

Chapter 2 - Atoms, Molecules, and Ions

1. Which of the following is/are postulates of Dalton's atomic theory?

1. Atoms combine in fixed ratios of whole numbers.
2. Atoms of each element have different properties.
3. Elements occur as solids, liquids, or gases.

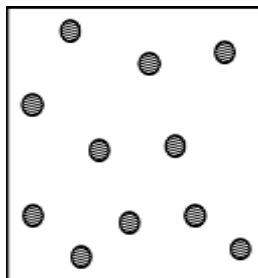
- A) 1 only
B) 2 only
C) 3 only
D) 1 and 2
E) 1, 2, and 3

ANS: D PTS: 1 DIF: easy REF: 2.1

OBJ: List the postulates of atomic theory.

TOP: early atomic theory | atomic theory of matter

2. Which of the following statements best describes the particulate representation depicted by the picture?



- A) The figure is a representation of a gas made up of a single element.
B) The figure is a representation of a liquid mixture of two elements.
C) The figure is a representation of a molecular solid.
D) The figure is a representation of a liquid mixture of two compounds.
E) The figure is a representation of a gas of a compound.

ANS: A PTS: 1 DIF: moderate REF: 2.1

OBJ: Define element, compound, and chemical reaction in the context of these postulates.

TOP: early atomic theory | atomic theory of matter

3. Which of the following is not a correct name–symbol combination?

- A) cobalt, Co
B) vanadium, V
C) neon, Ne
D) scandium, Sc
E) titanium, Mg

ANS: E PTS: 1 DIF: easy REF: 2.1

OBJ: Recognize the atomic symbols of the elements.

TOP: early atomic theory | atomic theory of matter

4. The symbol for tin is

- A) T.
- B) Tn.
- C) Si.
- D) Ti.
- E) Sn.

ANS: E PTS: 1 DIF: easy REF: 2.1
OBJ: Recognize the atomic symbols of the elements.
TOP: early atomic theory | atomic theory of matter KEY:
atomic symbol
MSC: general chemistry

5. What is the symbol for the element phosphorus?

- A) Po
- B) P
- C) Pt
- D) K
- E) Pr

ANS: B PTS: 1 DIF: easy REF: 2.1
OBJ: Recognize the atomic symbols of the elements.
TOP: early atomic theory | atomic theory of matter KEY:
atomic symbol
MSC: general chemistry

6. Which one of the following lists gives the correct symbols for the elements phosphorus, potassium, silver, chlorine, and sulfur?

- A) P, Po, Ag, Cl, S
- B) K, Ag, Po, Cl, S
- C) P, K, Ag, Cl, S
- D) Ph, K, Ag, S, Cl
- E) Ph, Po, Ag, Cl, S

ANS: C PTS: 1 DIF: easy REF: 2.1
OBJ: Recognize the atomic symbols of the elements.
TOP: early atomic theory | atomic theory of matter KEY:
atomic symbol
MSC: general chemistry

7. Which of the following lists gives the atomic symbols for potassium, magnesium, beryllium, and sodium?

- A) Po, Mn, Br, Na
- B) P, Mn, Be, Se
- C) K, Mg, Be, Na
- D) Pt, Mg, Be, Sc
- E) K, Mn, Br, Na

ANS: C PTS: 1 DIF: easy REF: 2.1
OBJ: Recognize the atomic symbols of the elements.

TOP: early atomic theory | atomic theory of matter KEY:
atomic symbol
MSC: general chemistry

8. The names of the elements whose symbols are Si, P, Mn, and S are, respectively,
- A) silicon, phosphorus, manganese, and sulfur.
 - B) silicon, potassium, magnesium, and sulfur.
 - C) silver, phosphorus, magnesium, and sodium.
 - D) silver, potassium, manganese, and sodium.
 - E) silicon, potassium, manganese, and sulfur.

ANS: A PTS: 1 DIF: easy REF: 2.1

OBJ: Recognize the atomic symbols of the elements.

TOP: early atomic theory | atomic theory of matter KEY:
atomic symbol

MSC: general chemistry

9. Which of the following is the atomic symbol for the element cobalt?
- A) CO
 - B) Co
 - C) C
 - D) co
 - E) All of the above

ANS: B PTS: 1 DIF: easy REF: 2.1

OBJ: Recognize the atomic symbols of the elements.

TOP: early atomic theory | atomic theory of matter KEY:
atomic symbol

MSC: general chemistry

10. A series of silicon–hydrogen compounds with the general formula $\text{Si}_n\text{H}_{2n+2}$ can be represented by the known compounds SiH_4 , Si_2H_6 , and Si_3H_8 . This best illustrates the law of
- A) multiple proportions.
 - B) conservation of charge.
 - C) definite composition.
 - D) conservation of mass.
 - E) conservation of atoms.

ANS: A PTS: 1 DIF: moderate REF: 2.1

OBJ: Explain the significance of the law of multiple proportions.

TOP: early atomic theory | atomic theory of matter

KEY: Dalton's atomic theory MSC: general chemistry

11. According to the law of multiple proportions:
- A) the total mass is the same after a chemical change as before the change.
 - B) it is not possible for the same two elements to form more than one compound.
 - C) the ratio of the masses of the elements in a compound is always the same.
 - D) if the same two elements form two different compounds, they do so in the same ratio.

E) none of these

ANS: E PTS: 1 DIF: moderate REF: 2.1

OBJ: Explain the significance of the law of multiple proportions.

TOP: general concepts | matter KEY: compound MSC: general chemistry

12. Which of the following pairs of compounds can be used to illustrate the law of multiple proportions?

A) H₂O and HCl

B) NO and NO₂

C) NH₄ and NH₄Cl

D) ZnO₂ and ZnCl₂

E) CH₄ and CO₂

ANS: B PTS: 1 DIF: moderate REF: 2.1

OBJ: Explain the significance of the law of multiple proportions.

TOP: general concepts | matter KEY: compound MSC: general chemistry

13. Cathode rays are

A) anions.

B) protons.

C) cations.

D) positrons.

E) electrons.

ANS: E PTS: 1 DIF: easy REF: 2.2

OBJ: Describe Thomson's experiment in which he discovered the electron.

TOP: early atomic theory | atomic theory of matter

KEY: structure of the atom | discovery of electron MSC: general chemistry

14. A subatomic particle is

A) a piece of an atom.

B) only found in the nucleus of an atom.

C) always positively charged.

D) larger than the nucleus of an atom.

E) always negatively charged.

ANS: A PTS: 1 DIF: easy REF: 2.1 | 2.2

OBJ: Describe Rutherford's nuclear model and the makeup of the nucleus.

TOP: early atomic theory | atomic theory of matter

15. Experiments were carried out in which a beam of cathode rays was first bent by a magnetic field and then bent back by an electrostatic field until the beam hit the screen exactly where it had been hitting before the fields were applied. This experiment permitted the direct measurement of

A) the ratio of mass to charge of an electron.

B) the charge on the nucleus of an atom.

C) the charge on the electron.

D) the mass of the atom.

E) the mass of the electron.

ANS: A PTS: 1 DIF: moderate REF: 2.2
OBJ: Describe Thomson's experiment in which he discovered the electron.
TOP: early atomic theory | atomic theory of matter
KEY: structure of the atom | discovery of electron MSC: general chemistry

16. Who discovered the electron?

- A) Bohr
- B) de Broglie
- C) Rutherford
- D) Heisenberg
- E) Thomson

ANS: E PTS: 1 DIF: moderate REF: 2.2
OBJ: Describe Thomson's experiment in which he discovered the electron.
TOP: early atomic theory | atomic theory of matter
KEY: structure of the atom | discovery of electron MSC: general chemistry

17. Which of the following conclusions regarding Rutherford's gold foil experiment is not consistent with the observations?

- A) The nucleus occupies only a small portion of the space of an atom.
- B) Most alpha particles travel straight through the gold foil.
- C) The nucleus occupies a large amount of the atom space.
- D) The nucleus, like the alpha particles used to bombard the gold foil, is positively charged.
- E) Wide angle deflections result from a collision of an alpha particle and a gold atom nucleus.

ANS: C PTS: 1 DIF: easy REF: 2.2
OBJ: Describe Rutherford's experiment that led to the nuclear model of the atom.
TOP: early atomic theory | atomic theory of matter

18. Who discovered the nucleus of an atom?

- A) Thomson
- B) de Broglie
- C) Rutherford
- D) Bohr
- E) Heisenberg

ANS: C PTS: 1 DIF: easy REF: 2.2
OBJ: Describe Rutherford's experiment that led to the nuclear model of the atom.
TOP: early atomic theory | atomic theory of matter
KEY: structure of the atom | nuclear model of atom MSC: general chemistry

19. If the Thomson model of the atom had been correct, Rutherford would have observed

- A) alpha particles bouncing off the foil.
- B) alpha particles going through the foil with little or no deflection.
- C) alpha particles greatly deflected by the metal foil.
- D) positive particles formed in the foil.
- E) None of the above observations is consistent with the Thomson model of the atom.

