are endothermic reactions. A wood log burning, a lit light bulb shining, and a person digesting food are exothermic reactions.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:51 AM

39. Which of the following changes is/are exothermic for the underlined object?

- i. Ice melts
 - ii. Hot french fries cool
 - iii. A beaker warms as chemicals react within it
 - iv. A hot plate warms a beaker of water
 - v. Water evaporates off of skin
- a. iii and iv
 - b. i and v
 - c. ii only
 - d. All are exothermic
 - e. None is exothermic

ANSWER: c

RATIONALE: Analysis: A. Incorrect. See Section 2.9, Goal 15. B. Incorrect. See Section 2.9, Goal 15. C. Correct. D. Incorrect. See Section 2.9, Goal 15. E. Incorrect. See Section 2.9, Goal 15.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: A chemical change that transfers energy to its surroundings is called an exothermic reaction. In an exothermic reaction, the energy term appears as a product; heat energy is transferred from the system. Hot French fries cool is an exothermic change because the heat energy is transferred.

Chapter 02: Matter and Energy

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:52 AM

40. Which of the following statement is *false* regarding the exothermic/endothemic reaction?
- A chemical change that releases energy to its surroundings is called an exothermic reaction
 - A chemical change that absorbs energy from its surroundings is called an endothermic reaction
 - “Sodium + Fluorine \rightarrow Sodium fluoride + Energy” is an example of an exothermic reaction
 - “ $2 A_2B + \text{Energy} \rightarrow 2 A_2 + B_2$ ” is an example of an exothermic reaction
 - All of the above statements are true.

ANSWER: d

RATIONALE: Analysis: A. Incorrect. See Section 2.9, Goal 15. B. Incorrect. See Section 2.9, Goal 15. C. Incorrect. See Section 2.9, Goal 15. D. Correct. E. Incorrect. See Section 2.9, Goal 15.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: An exothermic reaction is a chemical reaction that releases heat and gives net energy to its surrounding.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 2:54 AM

41. A book is pushed off a table, and it falls to the floor. Which of the following statement about the book is *false*?
- Its potential energy is at a maximum just as it leaves the table.
 - Its kinetic energy is at a maximum just before it hits the floor.
 - Its kinetic energy is equal to its potential energy at a point halfway between the table and the floor.
 - Its potential energy is reduced.
 - All of the above statements are true.

ANSWER: e

RATIONALE: Analysis: A. Incorrect. See Section 2.9, Goal 16. B. Incorrect. See Section 2.9, Goal 16. C. Incorrect. See Section 2.9, Goal 16. D. Incorrect. See Section 2.9, Goal 16. E. Correct.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: Kinetic energy is defined as the energy that depends upon the mass and velocity of an object. Also, kinetic energy is at its maximum, while moving. Potential energy has maximum without moving the object (restoring forces)

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 5:24 AM

42. Which of the following statements is *false* about the kinetic and potential energy?
- As a positively charged object moves toward a negatively charged object, its potential energy increases.
 - As a positively charged object moves toward another positively charged object, its potential energy increases.
 - As a negatively charged object moves toward another negatively charged object, its potential energy increases.
 - Increasing the distance between two electrically charged objects may raise or lower their potential energy.
 - All of the above statements are true.

ANSWER: a

Chapter 02: Matter and Energy

RATIONALE: Analysis: A. Correct. B. Incorrect. See Section 2.9, Goal 16. C. Incorrect. See Section 2.9, Goal 16. D. Incorrect. See Section 2.9, Goal 16. E. Incorrect. See Section 2.9, Goal 16.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: When like-charged particles move closer to one another within a molecule or when unlike-charged particles move apart, the potential energy of the molecule increases.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 5:24 AM

43. Which of the following statements is *false* regarding the kinetic energy and potential energy?

- The potential energy of an object depends on its position in a field where forces of attraction and/or repulsion are present.
- Any moving object has kinetic energy.
- Minimization of energy is one of the driving forces that cause chemical reactions to occur.
- Kinetic energy is always greater than potential energy for an object.
- Most of what we call “mechanical energy” is kinetic energy.

