

*Chemistry, 7e (McMurry/Fay)*  
**Chapter 2 Atoms, Molecules, and Ions**

2.1 Multiple-Choice Questions

1) What is the chemical symbol for manganese?

- A) Hg
- B) Mg
- C) Mn
- D) Na

Answer: C

Diff: 2 Var: 1

Topic: Section 2.1 Chemistry and the Elements

Learning Obj: LO 2.1 Use symbols to represent the elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

2) Which element has the chemical symbol, P?

- A) lead
- B) phosphorus
- C) platinum
- D) potassium

Answer: B

Diff: 2 Var: 1

Topic: Section 2.1 Chemistry and the Elements

Learning Obj: LO 2.1 Use symbols to represent the elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

3) According to history, the concept that all matter is composed of atoms was first proposed by

- A) the Greek philosopher Democritus, but not widely accepted until modern times.
- B) Dalton, but not widely accepted until the work of Mendeleev.
- C) Dalton, but not widely accepted until the work of Einstein.
- D) Dalton, and widely accepted within a few decades.

Answer: A

Diff: 1 Var: 1

Topic: Section 2.1 Chemistry and the Elements

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

4) Mendeleev arranged the elements according to

- A) atomic number and atomic weight.
- B) atomic weight and chemical reactivity.
- C) electron configuration and atomic weight.
- D) physical state and relative abundance.

Answer: B

Diff: 1 Var: 1

Topic: Section 2.2 Elements and the Periodic Table

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

5) Which is **not** true?

- A) Mendeleev ended each row in his periodic table with an inert gas.
- B) Mendeleev left gaps in his periodic table for undiscovered elements.
- C) Mendeleev ordered the elements in his periodic table by atomic weight.
- D) Mendeleev's periodic table predated the concept of electron configuration.

Answer: A

Diff: 1 Var: 1

Topic: Section 2.2 Elements and the Periodic Table

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

6) The horizontal rows of the periodic table are called

- A) groups.
- B) periods.
- C) triads.
- D) elements.

Answer: B

Diff: 1 Var: 1

Topic: Section 2.2 Elements and the Periodic Table

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

7) The vertical columns of the periodic table are called

- A) groups.
- B) periods.
- C) triads.
- D) elements.

Answer: A

Diff: 1 Var: 1

Topic: Section 2.2 Elements and the Periodic Table

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

8) Most elements in the periodic table are

- A) metals.
- B) non-metals.
- C) noble gases.
- D) semi-metals.

Answer: A

Diff: 1 Var: 1

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

9) Elements in a periodic group have similar

- A) chemical properties.
- B) densities.
- C) masses.
- D) physical properties.

Answer: A

Diff: 1 Var: 1

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

10) Which horizontal row of the periodic table contains the most elements?

- A) row 4
- B) row 5
- C) row 6
- D) They all contain the same number of elements.

Answer: C

Diff: 1 Var: 1

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

11) Which of the following statements does **not** describe a physical property of chlorine?

- A) Chlorine combines with sodium to form table salt.
- B) The color of chlorine gas is green.
- C) The density of chlorine gas at standard temperature and pressure is 3.17 g/L.
- D) The freezing point of chlorine is  $-101^{\circ}\text{C}$ .

Answer: A

Diff: 1 Var: 1

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

12) Which of the following statements does **not** describe a chemical property of oxygen?

- A) Iron will rust in the presence of oxygen.
- B) Oxygen combines with carbon to form carbon dioxide gas.
- C) The pressure is caused by collision of oxygen molecules with the sides of a container.
- D) When coal is burned in oxygen, the process is called combustion.

Answer: C

Diff: 1 Var: 1

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

13) Which group 5A element is most metallic?

- A) N
- B) P
- C) Sb
- D) Bi

Answer: D

Diff: 2 Var: 1

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

14) Which group of elements reacts violently with water?

- A) halogens
- B) noble gases
- C) alkali metals
- D) alkaline earth metals

Answer: C

Diff: 2 Var: 1

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

15) Gaseous elements characterized by low reactivity are found in group \_\_\_\_\_ of the periodic table.

- A) 5A
- B) 6A
- C) 7A
- D) 8A

Answer: D

Diff: 2 Var: 1

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

16) The observation that 15.0 g of hydrogen reacts with 120.0 g of oxygen to form 135.0 g of water is evidence for the law of

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

Answer: C

Diff: 1 Var: 1

Topic: Section 2.4 Observations Supporting Atomic Theory: The Conservation of Mass and the Law of Definite Proportions

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

17) The observation that 4.0 g of hydrogen reacts with 32.0 g of oxygen to form a product with O:H mass ratio = 8:1, and 6.0 g of hydrogen reacts with 48.0 g of oxygen to form the same product with O/H mass ratio = 8:1 is evidence for the law of

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

Answer: A

Diff: 1 Var: 1

Topic: Section 2.4 Observations Supporting Atomic Theory: The Conservation of Mass and the Law of Definite Proportions

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

18) Methane and oxygen react to form carbon dioxide and water. What mass of water is formed if 3.2 g of methane reacts with 12.8 g of oxygen to produce 8.8 g of carbon dioxide?

- A) 7.2 g
- B) 8.8 g
- C) 14.8 g
- D) 16.0 g

Answer: A

Diff: 2 Var: 1

Topic: Section 2.4 Observations Supporting Atomic Theory: The Conservation of Mass and the Law of Definite Proportions

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

19) Sodium metal and water react to form hydrogen and sodium hydroxide. If 5.98 g of sodium react with water to form 0.26 g of hydrogen and 10.40 g of sodium hydroxide, what mass of water was consumed in the reaction?

- A) 4.68 g
- B) 5.98 g
- C) 10.14 g
- D) 10.66 g

Answer: A

Diff: 2 Var: 1

Topic: Section 2.4 Observations Supporting Atomic Theory: The Conservation of Mass and the Law of Definite Proportions

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

20) A sample of pure lithium carbonate contains 18.8% lithium by mass. What is the % lithium by mass in a sample of pure lithium carbonate that has twice the mass of the first sample?

- A) 9.40%
- B) 18.8%
- C) 37.6%
- D) 75.2%

Answer: B

Diff: 3 Var: 1

Topic: Section 2.5 The Law of Multiple Proportions and Dalton's Atomic Theory

Learning Obj: LO 2.8 Demonstrate the law of multiple proportions using mass composition of two compounds of the same elements.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

21) A sample of pure calcium fluoride with a mass of 15.0 g contains 7.70 g of calcium. How much calcium is contained in 45.0 g of calcium fluoride?

- A) 2.56 g
- B) 7.70 g
- C) 15.0 g
- D) 23.1 g

Answer: D

Diff: 3 Var: 1

Topic: Section 2.5 The Law of Multiple Proportions and Dalton's Atomic Theory

Learning Obj: LO 2.8 Demonstrate the law of multiple proportions using mass composition of two compounds of the same elements.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

22) The observation that hydrogen and oxygen can react to form two compounds with different chemical and physical properties, one having an O:H mass ratio = 8:1 and the other having an O:H mass ratio = 16:1 is consistent with the law of

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

Answer: D

Diff: 1 Var: 1

Topic: Section 2.5 The Law of Multiple Proportions and Dalton's Atomic Theory

Learning Obj: LO 2.8 Demonstrate the law of multiple proportions using mass composition of two compounds of the same elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

23) Which of the following statements is **not** a postulate of Dalton's atomic theory?

- A) Each element is characterized by the mass of its atoms.
- B) Atoms are composed of protons, neutrons, and electrons.
- C) Chemical reactions only rearrange atomic combinations.
- D) Elements are composed of atoms.

Answer: B

Diff: 1 Var: 1

Topic: Section 2.5 The Law of Multiple Proportions and Dalton's Atomic Theory

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

24) Which of the following is a part of Dalton's atomic theory?

- A) Atoms are rearranged but not changed during a chemical reaction.
- B) Atoms break down during radioactive decay.
- C) Atoms contain protons, neutrons, and electrons.
- D) Isotopes of the same element have different masses.

Answer: A

Diff: 1 Var: 1

Topic: Section 2.5 The Law of Multiple Proportions and Dalton's Atomic Theory

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

25) Which of the following is **not** explained by Dalton's atomic theory?

- A) conservation of mass during a chemical reaction
- B) the existence of more than one isotope of an element
- C) the law of definite proportions
- D) the law of multiple proportions

Answer: B

Diff: 1 Var: 1

Topic: Section 2.5 The Law of Multiple Proportions and Dalton's Atomic Theory

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

26) Elements A and Q form two compounds, AQ and A<sub>2</sub>Q<sub>3</sub>. The mass ratio (mass Q)/(mass A) for AQ is 0.574. What is the mass ratio (mass Q)/(mass A) for A<sub>2</sub>Q<sub>3</sub>?

- A) 0.383
- B) 0.861
- C) 1.16
- D) 2.61

Answer: B

Diff: 2 Var: 1

Topic: Section 2.5 The Law of Multiple Proportions and Dalton's Atomic Theory

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

27) Elements A and Q form two compounds, AQ and A<sub>2</sub>Q. Which of the following must be true?

- A) (mass Q)/(mass A) is one for AQ, and 1/2 for A<sub>2</sub>Q.
- B) (mass Q)/(mass A) for AQ must equal (mass Q)/(mass A) for A<sub>2</sub>Q.
- C) (mass Q)/(mass A) for AQ must be 2 times (mass Q)/(mass A) for A<sub>2</sub>Q.
- D) (mass Q)/(mass A) for AQ must be 1/2 (mass Q)/(mass A) for A<sub>2</sub>Q.

Answer: C

Diff: 2 Var: 1

Topic: Section 2.5 The Law of Multiple Proportions and Dalton's Atomic Theory

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

28) Elements A and Q form two compounds. The ratio (mass Q)/(mass A) for compound one is 0.271 and ratio (mass Q)/(mass A) for compound two is 0.362. If compound one has the chemical formula AQ, what is the chemical formula for compound two?

- A) A<sub>3</sub>Q<sub>4</sub>
- B) A<sub>2</sub>Q<sub>3</sub>
- C) AQ<sub>2</sub>
- D) AQ<sub>3</sub>

Answer: A

Diff: 2 Var: 1

Topic: Section 2.5 The Law of Multiple Proportions and Dalton's Atomic Theory

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

29) The existence of electrons in atoms of all elements was demonstrated by

- A) Millikan's oil drop experiment.
- B) Rutherford's gold foil experiment.
- C) Thomson's cathode ray tube experiment.
- D) None of these

Answer: C

Diff: 1 Var: 1

Topic: Section 2.6 Atomic Structure: Electrons

Learning Obj: LO 2.9 Describe Thomson's cathode-ray experiment and what it contributed to the current model of atomic structure. (Figure 2.3)

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

30) The charge-to-mass ratio of an electron was established by

- A) Millikan's oil drop experiment.
- B) Rutherford's gold foil experiment.
- C) Thomson's cathode ray tube experiment.
- D) None of these

Answer: C

Diff: 1 Var: 1

Topic: Section 2.6 Atomic Structure: Electrons

Learning Obj: LO 2.9 Describe Thomson's cathode-ray experiment and what it contributed to the current model of atomic structure. (Figure 2.3)

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

31) The current model of the atom in which essentially all of an atom's mass is contained in a very small nucleus, whereas most of an atom's volume is due to the space in which the atom's electrons move was established by

- A) Millikan's oil drop experiment.
- B) Rutherford's gold foil experiment.
- C) Thomson's cathode ray tube experiment.
- D) None of these

Answer: B

Diff: 1 Var: 1

Topic: Section 2.7 Atomic Structure: Protons and Neutrons

Learning Obj: LO 2.11 Describe Rutherford's gold foil experiment and what it contributed to the current model of atomic structure. (Figure 2.5)

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.



32) The existence of neutrons in the nucleus of an atom was demonstrated by

- A) Millikan's oil drop experiment.
- B) Rutherford's gold foil experiment.
- C) Thomson's cathode ray tube experiment.
- D) None of these

Answer: D

Diff: 1 Var: 1

Topic: Section 2.7 Atomic Structure: Protons and Neutrons

Learning Obj: LO 2.12 Describe the structure and size of the atom. (Figure 2.6)

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

33) Most of the alpha particles directed at a thin gold foil in Rutherford's experiment

- A) bounced directly back from the foil.
- B) passed directly through the foil undeflected.
- C) passed through the foil but were deflected at an angle.
- D) were absorbed by the foil.