ANS: B PTS: 1 DIF: moderate REF: 2.2

OBJ: Define atomic number, mass number, and nuclide.

TOP: early atomic theory | atomic theory of matter
nuclear structure

KEY:

MSC: general chemistry

24. Which nuclide has the same number of protons as ${}^{14}_7\text{N}$?

A) ${}^{19}_9\text{F}$

B) ${}^{15}_8\text{O}$

C) ${}^{12}_6\text{C}$

D) ${}^{31}_{15}\text{P}$

E) ${}^{15}_7\text{N}$

ANS: E PTS: 1 DIF: easy

REF: 2.3

OBJ: Write the nuclide symbol for a given nuclide.

TOP: early atomic theory | atomic theory of matter
nuclear structure

KEY:

MSC: general chemistry

25. How many electrons does the ion ${}^{35}_{17}\text{Cl}^-$ have?

A) 18

B) 36

C) 16

D) 34

E) 19

ANS: A PTS: 1 DIF: easy

REF: 2.3

OBJ: Write the nuclide symbol for a given nuclide.

TOP: early atomic theory | atomic theory of matter

26. How many protons are there in the chromium-52 nuclide?

A) 29

B) 76

C) 23

D) 24

E) 28

ANS: D PTS: 1 DIF: easy

REF: 2.3

OBJ: Write the nuclide symbol for a given nuclide.

TOP: early atomic theory | atomic theory of matter
atomic symbol

KEY:

MSC: general chemistry

27. How many neutrons are there in the cobalt-59 nuclide?

A) 27

B) 2

C) 86

D) 59

E) 32

ANS: E PTS: 1 DIF: easy REF: 2.3
OBJ: Write the nuclide symbol for a given nuclide.
TOP: early atomic theory | atomic theory of matter KEY:
atomic symbol
MSC: general chemistry

28. An atom that has the same number of neutrons as ^{59}Ni is

- A) ^{58}Zn .
- B) ^{57}Fe .
- C) ^{57}Cr .
- D) ^{58}Mn .
- E) ^{59}Co .

ANS: B PTS: 1 DIF: easy REF: 2.3
OBJ: Write the nuclide symbol for a given nuclide.
TOP: early atomic theory | atomic theory of matter KEY:
atomic symbol
MSC: general chemistry

29. Which combination of protons, neutrons, and electrons correctly represents a ^{56}Fe nuclide?

- A) 26 protons, 30 neutrons, 56 electrons
- B) 26 protons, 30 neutrons, 30 electrons
- C) 26 protons, 30 neutrons, 26 electrons
- D) 56 protons, 26 neutrons, 56 electrons
- E) 56 protons, 26 neutrons, 26 electrons

ANS: C PTS: 1 DIF: easy REF: 2.3
OBJ: Write the nuclide symbol for a given nuclide.
TOP: early atomic theory | atomic theory of matter KEY:
atomic symbol
MSC: general chemistry

30. The species that has the same number of neutrons as $^{37}_{17}\text{Cl}$ is

- A) $^{36}_{16}\text{S}$.
- B) $^{35}_{17}\text{Cl}$.
- C) $^{40}_{18}\text{Ar}$.
- D) $^{32}_{16}\text{S}$.
- E) $^{31}_{15}\text{P}$.

ANS: A PTS: 1 DIF: moderate REF: 2.3
OBJ: Write the nuclide symbol for a given nuclide.
TOP: early atomic theory | atomic theory of matter KEY:
atomic symbol
MSC: general chemistry

31. Which of the following nuclides contains more protons than neutrons?

- A) ${}^1_1\text{H}$
- B) ${}^{19}_9\text{F}$
- C) ${}^{34}_{16}\text{S}$
- D) ${}^{24}_{12}\text{Mg}$
- E) ${}^4_2\text{He}$

ANS: A PTS: 1 DIF: moderate REF: 2.3

OBJ: Write the nuclide symbol for a given nuclide.

TOP: early atomic theory | atomic theory of matter

32. How many neutrons are there in 6 molecules of ${}^{33}_{16}\text{S}_2$?

- A) 204
- B) 102
- C) 6
- D) 396
- E) 192

ANS: A PTS: 1 DIF: difficult REF: 2.3

OBJ: Write the nuclide symbol for a given nuclide.

TOP: early atomic theory | atomic theory of matter

33. Suppose atom 1 has the same number of protons as atom 2, and atom 2 has the same number of neutrons as atom 3. Atom 1 does not have the same number of neutrons as atom 3. Which of the following statements is true?

- A) Atom 3 must have the same number of protons as atom 2.
- B) Atoms 1 and 2 must be isotopes.
- C) Atoms 1 and 3 must be isotopes.
- D) Atom 2 must have the same number of neutrons as atom 1.
- E) Atom 3 must have the same number of protons as atom 1.

ANS: B PTS: 1 DIF: difficult REF: 2.3

OBJ: Define and provide examples of isotopes of an element.

TOP: early atomic theory | atomic theory of matter

KEY:

nuclear structure

MSC: general chemistry

34. Which of the following statements is true concerning the two nuclides ${}^3\text{He}$ and ${}^4\text{He}$?

- A) They have the same number of neutrons.
- B) They are isotopes.
- C) They have the same relative atomic mass.
- D) They have the same mass number.
- E) They have different chemical properties.

ANS: B PTS: 1 DIF: easy REF: 2.3

OBJ: Define and provide examples of isotopes of an element.

TOP: early atomic theory | atomic theory of matter

KEY: isotope

MSC: general chemistry

35. Which of the following atomic symbols represents an isotope of ^{99}Ru ?

- A) ^{98}Tc
- B) ^{100}Rh
- C) ^{99}Rh
- D) ^{100}Ru
- E) ^{99}Tc

ANS: D PTS: 1 DIF: easy REF: 2.3

OBJ: Define and provide examples of isotopes of an element.

TOP: early atomic theory | atomic theory of matter

KEY: isotope

MSC: general chemistry

36. Which of the following represents a pair of isotopes?

	<u>Atomic Number</u>	<u>Mass Number</u>
A) I	17	36
II	18	36
B) I	7	15
II	8	15
C) I	17	35
II	17	37
D) I	17	37
II	18	38
E) I	7	16
II	8	17

ANS: C PTS: 1 DIF: easy REF: 2.3

OBJ: Define and provide examples of isotopes of an element.

TOP: early atomic theory | atomic theory of matter

KEY: isotope

MSC: general chemistry

37. There are three isotopes of carbon differing with respect to

- A) electron configuration.
- B) nuclear charge.
- C) number of neutrons.
- D) number of protons.
- E) atomic number.

ANS: C PTS: 1 DIF: easy REF: 2.3

OBJ: Define and provide examples of isotopes of an element.

TOP: early atomic theory | atomic theory of matter

KEY: isotope

MSC: general chemistry

38. Which of the following about the isotopes of a particular element is not true?

- A) Each unique isotope has a different atomic mass.
- B) Each unique isotope has a different atomic number.
- C) Each unique isotope has a different number of neutrons.

- D) Each unique isotope has the same number of protons.
E) In neutral atoms of each unique isotope, the number of electrons equals the number of protons.

ANS: B PTS: 1 DIF: moderate REF: 2.3

OBJ: Define and provide examples of isotopes of an element.

TOP: early atomic theory | atomic theory of matter

39. The neutral atoms of all the isotopes of the same element have

- A) different numbers of protons.
B) the same number of neutrons.
C) the same number of electrons.
D) the same mass.
E) the same mass number.

ANS: C PTS: 1 DIF: easy REF: 2.3

OBJ: Define and provide examples of isotopes of an element.

TOP: early atomic theory | atomic theory of matter

KEY: isotope

MSC: general chemistry

40. What is the symbol of the nuclide having 15 protons and 16 neutrons?

- A) ${}_{15}^{31}\text{S}$
B) ${}_{15}^{16}\text{S}$
C) ${}_{15}^{31}\text{P}$
D) ${}_{16}^{15}\text{S}$
E) ${}_{15}^{16}\text{P}$

ANS: C PTS: 1 DIF: moderate REF: 2.3

OBJ: Write the nuclide symbol of an element. (Example 2.1)

TOP: early atomic theory | atomic theory of matter

KEY:

atomic symbol

MSC: general chemistry

41. Which of the following has 62 neutrons, 46 protons, and 46 electrons?

- A) ${}_{48}^{108}\text{Cd}^{2+}$
B) ${}_{46}^{108}\text{Pd}$
C) ${}_{47}^{108}\text{Ag}^{+}$
D) ${}_{48}^{110}\text{Cd}^{2+}$
E) ${}_{45}^{103}\text{Rh}^{3+}$

ANS: B PTS: 1 DIF: easy REF: 2.3

OBJ: Write the nuclide symbol of an element. (Example 2.1)

TOP: general concepts | atomic theory of matter

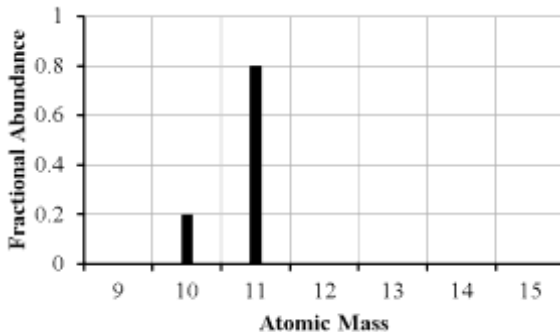
42. Which of the following elements has the largest atomic mass?

