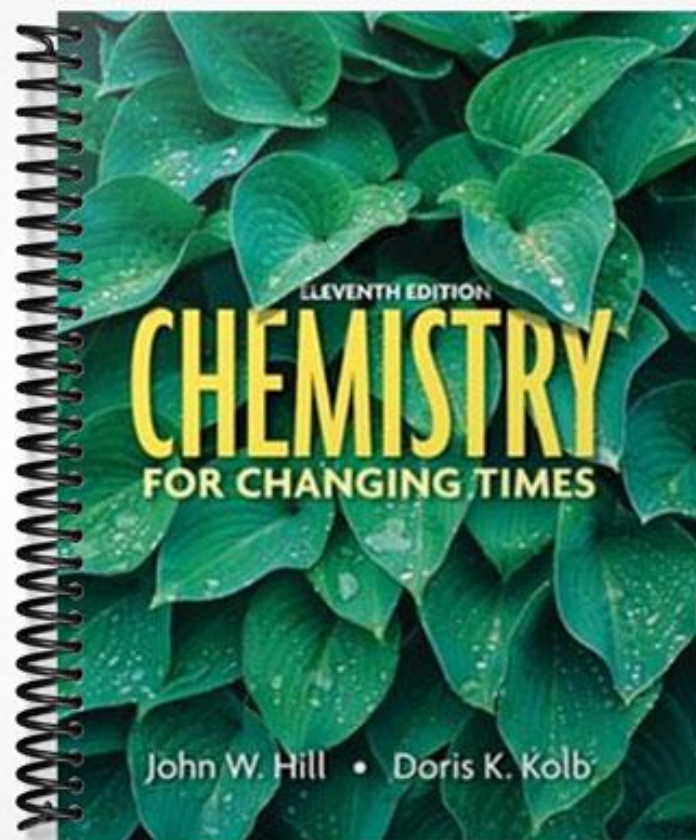


**TEST BANK**



## Chemistry for Changing Times, 11e (Hill/Kolb)

### Chapter 2: Atoms

#### Multiple Choice Questions

1) The Greek word **atomos** means

- A) atom.
- B) indivisible.
- C) invisible.
- D) continuous.

Answer: B

Type: MC      Page Ref: Sec. 2.1

2) Leucippus and Democritus proposed the "first" atomic view of matter. They arrived at this view based on

- A) many experiments.
- B) careful measurements.
- C) philosophical and intuitive speculation.
- D) All of the above contributed to their atomic view.

Answer: C

Type: MC      Page Ref: Sec. 2.1

3) The ancient Greeks believed that matter was composed of four basic elements. Which one of the following **WAS NOT** one of the four?

- A) gold
- B) fire
- C) water
- D) earth

Answer: A

Type: MC      Page Ref: Sec. 2.1

4) An atomic **view** of matter was first proposed approximately how many years ago?

- A) 50
- B) 100
- C) 200
- D) 2000

Answer: D

Type: MC      Page Ref: Sec. 2.1

5) Which of the following people believed that matter was continuous and was not made up of atoms?

- A) Aristotle
- B) Dalton
- C) Democritus
- D) Lavoisier

Answer: A

Type: MC      Page Ref: Sec. 2.1

6) The "father of modern chemistry" is

- A) Boyle.
- B) Lavoisier.
- C) Mendeleev.
- D) Proust.

Answer: B

Type: MC Page Ref: Sec. 2.2

7) 32 g of sulfur will react with 48 g of oxygen to produce 80 g of sulfur trioxide. If 32 g of sulfur and 100 g of oxygen are placed into a sealed container and allowed to react, what is the mass of the material in the container after the reaction is completed?

- A) 32 g
- B) 80 g
- C) 100 g
- D) 132 g

Answer: D

Type: MC Page Ref: Sec. 2.2

8) By definition, which of the following can be broken down into simpler substances?

- A) compound
- B) element
- C) gas
- D) liquid

Answer: A

Type: MC Page Ref: Sec. 2.2

9) Lavoisier performed many of the same experiments as his predecessors. The one thing that most distinguished Lavoisier's work was

- A) the results.
- B) the mass measurements.
- C) the chemicals.
- D) the glassware.