Answer: B

Diff: 1 Var: 1

Topic: Section 2.7 Atomic Structure: Protons and Neutrons

Learning Obj: LO 2.11 Describe Rutherford's gold foil experiment and what it contributed to the current model of atomic structure. (Figure 2.5)

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

34) Which subatomic particle has the **smallest** mass?

- A) a proton
- B) a neutron
- C) an electron
- D) an alpha particle

Answer: C

Diff: 2 Var: 1

Topic: Section 2.7 Atomic Structure: Protons and Neutrons

Learning Obj: LO 2.12 Describe the structure and size of the atom. (Figure 2.6)

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

35) The symbol that is usually used to represent atomic number is

- A) *A*.
- B) *N*.
- C) *X*.
- D) *Z*.

Answer: D

Diff: 1 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.15 Write isotope symbols for elements.

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

36) The mass number of an atom is equal to the number of

- A) electrons.
- B) neutrons.
- C) protons.
- D) protons plus neutrons.

Answer: D

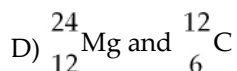
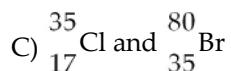
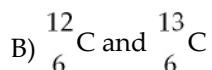
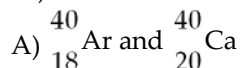
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Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

37) Which of the following two atoms are isotopes?



Answer: B

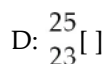
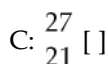
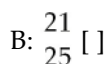
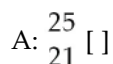
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Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

38) Which of the following represent isotopes?



- A) A and B
- B) A and C
- C) A and D
- D) C and D

Answer: B

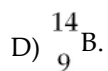
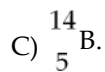
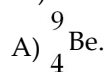
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Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.15 Write isotope symbols for elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

39) Boron-9 can be represented as



Answer: B

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.15 Write isotope symbols for elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

40) How many protons (p) and neutrons (n) are in an atom of  ${}^{90}_{38}\text{Sr}$ ?

A) 38 p, 52 n

B) 38 p, 90 n

C) 52 p, 38 n

D) 90 p, 38 n

Answer: A

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.15 Write isotope symbols for elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

41) How many protons (p) and neutrons (n) are in an atom of calcium-46?

A) 20 p, 26 n

B) 20 p, 46 n

C) 26 p, 20 n

D) 46 p, 60 n

Answer: A

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

42) What is the chemical symbol for an atom that has 29 protons and 36 neutrons?

- A) Cu
- B) Kr
- C) N
- D) Tb

Answer: A

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

43) How many electrons are in a neutral atom of iodine-131?

- A) 1
- B) 53
- C) 54
- D) 131

Answer: B

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

44) How many protons (p), neutrons (n), and electrons (e) are in one atom of  $^{23}_{12}\text{Mg}$ ?

- A) 12 p, 12 n, 12 e
- B) 12 p, 11 n, 12 e
- C) 12 p, 11 n, 10 e
- D) 12 p, 11 n, 14 e

Answer: B

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

45) Identify the chemical symbol of element Q in  $^{80}_{34}\text{Q}$ .

- A) Br
- B) Hg
- C) Pd
- D) Se

Answer: D

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.15 Write isotope symbols for elements.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

46) The atoms of a particular element all have the same number of protons as neutrons. Which of the following must be true?

- A) The atomic weight must be a whole number.
- B) The mass number for each atom must equal the atomic weight of the element.
- C) The mass number must be exactly twice the atomic number for each atom.
- D) All of these are true.

Answer: C

Diff: 1 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

47) Three atoms have the following properties.

	Proton	Neutron	Electron
Atom X	119	119	119
Atom Y	119	118	119
Atom Z	118	118	119

The elements X and Y are best described as

- A) isotopes.
- B) cations.
- C) different elements.
- D) anions.

Answer: A

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

48) Three atoms have the following properties.

	Proton	Neutron	Electron
Atom X	119	119	119
Atom Y	119	118	119
Atom Z	118	118	119

The elements Y and Z are best described as

- A) isotopes.
- B) cations.
- C) different elements.
- D) anions.

Answer: C

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

49) Three atoms have the following properties.

	Proton	Neutron	Electron
Atom X	119	119	119
Atom Y	119	119	118
Atom Z	118	118	119

Which of the following statements is true?

- A) Element Y and Z are isotopes of X.
- B) Element Y is an isotope of Z.
- C) Element Y is an ion of X.
- D) Element Z is an ion of Y.

Answer: C

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

50) What is the identity of the element with 6 protons, 7 neutrons, and 6 electrons?

- A) C
- B) N
- C) Al
- D) Mg

Answer: A

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

51) The smallest sample of carbon atoms that can be observed with the naked eye has a mass of approximately  $2 \times 10^{-8}$  g. Given that  $1 \text{ g} = 6.02 \times 10^{23}$  amu, and that carbon has an atomic weight of 12.01 amu, determine the number of carbon atoms present in the sample.

A)  $1 \times 10^{15}$

B)  $1 \times 10^{16}$

C)  $1 \times 10^{17}$

D)  $6 \times 10^{23}$

Answer: A

Diff: 3 Var: 1

Topic: Section 2.9 Atomic Weights and the Mole

Learning Obj: LO 2.17 Convert between grams and numbers of moles or atoms using molar mass and Avogadro's number.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

52) An element has two naturally occurring isotopes. One has an abundance of 37.4% and an isotopic mass of 184.953 amu, and the other has an abundance of 62.6% and a mass of 186.956 amu. What is the atomic weight of the element?

A) 185.702 amu

B) 185.954 amu

C) 186.207 amu

D) 186.956 amu

Answer: C

Diff: 3 Var: 1

Topic: Section 2.9 Atomic Weights and the Mole

Learning Obj: LO 2.16 Calculate atomic weight given the fractional abundance and mass of each isotope.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

53) The element antimony has an atomic weight of 121.757 amu and only two naturally-occurring isotopes. One isotope has an abundance of 57.3% and an isotopic mass of 120.904 amu. Based on these data, what is the mass of the other isotope?

A) 121.757 amu

B) 122.393 amu

C) 122.610 amu

D) 122.902 amu

Answer: D

Diff: 3 Var: 1

Topic: Section 2.9 Atomic Weights and the Mole

Learning Obj: LO 2.16 Calculate atomic weight given the fractional abundance and mass of each isotope.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

54) What is the mass of one atom of the element hydrogen?

- A) 2.0 g
- B) 1.0 g
- C)  $3.4 \times 10^{-24}$  g
- D)  $1.7 \times 10^{-24}$  g

Answer: D

Diff: 2 Var: 1

Topic: Section 2.9 Atomic Weights and the Mole

Learning Obj: LO 2.17 Convert between grams and numbers of moles or atoms using molar mass and Avogadro's number.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

55) How many moles and how many atoms of zinc are in a sample weighing 34.9 g?

- A) 0.533 mol,  $8.85 \times 10^{-25}$  atoms
- B) 0.533 mol,  $3.21 \times 10^{23}$  atoms
- C) 1.87 mol,  $3.10 \times 10^{-24}$  atoms
- D) 1.87 mol,  $1.13 \times 10^{24}$  atoms

Answer: B

Diff: 2 Var: 1

Topic: Section 2.9 Atomic Weights and the Mole

Learning Obj: LO 2.17 Convert between grams and numbers of moles or atoms using molar mass and Avogadro's number.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

56) Steel is galvanized by giving it a surface coating of zinc. Galvanized steel is an example of

- A) a compound.
- B) an element.
- C) a mixture.
- D) an ion.

Answer: C

Diff: 2 Var: 1

Topic: Section 2.10 Mixtures and Chemical Compounds: Molecules and Covalent Bonds

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

57) How many electrons are in the ion,  $\text{Zn}^{2+}$ ?

- A) 28
- B) 30
- C) 32
- D) 65

Answer: A

Diff: 2 Var: 1

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.22 Determine the number of electrons and protons from chemical symbol and charge.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.



58) How many electrons are in the ion,  $P^{3-}$ ?

- A) 12
- B) 18
- C) 28
- D) 34

Answer: B

Diff: 2 Var: 1

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.22 Determine the number of electrons and protons from chemical symbol and charge.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

59) What is the identity of element Q if the ion  $Q^{2+}$  contains 10 electrons?

- A) C
- B) O
- C) Ne
- D) Mg

Answer: D

Diff: 2 Var: 1

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.22 Determine the number of electrons and protons from chemical symbol and charge.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

60) How many electrons are in the ion,  $CO_3^{2-}$ ?

- A) 16
- B) 28
- C) 30
- D) 32

Answer: D

Diff: 2 Var: 1

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.22 Determine the number of electrons and protons from chemical symbol and charge.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

61) What type of bonding is found in the compound  $PCl_5$ ?

- A) covalent bonding
- B) hydrogen bonding
- C) ionic bonding
- D) metallic bonding

Answer: A

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.26 Convert between name and formula for binary molecular compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

62) Which of the species below has 28 protons and 26 electrons?

A)  $\text{Fe}^{2+}$

B)  $\text{Ni}^{2+}$

C)  ${}_{26}^{54}\text{Fe}$

D)  ${}_{28}^{54}\text{Ni}$

Answer: B

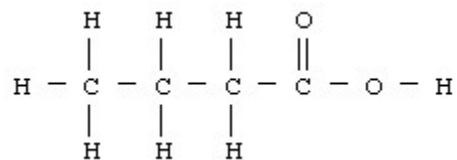
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Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

63) Butyric acid has the structural formula given below.



What is the molecular or chemical formula for butyric acid?

A) CHO

B)  $\text{C}_2\text{H}_4\text{O}$

C)  $\text{C}_4\text{H}_8\text{O}_2$

D)  $\text{C}_5\text{H}_8\text{O}_3$

Answer: C

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

64) The solid compound,  $\text{Na}_2\text{CO}_3$ , contains

A)  $\text{Na}^+$ ,  $\text{C}^{4+}$ , and  $\text{O}^{2-}$  ions.

B)  $\text{Na}^+$  ions and  $\text{CO}_3^{2-}$  ions.

C)  $\text{Na}_2^+$  and  $\text{CO}_3^{2-}$  ions.

D)  $\text{Na}_2\text{CO}_3$  molecules.

Answer: B

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

65) Which of the following statements concerning ionic compounds is true?

- A) Essentially all ionic compounds are solids at room temperature and pressure.
- B) Ionic compounds do not contain any covalent bonds.
- C) Ionic compounds contain the same number of positive ions as negative ions.
- D) The chemical formula for an ionic compound must show a nonzero net charge.

Answer: A

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

66) The gas Freon-11,  $\text{CCl}_3\text{F}$ , contains

- A)  $\text{C}^{4+}$ ,  $\text{Cl}^-$ , and  $\text{F}^-$  ions.
- B)  $\text{C}^{4+}$ ,  $\text{Cl}_3^-$ , and  $\text{F}^-$  ions.
- C)  $\text{C}^{4+}$  and  $\text{Cl}_3\text{F}^{4-}$  ions.
- D)  $\text{CCl}_3\text{F}$  molecules.

Answer: D

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

67) The definitive distinction between ionic bonding and covalent bonding is that

- A) ionic bonding involves a sharing of electrons and covalent bonding involves a transfer of electrons.
- B) ionic bonding involves a transfer of electrons and covalent bonding involves a sharing of electrons.
- C) ionic bonding requires two nonmetals and covalent bonding requires a metal and a nonmetal.
- D) covalent bonding requires two nonmetals and ionic bonding requires a metal and a nonmetal.

Answer: B

Diff: 1 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

68) The formula for dinitrogen trioxide is

- A)  $\text{N}(\text{OH})_3$ .
- B)  $(\text{NO}_3)_2$ .
- C)  $\text{N}_2\text{O}_3$ .
- D)  $\text{N}_3\text{O}_2$ .

Answer: C

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.26 Convert between name and formula for binary molecular compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

69) The chemical formula for potassium peroxide is

- A) KOH.
- B) KO<sub>2</sub>.
- C) K<sub>2</sub>O.
- D) K<sub>2</sub>O<sub>2</sub>.

Answer: D

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

70) By analogy with the oxoanions of sulfur, H<sub>2</sub>TeO<sub>3</sub> would be named

- A) hydrotellurous acid.
- B) pertelluric acid.
- C) telluric acid.
- D) tellurous acid.

Answer: D

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

71) The ions ClO<sub>4</sub><sup>-</sup>, ClO<sub>3</sub><sup>-</sup>, ClO<sub>2</sub><sup>-</sup>, and ClO<sup>-</sup> are named respectively

- A) hypochlorate, chlorate, chlorite, perchlorite.
- B) hypochlorite, chlorite, chlorate, perchlorate.
- C) perchlorate, chlorate, chlorite, hypochlorite.
- D) perchlorite, chlorite, chlorate, hypochlorate.