- A) rhenium

- B) manganese
- C) thallium
- D) argon
- E) fluorine

ANS: C PTS: 1 DIF: easy REF: 2.4
 OBJ: Define atomic mass unit and atomic weight.
 TOP: early atomic theory | atomic theory of matter
 KEY: atomic weight | atomic mass unit MSC: general chemistry

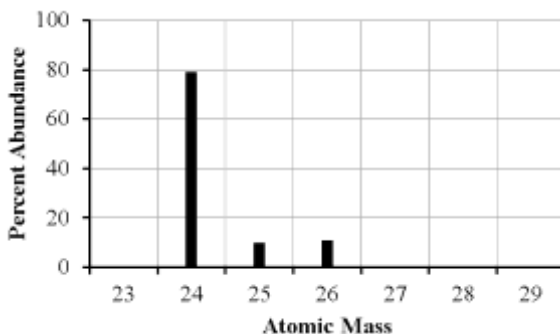
43. The mass spectrum of an element with two naturally occurring isotopes is shown below. What is the best estimate of the element's atomic mass?



- A) 10 amu
- B) 11 amu
- C) 10.8 amu
- D) 10.2 amu
- E) 10.5 amu

ANS: C PTS: 1 DIF: moderate REF: 2.4
 OBJ: Describe how a mass spectrometer can be used to determine the fractional abundance of the isotopes of an element.
 TOP: early atomic theory | atomic theory of matter

44. The mass spectrum of an element with two naturally occurring isotopes is shown below. Its average atomic mass would be best estimated as



- A) less than 26 amu but greater than 25 amu.
- B) less than 25 amu but greater than 24 amu.
- C) equal to 24 amu.
- D) equal to 25 amu.

E) greater than 26 amu.

ANS: B PTS: 1 DIF: moderate REF: 2.4

OBJ: Describe how a mass spectrometer can be used to determine the fractional abundance of the isotopes of an element.

TOP: early atomic theory | atomic theory of matter

45. Lithium has two naturally occurring isotopes, ${}^6\text{Li}$ and ${}^7\text{Li}$. The average atomic mass of lithium is 6.941. Which of the following statements concerning the relative abundance of each isotope is correct?

- A) The abundance of ${}^7\text{Li}$ is greater than ${}^6\text{Li}$.
- B) The abundance of ${}^7\text{Li}$ is less than ${}^6\text{Li}$.
- C) The abundance of ${}^6\text{Li}$ is equal to the abundance of ${}^7\text{Li}$.
- D) Not enough data is provided to determine the correct answer.
- E) Based on the atomic mass, only ${}^7\text{Li}$ occurs naturally.

ANS: A PTS: 1 DIF: moderate REF: 2.4

OBJ: Describe how a mass spectrometer can be used to determine the fractional abundance of the isotopes of an element.

TOP: early atomic theory | atomic theory of matter

46. A certain element is listed as having an atomic mass of 63.5 amu. It is probably true that this element contains

- A) a mixture of isotopes.
- B) a mixture of neutrons.
- C) a mixture of isomers.
- D) a mixture of allotropes.
- E) a mixture of ions.

ANS: A PTS: 1 DIF: moderate REF: 2.4

OBJ: Determine the atomic mass of an element from the isotopic masses and fractional abundances. (Example 2.2)

TOP: early atomic theory | atomic theory of matter
atomic weight

KEY:

MSC: general chemistry

47. The average atomic mass of Eu is 151.96 amu. There are only two naturally occurring isotopes of europium, ${}^{151}\text{Eu}$ with a mass of 151.0 amu and ${}^{153}\text{Eu}$ with a mass of 153.0 amu. The natural abundance of the ${}^{151}\text{Eu}$ isotope must be approximately

- A) 60%.
- B) 20%.
- C) 50%.
- D) 80%.
- E) 40%.

ANS: C PTS: 1 DIF: moderate REF: 2.4

OBJ: Determine the atomic mass of an element from the isotopic masses and fractional abundances. (Example 2.2)

TOP: early atomic theory | atomic theory of matter
atomic weight

KEY:

MSC: general chemistry

48. Naturally occurring element X exists in three isotopic forms: X-28 (27.977 amu, 92.21% abundance), X-29 (28.976 amu, 4.70% abundance), and X-30 (29.974 amu, 3.09% abundance). Calculate the atomic weight of X.

- A) 29.09 amu
- B) 28.09 amu
- C) 35.29 amu
- D) 86.93 amu
- E) 25.80 amu

ANS: B PTS: 1 DIF: moderate REF: 2.4

OBJ: Determine the atomic mass of an element from the isotopic masses and fractional abundances. (Example 2.2)

TOP: early atomic theory | atomic theory of matter KEY:
atomic weight

MSC: general chemistry

49. Neon has three naturally occurring isotopes. The abundance of ^{20}Ne is 90.48% and ^{22}Ne is 9.25%. What is the percent abundance of ^{21}Ne ?

- A) 9.25%
- B) 0.27%
- C) 49.9%
- D) 33.2%
- E) 81.2%

ANS: B PTS: 1 DIF: easy REF: 2.4

OBJ: Determine the atomic mass of an element from the isotopic masses and fractional abundances. TOP: early atomic theory | atomic theory of matter

50. An element, X, has the following isotopic composition: X-200, 90%; X-199, 8.0%; and X-202, 2.0%. Its average atomic mass is closest to

- A) 200 amu.
- B) 203 amu.
- C) 199 amu.
- D) 202 amu.
- E) 201 amu.

ANS: A PTS: 1 DIF: moderate REF: 2.4

OBJ: Determine the atomic mass of an element from the isotopic masses and fractional abundances. (Example 2.2)

TOP: early atomic theory | atomic theory of matter KEY:
atomic weight

MSC: general chemistry

51. Which of the following concerning atomic mass is/are correct?

1. The atomic mass listed on a modern periodic table for each element is the mass of the most abundant isotope.
2. The atomic mass listed on a modern periodic table is a relative atomic mass,

based on the definition that ^{12}C equals 12 amu.

3. Relative atomic masses can only be determined with a mass spectrometer.

- A) 1 only
- B) 2 only
- C) 1 and 2
- D) 2 and 3
- E) 1, 2, and 3

ANS: B PTS: 1 DIF: moderate REF: 2.4

OBJ: Determine the atomic mass of an element from the isotopic masses and fractional abundances. TOP: early atomic theory | atomic theory of matter

52. A periodic law based on atomic masses would necessitate Te and I changing places in the periodic table. This was not done in the early periodic table because

- A) a periodic law based on atomic masses is not valid.
- B) it was thought that the atomic masses might be in error.
- C) iodine behaves chemically like chlorine and bromine.
- D) the tellurium samples could contain a heavy impurity.
- E) iodine contains one naturally occurring isotope, whereas tellurium consists of several isotopes.

ANS: C PTS: 1 DIF: easy REF: 2.5

OBJ: Identify periods and groups on the periodic table.

TOP: early atomic theory | periodic table KEY: group MSC: general chemistry

53. The elements in a row of the periodic table are known as

- A) metals.
- B) a period.
- C) metalloids.
- D) a family.
- E) a group.

ANS: B PTS: 1 DIF: easy REF: 2.5

OBJ: Identify periods and groups on the periodic table.

TOP: early atomic theory | periodic table KEY: period MSC: general chemistry

54. Which of the following statements about different elements is incorrect?

- A) Potassium is an alkali metal.
- B) Fluorine is a halogen.
- C) Aluminum is a transition element.
- D) Barium is an alkaline earth metal.
- E) Helium is a noble gas.

ANS: C PTS: 1 DIF: easy REF: 2.5

OBJ: Find the main-group and transition elements on the periodic table.

TOP: early atomic theory | periodic table MSC: general chemistry

55. Which of the following statements is not true about the element calcium?

- A) It is a metal.
- B) It is an alkaline earth metal.

- C) It is in period 4.
- D) It has chemical and physical properties most similar to silver.
- E) It is in group IIA (group 2).

ANS: D PTS: 1 DIF: easy REF: 2.5

OBJ: Find the main-group and transition elements on the periodic table.

TOP: early atomic theory | periodic table

56. The elements in groups 1A-8A or 1-2 and 15-18 are known as the

- A) main group.
- B) alkaline earth metals.
- C) metalloids or semimetals.
- D) halogens.
- E) transition metals.