Answer: B

Type: MC Page Ref: Sec. 2.2

10) By measuring the mass of substances before and after chemical reactions, Lavoisier summarized his observations with a(n)

- A) hypothesis.
- B) observation.
- C) theory.
- D) law.

Answer: D

Type: MC Page Ref: Sec. 2.2

- 11) Which one of the following statements **IS NOT** a correct statement of the Law of Conservation of Mass?
- A) The mass of a system is dependent upon chemical reactions that may occur.
  - B) The mass of a system is conserved in a chemical reaction.
  - C) Matter cannot be created or destroyed.
  - D) Atoms are conserved in chemical reactions.
- Answer: A  
Type: MC      Page Ref: Sec. 2.2
- 12) A mixture containing 15 grams of carbon and 25 grams of oxygen is sealed in a flask. The total mass of the system is 140 grams. The flask is heated to cause the carbon and oxygen to react. The sealed flask is massed. What is the mass of the sealed flask?
- A) 40 grams
  - B) 100 grams
  - C) 125 grams
  - D) 140 grams
- Answer: D  
Type: MC      Page Ref: Sec. 2.2
- 13) A student measures 10.5 g of mercury(II) oxide into an open test tube and heats. The heat causes the mercury(II) oxide to decompose into mercury and oxygen. After reaction, the student finds the mass of the contents of the tube to be 9.7 g. Which one of the following describes these observations?
- A) The decomposition of mercury(II) oxide does not obey the Law of Conservation of Mass.
  - B) 0.8 grams of oxygen gas are lost from the tube.
  - C) There are errors associated with the student's measurements.
  - D) Heating destroys some mass.
- Answer: B  
Type: MC      Page Ref: Sec. 2.2
- 14) The amount of carbon on the earth, including the atmosphere,
- A) is essentially constant.
  - B) is decreasing due to consumption of carbon based fuels, such as coal and petroleum.
  - C) is increasing due to plant and animal growth on the planet.
  - D) fluctuates dramatically with the seasons.
- Answer: A  
Type: MC      Page Ref: Sec. 2.2
- 15) The amount of aluminum on the earth today relative to the amount 100 years ago when Al was first commercially extracted from bauxite, an aluminum containing ore,
- A) is essentially the same.
  - B) is decreasing rapidly due to production of aluminum beverage containers.
  - C) is decreasing, but more slowly recently due to interest in recycling.
  - D) is actually increasing due to recycling efforts and more energy efficient production methods.
- Answer: A  
Type: MC      Page Ref: Sec. 2.2

- 16) Hydrogen peroxide decomposes into water and oxygen when exposed to heat or light. A tightly capped bottle of hydrogen peroxide is placed on a mass scale (a balance) and exposed to light for three weeks. The mass reading on the scale does not change. This is an example of
- A) the Law of Conservation of Mass.
  - B) the Law of Definite Proportions.
  - C) the Law of Constant Composition.
  - D) the Law of Multiple Proportions.

Answer: A

Type: MC Page Ref: Sec. 2.2

- 17) Methane can be decomposed into two simpler substances, hydrogen and carbon. Therefore, methane
- A) is a gas.
  - B) cannot be an element.
  - C) must be a mixture.
  - D) must have the formula CH.

Answer: B

Type: MC Page Ref: Sec. 2.2

- 18) The ability to recycle aluminum (or glass, or plastic) is ultimately an illustration of
- A) the law of the conservation of mass.
  - B) the law of definite proportions.
  - C) the ingenuity of chemists.
  - D) the law of multiple proportions.

Answer: A

Type: MC Page Ref: Sec. 2.2

- 19) When electricity is passed through molten potassium bromide, two simpler substances, potassium and bromine, are produced. Therefore, potassium bromide
- A) cannot be an element.
  - B) must be a mixture.
  - C) has less mass than the resulting potassium and bromine do.
  - D) must have the formula PB.

Answer: A

Type: MC Page Ref: Sec. 2.2

- 20) The Law of Definite Proportions was first stated by
- A) Lavoisier.
  - B) Galileo.
  - C) Dalton.
  - D) Proust.