Answer: C

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

72) The compound, NO<sub>2</sub>, is named

- A) nitrate.
- B) nitrite.
- C) nitrogen dioxide.
- D) nitrogen(IV) oxide.

Answer: C

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.26 Convert between name and formula for binary molecular compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

73) The ion  $\text{NO}_2^-$  is named

- A) nitrate ion.
- B) nitrite ion.
- C) nitrogen dioxide ion.
- D) nitrogen(II) oxide ion.

Answer: B

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

74) The thiosulfate ion is

- A)  $\text{HS}^-$ .
- B)  $\text{HSO}_4^{2-}$ .
- C)  $\text{SO}_5^{2-}$ .
- D)  $\text{S}_2\text{O}_3^{2-}$ .

Answer: D

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

75)  $\text{KH}_2\text{PO}_4$  is

- A) hydropotassium phosphate.
- B) potassium dihydrogen phosphate.
- C) potassium diphosphate.
- D) potassium hydrogen(II) phosphate.

Answer: B

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

76) What is the name of the compound formed between Ca and N?

- A) calcium dinitride
- B) calcium trinitride
- C) monocalcium trinitride
- D) calcium nitride

Answer: D

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

77) How many of the following names are correct?

$\text{PCl}_5$	potassium pentachloride
$\text{NaCN}$	sodium cyanide
$\text{KrF}_4$	krypton tetrafluoride
$\text{Fe}(\text{NO}_3)_2$	iron (II) nitrate

- A) 1
- B) 2
- C) 3
- D) 4

Answer: B

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

78) What group of elements does the shaded area in the following periodic table indicate?

- A) alkali metals
- B) alkaline earth metals
- C) inner transition metals
- D) transition metals

Answer: D

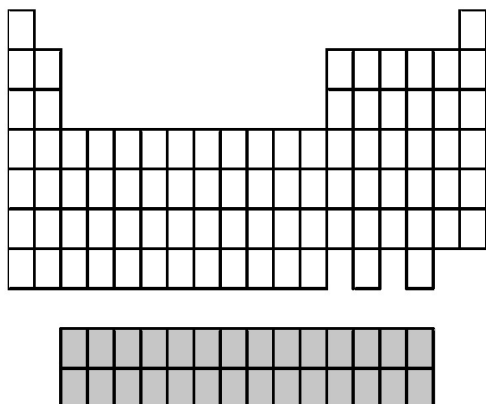
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Topic: Conceptual Problems

Learning Obj: LO 2.4 Identify groups as main group, transition metal group, or inner transition group.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

79) What group of elements does the shaded area in the following periodic table indicate?



- A) alkali metals
- B) alkaline earth metals
- C) inner transition metals
- D) transition metals

Answer: C

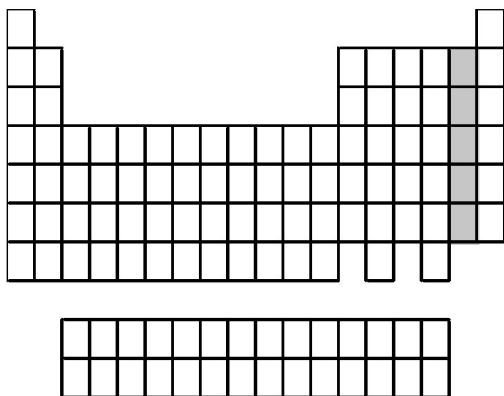
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Topic: Conceptual Problems

Learning Obj: LO 2.4 Identify groups as main group, transition metal group, or inner transition group.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

80) What group of elements does the shaded area in the following periodic table indicate?



- A) alkali metals
- B) alkaline earth metals
- C) halogens
- D) noble gases

Answer: C

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

81) What group of elements does the shaded area in the following periodic table indicate?

The image shows a simplified periodic table with 7 rows and 18 columns. The first two columns are shaded gray. The first column has 7 cells, and the second column has 6 cells. The rest of the table is empty. Below the main table is a separate 2x10 grid.

- A) alkali metals
- B) alkaline earth metals
- C) halogens
- D) noble gases

Answer: B

Diff: 2 Var: 1

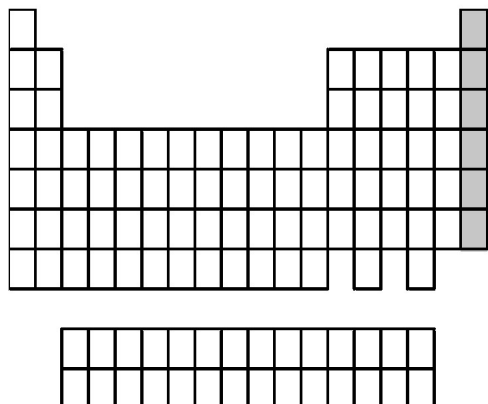
Topic: Conceptual Problems

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.



82) What group of elements does the shaded area in the following periodic table indicate?



- A) alkali metals
- B) alkaline earth metals
- C) halogens
- D) noble gases

Answer: D

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

83) What group of elements does the shaded area in the following periodic table indicate?

The image shows a simplified periodic table with 7 rows and 18 columns. The first column is shaded gray. The second column has two cells in the first two rows. The third through tenth columns have one cell each in all seven rows. The eleventh through fourteenth columns have one cell each in the first three rows. The fifteenth through sixteenth columns have one cell each in all seven rows. The seventeenth column has one cell in the first three rows. The eighteenth column has one cell in the first row. Below the main table is a separate 2x10 grid.

- A) alkali metals
- B) alkaline earth metals
- C) halogens
- D) noble gases

Answer: A

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

84) What group of elements does the shaded area in the following periodic table indicate?

The image shows a simplified periodic table with 7 rows and 18 columns. The first two columns are on the left, and the last two are on the right. A shaded region is located in the middle, covering the following cells: Row 4, Column 10; Row 5, Column 10; Row 6, Column 10; Row 6, Column 11; Row 7, Column 11. Below the main table is a separate 2x18 grid.

- A) gases
- B) metals
- C) nonmetals
- D) semimetals

Answer: D

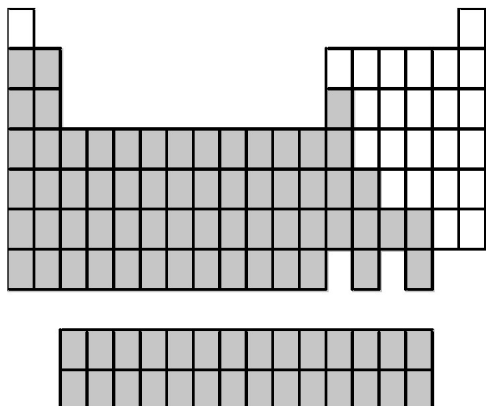
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Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

85) What group of elements does the shaded area in the following periodic table indicate?



- A) gases
- B) metals
- C) nonmetals
- D) semimetals

Answer: B

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

86) What group of elements does the shaded area in the following periodic table indicate?

- A) gases
- B) metals
- C) nonmetals
- D) semimetals

Answer: C

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

87) Which element is most chemically similar to the element indicated by the letter E in the following periodic table?

- A) A
- B) B
- C) C
- D) D

Answer: B

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

88) Which element is most chemically similar to the element indicated by the letter E in the following periodic table?

- A) A
- B) B
- C) C
- D) D

Answer: D

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

89) Which element is most chemically similar to the element indicated by the letter E in the following periodic table?

- A) A
- B) B
- C) C
- D) D

Answer: C

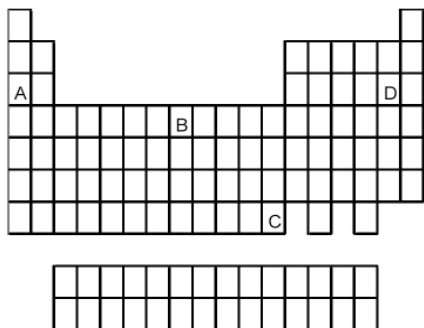
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Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

90) Which element indicated by letter in the following periodic table reacts rapidly with water to form an alkaline solution?



- A) A
- B) B
- C) C
- D) D

Answer: A

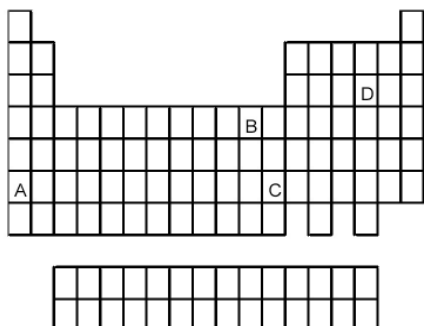
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Topic: Conceptual Problems

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

91) Which element indicated by letter in the following periodic table reacts rapidly with water to form an alkaline solution?



- A) A
- B) B
- C) C
- D) D

Answer: A

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

92) Which element indicated by letter in the following periodic table reacts rapidly with water to form an alkaline solution?

- A) A
- B) B
- C) C
- D) D

Answer: A

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

93) Which element indicated by letter in the following periodic table is a gas at room temperature and a pressure of 1.0 atm?

- A) A
- B) B
- C) C
- D) D

Answer: D

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.



94) Which element indicated by letter in the following periodic table is a gas at room temperature and a pressure of 1.0 atm?

- A) A
- B) B
- C) C
- D) D

Answer: D

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

95) Which element indicated by letter in the following periodic table is a gas at room temperature and a pressure of 1.0 atm?

- A) A
- B) B
- C) C
- D) D

Answer: D

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

96) Which element indicated by letter in the following periodic table is the poorest conductor of electricity and heat?

- A) A
- B) B
- C) C
- D) D

Answer: C

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

97) Which element indicated by letter in the following periodic table is the best conductor of electricity and heat?

- A) A
- B) B
- C) C
- D) D

Answer: A

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

Use the periodic table below to answer the following questions.

A								C		D									
B																			


98) Which elements commonly form anions?

- A) A and B
- B) A and C
- C) B and D
- D) C and D

Answer: D

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

99) Which elements commonly form cations?

- A) A and B
- B) A and C
- C) B and D
- D) C and D

Answer: A

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

100) Which elements commonly form covalent bonds?

- A) A and B
- B) A and C
- C) B and D
- D) C and D

Answer: D

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

Use the periodic table below to answer the following questions.

	A																


101) Which is the correct formula of the binary fluoride of element A?

- A)  $\text{AF}_2$
- B)  $\text{AF}_3$
- C)  $\text{AF}_5$
- D)  $\text{AF}_6$

Answer: A

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

102) Which is the correct formula of the binary fluoride of element B?

- A)  $\text{BF}_2$
- B)  $\text{BF}_3$
- C)  $\text{BF}_5$
- D)  $\text{BF}_6$

Answer: B

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

103) In which pair are both formulas of binary fluorides of element C correct?

- A)  $\text{CF}_2$  and  $\text{CF}_3$
- B)  $\text{CF}_2$  and  $\text{CF}_6$
- C)  $\text{CF}_3$  and  $\text{CF}_5$
- D)  $\text{CF}_5$  and  $\text{CF}_6$

Answer: C

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

104) In which pair are both formulas of binary fluorides of element D correct?

- A)  $DF_2$  and  $DF_3$
- B)  $DF_2$  and  $DF_6$
- C)  $DF_3$  and  $DF_5$
- D)  $DF_5$  and  $DF_6$

Answer: B

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

105) Which is most likely to form a binary oxide with the formula  $MO$  (where M = element A, B, C, or D)?

- A) element A
- B) element B
- C) element C
- D) element D

Answer: A

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

106) Which is most likely to form a binary oxide with the formula  $MO_3$  (where M = element A, B, C, or D)?

- A) element A
- B) element B
- C) element C
- D) element D

Answer: D

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

107) Which is most likely to form a binary oxide with the formula  $M_2O_3$  (where M = element A, B, C, or D)?

- A) element A
- B) element B
- C) element C
- D) element D

Answer: B

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

108) Which is most likely to form a binary oxide with the formula  $M_4O_{10}$  (where M = element A, B, C, or D)?