ANS: A PTS: 1 DIF: easy REF: 2.5

OBJ: Locate the alkali metal and halogen groups on the periodic table.

TOP: early atomic theory | periodic table

57. Choose the group containing the most reactive nonmetals.

- A) Group 5A
- B) Group 3A
- C) Group 7A
- D) Group 8A
- E) Group 1A

ANS: C PTS: 1 DIF: easy REF: 2.5

OBJ: Locate the alkali metal and halogen groups on the periodic table.

TOP: early atomic theory | periodic table KEY: nonmetal MSC: general chemistry

58. Which element belongs to the transition metals?

- A) palladium
- B) sodium
- C) calcium
- D) iodine
- E) helium

ANS: A PTS: 1 DIF: easy REF: 2.5

OBJ: Locate the alkali metal and halogen groups on the periodic table.

TOP: early atomic theory | periodic table

59. Which of the following statements about different elements is/are true?

1. As is a metalloid and Se is a nonmetal.
2. Cu is a transition element and Ge is a metalloid.
3. Both F and I are halogens.

- A) 1 only
- B) 2 only
- C) 3 only
- D) 1 and 2

E) 1, 2, and 3

ANS: E PTS: 1 DIF: easy REF: 2.5

OBJ: Recognize the portions of the periodic table that contain the metals, nonmetals, and metalloids (semimetals). TOP: early atomic theory | periodic table

MSC: general chemistry

60. Which of the following is a metalloid?

- A) oxygen
- B) hydrogen
- C) silicon
- D) carbon
- E) copper

ANS: C PTS: 1 DIF: easy REF: 2.5

OBJ: Recognize the portions of the periodic table that contain the metals, nonmetals, and metalloids (semimetals). TOP: early atomic theory | periodic table

KEY: metalloid MSC: general chemistry

61. All of the following elements are best classified as metalloids except

- A) Si.
- B) Te.
- C) As.
- D) B.
- E) Ga.

ANS: E PTS: 1 DIF: easy REF: 2.5

OBJ: Recognize the portions of the periodic table that contain the metals, nonmetals, and metalloids (semimetals). TOP: early atomic theory | periodic table

KEY: metalloid MSC: general chemistry

62. Which formula is best described as a (condensed) structural formula?

- A) $C_2B_{10}H_{12}$
- B) $C_6H_{11}Cl$
- C) $CH_3CH_2CH_2CH_2Cl$
- D) $C_{12}H_{22}O_{11}$
- E) C_2H_6O

ANS: C PTS: 1 DIF: easy REF: 2.6

OBJ: Determine whether a chemical formula is also a molecular formula.

TOP: early atomic theory | chemical substance

63. Which of the following is/are information that is unique to a space-filling molecular model?

1. The model shows the relative sizes of each element.
2. The model shows the charge distribution.
3. The model shows the types of bonds (single or multiple) connecting the atoms.

- A) 1 only
- B) 2 only

- C) 3 only
- D) 1 and 2
- E) 1, 2, and 3

ANS: A PTS: 1 DIF: easy REF: 2.6

OBJ: Determine whether a chemical formula is also a molecular formula.

TOP: early atomic theory | chemical substance

64. In a particular mass of $\text{KAu}(\text{CN})_2$, there are 8.87×10^{20} atoms of gold. What is the total number of atoms in this sample?

- A) 1.77×10^{21}
- B) 2.66×10^{21}
- C) 5.32×10^{21}
- D) 4.44×10^{21}
- E) 3.55×10^{21}

ANS: C PTS: 1 DIF: easy REF: 2.6

OBJ: Determine whether a chemical formula is also a molecular formula.

TOP: early atomic theory | chemical substance

KEY: chemical formula

MSC: general chemistry

65. A sample of TNT, $\text{C}_7\text{H}_5\text{N}_3\text{O}_6$, has 7.68×10^{21} nitrogen atoms. How many hydrogen atoms are there in this sample of TNT?

- A) 1.54×10^{22}
- B) 10.24×10^{21}
- C) 1.28×10^{22}
- D) 7.68×10^{21}
- E) 1.79×10^{22}

ANS: C PTS: 1 DIF: easy REF: 2.6

OBJ: Determine whether a chemical formula is also a molecular formula.

TOP: early atomic theory | chemical substance

KEY: chemical formula

MSC: general chemistry

66. A 1.4-g sample of washing soda, $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$, has 2.9×10^{21} carbon atoms. How many oxygen atoms are present in 1.4 g of washing soda?

- A) 2.9×10^{22}
- B) 2.9×10^{21}
- C) 4.1×10^{21}
- D) 3.8×10^{22}
- E) 8.8×10^{21}

ANS: D PTS: 1 DIF: easy REF: 2.6

OBJ: Determine whether a chemical formula is also a molecular formula.

TOP: early atomic theory | chemical substance

KEY: chemical formula

MSC: general chemistry

67. A sample of the mineral troegerite, $(\text{UO}_2)_3(\text{AsO}_4)_2 \cdot 12\text{H}_2\text{O}$, has 1.33×10^{21} U atoms. How many arsenic atoms are present in this sample of troegerite?

- A) 2.00×10^{22}
- B) 1.60×10^{22}
- C) 2.66×10^{21}
- D) 6.65×10^{22}
- E) 8.87×10^{20}

ANS: E PTS: 1 DIF: easy REF: 2.6
OBJ: Determine whether a chemical formula is also a molecular formula.
TOP: early atomic theory | chemical substance KEY: chemical formula
MSC: general chemistry

68. An ion is formed
- A) by either adding electrons to or subtracting electrons from the atom.
 - B) by either adding protons to or subtracting protons from the atom.
 - C) by either adding neutrons to or subtracting neutrons from the atom.
 - D) All of the above are true.
 - E) Two of the above are true.

ANS: A PTS: 1 DIF: easy REF: 2.6
OBJ: Define ion, cation, and anion. TOP: early atomic theory | chemical substance
KEY: chemical formula | ionic substance MSC: general chemistry

69. The species Au^+ , Mg^{2+} , and V^{3+} are all
- A) anions.
 - B) isotopes.
 - C) isoelectronic.
 - D) allotropes.
 - E) cations.

ANS: E PTS: 1 DIF: easy REF: 2.6
OBJ: Define ion, cation, and anion. TOP: early atomic theory | chemical substance

70. The species that is formed when a molecule gains or loses an electron is called
- A) an ion.
 - B) a metalloid.
 - C) an isotope.
 - D) an atom.
 - E) a metal.

ANS: A PTS: 1 DIF: easy REF: 2.6
OBJ: Define ion, cation, and anion. TOP: early atomic theory | chemical substance

71. Which of the following statements is true about one formula unit of SrBr_2 ?
- A) It is composed of one Sr atom and one Br_2 molecule.
 - B) It is composed of one Sr atom and two Br atoms.
 - C) It is composed of one Sr^{2+} ion and one Br_2^{2-} ion.
 - D) It is composed of one SrBr_2 molecule.
 - E) It is composed of one Sr^{2+} ion and two Br^- ions.

ANS: E PTS: 1 DIF: easy REF: 2.6
OBJ: Classify compounds as ionic or molecular.

TOP: early atomic theory | chemical substance

72. Aluminum(III) sulfite is an ionic compound formed from Al^{3+} and SO_3^{2-} . What is the correct way to represent the formula?

- A) AlSO_3^+
- B) $\text{Al}(\text{SO}_3)_2^-$
- C) $\text{Al}^{3+}\text{SO}_3^{2-}$
- D) $\text{Al}_2(\text{SO}_3)_3$
- E) $\text{Al}_7(\text{SO}_3)_{10.5}$

ANS: D PTS: 1 DIF: easy REF: 2.6

OBJ: Write an ionic formula, given the ions..

TOP: chemical formulas

73. Chemical reactions between nonmetals and nonmetals primarily involve

- A) sharing of electrons.
- B) interactions between protons.
- C) transfer of electrons.
- D) interactions among protons, electrons, and neutrons.
- E) interactions between protons and electrons.

ANS: A PTS: 1 DIF: easy REF: 2.6

OBJ: Classify compounds as ionic or molecular.

TOP: early atomic theory | chemical substance

KEY: chemical formula | molecular substance

MSC: general chemistry

74. Which of the following is an ionic compound?

- A) HOClO
- B) NH_3
- C) CH_3OH
- D) N_2O_3
- E) NH_4CN

ANS: E PTS: 1 DIF: moderate REF: 2.6

OBJ: Classify compounds as ionic or molecular.

TOP: early atomic theory | chemical substance

KEY: chemical formula | ionic substance MSC: general chemistry

75. The formula of water, H_2O , suggests

- A) there is twice as much mass of hydrogen as oxygen in each molecule.
- B) there are two oxygen atoms and one hydrogen atom per water molecule.
- C) there is twice as much mass of oxygen as of hydrogen in each molecule.
- D) there are two hydrogen atoms and one oxygen atom per water molecule.
- E) none of these

ANS: D PTS: 1 DIF: easy REF: 2.6

OBJ: Define and provide examples for the term formula unit.