Answer: D

Type: MC Page Ref: Sec. 2.3

21) When added to a sealed flask and heated, 6.0 g of carbon and 16.0 g of oxygen react to form 22.0 g of carbon dioxide. How much carbon dioxide is formed when 12.0 g of carbon is reacted with 100.0 g of oxygen?

- A) 22.0 g
- B) 28.0 g
- C) 44.0 g
- D) 112.0 g

Answer: C

Type: MC Page Ref: Sec. 2.3

22) The observation that 20 g of hydrogen gas always combines with 160 g of oxygen gas to form 180 g of water, even when there is more than 160 g of oxygen present in the reaction container, illustrates the law of

- A) definite proportions.
- B) multiple proportions.
- C) ideal gases.
- D) excess reactants.

Answer: A

Type: MC Page Ref: Sec. 2.3

23) No matter how much extra oxygen is available, 12 grams of carbon always combines with 32 grams of oxygen. This best illustrates the law of

- A) conservation of mass.
- B) definite proportions.
- C) multiple proportions.
- D) conservation of energy.

Answer: B

Type: MC Page Ref: Sec. 2.3

24) Heptane is always composed of 84.0% carbon and 16.0% hydrogen. This illustrates the law of

- A) conservation of mass.
- B) definite proportions.
- C) multiple proportions.
- D) all of the above

Answer: B

Type: MC Page Ref: Sec. 2.3

25) When 10.00 g of lead and 1.56 grams of sulfur react, 11.56 g of lead sulfide is produced. Suppose 30.00 g of lead and 1.56 g of sulfur are allowed to react. Analysis of the reaction mixture would show

- A) 31.56 g of lead sulfide.
- B) 34.68 g of lead sulfide.
- C) 11.56 g of lead sulfide and 20.00 g of lead.
- D) no reaction

Answer: C

Type: MC Page Ref: Sec. 2.3

26) 2 g of sulfur will react with 3 g of oxygen to produce 5 g of sulfur trioxide. If 32 g of sulfur and 100 g of oxygen are placed into a sealed container and allowed to react, how much sulfur dioxide will be produced?

- A) 32 g
- B) 48 g
- C) 80 g
- D) 100 g

Answer: C

Type: MC Page Ref: Sec. 2.3

27) Sample A contains 75% carbon and 25% hydrogen. If sample B is the same substance, it will contain \_\_\_\_\_% carbon and \_\_\_\_\_% hydrogen.

- A) 60% carbon and 40% hydrogen
- B) 70% carbon and 30% hydrogen
- C) 75% carbon and 25% hydrogen
- D) 85% carbon and 15% hydrogen

Answer: C

Type: MC Page Ref: Sec. 2.3

28)  $C^{O_2}$  always contains 3 g of C for every 8 g of O. This is an example of

- A) Dalton's atomic theory.
- B) Lavoisier's Law of Conservation of Mass.
- C) Dalton's Law of Multiple Proportions.
- D) Proust's Law of Definite Proportions.

Answer: D

Type: MC Page Ref: Sec. 2.3

29) Which of the following parts (postulates) of Dalton's atomic theory has been modified in light of later discoveries?

- A) All matter is made up of very small particles called atoms.
- B) Atoms are indivisible.
- C) Chemical reactions involve rearrangement of atoms.
- D) Compounds are formed from atoms.

Answer: B

Type: MC Page Ref: Sec. 2.4

30) Which of the following laws is **NOT** explained by Dalton's atomic theory?

- A) the law of conservation of mass
- B) the law of definite proportions
- C) the law of multiple proportions
- D) the periodic law

Answer: D

Type: MC Page Ref: Sec. 2.4

31) \_\_\_\_\_ was the first person to propose a consistent "modern" atomic theory.

- A) Dalton
- B) Democritus
- C) Proust
- D) Lavoisier

Answer: A

Type: MC Page Ref: Sec. 2.4

32) Which discovery was **not** in conflict with Dalton's atomic theory?