- A) element A
- B) element B
- C) element C
- D) element D

Answer: C

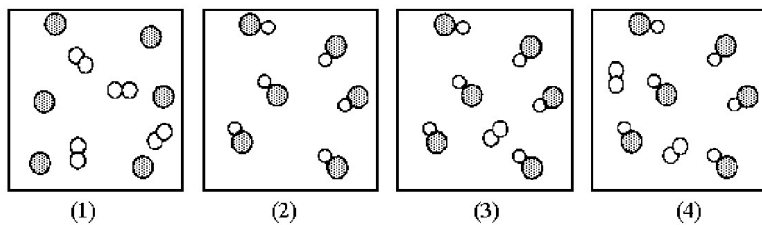
Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

109) Assume that the mixture of substances in drawing (1) undergoes a chemical reaction. Which of the drawings (2)-(4) represents a product mixture that is consistent with the law of mass conservation?



- A) drawing (2)
- B) drawing (3)
- C) drawing (4)

Answer: B

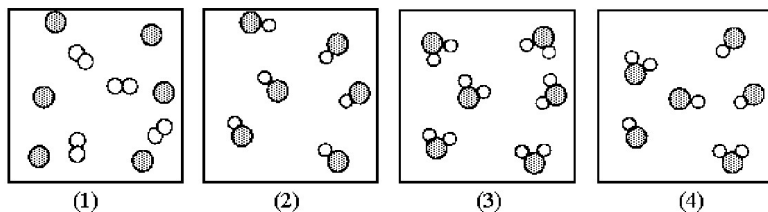
Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G3 Read and interpret graphs and data.

110) Assume that the mixture of substances in drawing (1) undergoes a chemical reaction. Which of the drawings (2)-(4) represents a product mixture that is consistent with the law of mass conservation?



- A) drawing (2)
- B) drawing (3)
- C) drawing (4)

Answer: C

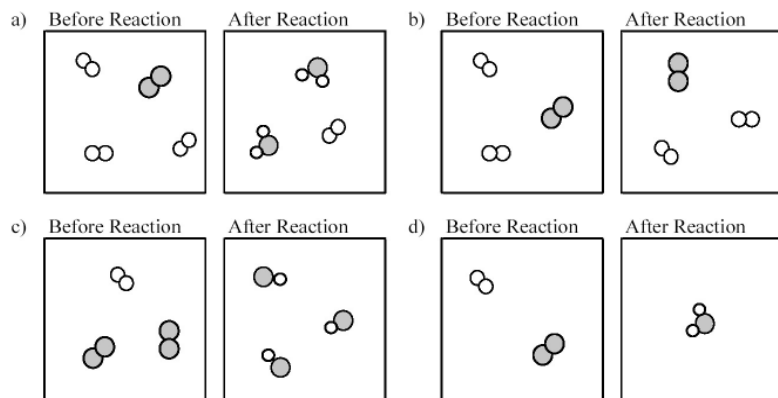
Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G3 Read and interpret graphs and data.

111) Which of the following drawings depicts a chemical reaction consistent with Dalton's atomic theory?



- A) drawing a)
- B) drawing b)
- C) drawing c)
- D) drawing d)

Answer: A

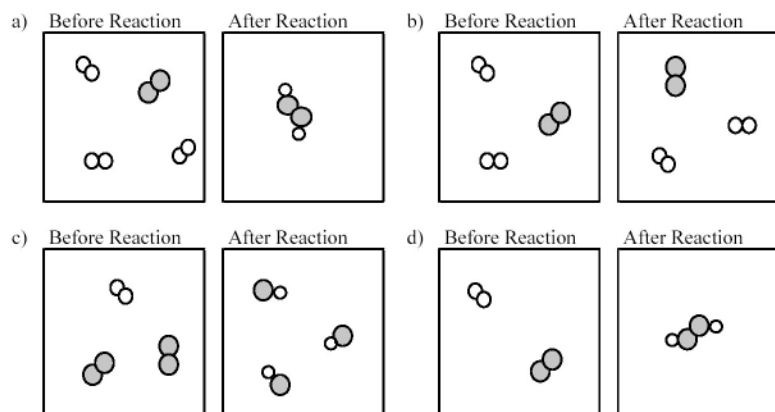
Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.8 Demonstrate the law of multiple proportions using mass composition of two compounds of the same elements.

Global Obj: G3 Read and interpret graphs and data.

112) Which of the following drawings depicts a chemical reaction consistent with Dalton's atomic theory?



- A) drawing a)
- B) drawing b)
- C) drawing c)
- D) drawing d)

Answer: D

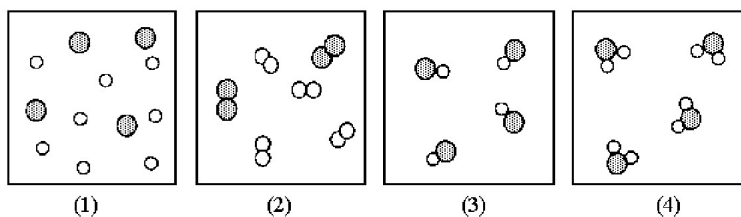
Diff: 2    Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.8 Demonstrate the law of multiple proportions using mass composition of two compounds of the same elements.

Global Obj: G3 Read and interpret graphs and data.

113) If shaded and unshaded spheres represent atoms of different elements, as shown in drawing (1), which drawings (2)-(4) represent the law of multiple proportions?



- A) only drawings (2) and (3)
- B) only drawings (2) and (4)
- C) only drawings (3) and (4)
- D) drawings (2), (3), and (4)

Answer: C

Diff: 2    Var: 1

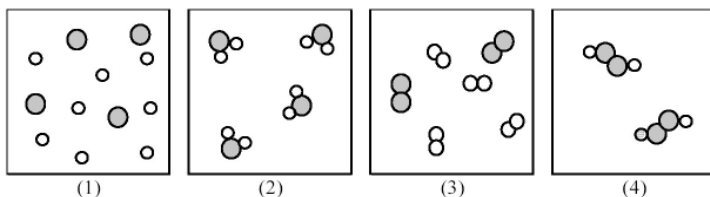
Topic: Conceptual Problems

Learning Obj: LO 2.8 Demonstrate the law of multiple proportions using mass composition of two compounds of the same elements.

Global Obj: G3 Read and interpret graphs and data.



114) If shaded and unshaded spheres represent atoms of different elements, as shown in drawing (1), which drawings (2)-(4) represent the law of multiple proportions?



- A) only drawings (2) and (3)
- B) only drawings (2) and (4)
- C) only drawings (3) and (4)
- D) drawings (2), (3), and (4)

Answer: B

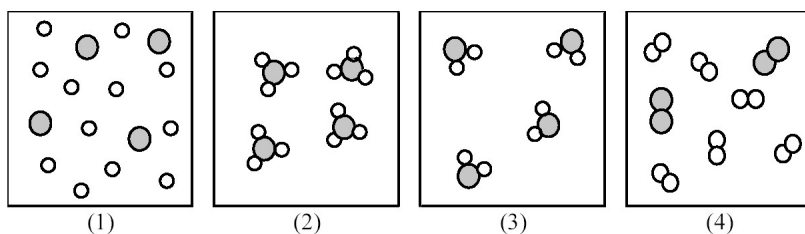
Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.8 Demonstrate the law of multiple proportions using mass composition of two compounds of the same elements.

Global Obj: G3 Read and interpret graphs and data.

115) If shaded and unshaded spheres represent atoms of different elements, as shown in drawing (1), which drawings (2)-(4) represent the law of multiple proportions?



- A) only drawings (2) and (3)
- B) only drawings (2) and (4)
- C) only drawings (3) and (4)
- D) drawings (2), (3), and (4)

Answer: A

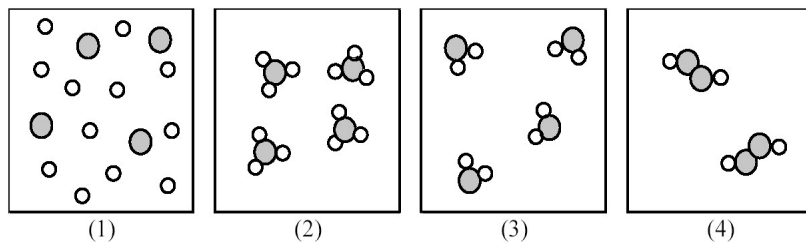
Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.8 Demonstrate the law of multiple proportions using mass composition of two compounds of the same elements.

Global Obj: G3 Read and interpret graphs and data.

116) If shaded and unshaded spheres represent atoms of different elements, as shown in drawing (1), which drawings (2)-(4) represent the law of multiple proportions?



- A) only drawings (2) and (3)
- B) only drawings (2) and (4)
- C) only drawings (3) and (4)
- D) drawings (2), (3), and (4)

Answer: D

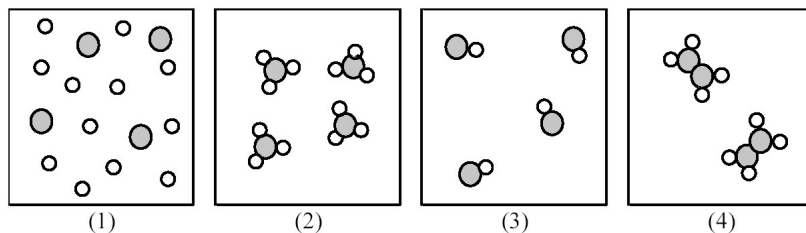
Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.8 Demonstrate the law of multiple proportions using mass composition of two compounds of the same elements.

Global Obj: G3 Read and interpret graphs and data.

117) If shaded and unshaded spheres represent atoms of different elements, as shown in drawing (1), which combination of drawings (2)-(4) represent the law of multiple proportions?



- A) only drawings (2) and (3)
- B) only drawings (2) and (4)
- C) only drawings (3) and (4)
- D) drawings (2), (3), and (4)

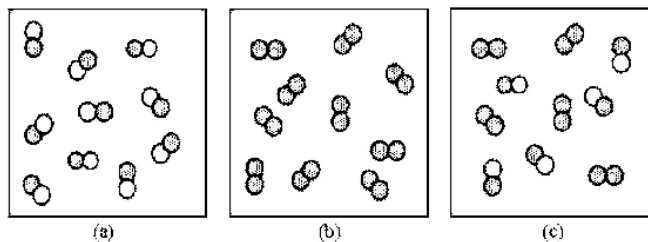
Answer: D

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.8 Demonstrate the law of multiple proportions using mass composition of two compounds of the same elements.

Global Obj: G3 Read and interpret graphs and data.



118) Which of the above drawings represents a pure element?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)

Answer: B

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G3 Read and interpret graphs and data.

119) Which of the above drawings represents a pure compound?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)

Answer: A

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G3 Read and interpret graphs and data.

120) Which of the above drawings represents a mixture?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)

Answer: C

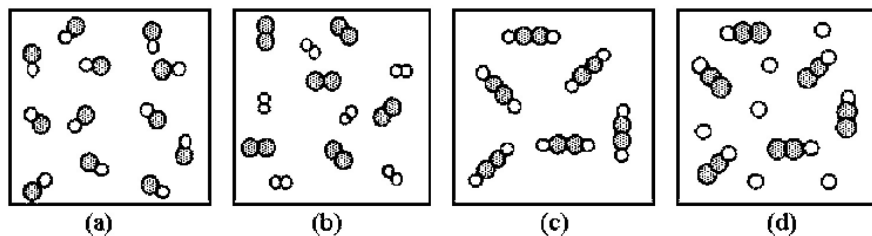
Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G3 Read and interpret graphs and data.

121) Which of the following drawings represents a collection of acetylene ( $C_2H_2$ ) molecules? The shaded spheres represent carbon atoms and the unshaded spheres represent hydrogen atoms.



- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

Answer: C

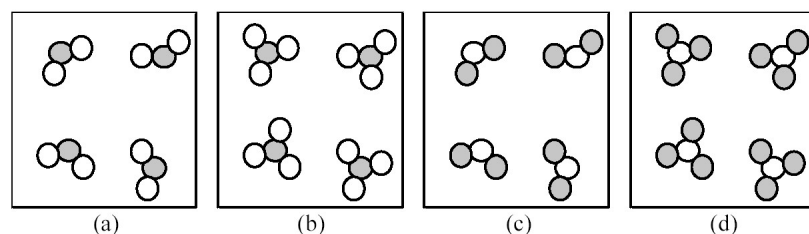
Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G3 Read and interpret graphs and data.

122) If unshaded spheres represent sulfur atoms and shaded spheres represent oxygen atoms, which of the following drawings depicts a collection of sulfur trioxide molecules?



- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

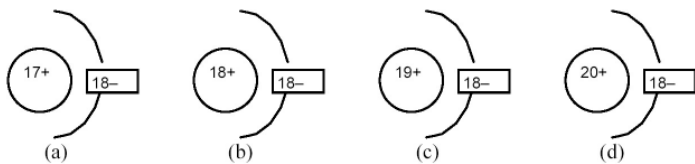
Answer: D

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G3 Read and interpret graphs and data.



123) Which of the above drawings represents an Ar atom?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

Answer: B

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.

124) Which of the above drawings represents a  $\text{Cl}^-$  ion?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

Answer: A

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.

125) Which of the above drawings represents a  $\text{Ca}^{2+}$  ion?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

Answer: D

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.

126) Which of the above drawings represents a  $\text{K}^+$  ion?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

Answer: C

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.

127) Which of the following figures represents  ${}^3_1\text{H}$ ? Unshaded spheres represent neutrons and shaded spheres represent protons.



- A) figure (1)
- B) figure (2)
- C) figure (3)
- D) figure (4)

Answer: B

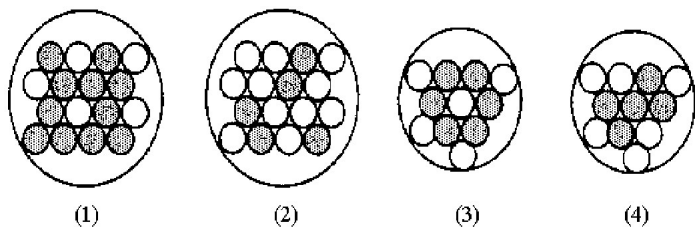
Diff: 2    Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.

128) Which of the following figures represents  ${}^{11}_5\text{B}$ ? Unshaded spheres represent neutrons and shaded spheres represent protons.



- A) figure (1)
- B) figure (2)
- C) figure (3)
- D) figure (4)

Answer: D

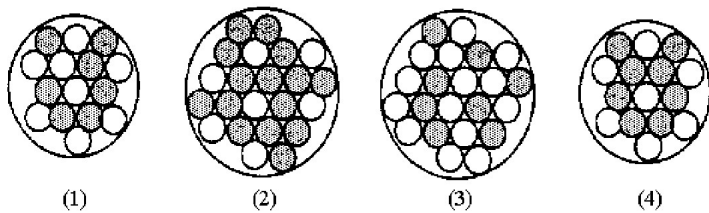
Diff: 2    Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.

129) Which of the following figures represents  $^{15}_7\text{N}$ ? Unshaded spheres represent neutrons and shaded spheres represent protons.



- A) figure (1)
- B) figure (2)
- C) figure (3)
- D) figure (4)

Answer: A

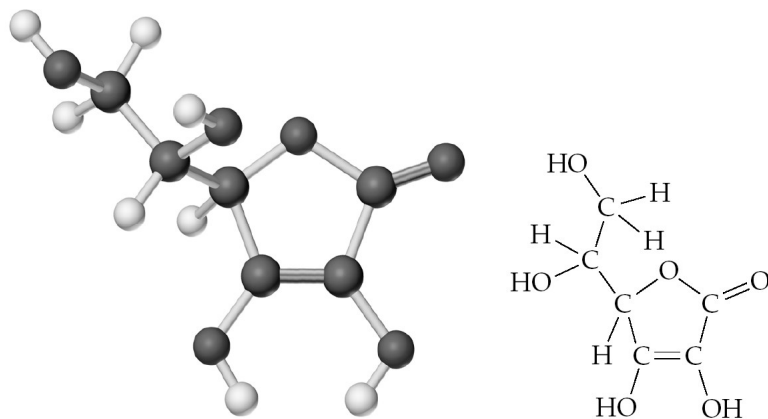
Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.

130) Give the molecular formula corresponding to the following ball-and-stick molecular representation of vitamin C (ascorbic acid) (gray = C, unshaded = H, black = O). In writing the formula, list the atoms in alphabetical order.



Vitamin C  
(ascorbic acid)

- A) CHO
- B)  $\text{C}_3\text{H}_4\text{O}_3$
- C)  $\text{C}_6\text{H}_4\text{O}_6$
- D)  $\text{C}_6\text{H}_8\text{O}_6$

Answer: D

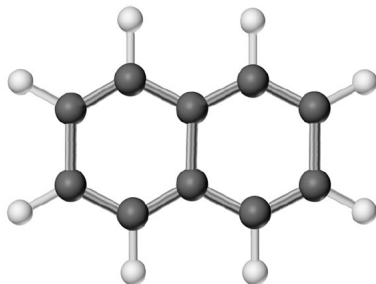
Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

131) Give the molecular formula corresponding to the following ball-and-stick molecular representation of naphthalene (gray = C, unshaded = H). In writing the formula, list the atoms in alphabetical order.



- A) CH
- B) C<sub>5</sub>H<sub>4</sub>
- C) C<sub>10</sub>H<sub>8</sub>
- D) C<sub>10</sub>H<sub>10</sub>

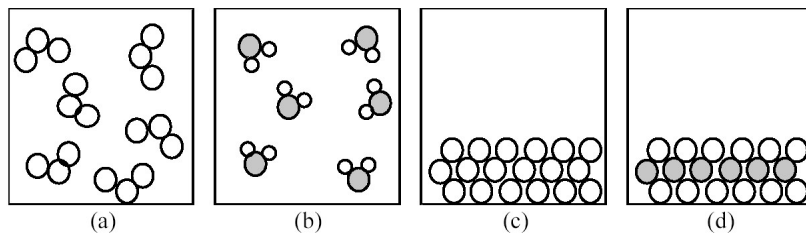
Answer: C

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.



132) If shaded and unshaded spheres represent atoms of different elements, which of the above drawings most likely represents an ionic compound at room temperature and a pressure of 1 atm?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

Answer: D

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.



133) If shaded and unshaded spheres represent atoms of different elements, which of the above drawings most likely represents a molecular compound at room temperature and a pressure of 1 atm?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

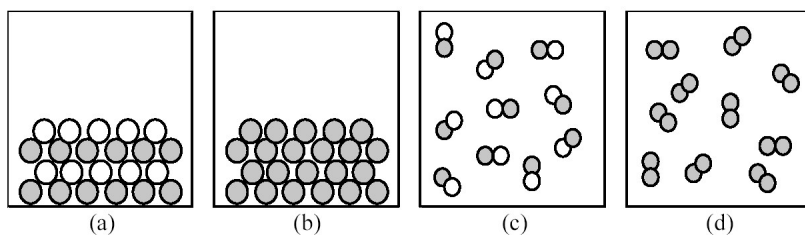
Answer: B

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.



134) If shaded and unshaded spheres represent atoms of different elements, which of the above drawings most likely represents an ionic compound at room temperature and a pressure of 1 atm?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

Answer: A

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.

135) If shaded and unshaded spheres represent atoms of different elements, which of the above drawings most likely represents a molecular compound at room temperature and a pressure of 1 atm?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

Answer: C

Diff: 2 Var: 1

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.

## 2.2 Algorithmic Questions

1) What is the chemical symbol for thallium?

- A) Ti
- B) Tl
- C) Tm
- D) Th

Answer: B

Diff: 2 Var: 5

Topic: Section 2.1 Chemistry and the Elements

Learning Obj: LO 2.1 Use symbols to represent the elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

2) What is the chemical symbol for arsenic?

- A) Ac
- B) Ar
- C) As
- D) At

Answer: C

Diff: 2 Var: 5

Topic: Section 2.1 Chemistry and the Elements

Learning Obj: LO 2.1 Use symbols to represent the elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

3) What is the chemical symbol for niobium?

- A) Au
- B) Nb
- C) Pb
- D) Nn

Answer: B

Diff: 2 Var: 50+

Topic: Section 2.1 Chemistry and the Elements

Learning Obj: LO 2.1 Use symbols to represent the elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

4) What is the chemical symbol for platinum?

- A) Pd
- B) Pr
- C) Pt
- D) Au

Answer: C

Diff: 2 Var: 50+

Topic: Section 2.1 Chemistry and the Elements

Learning Obj: LO 2.1 Use symbols to represent the elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

5) Which element has the chemical symbol, Au?

- A) antimony
- B) americium
- C) gold
- D) lead

Answer: C

Diff: 2 Var: 50+

Topic: Section 2.1 Chemistry and the Elements

Learning Obj: LO 2.1 Use symbols to represent the elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

6) What is the chemical symbol for carbon?

- A) Co
- B) Cr
- C) C
- D) Ca

Answer: C

Diff: 2 Var: 5

Topic: Section 2.1 Chemistry and the Elements

Learning Obj: LO 2.1 Use symbols to represent the elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

7) Which element has the chemical symbol, Pb?

- A) tin
- B) lead
- C) mercury
- D) potassium

Answer: B

Diff: 2 Var: 5

Topic: Section 2.1 Chemistry and the Elements

Learning Obj: LO 2.1 Use symbols to represent the elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

8) Which element has the chemical symbol, N?

- A) nickel
- B) niobium
- C) nitrogen
- D) nobelium

Answer: C

Diff: 2 Var: 5

Topic: Section 2.1 Chemistry and the Elements

Learning Obj: LO 2.1 Use symbols to represent the elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

9) Which of the following elements has chemical properties similar to oxygen?

- A) neon
- B) hydrogen
- C) nitrogen
- D) tellerium

Answer: D

Diff: 2 Var: 50+

Topic: Section 2.2 Elements and the Periodic Table

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

10) \_\_\_\_\_ is used in lights and signs.

- A) Neon
- B) Helium
- C) Iodine
- D) Silicon

Answer: A

Diff: 2 Var: 50+

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

11) \_\_\_\_\_ does not combine with any other element.

- A) Chlorine
- B) Nitrogen
- C) Helium
- D) Krypton

Answer: C

Diff: 2 Var: 50+

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

12) Identify a chemical property.

- A) tarnishing
- B) boiling point
- C) taste
- D) solubility

Answer: A

Diff: 2 Var: 50+

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

13) \_\_\_\_\_ is a nonmetal that is a solid at room temperature.

- A) Calcium
- B) Selenium
- C) Bromine
- D) Copper

Answer: B

Diff: 2 Var: 50+

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

14) Rubidium belongs to the \_\_\_\_\_ group of the periodic table.

- A) alkali metal
- B) alkaline earth metal
- C) halogen
- D) noble gas

Answer: A

Diff: 2 Var: 6

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

15) Chlorine belongs to the \_\_\_\_\_ group of the periodic table.

- A) alkali metal
- B) alkaline earth metal
- C) halogen
- D) noble gas

Answer: C

Diff: 2 Var: 5

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

16) Radon belongs to the \_\_\_\_\_ group of the periodic table.

- A) alkali metal
- B) alkaline earth metal
- C) halogen
- D) noble gas

Answer: D

Diff: 2 Var: 6

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

17) Calcium belongs to the \_\_\_\_\_ group of the periodic table.

- A) alkali metal
- B) alkaline earth metal
- C) halogen
- D) noble gas

Answer: B

Diff: 2 Var: 5

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

18) Which of the following elements has chemical properties similar to oxygen?

- A) fluorine
- B) hydrogen
- C) nitrogen
- D) sulfur

Answer: D

Diff: 2 Var: 5

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

19) Which of the following elements is a gas at room temperature?

- A) bromine
- B) iron
- C) krypton
- D) sodium

Answer: C

Diff: 2 Var: 5

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

20) Which of the following elements is **not** a solid at room temperature?

- A) Ag
- B) Al
- C) He
- D) Fe

Answer: C

Diff: 2 Var: 5

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

21) Which of the following elements is classified as a semimetal?

- A) calcium
- B) silicon
- C) fluorine
- D) uranium

Answer: B

Diff: 2 Var: 5

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

22) Which of the following elements is a good conductor of heat and electricity?

- A) carbon
- B) chlorine
- C) neon
- D) zinc

Answer: D

Diff: 2 Var: 5

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

23) Which one of the following elements is a **poor** conductor of heat and electricity?

- A) copper
- B) phosphorus
- C) iron
- D) lead

Answer: B

Diff: 2 Var: 5

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

24) All of the following elements are nonmetals except

- A) beryllium.
- B) carbon.
- C) hydrogen.
- D) oxygen.

Answer: A

Diff: 2 Var: 5

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

25) Which of the following underlined items is **not** an intensive property?

- A) the **amount** of gold.
- B) the **color** of copper hydroxide
- C) the **density** of argon
- D) the **melting point** of iron metal

Answer: A

Diff: 2 Var: 50+

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

26) Which of the following underlined items is **not** an extensive property?