TOP: early atomic theory | chemical substance

MSC: general chemistry

KEY: chemical formula

80. The empirical formula of a salt consisting of Sr^{2+} and NO_2^- ions is

- A) $\text{Sr}^{2+}\text{NO}_2^-$.
- B) SrNO_2 .
- C) Sr_2NO_2 .
- D) $\text{Sr}_2(\text{NO}_2)_3$.
- E) $\text{Sr}(\text{NO}_2)_2$.

ANS: E PTS: 1 DIF: moderate REF: 2.6

OBJ: Write an ionic formula, given the ions.

TOP: early atomic theory | chemical substance

81. Which of the following molecules is a hydrocarbon?

- A) H_2O
- B) $\text{CH}_3\text{CH}_2\text{CH}_3$
- C) $\text{C}_6\text{H}_{12}\text{O}_6$
- D) $\text{CH}_3\text{CH}_2\text{OH}$
- E) CH_3OCH_3

ANS: B PTS: 1 DIF: easy REF: 2.7

OBJ: Explain what makes a molecule a hydrocarbon.

TOP: early atomic theory | chemical substance

KEY: organic compound MSC: general chemistry

82. Which of the following molecules contains the ether functional group?

- A) $\text{CH}_3\text{CH}_2\text{NH}_2$
- B) $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$
- C) $\text{CH}_3\text{CH}_2\text{OH}$
- D) $\text{CH}_3\text{CH}_2\text{COOH}$
- E) H_2O

ANS: B PTS: 1 DIF: easy REF: 2.7

OBJ: Recognize some functional groups of organic molecules.

TOP: early atomic theory | chemical substance

KEY: organic compound MSC: general chemistry

83. Which of the following molecules contains the carboxylic acid functional group?

- A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- B) $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$
- C) CH_3NHCH_3
- D) $\text{CH}_3\text{OCH}_2\text{CH}_3$
- E) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$

ANS: E PTS: 1 DIF: easy REF: 2.7

OBJ: Recognize some functional groups of organic molecules.

TOP: early atomic theory | chemical substance

KEY: organic compound MSC: general chemistry

84. Which of the following molecules contains the alcohol functional group?

- A) C_6H_6
- B) CH_3OH
- C) CH_4

D) CH_3OCH_3

E) C_2H_2

ANS: B PTS: 1 DIF: easy REF: 2.7

OBJ: Recognize some functional groups of organic molecules.

TOP: early atomic theory | chemical substance

KEY: organic compound MSC: general chemistry

85. How many electrons does a barium ion have?

A) 56

B) 8

C) 54

D) 38

E) 2

ANS: C PTS: 1 DIF: easy REF: 2.8

OBJ: Learn the rules for predicting the charges of monatomic ions in ionic compounds.

TOP: early atomic theory | chemical substance

KEY: chemical formula | ionic substance MSC: general chemistry

86. Which of the following statements is false?

A) A crystal of calcium fluoride has equal numbers of calcium ions and fluoride ions.

B) A sodium atom is most likely to ionize to form a cation of charge +1.

C) A sulfide ion has a total of $18 e^-$.

D) A potassium ion has a total of $18 e^-$.

E) The charge on a neutral chlorine atom is zero.

ANS: A PTS: 1 DIF: moderate REF: 2.8

OBJ: Learn the rules for predicting the charges of monatomic ions in ionic compounds.

TOP: early atomic theory | chemical substance

KEY: chemical formula | ionic substance MSC: general chemistry

87. As an ion, sodium has _____ electrons?

A) 24

B) 14

C) 11

D) 28

E) 10

ANS: E PTS: 1 DIF: easy REF: 2.8

OBJ: Learn the rules for predicting the charges of monatomic ions in ionic compounds.

TOP: early atomic theory | chemical substance

KEY: chemical formula | ionic substance MSC: general chemistry

88. How many electrons does a chloride ion have?

A) 17

B) 22

C) 15

D) 18

E) 2

ANS: D PTS: 1 DIF: easy REF: 2.8
OBJ: Learn the rules for predicting the charges of monatomic ions in ionic compounds.
TOP: early atomic theory | chemical substance
KEY: chemical formula | ionic substance MSC: general chemistry

89. Which metals form cations with varying positive charges?

- A) many transition metals
- B) Zn and Al
- C) Group 1 metals
- D) Group 1 and Group 2 metals
- E) Group 2 metals

ANS: A PTS: 1 DIF: easy REF: 2.8
OBJ: Learn the rules for predicting the charges of monatomic ions in ionic compounds.
TOP: early atomic theory | chemical substance
KEY: chemical formula | ionic substance MSC: general chemistry

90. Which of the following represents a known ion?

- A) S^{2+}
- B) Sc^{4+}
- C) Sn^{2+}
- D) P^{4-}
- E) Na^{-}

ANS: C PTS: 1 DIF: moderate REF: 2.8
OBJ: Learn the rules for predicting the charges of monatomic ions in ionic compounds.
TOP: early atomic theory | chemical substance
KEY: chemical formula | ionic substance MSC: general chemistry

91. The formula for the sulfide ion is

- A) SO_4^{2-} .
- B) SO_3^{2-} .
- C) $S_2O_3^{2-}$.
- D) S^{2-} .
- E) HSO_4^{-} .

ANS: D PTS: 1 DIF: easy REF: 2.8
OBJ: Apply the rules for naming monatomic ions.
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

92. The correct name for Sn^{2+} is

- A) monotin ion.
- B) tin(II) ion.
- C) tin ion.
- D) tin(I) ion.
- E) tin.

ANS: B PTS: 1 DIF: easy REF: 2.8
OBJ: Apply the rules for naming monatomic ions.
TOP: early atomic theory | chemical substance

93. The formula of the perchlorate ion is

- A) Cl_2O_3^- .
- B) ClO_2^- .
- C) CN^- .
- D) ClO_4^- .
- E) ClO^- .

ANS: D PTS: 1 DIF: easy REF: 2.8
OBJ: Learn the names and charges of common polyatomic ions.
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

94. The name of the SO_4^{2-} ion is

- A) persulfate.
- B) thiosulfite.
- C) sulfite.
- D) sulfate.
- E) sulfide.

ANS: D PTS: 1 DIF: easy REF: 2.8
OBJ: Learn the names and charges of common polyatomic ions.
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

95. The formulas of the nitrite, phosphate, and nitrate ions are represented, respectively, as

- A) N^{3-} , PO_3^{3-} , NO_3^- .
- B) NO^- , P^{5-} , NO_3^- .
- C) NO_2^- , P^{3-} , NO_3^- .
- D) NO_3^- , PO_2^- , N^{3-} .
- E) NO_2^- , PO_4^{3-} , NO_3^- .

ANS: E PTS: 1 DIF: easy REF: 2.8
OBJ: Learn the names and charges of common polyatomic ions.
TOP: early atomic theory | chemical substance
KEY: nomenclature | ionic compound MSC: general chemistry

96. The formulas of the hydroxide ion, the nitrate ion, and the phosphate ion are represented, respectively, as

- A) OH^- , NO_2^- , PO_3^{3-} .
- B) OH^- , NO_2^- , PO_4^{3-} .
- C) H^- , NO_2^- , P^{3-} .
- D) H^- , NO_3^- , P^{3-} .
- E) OH^- , NO_3^- , PO_4^{3-} .

ANS: E PTS: 1 DIF: easy REF: 2.8
OBJ: Learn the names and charges of common polyatomic ions.
TOP: early atomic theory | chemical substance
KEY: nomenclature | ionic compound MSC: general chemistry

97. All the following ions have the same charge except

- A) sulfate.
- B) dichromate.
- C) chlorate.
- D) sulfide.
- E) sulfite.

ANS: C PTS: 1 DIF: easy REF: 2.8
OBJ: Learn the names and charges of common polyatomic ions.
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

98. All the following ions have the same charge except

- A) oxide.
- B) monohydrogen phosphate.
- C) peroxide.
- D) permanganate.
- E) oxalate.

ANS: D PTS: 1 DIF: easy REF: 2.8
OBJ: Learn the names and charges of common polyatomic ions.
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

99. The formulas of the carbonate ion, the ammonium ion, and the chlorate ion are represented, respectively, as

- A) CO_3^{2-} , NH_2^- , ClO_3^- .
- B) CO_3^{2-} , NH_4^+ , ClO_3^- .
- C) CO_2^- , NH_4^+ , ClO^- .
- D) P^{3-} , NH_3^+ , ClO_2^- .
- E) CO_3^{2-} , NH_3^+ , ClO_2^- .