ANSWER: d

RATIONALE: Analysis: A. Incorrect. See Section 2.9, Goal 16. B. Incorrect. See Section 2.9, Goal 16. C. Incorrect. See Section 2.9, Goal 16. D. Correct. E. Incorrect. See Section 2.9, Goal 16.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: As an object exerts kinetic energy, it loses some of it, in the form of friction due to surface contact. In case of height (potential energy) nothing happens. Potential energy is greater than kinetic energy.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 5:25 AM

44. When freshly cut sodium metal is exposed to air, the mass of the substance increases. Which of the following is the best explanation for this apparent violation of the Law of Conservation of Mass?

- The air “pushes down” on the metal, causing the balance to display a falsely high mass.
- The sodium atoms move closer to one another, causing the sample to gain mass.
- The sodium reacts with a component of the air, and the total mass of the reactants is equal to the total mass of the products.
- Thermal energy of the air is converted into the additional mass.
- The Law of Conservation of Mass does not apply to metals.

ANSWER: c

RATIONALE: Analysis: A. Incorrect. See Section 2.10, Goal 17. B. Incorrect. See Section 2.10, Goal 17. C. Correct. D. Incorrect. See Section 2.10, Goal 17. E. Incorrect. See Section 2.10, Goal 17.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: The Law of Conservation of Mass states that the total mass of the reactants in a chemical change is equal to the total mass of the products.

DATE CREATED: 2/26/2020 9:43 AM

Chapter 02: Matter and Energy

DATE MODIFIED: 3/5/2020 5:25 AM

45. When paper is burned, the mass of the remaining ash is less than the mass of the original paper. Which of the following is the best explanation for this apparent violation of the Law of Conservation of Mass?

- Some of the mass is converted into the heat energy evolved from burning.
- When invisible substances are taken into account, the total mass of the reactants is equal to the total mass of the products.
- The ash is more dense than the paper.
- The different molecular structure of the ash causes it to appear to have less mass until it is compacted.
- The mass of the ash cannot be accurately determined.

ANSWER: b

RATIONALE: Analysis: A. Incorrect. See Section 2.10, Goal 17. B. Correct. C. Incorrect. See Section 2.10, Goal 17. D. Incorrect. See Section 2.10, Goal 17. E. Incorrect. See Section 2.10, Goal 17.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: Burning is a chemical reaction between a burning object and the oxygen in air. The oxygen in the air is the reactant. The carbon dioxide and water vapor are the products. The Law of Conservation of Mass states that the total mass of the reactants in a chemical change is equal to the total mass of the products.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 5:26 AM

46. Which of the following is the best statement of the Law of Conservation of Mass?

- In any non-nuclear change, energy is conserved.
- In a chemical change, the mass of the reactants is always greater than or equal to the mass of the products.
- In a chemical change, the mass of the products is always greater than or equal to the mass of the reactants.
- For endothermic chemical reactions, the mass of the products is greater than the mass of the reactants, and for exothermic chemical reactions, the mass of the products is less than the mass of the reactants.
- In a chemical change, mass is neither created nor destroyed.

ANSWER: e

RATIONALE: Analysis: A. Incorrect. See Section 2.9, Goal 16. B. Incorrect. See Section 2.9, Goal 16. C. Incorrect. See Section 2.9, Goal 16. D. Incorrect. See Section 2.9, Goal 16. E. Correct.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: The Law of Conservation of Mass states that the total mass of the reactants in a chemical change is equal to the total mass of the products.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 5:15 AM

47. When coasting on a bicycle on a level street, the bicycle will eventually come to a stop. Which of the following is the best explanation for this apparent violation of the Law of Conservation of Energy?