- A) the **color** of a cobalt compound
- B) the **diameter** of a gold nugget
- C) the **mass** of a diamond
- D) the **volume** of a glucose solution

Answer: A

Diff: 2 Var: 50+

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

27) Which group 1A element is **not** a metal?

- A) H
- B) K
- C) Cs
- D) Be

Answer: A

Diff: 2 Var: 50+

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

28) Which of the following elements is a liquid at room temperature?

- A) neon
- B) helium
- C) mercury
- D) lithium

Answer: C

Diff: 2 Var: 50+

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.



29) Which of the following elements is **not** a solid at room temperature?

- A) Zn
- B) Hg
- C) N
- D) C

Answer: C

Diff: 2 Var: 50+

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

30) Which of the following elements is classified as a semimetal?

- A) gold
- B) astatine
- C) osmium
- D) berkelium

Answer: B

Diff: 2 Var: 50+

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

31) Which of the following elements is a good conductor of heat and electricity?

- A) silicon
- B) iodine
- C) radon
- D) lead

Answer: D

Diff: 2 Var: 50+

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

32) Which one of the following elements is a **poor** conductor of heat and electricity?

- A) nickel
- B) sulfur
- C) aluminum
- D) lead

Answer: B

Diff: 2 Var: 50+

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

33) All of the following elements are nonmetals except

- A) copper.
- B) nitrogen.
- C) krypton.
- D) phosphorus.

Answer: A

Diff: 2 Var: 50+

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

34) Methane and oxygen react to form carbon dioxide and water. What mass of water is formed if 6.4 g of methane reacts with 25.6 g of oxygen to produce 17.6 g of carbon dioxide?

- A) 14.4 g
- B) 17.6 g
- C) 29.6 g
- D) 32.0 g

Answer: A

Diff: 2 Var: 5

Topic: Section 2.4 Observations Supporting Atomic Theory: The Conservation of Mass and the Law of Definite Proportions

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

35) Sodium metal and water react to form hydrogen and sodium hydroxide. If 11.96 g of sodium react with water to form 0.52 g of hydrogen and 20.80 g of sodium hydroxide, what mass of water was involved in the reaction?

- A) 9.36 g
- B) 11.96 g
- C) 20.28 g
- D) 21.32 g

Answer: A

Diff: 2 Var: 5

Topic: Section 2.4 Observations Supporting Atomic Theory: The Conservation of Mass and the Law of Definite Proportions

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

36) A sample of pure lithium chloride contains 16% lithium by mass. What is the % lithium by mass in a sample of pure lithium carbonate that has twice the mass of the first sample?

- A) 8.20%
- B) 16.4%
- C) 32.8%
- D) 65.6%

Answer: B

Diff: 2 Var: 5

Topic: Section 2.4 Observations Supporting Atomic Theory: The Conservation of Mass and the Law of Definite Proportions

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

37) A sample of pure calcium fluoride with a mass of 15.0 g contains 7.70 g of calcium. How much calcium is contained in 35.0 g of calcium fluoride?

- A) 1.99 g
- B) 7.70 g
- C) 15.0 g
- D) 18.0 g

Answer: D

Diff: 2 Var: 5

Topic: Section 2.4 Observations Supporting Atomic Theory: The Conservation of Mass and the Law of Definite Proportions

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

38) Mg can react with HCl to produce the white solid  $\text{MgCl}_2$  and  $\text{H}_2$  gas. A student mixes 1.99 g of Mg with 5.98 g of HCl. If the mass of the white solid is 7.79 g, then what is the mass of  $\text{H}_2$  produced?

- A) 0.0 g
- B) 0.18 g
- C) 2.0 g
- D) 15.76 g

Answer: B

Diff: 2 Var: 4

Topic: Section 2.4 Observations Supporting Atomic Theory: The Conservation of Mass and the Law of Definite Proportions

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

39) Elements A and Q form two compounds, AQ and A<sub>2</sub>Q<sub>3</sub>. The mass ratio (mass Q)/(mass A) for AQ is 0.286. What is the mass ratio (mass Q)/(mass A) for A<sub>2</sub>Q<sub>3</sub>?

- A) 0.191
- B) 0.429
- C) 2.33
- D) 5.24

Answer: B

Diff: 2 Var: 5

Topic: Section 2.5 The Law of Multiple Proportions and Dalton's Atomic Theory

Learning Obj: LO 2.8 Demonstrate the law of multiple proportions using mass composition of two compounds of the same elements.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

40) A proton is approximately

- A) 600 times larger than an electron.
- B) 2000 times larger than an electron.
- C) 700 times smaller than an electron.
- D) 3000 times smaller than an electron.

Answer: B

Diff: 2 Var: 50+

Topic: Section 2.7 Atomic Structure: Protons and Neutrons

Learning Obj: LO 2.12 Describe the structure and size of the atom. (Figure 2.6)

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

41) Which are isotopes? An atom that has an atomic number of 12 and a mass number of 26 is an isotope of an atom that has

- A) an atomic number of 13 and a mass number of 26.
- B) an atomic number of 12 and a mass number of 24.
- C) 12 neutrons and 14 protons.
- D) 12 protons and 14 neutrons.

Answer: B

Diff: 2 Var: 5

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.15 Write isotope symbols for elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

42) Which of the following represent isotopes?

$$\text{A: } \begin{matrix} 56 \\ 26 \end{matrix} [ ] \quad \text{B: } \begin{matrix} 56 \\ 27 \end{matrix} [ ] \quad \text{C: } \begin{matrix} 55 \\ 26 \end{matrix} [ ] \quad \text{D: } \begin{matrix} 58 \\ 28 \end{matrix} [ ]$$

- A) A and B
- B) A and C
- C) A and D
- D) C and D

Answer: B

Diff: 2 Var: 5

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.15 Write isotope symbols for elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

43) How many protons (p) and neutrons (n) are in an atom of  $^{226}_{88}\text{Ra}$ ?

- A) 88 p, 138 n
- B) 88 p, 226 n
- C) 138 p, 88 n
- D) 226 p, 88 n

Answer: A

Diff: 2 Var: 5

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

44) How many protons (p) and neutrons (n) are in an atom of calcium-46?

- A) 20 p, 26 n
- B) 20 p, 46 n
- C) 26 p, 20 n
- D) 46 p, 20 n

Answer: A

Diff: 2 Var: 5

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

45) What is the element symbol for an atom that has 33 protons and 41 neutrons?

- A) As
- B) Nb
- C) O
- D) W

Answer: A

Diff: 2 Var: 5

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.15 Write isotope symbols for elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

46) How many electrons are in a neutral atom of iodine-131?

- A) 1
- B) 53
- C) 54
- D) 131

Answer: B

Diff: 2 Var: 5

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

47) Identify the chemical symbol of element Q in  ${}^{76}_{34}\text{Q}$ .

- A) As
- B) Mo
- C) Os
- D) Se

Answer: D

Diff: 2 Var: 5

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.15 Write isotope symbols for elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

48) Which are isotopes? An atom that has an atomic number of 35 and a mass number of 76 is an isotope of an atom that has

- A) an atomic number of 31 and a mass number of 76.
- B) an atomic number of 35 and a mass number of 80.
- C) 41 neutrons and 35 protons.
- D) 41 protons and 35 neutrons.

Answer: B

Diff: 2 Var: 12

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

49) The isotope represented by  ${}^9_6\text{C}$  is named

- A) carbon-6.
- B) carbon-3.
- C) carbon-9.
- D) carbon-15.

Answer: C

Diff: 2 Var: 9

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.15 Write isotope symbols for elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

50) A bottle of pure element was missing part of a label. The label said  $2.258 \times 10^{23}$  atoms. You determine the mass of the elements in the bottle to be 10.51946. What is the identity of this element?

- A) B
- B) N
- C) Si
- D) Sr

Answer: C

Diff: 3 Var: 4

Topic: Section 2.9 Atomic Weights and the Mole

Learning Obj: LO 2.17 Convert between grams and numbers of moles or atoms using molar mass and Avogadro's number.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

51) What is the standard isotope that is used to define the number of atoms in a mole?

- A)  $^{14}\text{N}$
- B)  $^{12}\text{C}$
- C)  $^9\text{Be}$
- D)  $^{31}\text{P}$

Answer: B

Diff: 1 Var: 50+

Topic: Section 2.9 Atomic Weights and the Mole

Learning Obj: LO 2.17 Convert between grams and numbers of moles or atoms using molar mass and Avogadro's number.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

52) The number of atoms of carbon in 28 g of silicon is

- A) 28
- B)  $28 \times 6.022 \times 10^{22}$
- C)  $2.8 \times 10^{23}$
- D)  $6.022 \times 10^{23}$

Answer: D

Diff: 2 Var: 8

Topic: Section 2.9 Atomic Weights and the Mole

Learning Obj: LO 2.17 Convert between grams and numbers of moles or atoms using molar mass and Avogadro's number.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

53) One mole of which element has the **smallest** mass?

- A) Co
- B) Zn
- C) Ni
- D) Ru

Answer: C

Diff: 2 Var: 50+

Topic: Section 2.9 Atomic Weights and the Mole

Learning Obj: LO 2.17 Convert between grams and numbers of moles or atoms using molar mass and Avogadro's number.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

54) 24.0 g of which element contains the greatest number of atoms?

- A) Be
- B) C
- C) O
- D) Na

Answer: A

Diff: 2 Var: 50+

Topic: Section 2.9 Atomic Weights and the Mole

Learning Obj: LO 2.17 Convert between grams and numbers of moles or atoms using molar mass and Avogadro's number.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

55) A banana split is an example of

- A) a compound.
- B) an element.
- C) a mixture.
- D) an ion.

Answer: C

Diff: 2 Var: 5

Topic: Section 2.10 Mixtures and Chemical Compounds: Molecules and Covalent Bonds

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

56) Hydrochloric acid is an example of

- A) a compound.
- B) an element.
- C) an ion.
- D) a mixture.

Answer: D

Diff: 2 Var: 5

Topic: Section 2.10 Mixtures and Chemical Compounds: Molecules and Covalent Bonds

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

57) Iodine is an example of

- A) a compound.
- B) an element.
- C) a mixture.
- D) an ion.

Answer: B

Diff: 2 Var: 5

Topic: Section 2.10 Mixtures and Chemical Compounds: Molecules and Covalent Bonds

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

58) Water is an example of

- A) a compound.
- B) an element.
- C) a mixture.
- D) an ion.

Answer: A

Diff: 2 Var: 4

Topic: Section 2.10 Mixtures and Chemical Compounds: Molecules and Covalent Bonds

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.



59) A cake is an example of

- A) a compound.
- B) an element.
- C) mixture.
- D) an anion.

Answer: C

Diff: 2 Var: 21

Topic: Section 2.10 Mixtures and Chemical Compounds: Molecules and Covalent Bonds

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

60) Orange juice is an example of

- A) a compound.
- B) an element.
- C) an ion.
- D) a mixture.

Answer: D

Diff: 2 Var: 24

Topic: Section 2.10 Mixtures and Chemical Compounds: Molecules and Covalent Bonds

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

61) Aluminum is an example of

- A) a compound.
- B) an element.
- C) a mixture.
- D) an ion.

Answer: B

Diff: 2 Var: 27

Topic: Section 2.10 Mixtures and Chemical Compounds: Molecules and Covalent Bonds

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

62) Ethane is an example of

- A) a compound.
- B) an element.
- C) a mixture.
- D) a cation.

Answer: A

Diff: 2 Var: 18

Topic: Section 2.10 Mixtures and Chemical Compounds: Molecules and Covalent Bonds

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

63) In which set do all elements tend to form cations in binary ionic compounds?

- A) Li, B, O
- B) Mg, Cr, Pb
- C) N, As, Bi
- D) O, F, Cl

Answer: B

Diff: 2 Var: 5

Topic: Section 2.11 Ions and Ionic Bonds

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

64) How many electrons are in the ion,  $\text{Fe}^{2+}$ ?

- A) 24
- B) 26
- C) 28
- D) 56

Answer: A

Diff: 2 Var: 5

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.22 Determine the number of electrons and protons from chemical symbol and charge.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

65) How many electrons are in the ion,  $\text{S}^{2-}$ ?

- A) 14
- B) 18
- C) 30
- D) 34

Answer: B

Diff: 2 Var: 5

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.22 Determine the number of electrons and protons from chemical symbol and charge.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

66) In which of the following sets do all species have the same number of electrons?