ANS: B PTS: 1 DIF: easy REF: 2.8
OBJ: Learn the names and charges of common polyatomic ions.
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

100. The systematic name for BaH_2 is

- A) barium(II) hydrate.
- B) barium hydride.
- C) barium dihydrate.
- D) barium dihydrogen.
- E) barium dihydride.

ANS: B PTS: 1 DIF: moderate REF: 2.8
OBJ: Name an ionic compound from its formula. (Example 2.4)
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

101. What is the name of the compound whose formula is $\text{Al}_2(\text{SO}_4)_3$?

- A) aluminum sulfate
- B) dialuminum tri(sulfur tetraoxygen)

- C) aluminum sulfide
- D) aluminum persulfate
- E) aluminum sulfite

ANS: A PTS: 1 DIF: easy REF: 2.8
OBJ: Name an ionic compound from its formula. (Example 2.4)
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

102. The correct name for FeO is
- A) iron(I) oxide.
 - B) iron oxide.
 - C) iron monoxide.
 - D) iron(II) oxide.
 - E) iron(III) oxide.

ANS: D PTS: 1 DIF: easy REF: 2.8
OBJ: Name an ionic compound from its formula. (Example 2.4)
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

103. What is the formula for the chloride of praseodymium(III)?

- A) $\text{Pr}_2(\text{ClO}_2)_3$
- B) $\text{Pr}(\text{ClO}_4)_2$
- C) Pr_3Cl
- D) PrCl_3
- E) $\text{Pr}(\text{ClO}_3)_3$

ANS: D PTS: 1 DIF: moderate REF: 2.8
OBJ: Write the formula of an ionic compound from its name. (Example 2.5)
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

104. What is the correct formula for bismuth(III) sulfite?

- A) BiSO_3
- B) Bi_2SO_3
- C) $\text{Bi}_3(\text{SO}_3)_2$
- D) $\text{Bi}_2(\text{SO}_3)_3$
- E) $\text{Bi}(\text{SO}_3)_2$

ANS: D PTS: 1 DIF: moderate REF: 2.8
OBJ: Write the formula of an ionic compound from its name.
TOP: chemical formulas

105. What is the correct name for Sc_2O_3 ?

- A) manganese(III) oxide
- B) manganese oxide
- C) dimanganese trioxide
- D) manganese trioxide
- E) dimanganese(II) oxide

ANS: A PTS: 1 DIF: moderate REF: 2.8

OBJ: Write the formula of an ionic compound from its name.

TOP: chemical formulas

106. What is the formula for calcium nitride?

- A) CaNO_2
- B) $\text{Ca}(\text{NO}_3)_2$
- C) $\text{Ca}(\text{NO}_2)_2$
- D) Ca_3N_2
- E) Ca_2N_3

ANS: D PTS: 1 DIF: moderate REF: 2.8

OBJ: Write the formula of an ionic compound from its name. (Example 2.5)

TOP: early atomic theory | chemical substance

KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

107. The formula of magnesium sulfide is

- A) MgS .
- B) MgSO_2 .
- C) MgSO_4 .
- D) MgSO_3 .
- E) $\text{Mg}(\text{SO}_4)_2$.

ANS: A PTS: 1 DIF: easy REF: 2.8

OBJ: Write the formula of an ionic compound from its name. (Example 2.5)

TOP: early atomic theory | chemical substance

KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

108. What is the formula of magnesium nitrite?

- A) $\text{Mg}(\text{NO}_2)_2$
- B) Mg_3N_2
- C) $\text{Mg}_2(\text{NO}_2)_2$
- D) Mg_2N_3
- E) $\text{Mg}(\text{NO}_2)_3$

ANS: A PTS: 1 DIF: easy REF: 2.8

OBJ: Write the formula of an ionic compound from its name. (Example 2.5)

TOP: early atomic theory | chemical substance

KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

109. The formula for aluminum bromide is

- A) AlBr .
- B) AlBr .
- C) Al_2Br_3 .
- D) AlBr_2 .
- E) AlBr_3 .

ANS: E PTS: 1 DIF: easy REF: 2.8

OBJ: Write the formula of an ionic compound from its name. (Example 2.5)

TOP: early atomic theory | chemical substance

KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

110. The chemical formula for iron(III) sulfide is

- A) $\text{Fe}_3(\text{SO}_4)_2$.
- B) Fe_2S_3 .
- C) $\text{Fe}_3(\text{SO}_3)_2$.
- D) $\text{Fe}_2(\text{SO}_3)_3$.
- E) $\text{Fe}_2(\text{SO}_4)_3$.

ANS: B PTS: 1 DIF: easy REF: 2.8
OBJ: Write the formula of an ionic compound from its name. (Example 2.5)
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

111. The formula for aluminum sulfate is

- A) $\text{Al}_2(\text{SO}_3)_3$.
- B) Al_2S_3 .
- C) $\text{Al}_2(\text{SO}_4)_3$.
- D) Al_3S_2 .
- E) $\text{Al}_3(\text{SO}_4)_2$.

ANS: C PTS: 1 DIF: easy REF: 2.8
OBJ: Write the formula of an ionic compound from its name. (Example 2.5)
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

112. The formula for copper(II) phosphate is

- A) $\text{Co}_3(\text{PO}_4)_2$.
- B) CuPO_4 .
- C) $\text{Co}_2(\text{PO}_4)_3$.
- D) $\text{Cu}_2(\text{PO}_4)_3$.
- E) $\text{Cu}_3(\text{PO}_4)_2$.

ANS: E PTS: 1 DIF: easy REF: 2.8
OBJ: Write the formula of an ionic compound from its name. (Example 2.5)
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

113. Choose the name–formula pair that does not match.

- A) calcium fluoride, CaF_2
- B) iron(III) oxide, Fe_2O_3
- C) aluminum oxide, Al_2O_3
- D) potassium permanganate, K_2MnO_4
- E) sodium sulfite, Na_2SO_3

ANS: D PTS: 1 DIF: easy REF: 2.8
OBJ: Write the formula of an ionic compound from its name. (Example 2.5)
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

114. Choose the name–formula pair that does not match.

- A) calcium hydride, CaH_2

- B) ammonium hydrogen carbonate, NH_4CO_3
- C) sodium chlorite, NaClO_2
- D) calcium hydroxide, $\text{Ca}(\text{OH})_2$
- E) nitric acid, HNO_3

ANS: B PTS: 1 DIF: easy REF: 2.8
OBJ: Write the formula of an ionic compound from its name. (Example 2.5)
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

115. The formula for aluminum fluoride is

- A) AlF_3 .
- B) AlF .
- C) Al_2F .
- D) AlF_4 .
- E) AlF_2 .

ANS: A PTS: 1 DIF: easy REF: 2.8
OBJ: Write the formula of an ionic compound from its name. (Example 2.5)
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

116. The formula for potassium carbonate is

- A) P_2C .
- B) K_2CO_3 .
- C) Po_2CO_3 .
- D) P_2CO_3 .
- E) K_2C .

ANS: B PTS: 1 DIF: easy REF: 2.8
OBJ: Write the formula of an ionic compound from its name. (Example 2.5)
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

117. The formula for magnesium nitride is

- A) Mg_2N_3 .
- B) Mg_3N_2 .
- C) MgNO_2 .
- D) $\text{Mg}(\text{NO}_2)_2$.
- E) MgN .

ANS: B PTS: 1 DIF: easy REF: 2.8
OBJ: Write the formula of an ionic compound from its name. (Example 2.5)
TOP: early atomic theory | chemical substance
KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

118. What is the subscript of potassium in the formula for potassium sulfate?

- A) 2
- B) 5
- C) 3
- D) 4

E) 1

ANS: A PTS: 1 DIF: easy REF: 2.8

OBJ: Write the formula of an ionic compound from its name. (Example 2.5)

TOP: early atomic theory | chemical substance

KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

119. What is the formula for sodium peroxide?

A) Na_3O_2

B) NaO

C) Na_2O

D) NaO_2

E) Na_2O_2

ANS: E PTS: 1 DIF: easy REF: 2.8

OBJ: Write the formula of an ionic compound from its name. (Example 2.5)

TOP: early atomic theory | chemical substance

KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

120. What is the formula for the chlorate of gadolinium(III)?

A) $\text{Gd}(\text{ClO}_4)_2$

B) GdCl_2

C) $\text{Gd}_2(\text{ClO}_3)_3$

D) GdCl_3

E) $\text{Gd}(\text{ClO}_3)_3$

ANS: E PTS: 1 DIF: moderate REF: 2.8

OBJ: Write the formula of an ionic compound from its name. (Example 2.5)

TOP: early atomic theory | chemical substance

KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

121. What is the formula for the nitride of samarium(III)?

A) SmN

B) Sm_2N_3

C) $\text{Sm}(\text{NO}_3)_2$

D) $\text{Sm}(\text{NO}_3)_3$

E) $\text{Sm}(\text{NO}_2)_3$

ANS: A PTS: 1 DIF: moderate REF: 2.8

OBJ: Write the formula of an ionic compound from its name. (Example 2.5)

TOP: early atomic theory | chemical substance

KEY: nomenclature of simple compound | ionic compound MSC: general chemistry

122. The correct name for LiCl is

A) monolithium chloride.