- A) the discovery of electrical charge
- B) the discovery of the electron
- C) the discovery of the element gallium
- D) the discovery of the proton

Answer: C

Type: MC Page Ref: Sec. 2.4

33) After many observations, Proust stated that elements combine in definite proportions to form compounds. Dalton explained these observations by proposing that matter must consist of atoms. Dalton's explanation is called a(n)

- A) law.
- B) theory.
- C) hypothesis.
- D) observation.

Answer: B

Type: MC Page Ref: Sec. 2.4

34) Nitrogen forms a number of different compounds with oxygen, depending upon the experimental conditions. This type of observation concerning the behavior of matter is summarized by

- A) the law of conservation of mass.
- B) the law of definite proportions.
- C) the law of constant composition.
- D) the law of multiple proportions.

Answer: D

Type: MC Page Ref: Sec. 2.4

35) Which one of the following **IS NOT** part of Dalton's atomic theory?

- A) Matter is composed of atoms.
- B) Atoms of the same element have the same properties.
- C) Atoms of different elements have different properties.
- D) Atoms change into other atoms in chemical reactions.

Answer: D

Type: MC Page Ref: Sec. 2.4



36) Although all parts (postulates) of Dalton's atomic theory are important, which one of the postulates is crucial to explain the observations summarized by the Law of Definite Proportions?

- A) Matter is composed of atoms.
- B) Atoms of the same element have the same properties.
- C) Atoms combine with other atoms in fixed, whole number ratios to form compounds.
- D) Atoms are very small.

Answer: C

Type: MC Page Ref: Sec. 2.4

37) Which one of the following **DOES NOT** occur in a chemical reaction?

- A) matter is rearranged
- B) matter is conserved
- C) atoms react with other atoms
- D) atoms are changed into other atoms

Answer: D

Type: MC Page Ref: Sec. 2.4

38) Dalton explained the law of conservation of mass by stating that atoms are neither created nor destroyed in a chemical reaction. Dalton's explanation is an example of a scientific

- A) theory.
- B) law.
- C) hypothesis.
- D) experiment.

Answer: A

Type: MC Page Ref: Sec. 2.4

39) Which set of compounds illustrates the law of **multiple proportions**?

- A)  $\text{NH}_3$ ,  $\text{PH}_3$ ,  $\text{AsH}_3$
- B)  $\text{NH}_3$ ,  $\text{NF}_3$ ,  $\text{NCl}_3$
- C)  $\text{NH}_3$ ,  $\text{N}_2\text{H}_4$
- D) all of these

Answer: C

Type: MC Page Ref: Sec. 2.4

40) Which set of compounds illustrates the law of **multiple proportions**?

- A)  $\text{CH}_4$ ,  $\text{C}_2\text{H}_6$ ,  $\text{C}_3\text{H}_8$
- B)  $\text{NO}$ ,  $\text{NH}_3$ ,  $\text{NH}_4\text{Cl}$
- C)  $\text{H}_2\text{O}$ ,  $\text{H}_2$
- D) all of these

Answer: A

Type: MC Page Ref: Sec. 2.4

41) Under conditions of limited oxygen, carbon burns to form carbon monoxide, a poisonous gas. In conditions with unlimited oxygen, carbon burns to form carbon dioxide. This illustrates the law of

- A) conservation of mass.
- B) definite proportions.
- C) different chemical reactions.
- D) multiple proportions.

Answer: D

Type: MC Page Ref: Sec. 2.4

42) In plentiful air, 3.0 parts of carbon react with 8.0 parts of oxygen to form carbon dioxide. How much carbon is required to produce 2200 g of carbon dioxide?

- A) 6600
- B) 3300
- C) 1200
- D) 600

Answer: D

Type: MC Page Ref: Sec. 2.4

43) Which set of compounds illustrates the law of **multiple proportions**?

- A)  $\text{SO}_2$ ,  $\text{SO}_3$
- B)  $\text{N}_2\text{O}$ ,  $\text{NO}$ ,  $\text{NO}_2$
- C)  $\text{H}_2\text{O}$ ,  $\text{H}_2\text{O}_2$
- D) all of these

Answer: D

Type: MC Page Ref: Sec. 2.4

44) John Dalton discovered which of the following laws?