- The kinetic energy is converted into an equal amount of energy in other forms.
- The rubber in the tires is converted into energy.
- If there was no air resistance, the bicycle would continue moving indefinitely.

Chapter 02: Matter and Energy

- d. The street must actually be slightly angled uphill.
- e. This is not a chemical reaction, so it does not obey the Law of Conservation of Energy.

ANSWER: a

RATIONALE: Analysis: A. Correct. B. Incorrect. See Section 2.10, Goal 18. C. Incorrect. See Section 2.10, Goal 18. D. Incorrect. See Section 2.10, Goal 18. E. Incorrect. See Section 2.10, Goal 18.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: The Law of Conservation of Energy states that the total energy of an isolated system remains constant. It is conserved over time. Even when a chemical change occurs within that system, the energy of the system is conserved. It is neither created nor destroyed. Hence, kinetic energy is converted into equal amount of energy in other forms.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 5:17 AM

48. When room temperature solutions of vinegar and drain cleaner are combined, the temperature of the resulting solution is greater than room temperature. Which of the following is the best explanation for this apparent violation of the Law of Conservation of Energy?

- a. Some of the mass of the room temperature solutions is converted into heat energy.
- b. The total energy of the original solutions is equal to the total energy of the resulting solution plus the heat energy.
- c. An ordinary chemical reaction occurs, so the Law of Conservation of Energy does not apply.
- d. The thermometer used to measure the temperature of the solutions must be faulty.
- e. The Law of Conservation of Energy does not apply to heat energy.

ANSWER: b

RATIONALE: Analysis: A. Incorrect. See Section 2.10, Goal 18. B. Correct. C. Incorrect. See Section 2.10, Goal 18. D. Incorrect. See Section 2.10, Goal 18. E. Incorrect. See Section 2.10, Goal 18.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: The Law of Conservation of Energy states that the quantity of energy within an isolated system does not change. Even when a chemical change occurs within that system, the energy of the system is conserved. It is neither created nor destroyed. Total mass of reactants are always equal to the total mass of products.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 5:17 AM

49. Which of the following is the best statement of the Law of Conservation of Energy?

- a. Kinetic energy cannot be converted into potential energy.
- b. Kinetic energy cannot be converted into chemical energy.
- c. Potential energy cannot be converted into chemical energy.
- d. Energy is neither created nor destroyed in an ordinary change.
- e. The total energy of the products of a chemical reaction is greater than or equal to the total energy of the reactants.

ANSWER: d

RATIONALE: Analysis: A. Incorrect. See Section 2.10, Goal 18. B. Incorrect. See Section 2.10, Goal 18. C.

Chapter 02: Matter and Energy

Incorrect. See Section 2.10, Goal 18. D. Correct. E. Incorrect. See Section 2.10, Goal 18.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: The Law of Conservation of Energy states that the quantity of energy within an isolated system does not change. Even when a chemical change occurs within that system, the energy of the system is conserved. It is neither created nor destroyed.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 3/5/2020 5:19 AM

50. Under what condition is the Law of Conservation of Energy not obeyed?

- a. Digestion of food
- b. Human (and some animal) metabolism of sports drinks
- c. High speed travel, such as in military jets and the space shuttle
- d. Nuclear changes
- e. The Law of Conservation of Energy is always obeyed

ANSWER: d

RATIONALE: Analysis: A. Incorrect. See Section 2.10, Goal 18. B. Incorrect. See Section 2.10, Goal 18. C. Incorrect. See Section 2.10, Goal 18. D. Correct. E. Incorrect. See Section 2.10, Goal 18.

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

OTHER: According to the Law of Conservation of Energy, energy can be neither created nor destroyed. During nuclear reaction, mass is converted into energy, violating the Law of Conservation of Energy.

DATE CREATED: 2/26/2020 9:43 AM

DATE MODIFIED: 2/29/2020 4:05 AM