B) lithium chloride.

C) lithium(I) chloride.

D) monolithium monochloride.

E) lithium monochloride.

ANS: B PTS: 1 DIF: easy REF: 2.8

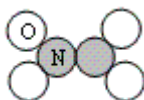
OBJ: Name a binary compound from its formula. (Example 2.6)

TOP: early atomic theory | chemical substance

KEY: nomenclature of simple compound | ionic compound

MSC: general chemistry

123. The chemical name for the model



is

A) dinitrogen tetroxide.

B) nitrogen tetroxide.

C) nitrogen oxide.

D) nitric oxide.

E) nitrogen trioxide

ANS: A

PTS: 1

DIF: easy

REF: 2.8

OBJ: Name a binary molecular compound from its molecular model. (Example 2.8)

TOP: early atomic theory | chemical substance

KEY: nomenclature of simple compound | binary molecular compound

MSC: general chemistry

124. The chemical name for the binary, non-ionic molecule with the formula PBr_5 is

A) phosphorus pentabromide.

B) monophosphorus bromide.

C) phosphide pentabromide.

D) phosphorus pentabromine.

E) monophosphorus pentabromine.

ANS: A

PTS: 1

DIF: easy

REF: 2.8

OBJ: Name a binary molecular compound from its molecular model.

TOP: early atomic theory | chemical substance

125. The formula for chloric acid is

A) HClO_2 .

B) HClO .

C) HCl .

D) HClO_4 .

E) HClO_3 .

ANS: E

PTS: 1

DIF: easy

REF: 2.8

OBJ: Learn the approach for naming binary acids and oxoacids.

TOP: early atomic theory | chemical substance

KEY: nomenclature of simple compound | acid

MSC: general chemistry

126. Which name–formula pair is incorrect?

A) HI , hydroiodic acid

B) H_2SO_3 , sulfurous acid

C) H_2SO_4 , sulfuric acid

D) HClO_4 , perchloric acid

E) HNO_3 , carbonic acid

ANS: E

PTS: 1

DIF: easy

REF: 2.8

OBJ: Learn the approach for naming binary acids and oxoacids.

TOP: early atomic theory | chemical substance

127. Which name–formula pair is incorrect?

- A) hypochlorous acid, HClO_2
- B) titanium(IV) carbide, TiC
- C) strontium nitride, Sr_3N_2
- D) magnesium sulfate heptahydrate, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
- E) dinitrogen tetroxide, N_2O_4

ANS: A PTS: 1 DIF: difficult REF: 2.8

OBJ: Learn the approach for naming binary acids and oxoacids.

TOP: early atomic theory | chemical substance

KEY: nomenclature of simple compound MSC: general chemistry

128. The oxoanion that comes from nitrous acid is

- A) N_2O_3^- .
- B) NO_2^- .
- C) HNO_3^- .
- D) NO^- .
- E) NO_3^- .

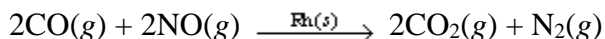
ANS: B PTS: 1 DIF: easy REF: 2.8

OBJ: Write the name and formula of an anion from the acid. (Example 2.9)

TOP: early atomic theory | chemical substance

KEY: nomenclature of simple compound | acid MSC: general chemistry

129. For the following balanced chemical equation, which substance represents the catalyst?



- A) $\text{NO}(g)$
- B) $\text{CO}(g)$
- C) $\text{CO}_2(g)$
- D) $\text{N}_2(g)$
- E) $\text{Rh}(s)$

ANS: E PTS: 1 DIF: easy REF: 2.9

OBJ: Identify the reactants and products in a chemical equation.

TOP: early atomic theory | chemical equation

MSC: general chemistry KEY: writing equation

130. What is the balanced chemical equation that represents the following reaction?



- A) $6\text{H} + 2\text{N} \rightarrow 2\text{NH}_3$
- B) $6\text{H} + 2\text{N} \rightarrow 2\text{HN}_3$
- C) $2\text{N} + 2\text{H}_3 \rightarrow 2\text{H}_3\text{N}$
- D) $6\text{H} + 2\text{N} \rightarrow 2\text{N}_3\text{H}$



ANS: E PTS: 1 DIF: easy REF: 2.9
OBJ: Identify the reactants and products in a chemical equation.
TOP: early atomic theory | chemical equation KEY: writing equation
MSC: general chemistry

131. In the following chemical equation, what is the reactant?



- A) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}(s)$
- B) $\text{H}_2\text{O}(l)$
- C) $\text{CuO}(s)$
- D) $\text{SO}_3(g)$
- E) $\text{CuSO}_4(s)$

ANS: A PTS: 1 DIF: easy REF: 2.9
OBJ: Identify the reactants and products in a chemical equation.
TOP: early atomic theory | chemical equation KEY: writing equation
MSC: general chemistry

132. Which is a correct balanced chemical equation corresponding to the following description of a chemical reaction?

Hydrochloric acid reacts with magnesium metal to produce aqueous magnesium chloride and hydrogen gas.

- A) $2\text{HCl}(aq) + \text{Mg}(s) \rightarrow \text{MgCl}_2(aq) + 2\text{H}(g)$
- B) $2\text{HCl}(aq) + \text{Mg}(s) \rightarrow \text{MgCl}_2(aq) + \text{H}_2(g)$
- C) $2\text{HCl}(aq) + \text{Mg}(s) \rightarrow \text{MgCl}(aq) + \text{H}_2(g)$
- D) $2\text{HCl}(aq) + \text{Mg}(aq) \rightarrow \text{MgCl}_2(s) + \text{H}_2(g)$
- E) $\text{HCl}(aq) + \text{Mg}(s) \rightarrow \text{MgCl}(aq) + \text{H}(g)$

ANS: B PTS: 1 DIF: moderate REF: 2.9
OBJ: Write chemical equations using appropriate phase labels, symbols of reactions conditions, and the presence of a catalyst. TOP: early atomic theory | chemical equation
KEY: balancing chemical equation MSC: general chemistry

133. Sulfuric acid reacts with aqueous sodium hydroxide to produce aqueous sodium sulfate and liquid water. Which is the correct balanced chemical equation for this reaction description?

- A) $\text{H}_2\text{SO}_4(aq) + 2\text{NaOH}(aq) \rightarrow \text{Na}_2\text{S}(aq) + 2\text{H}_2\text{O}(l) + 2\text{O}_2(g)$
- B) $\text{H}_2\text{S}(aq) + 2\text{NaOH}(aq) \rightarrow \text{Na}_2\text{S}(aq) + 2\text{H}_2\text{O}(l)$
- C) $\text{H}_2\text{SO}_4(aq) + \text{NaOH}(aq) \rightarrow \text{NaSO}_4(aq) + \text{H}_2\text{O}(g)$
- D) $\text{H}_2\text{SO}_4(aq) + 2\text{NaOH}(aq) \rightarrow \text{Na}_2\text{SO}_4(aq) + 2\text{H}_2\text{O}(l)$
- E) $\text{H}_2\text{SO}_4(aq) + (\text{NaOH})_2(aq) \rightarrow \text{Na}_2\text{SO}_4(aq) + 2\text{H}_2\text{O}(l)$

ANS: D PTS: 1 DIF: moderate REF: 2.9
OBJ: Write chemical equations using appropriate phase labels, symbols of reactions conditions, and the presence of a catalyst. TOP: early atomic theory | chemical reaction

134. How many of the following statements are true concerning chemical equations?

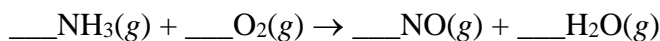
- I. Coefficients can be fractions.

- II. Subscripts can be fractions.
- III. Coefficients represent the relative masses of the reactants and/or products.
- IV. Changing the subscripts to balance an equation can be done only once.
- V. Atoms are conserved when balancing chemical equations.

- A) 3
- B) 4
- C) 2
- D) 5
- E) 1

ANS: C PTS: 1 DIF: moderate REF: 2.10
OBJ: Master techniques for balancing chemical equations. (Example 2.12)
TOP: early atomic theory | chemical equation
KEY: balancing chemical equation MSC: general chemistry

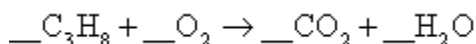
135. When the following equation is balanced with lowest whole-number coefficients, what is the coefficient for NO(g)?



- A) 3
- B) 2
- C) 5
- D) 4
- E) 1

ANS: D PTS: 1 DIF: moderate REF: 2.10
OBJ: Master techniques for balancing chemical equations. (Example 2.12)
TOP: early atomic theory | chemical equation
KEY: balancing chemical equation MSC: general chemistry

136. The complete combustion of propane, C₃H₈, yields carbon dioxide and water:

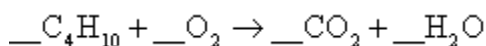


The smallest whole-number coefficient of oxygen in the balanced equation is

- A) 6.
- B) 3.
- C) 7.
- D) 4.
- E) 5.