- A) The Law of Conservation of Mass
- B) The Law of Definite Proportions
- C) The Law of Constant Composition
- D) The Law of Multiple Proportions

Answer: D

Type: MC Page Ref: Sec. 2.4

45) Mendeleev organized the elements

- A) by increasing atomic number and similar properties.
- B) by increasing atomic weight and similar properties.
- C) alphabetically by name.
- D) by number of electrons.

Answer: B

Type: MC Page Ref: Sec. 2.5

46) The unit of atomic weight is

- A) atomic weight unit.
- B) atomic mass unit.
- C) microgram.
- D) the mass of an electron.

Answer: B

Type: MC Page Ref: Sec. 2.5

- 47) The atomic masses for elements are
- A) actual masses determined by weighing individual atoms.
  - B) relative masses determined by comparison with a standard reference.
  - C) the same as the atomic number.
  - D) unknown.
- Answer: B  
Type: MC      Page Ref: Sec. 2.5
- 48) Perhaps the greatest triumph of Mendeleev's periodic table was
- A) the use of rows and columns to organize the elements.
  - B) the ability to predict electron configurations of elements.
  - C) the use of atomic numbers as an organizing criterion.
  - D) the prediction of the existence of undiscovered elements.
- Answer: D  
Type: MC      Page Ref: Sec. 2.5
- 49) The scientist who in 1828 published a table of atomic weights containing 54 elements was
- A) Dalton.
  - B) Berzelius.
  - C) Mendeleev.
  - D) Boyle.
- Answer: B  
Type: MC      Page Ref: Sec. 2.5
- 50) The Periodic Table is helpful in all of the following endeavors but one. Which is the exception?
- A) predicting formulas of compounds
  - B) predicting chemical reactivity of elements
  - C) predicting physical properties of elements
  - D) predicting monetary values of elements
- Answer: D  
Type: MC      Page Ref: Sec. 2.5
- 51) Mendeleev's statement of the **periodic law** is "the properties of the elements are periodic functions of their \_\_\_\_\_."
- A) atomic masses
  - B) atomic numbers
  - C) both atomic weights and atomic numbers
  - D) position in his periodic table
- Answer: A  
Type: MC      Page Ref: Sec. 2.5
- 52) The modern periodic law of the elements states that the properties of the element are periodic functions of
- A) atomic masses.
  - B) atomic numbers.
  - C) both atomic weights and atomic numbers.
  - D) position in the periodic table.
- Answer: B  
Type: MC      Page Ref: Sec. 2.5

53) What is the name of the Russian chemist who was a pioneer in the development of the periodic law?

- A) Meyerovic
- B) Mendeleev
- C) Döbereiner
- D) Newlands

Answer: B

Type: MC Page Ref: Sec. 2.5

54) When Mendeleev developed his periodic table, he placed the **greatest** emphasis on

- A) the atomic numbers of the elements
- B) putting elements with similar properties in the same column
- C) leaving no holes or blank spaces in the table
- D) the melting points of the elements

Answer: B

Type: MC Page Ref: Sec. 2.5

55) The "box" for an element on the periodic table will include all of the following information about an element EXCEPT

- A) its atomic number.
- B) the proportion of the element in a compound.
- C) its atomic symbol.
- D) its atomic mass.

Answer: B

Type: MC Page Ref: Sec. 2.5

56) Mendeleev published his periodic table in 1869. All of the following can be considered as "precursors" of the modern periodic table EXCEPT:

- A) Dalton's "Atomic Theory".
- B) De Chancourtois's "Telluric Helix".
- C) Dobereiner's "Triads".
- D) Newlands's "Law of Octaves".

Answer: A

Type: MC Page Ref: Sec. 2.5

57) Is it always possible to recycle and reuse materials?

- A) Yes, because atoms cannot be destroyed in a chemical reaction.
- B) Yes, because atoms can only be rearranged in a chemical reaction.
- C) No, because atoms can be changed into other kinds of atoms.
- D) No, because the atoms may be spread so thinly that it would take too much time and energy to collect them and bring them back together.