- A)  $\text{Cl}^-$ , Ar,  $\text{Ca}^{2+}$
- B) N,  $\text{O}^{2-}$ ,  $\text{F}^-$
- C)  $\text{Sc}^{3+}$ ,  $\text{Y}^{3+}$ ,  $\text{La}^{3+}$
- D) Cr,  $\text{Cr}^{2+}$ ,  $\text{Cr}^{3+}$

Answer: A

Diff: 2 Var: 5

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.22 Determine the number of electrons and protons from chemical symbol and charge.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

67) In which of the following sets do all species have the same number of protons?

- A) At<sup>-</sup>, Rn, Ra<sup>2+</sup>
- B) C, N<sup>3-</sup>, O<sup>2-</sup>
- C) CO<sup>3+</sup>, Rh<sup>3+</sup>, Ir<sup>3+</sup>
- D) Br, Co<sup>2+</sup>, Co<sup>3+</sup>

Answer: D

Diff: 2 Var: 5

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.22 Determine the number of electrons and protons from chemical symbol and charge.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

68) In which of the following sets do all species have the same number of electrons?

- A) I<sup>-</sup>, Xe, Cs<sup>2+</sup>
- B) C, N<sup>3-</sup>, O<sup>2-</sup>
- C) Mg<sup>2+</sup>, Ca<sup>2+</sup>, Ba<sup>2+</sup>
- D) S, S<sup>2-</sup>, S<sup>2+</sup>

Answer: A

Diff: 2 Var: 50+

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.22 Determine the number of electrons and protons from chemical symbol and charge.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

69) In which of the following sets do all species have the same number of protons?

- A) Br<sup>-</sup>, Kr, Rb<sup>2+</sup>
- B) C, N<sup>3-</sup>, O<sup>2-</sup>
- C) Mg<sup>2+</sup>, Ca<sup>2+</sup>, Ba<sup>2+</sup>
- D) O, O<sup>2-</sup>, O<sup>2+</sup>

Answer: D

Diff: 2 Var: 50+

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.22 Determine the number of electrons and protons from chemical symbol and charge.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

70) What is the identity of element Q if the ion Q<sup>2+</sup> contains 18 electrons?

- A) Si
- B) S
- C) Ar
- D) Ca

Answer: D

Diff: 2 Var: 5

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.22 Determine the number of electrons and protons from chemical symbol and charge.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

71) How many electrons are in the ion,  $\text{SO}_4^{2-}$ ?

- A) 26
- B) 46
- C) 48
- D) 50

Answer: D

Diff: 2 Var: 5

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.22 Determine the number of electrons and protons from chemical symbol and charge.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

72) In which set do all elements tend to form anions in binary ionic compounds?

- A) Cs, B, O
- B) Ca, Zn, Pb
- C) N, Sb, Bi
- D) S, Cl, Br

Answer: D

Diff: 2 Var: 5

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.21 Classify bonds as ionic or covalent.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

73) What type of bonding is found in the compound  $\text{NH}_3$ ?

- A) covalent bonding
- B) hydrogen bonding
- C) ionic bonding
- D) metallic bonding

Answer: A

Diff: 2 Var: 5

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.21 Classify bonds as ionic or covalent.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

74) Which one of the following compounds contains ionic bonds?

- A)  $\text{MgO}$
- B)  $\text{HCl}$
- C)  $\text{PCl}_3$
- D)  $\text{CO}_2$

Answer: A

Diff: 2 Var: 5

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.21 Classify bonds as ionic or covalent.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

75) Which of the following is the correct chemical formula for a molecule of iodine?

- A) I
- B) I<sup>-</sup>
- C) I<sup>+</sup>
- D) I<sub>2</sub>

Answer: D

Diff: 2 Var: 5

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.21 Classify bonds as ionic or covalent.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

76) Which of the compounds, Ca H<sub>2</sub>, H<sub>2</sub>O , C H<sub>4</sub>, XeF<sub>4</sub> are ionic compounds?

- A) only C H<sub>4</sub>
- B) only Ca H<sub>2</sub>
- C) Ca H<sub>2</sub> and Xe F<sub>4</sub>
- D) H<sub>2</sub>O , C H<sub>4</sub>, and XeF<sub>4</sub>

Answer: B

Diff: 2 Var: 5

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.21 Classify bonds as ionic or covalent.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

77) Which of the compounds C<sub>2</sub>H<sub>6</sub>, CaCl<sub>2</sub>, Cu(NO<sub>3</sub>)<sub>2</sub>, OF<sub>2</sub> are expected to exist as molecules?

- A) only C<sub>2</sub>H<sub>6</sub>
- B) C<sub>2</sub>H<sub>6</sub> and OF<sub>2</sub>
- C) C<sub>2</sub>H<sub>6</sub>, Cu(NO<sub>3</sub>)<sub>2</sub>, and OF<sub>2</sub>
- D) CaCl<sub>2</sub> and Cu(NO<sub>3</sub>)<sub>2</sub>

Answer: B

Diff: 2 Var: 5

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.21 Classify bonds as ionic or covalent.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

78) Which of the following elements has the **least** tendency to form an ion?

- A) Be
- B) H
- C) He
- D) O

Answer: C

Diff: 2 Var: 5

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.21 Classify bonds as ionic or covalent.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

79) The solid compound,  $\text{Na}_4\text{SiO}_4$ , contains

- A)  $\text{Na}^+$ ,  $\text{Si}^{4+}$ , and  $\text{O}^{2-}$  ions.
- B)  $\text{Na}^+$  ions and  $\text{SiO}_4^{4-}$  ions.
- C)  $\text{Na}_4^+$  and  $\text{SiO}_4^{4-}$  ions.
- D)  $\text{Na}_4\text{SiO}_4$  molecules.

Answer: B

Diff: 2 Var: 4

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.23 Match the molecular representation of an ionic compound with its chemical formula.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

80) What is the chemical formula for nickel(II) phosphate?

- A)  $\text{Ni}_2\text{P}$
- B)  $\text{Ni}_2\text{PO}_4$
- C)  $\text{Ni}_3\text{P}_2$
- D)  $\text{Ni}_3(\text{PO}_4)_2$

Answer: D

Diff: 2 Var: 5

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

81) What is the charge on the Sc ions in  $\text{Sc}_2\text{O}_3$ ?

- A) 2-
- B) 1+
- C) 2+
- D) 3+

Answer: D

Diff: 2 Var: 5

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

82)  $\text{Na}_2\text{S}$  is named

- A) sodium disulfide.
- B) sodium sulfide.
- C) sodium(II) sulfide.
- D) sodium sulfur.

Answer: B

Diff: 2 Var: 5

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

83) What is the chemical formula for strontium hydroxide?

- A)  $\text{SrH}_2$
- B)  $\text{SrOH}$
- C)  $\text{SrOH}_2$
- D)  $\text{Sr}(\text{OH})_2$

Answer: D

Diff: 2 Var: 5

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

84) What is the chemical formula for radium hydride?

- A)  $\text{RaH}_2$
- B)  $\text{RaOH}$
- C)  $\text{RaOH}_2$
- D)  $\text{Ra}(\text{OH})_2$

Answer: A

Diff: 2 Var: 5

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.26 Convert between name and formula for binary molecular compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

85) An aqueous solution of  $\text{HCl}$  is named

- A) hydrochloric acid.
- B) hydrochlorous acid.
- C) chloric acid.
- D) chlorous acid.

Answer: A

Diff: 2 Var: 5

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

86) The chemical formula for the nitrite ion is

- A)  $\text{N}^{2-}$ .
- B)  $\text{N}^{3-}$ .
- C)  $\text{NO}_2^-$ .
- D)  $\text{NO}_3^-$ .

Answer: C

Diff: 2 Var: 5

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

87) The chemical formula for rubidium peroxide is

- A) RbOH.
- B) RbO<sub>2</sub>.
- C) Rb<sub>2</sub>O.
- D) Rb<sub>2</sub>O<sub>2</sub>.

Answer: D

Diff: 2 Var: 5

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

88) The compound, Cu(I O<sub>3</sub>)<sub>2</sub>, is named

- A) copper iodate(II).
- B) copper(I) iodate.
- C) copper(I) iodate(II).
- D) copper(II) iodate.

Answer: D

Diff: 2 Var: 5

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

89) The compound, ClO , is named

- A) chlorite.
- B) hypochlorite.
- C) chlorine monoxide.
- D) chlorine (II) oxide.

Answer: C

Diff: 2 Var: 5

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.26 Convert between name and formula for binary molecular compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

90) The ion, NO<sub>2</sub><sup>-</sup>, is named

- A) nitrate ion.
- B) nitrite ion.
- C) nitrogen dioxide ion.
- D) nitrogen(II) oxide ion.

Answer: B

Diff: 2 Var: 5

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.



91) The chemical formula for chlorous acid is

- A)  $\text{HClO}(aq)$ .
- B)  $\text{HClO}_2(aq)$ .
- C)  $\text{HClO}_3(aq)$ .
- D)  $\text{HClO}_4(aq)$ .

Answer: B

Diff: 2 Var: 5

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.26 Convert between name and formula for binary molecular compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

92) The chemical formula for magnesium nitride is

- A)  $\text{Mg}(\text{NO}_3)_2$ .
- B)  $\text{Mg}(\text{NO}_2)_2$ .
- C)  $\text{Mg}_3\text{N}_2$ .
- D)  $\text{MgN}_2$ .

Answer: C

Diff: 2 Var: 5

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

93) In which set do all elements tend to form cations in binary ionic compounds?

- A) Na, B, S
- B) Ca, Cr, Pb
- C) S, As, Bi
- D) O, Br, I

Answer: B

Diff: 2 Var: 50+

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

94) In which set do all elements tend to form anions in binary ionic compounds?

- A) C, S, Pb
- B) K, Fe, F
- C) Na, Ba, Al
- D) N, O, Cl

Answer: D

Diff: 2 Var: 50+

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

95) What is the most likely charge on an ion of phosphorus, P?

- A) 5-
- B) 3-
- C) 1+
- D) 5+

Answer: B

Diff: 2 Var: 50+

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

96) Which element can form more than one kind of monatomic ion?

- A) Sr
- B) Al
- C) Sn
- D) O

Answer: C

Diff: 2 Var: 50+

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

97) Which element can form more than one kind of monatomic ion?

- A) Na
- B) I
- C) Cr
- D) Zn

Answer: C

Diff: 2 Var: 50+

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

98) Which one of the following compounds contains ionic bonds?

- A) MgS
- B) HF
- C) NCl<sub>3</sub>
- D) SiO<sub>2</sub>

Answer: A

Diff: 2 Var: 48

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

99) Which of the following is the correct chemical formula for a molecule of nitrogen?

- A) N
- B) N<sup>-</sup>
- C) N<sup>+</sup>
- D) N<sub>2</sub>

Answer: D

Diff: 2 Var: 7

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.26 Convert between name and formula for binary molecular compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

100) Which of the compounds, Na<sub>3</sub>P, PH<sub>3</sub>, C<sub>2</sub>H<sub>6</sub>, IBr<sub>3</sub>, are ionic compounds?

- A) only C<sub>2</sub>H<sub>6</sub>
- B) only Na<sub>3</sub>P
- C) Na<sub>3</sub>P and PH<sub>3</sub>
- D) PH<sub>3</sub>, C<sub>2</sub>H<sub>6</sub>, and IBr<sub>3</sub>

Answer: B

Diff: 2 Var: 50+

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

101) Which of the compounds, C<sub>5</sub>H<sub>12</sub>, CaF<sub>2</sub>, Pd(NO<sub>3</sub>)<sub>2</sub>, OCl<sub>2</sub>, are expected to exist as molecules?

- A) only C<sub>5</sub>H<sub>12</sub>
- B) C<sub>5</sub>H<sub>12</sub> and OCl<sub>2</sub>
- C) C<sub>5</sub>H<sub>12</sub>, Pd(NO<sub>3</sub>)<sub>2</sub>, and OCl<sub>2</sub>
- D) CaF<sub>2</sub> and Pd(NO<sub>3</sub>)<sub>2</sub>

Answer: B

Diff: 2 Var: 50+

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.26 Convert between name and formula for binary molecular compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

102) Which of the following elements has the **least** tendency to form an ion?

- A) Ca
- B) Li
- C) Kr
- D) S

Answer: C

Diff: 2 Var: 50+

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

103) What is the chemical formula for iron(II) phosphate?

- A)  $\text{Fe}_2\text{P}$
- B)  $\text{Fe}_2\text{PO}_4$
- C)  $\text{Fe}_3\text{P}_4$
- D)  $\text{Fe}_3(\text{PO}_4)_2$

Answer: D

Diff: 2 Var: 36

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

104) What is the charge on the In in the ionic compound  $\text{In}_2\text{Te}_3$ ?