ANS: E PTS: 1 DIF: easy REF: 2.10
OBJ: Master techniques for balancing chemical equations. (Example 2.12)
TOP: early atomic theory | chemical equation
KEY: balancing chemical equation MSC: general chemistry

137. The complete combustion of butane, C₄H₁₀, yields carbon dioxide and water:



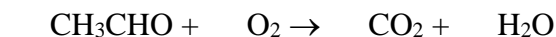
The smallest whole-number coefficient of oxygen in the balanced equation is

- A) 12.

- B) 14.
- C) 10.
- D) 11.
- E) 13.

ANS: E PTS: 1 DIF: moderate REF: 2.10
OBJ: Master techniques for balancing chemical equations. (Example 2.12)
TOP: early atomic theory | chemical equation
KEY: balancing chemical equation MSC: general chemistry

138. The products of the combustion of acetaldehyde with oxygen are shown in the following equation:

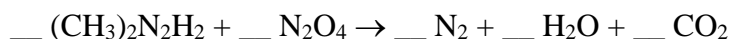


When properly balanced, the equation indicates that _____ molecules of O₂ are required to burn 2 molecules of CH₃CHO.

- A) 2
- B) 6
- C) 4
- D) 3
- E) 5

ANS: E PTS: 1 DIF: moderate REF: 2.10
OBJ: Master techniques for balancing chemical equations. (Example 2.12)
TOP: early atomic theory | chemical equation
KEY: balancing chemical equation MSC: general chemistry

139. Energy from the following reaction provided the lift for the moon lander:



When the equation is balanced, the smallest whole-number coefficient of nitrogen is

- A) 5.
- B) 4.
- C) 1.
- D) 3.
- E) 2.

ANS: D PTS: 1 DIF: difficult REF: 2.10
OBJ: Master techniques for balancing chemical equations. (Example 2.12)
TOP: early atomic theory | chemical equation
KEY: balancing chemical equation MSC: general chemistry

140. Treatment of sodium borohydride with sulfuric acid is a convenient method for the preparation of diborane:



When the equation is balanced, the lowest whole number coefficient for hydrogen is

- A) 5.
- B) 2.
- C) 4.
- D) 1.

E) 3.

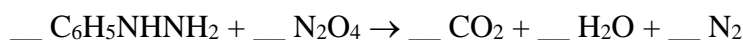
ANS: B PTS: 1 DIF: difficult REF: 2.10
OBJ: Master techniques for balancing chemical equations. (Example 2.12)
TOP: early atomic theory | chemical equation
KEY: balancing chemical equation MSC: general chemistry

141. All the following may change during a chemical reaction except

- A) the total volume of the system.
- B) the density of the system.
- C) the temperature of the system.
- D) the total number of atoms in the system.
- E) the total number of molecules in the system.

ANS: D PTS: 1 DIF: easy REF: 2.10
OBJ: Master techniques for balancing chemical equations. (Example 2.12)
TOP: early atomic theory | chemical equation
KEY: balancing chemical equation MSC: general chemistry

142. The complete combustion of phenylhydrazine, $C_6H_5NHNH_2$, with the oxidizer dinitrogen tetraoxide is shown in the following equation:

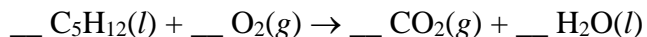


When this equation is balanced, the sum of all the coefficients (using smallest whole numbers) is

- A) 30.
- B) 20.
- C) 25.
- D) 10.
- E) 15.

ANS: B PTS: 1 DIF: difficult REF: 2.10
OBJ: Master techniques for balancing chemical equations. (Example 2.12)
TOP: early atomic theory | chemical equation
KEY: balancing chemical equation MSC: general chemistry

143. The complete combustion of pentane yields carbon dioxide and water. When the equation



is balanced, the ratio of the coefficient of CO_2 to the coefficient of O_2 is

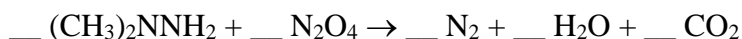
- A) 8:5.
- B) 8:6.
- C) 6:5.
- D) 5:6.
- E) 5:8.

ANS: E PTS: 1 DIF: moderate REF: 2.10
OBJ: Master techniques for balancing chemical equations. (Example 2.12)
TOP: early atomic theory | chemical equation
KEY: balancing chemical equation MSC: general chemistry

144. A reaction occurs between sodium carbonate and hydrochloric acid, producing sodium chloride, carbon dioxide, and water. Which is the correct set of coefficients, respectively, for the balanced reaction?
- A) 3 6 6 3 4
B) 8 6 5 10 5
C) 5 10 10 5 5
D) 1 2 2 1 1
E) none of these

ANS: D PTS: 1 DIF: difficult REF: 2.10
OBJ: Master techniques for balancing chemical equations. (Example 2.12)
TOP: early atomic theory | chemical equation
KEY: balancing chemical equation MSC: general chemistry

145. When the equation

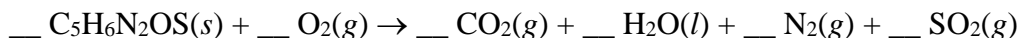


is balanced, the sum of all the coefficients (simplest whole number) is

- A) 13.
B) 12.
C) 9.
D) 10.
E) 11.

ANS: B PTS: 1 DIF: difficult REF: 2.10
OBJ: Master techniques for balancing chemical equations. (Example 2.12)
TOP: early atomic theory | chemical equation
KEY: balancing chemical equation MSC: general chemistry

146. When the equation

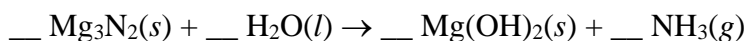


is balanced, the sum of all the coefficients (simplest whole number) is

- A) 19.
B) 20.
C) 24.
D) 18.
E) 21.

ANS: D PTS: 1 DIF: difficult REF: 2.10
OBJ: Master techniques for balancing chemical equations. (Example 2.12)
TOP: early atomic theory | chemical equation
KEY: balancing chemical equation MSC: general chemistry

147. Ammonia can be made by reaction of water with magnesium nitride:



When the equation is properly balanced, the sum of the coefficients is

- A) 6.
B) 14.
C) 12.

D) 9.

E) 8.

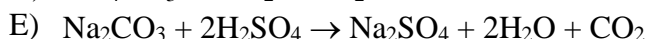
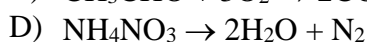
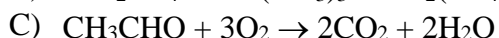
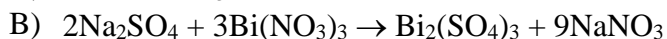
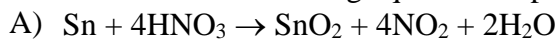
ANS: C PTS: 1 DIF: moderate REF: 2.10

OBJ: Master techniques for balancing chemical equations. (Example 2.12)

TOP: early atomic theory | chemical equation

KEY: balancing chemical equation MSC: general chemistry

148. Which one of the following equations is properly balanced?



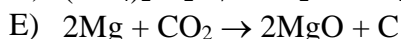
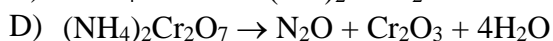
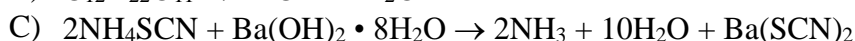
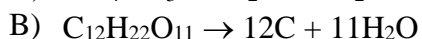
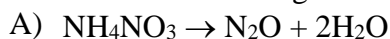
ANS: A PTS: 1 DIF: easy REF: 2.10

OBJ: Determine if a chemical reaction is balanced.

TOP: early atomic theory | chemical equation

KEY: balancing chemical equation MSC: general chemistry

149. Which of the following chemical equations is not balanced?



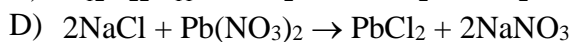
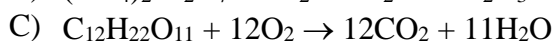
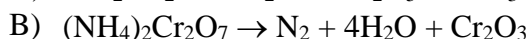
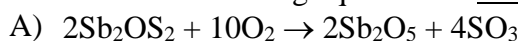
ANS: D PTS: 1 DIF: easy REF: 2.10

OBJ: Determine if a chemical reaction is balanced.

TOP: early atomic theory | chemical equation

KEY: balancing chemical equation MSC: general chemistry

150. Which of the following equations is not balanced?



ANS: E PTS: 1 DIF: easy REF: 2.10

OBJ: Determine if a chemical reaction is balanced.

TOP: early atomic theory | chemical equation

KEY: balancing chemical equation MSC: general chemistry