Answer: D

Type: MC Page Ref: Sec. 2.6

58) For which of the following would recycling of iron not be practical?

- A) Old cars that are compressed in junkyards.
- B) Steel beams that have been removed from a bridge.
- C) Rust that flakes off a car body.
- D) Wrought iron fences.

Answer: C

Type: MC Page Ref: Sec. 2.6

59) If drops of water are subdivided to the ultimately smallest drops possible, what is the smallest particle of water that retains the chemical and physical properties of water?

- A) molecule
- B) mixture
- C) atom
- D) micron

Answer: A

Type: MC Page Ref: Sec. 2.7

60) All of the following are molecules EXCEPT

- A) CO<sub>2</sub>
- B) CO
- C) O
- D) O<sub>3</sub>

Answer: C

Type: MC Page Ref: Sec. 2.7

### True/False Questions

1) Leucippus and Democritus based their ideas about atoms on careful experimental results.

Answer: True  False

Type: TF Page Ref: Sec. 2.1

2) During a chemical reaction, matter can neither be created nor destroyed.

Answer:  True  False

Type: TF Page Ref: Sec. 2.2

3) Lavoisier's experiments showed that matter can be gained or lost in a chemical change.

Answer: True  False

Type: TF Page Ref: Sec. 2.2

4) The Law of Constant Composition and the Law of Definite Proportions are different names for the same phenomenon.

Answer:  True  False

Type: TF Page Ref: Sec. 2.3

5) Substance A contains 75% carbon and 25% hydrogen. Substance B contains 80% carbon and 20% hydrogen. A and B are the same substance.

Answer: True  False

Type: TF Page Ref: Sec. 2.3

- 6) Ammonia and hydrazine are compounds composed of only hydrogen and nitrogen. These compounds illustrate the law of multiple proportions.  
Answer:  True  False  
Type: TF Page Ref: Sec. 2.4
- 7) Dalton's atomic theory states that atoms may change into other atoms in a chemical reaction.  
Answer: True  False  
Type: TF Page Ref: Sec. 2.4
- 8) Mendeleev was the first person to attempt to arrange the elements in a systematic order.  
Answer: True  False  
Type: TF Page Ref: Sec. 2.5
- 9) Mendeleev arranged the elements in his periodic table solely in order of increasing atomic mass.  
Answer: True  False  
Type: TF Page Ref: Sec. 2.5
- 10) Scientists can observe computer enhanced images of atoms.  
Answer:  True  False  
Type: TF Page Ref: Sec. 2.6
- 11) A molecule is a group of atoms that are chemically bonded together.  
Answer:  True  False  
Type: TF Page Ref: Sec. 2.7

### Short Answer Questions

- 1) Antoine Lavoisier is often credited with doing more than anyone else to establish chemistry as a quantitative science. What was the significance of Lavoisier's work?  
Answer: careful measurements on chemical reactions  
Type: SA Page Ref: Sec. 2.2
- 2) When 10.0 g of lead are heated with 1.6 g of sulfur, 11.6 g of lead sulfide are formed. How many grams of lead sulfide form when 10.0 g of lead are heated with 3.0 g of sulfur?  
Answer: 11.6 g  
Type: SA Page Ref: Sec. 2.3
- 3) Describe what happens in a chemical reaction.  
Answer: The arrangement of atoms changes.  
Type: SA Page Ref: Sec. 2.4
- 4) In light of present day knowledge criticize Dalton's proposal that atoms are indivisible.  
Answer: Radioactive elements decompose into elements that are different from the parent element and emit particles in the process.  
Type: SA Page Ref: Sec. 2.4
- 5) Explain why Mendeleev left gaps in his periodic table of the elements.  
Answer: Mendeleev left gaps in his periodic table so that elements with similar properties could be grouped together. He correctly predicted that the gaps would correspond to elements that had not been discovered at that time.  
Type: SA Page Ref: Sec. 2.5

### Essay Questions

1) What is the significance of the Law of Conservation of Mass in waste disposal?

Answer:

Type: ES      Page Ref: Sec. 2.2

2) Distinguish a compound from a mixture.

Answer:

Type: ES      Page Ref: Sec. 2.3