- A) 2-
- B) 1+
- C) 2+
- D) 3+

Answer: D

Diff: 2 Var: 48

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

105)  $\text{Na}_2\text{O}$  is named

- A) sodium dioxide.
- B) sodium oxide.
- C) sodium(II) oxide.
- D) sodium oxygen.

Answer: B

Diff: 2 Var: 24

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

106) What is the chemical formula for cesium bicarbonate?

- A)  $\text{Cs}_2\text{HCO}_3$
- B)  $\text{CsHCO}$
- C)  $\text{CsHCO}_2$
- D)  $\text{CsHCO}_3$

Answer: D

Diff: 2 Var: 18

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

107) What is the chemical formula for calcium chromate?

- A)  $\text{CaCrO}_2$
- B)  $\text{CaCrO}$
- C)  $\text{CaCrO}_3$
- D)  $\text{CaCrO}_4$

Answer: D

Diff: 2 Var: 27

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

108) The chemical formula for the carbonate ion is

- A)  $\text{C}^-$ .
- B)  $\text{CO}^-$ .
- C)  $\text{CO}_3^{2-}$ .
- D)  $\text{CO}_2^{2-}$ .

Answer: C

Diff: 2 Var: 32

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

109) The compound,  $\text{Sn}(\text{IO}_3)_2$ , is named

- A) tin iodate(II).
- B) tin(I) iodate.
- C) tin(I) iodate(II).
- D) tin(II) iodate.

Answer: D

Diff: 2 Var: 24

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

110) The chemical formula for calcium telluride is

- A)  $\text{Ca}(\text{TeO}_3)$ .
- B)  $\text{Ca}(\text{TeO}_2)$ .
- C)  $\text{CaTe}$ .
- D)  $\text{CaTe}_2$ .

Answer: C

Diff: 2 Var: 24

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

111) What are the names of the ions  $\text{Mn}^{2+}$ ,  $\text{Sn}^{2+}$ , and  $\text{Se}^{2-}$ ?

- A) manganese, tin, and selenium
- B) manganese, tin(II), and selenide
- C) manganese(II), tin(II), and selenium(II-)
- D) manganous, stannous, and selenide

Answer: B

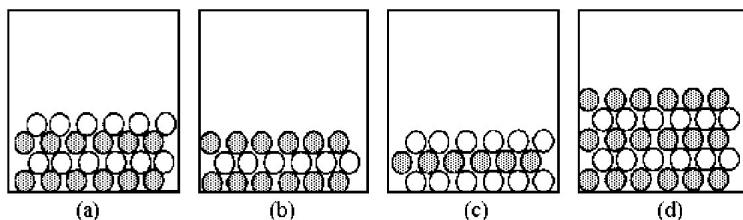
Diff: 2 Var: 50+

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

In the following drawings, shaded spheres represent cations and unshaded spheres represent anions.



112) Which drawing represents the ionic compound  $\text{Sr}_3(\text{PO}_4)_2$ ?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

Answer: D

Diff: 3 Var: 8

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.

113) Which drawing represents the ionic compound  $\text{Ag}_2\text{CO}_3$ ?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

Answer: B

Diff: 3 Var: 16

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.

114) Which drawing represents the ionic compound  $\text{BaF}_2$ ?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

Answer: C

Diff: 3 Var: 36

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.

115) Which drawing represents the ionic compound  $\text{AgClO}_3$ ?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

Answer: A

Diff: 3 Var: 21

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.

116) Which drawing represents the ionic compound  $\text{RbClO}_4$ ?

- A) drawing (a)
- B) drawing (b)
- C) drawing (c)
- D) drawing (d)

Answer: A

Diff: 3 Var: 15

Topic: Conceptual Problems

Learning Obj: LO 2.20a Convert between structural formulas, ball-and-stick models, and chemical formulas.

Global Obj: G3 Read and interpret graphs and data.

## 2.3 Short Answer Questions

1) The symbol for mercury is \_\_\_\_\_.

Answer: Hg

Diff: 2 Var: 1

Topic: Section 2.1 Chemistry and the Elements

Learning Obj: LO 2.1 Use symbols to represent the elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

2) Pb is the symbol for the element \_\_\_\_\_.

Answer: lead

Diff: 2 Var: 1

Topic: Section 2.1 Chemistry and the Elements

Learning Obj: LO 2.1 Use symbols to represent the elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

3) In a periodic table rows are called \_\_\_\_\_ and columns are called \_\_\_\_\_.

Answer: periods, groups

Diff: 2 Var: 1

Topic: Section 2.2 Elements and the Periodic Table

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

4) The element Al can be found in period \_\_\_\_\_ and group \_\_\_\_\_ of the periodic table.

Answer: 3, 3A

Diff: 2 Var: 16

Topic: Section 2.2 Elements and the Periodic Table

Learning Obj: LO 2.2 Identify the location of metals, nonmetals, and semimetals on the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

5) The element that is in period 5 and group 2A has the symbol \_\_\_\_\_.

Answer: Sr

Diff: 2 Var: 16

Topic: Section 2.2 Elements and the Periodic Table

Learning Obj: LO 2.3 Indicate the atomic number, group number, and period number for an element whose position in the periodic table is given.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

6) A property that depends on the amount of a substance is an \_\_\_\_\_ property, whereas a property that is independent on the amount of substance is an \_\_\_\_\_ property.

Answer: extensive, intensive

Diff: 2 Var: 1

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

7) Elements are classified as metals, nonmetals, or semimetals. At room temperature a certain element exists as a dull yellow solid that is a poor conductor of electricity and is brittle. This element is most likely a \_\_\_\_\_.

Answer: nonmetal

Diff: 2 Var: 1

Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.6 Use the properties of an element to classify it as metal, nonmetal, or semimetal and give its location in the periodic table.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

8) Sodium is an example of an \_\_\_\_\_ metal that reacts with water to form hydrogen gas and an \_\_\_\_\_ solution.

Answer: alkali, alkaline (basic)

Diff: 2 Var: 1

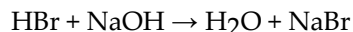
Topic: Section 2.3 Some Common Groups of Elements and Their Properties

Learning Obj: LO 2.5 Specify the location and give examples of elements in the alkali metal, alkaline earth metal, halogen, and noble gas groups.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.



9) 81 g of HBr react with 40 g of NaOH to produce 18 g of H<sub>2</sub>O, then the number of grams of NaBr produced is \_\_\_\_\_.



Answer: 103 g

Diff: 2 Var: 1

Topic: Section 2.4 Observations Supporting Atomic Theory: The Conservation of Mass and the Law of Definite Proportions

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

10) According to the law of multiple proportions, if 12 g of carbon combine with 16 g of oxygen to form CO, the number of grams of carbon that combine with 16 g of oxygen in the formation of CO<sub>2</sub> is \_\_\_\_\_.

Answer: 6 g

Diff: 2 Var: 1

Topic: Section 2.5 The Law of Multiple Proportions and Dalton's Atomic Theory

Learning Obj: LO 2.7 Determine the mass of the products in a reaction using the law of mass conservation.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

11) The charge to mass ratio of an electron was determined from Rutherford's cathode-ray tube experiment to be  $1.759 \times 10^8$  C/g and the charge on a single electron was determined from the Millikan oil drop experiment to be  $1.602 \times 10^{-19}$  C, so the mass of a single electron is \_\_\_\_\_.

Answer:  $9.11 \times 10^{-28}$  g

Diff: 3 Var: 1

Topic: Section 2.6 Atomic Structure: Electrons

Learning Obj: LO 2.10a Describe Milikan's oil drop experiment and what it contributed to the current model of atomic structure. (Figure 2.4)

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

12) The subatomic particles contained in the nucleus of an atom are \_\_\_\_\_ and \_\_\_\_\_.

Answer: protons, neutrons

Diff: 1 Var: 1

Topic: Section 2.7 Atomic Structure: Protons and Neutrons

Learning Obj: LO 2.12 Describe the structure and size of the atom. (Figure 2.6)

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

13) Atoms of the same element always have the same number of \_\_\_\_\_ in their nuclei.

Answer: protons

Diff: 1 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

14) Isotopes have the same number of \_\_\_\_\_ but different numbers of \_\_\_\_\_ in their nuclei.

Answer: protons, neutrons

Diff: 1 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.15 Write isotope symbols for elements.

Global Obj: G1 Demonstrate an understanding of the principles of scientific inquiry.

15) The symbol of the isotope having  $Z = 88$  and  $A = 226$  is \_\_\_\_\_.

Answer:  ${}_{88}^{226}\text{Ra}$

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.15 Write isotope symbols for elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

16) The symbol for technetium-98 is \_\_\_\_\_.

Answer:  ${}_{43}^{98}\text{Tc}$

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.15 Write isotope symbols for elements.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

17) The number of neutrons in a neutral atom of uranium-238 is \_\_\_\_\_.

Answer: 146

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

18) A neutral atom with atomic number 5 and mass number 11 contains \_\_\_\_\_ electrons.

Answer: 5

Diff: 2 Var: 1

Topic: Section 2.8 Atomic Numbers

Learning Obj: LO 2.14 Determine the mass number, atomic number, and number of protons, neutrons, and electrons from an isotope symbol.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

19) Chlorine has two common isotopes, chlorine-35 and chlorine-37, and an atomic mass of 35.45 amu. The natural abundance of chlorine-35 is \_\_\_\_\_ (greater than, less than, the same as) the natural abundance of chlorine-37.

Answer: greater than

Diff: 2 Var: 1

Topic: Section 2.9 Atomic Weights and the Mole

Learning Obj: LO 2.16 Calculate atomic weight given the fractional abundance and mass of each isotope.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

20) The number of atoms in 1 g of H is \_\_\_\_\_ (greater than, less than, the same as) the number of atoms in 12 g of C.

Answer: the same as

Diff: 2 Var: 8

Topic: Section 2.9 Atomic Weights and the Mole

Learning Obj: LO 2.17 Convert between grams and numbers of moles or atoms using molar mass and Avogadro's number.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

21) To the nearest whole number, the number of grams of Ba in 3.25 mol of Ba is \_\_\_\_\_.

Answer: 446 g

Diff: 2 Var: 1

Topic: Section 2.9 Atomic Weights and the Mole

Learning Obj: LO 2.17 Convert between grams and numbers of moles or atoms using molar mass and Avogadro's number.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

22) The number of moles of Li in 34.7 g Li is \_\_\_\_\_.

Answer: 5.00 mol

Diff: 2 Var: 1

Topic: Section 2.9 Atomic Weights and the Mole

Learning Obj: LO 2.17 Convert between grams and numbers of moles or atoms using molar mass and Avogadro's number.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

23) 10% saline solution (sodium chloride dissolved in water) is an example of a \_\_\_\_\_.

Answer: mixture

Diff: 2 Var: 1

Topic: Section 2.10 Mixtures and Chemical Compounds: Molecules and Covalent Bonds

Learning Obj: LO 2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

24) The number of electrons in the ion  $\text{Ca}^{2+}$  is \_\_\_\_\_.

Answer: 18

Diff: 2 Var: 1

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.22 Determine the number of electrons and protons from chemical symbol and charge.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

25) The number of electrons in the ion  $\text{C}^{4-}$  is \_\_\_\_\_.

Answer: 10

Diff: 2 Var: 1

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.22 Determine the number of electrons and protons from chemical symbol and charge.

Global Obj: G4 Demonstrate the quantitative skills needed to succeed in chemistry.

26) The bonding in NaI is \_\_\_\_\_, whereas the bonding in NH<sub>3</sub> is \_\_\_\_\_.

Answer: ionic, covalent

Diff: 2 Var: 50+

Topic: Section 2.11 Ions and Ionic Bonds

Learning Obj: LO 2.21 Classify bonds as ionic or covalent.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

27) Phosphate ion has the formula \_\_\_\_\_.

Answer: PO<sub>4</sub><sup>3-</sup>

Diff: 2 Var: 1

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.25 Convert between formula and name for ionic compounds with polyatomic ions.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.

28) The formula of thallium(III) selenide contains \_\_\_\_\_ thallium(III) and \_\_\_\_\_ selenide ions.

Answer: 2, 3

Diff: 2 Var: 16

Topic: Section 2.12 Naming Chemical Compounds

Learning Obj: LO 2.24 Convert between name and formula for binary ionic compounds.

Global Obj: G2 Demonstrate the ability to think critically and employ critical thinking skills.