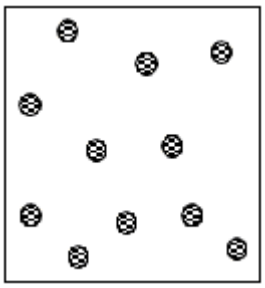
Chapter 02 - Atoms, Molecules, and Ions

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

ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.1
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.24 - List the postulates of atomic theory.
TOPICS: 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 molecular solid.
    c. The figure is a representation of a liquid mixture of two elements.
    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.

ANSWER: a
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.1
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.25 - Define element, compound, and chemical reaction in the context of these postulates.
TOPICS: early atomic theory
atomic theory of matter

3. Which of the following is <u>not</u> a correct name–symbol combination?

a. gallium, Ga
b. iron, Fe
c. nitrogen, N
d. argon, Ar
e. sodium, He

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.1
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.26 - Recognize the atomic symbols of the elements.
TOPICS: early atomic theory
atomic theory of matter

4. The symbol for tin is
a. T.
b. Tn.
c. Si.
d. Ti.
e. Sn.

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.1
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.26 - Recognize the atomic symbols of the elements.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic symbol
OTHER: general chemistry

5. What is the symbol for the element phosphorus?
a. Po
b. P
c. Pt
d. K
e. Pr

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.1

HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.26 - Recognize the atomic symbols of the elements.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic symbol
OTHER: 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

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.1
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.26 - Recognize the atomic symbols of the elements.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic symbol
OTHER: 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

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.1
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.26 - Recognize the atomic symbols of the elements.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic symbol
OTHER: 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.

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.1
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.26 - Recognize the atomic symbols of the elements.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic symbol
OTHER: 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

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.1
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.26 - Recognize the atomic symbols of the elements.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic symbol
OTHER: general chemistry

10. A series of silicon–hydrogen compounds with the general formula Si_nH_{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.

ANSWER: a
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.1
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.27 - Explain the significance of the law of multiple proportions.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: Dalton's atomic theory
OTHER: 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

ANSWER: e
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.1
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.27 - Explain the significance of the law of multiple proportions.
TOPICS: general concepts
matter
KEYWORDS: compound
OTHER: general chemistry

12. Which of the following pairs of compounds can be used to illustrate the law of multiple proportions?
    a. H_2O and HCl
    b. NO and NO_2
    c. NH_4 and NH_4Cl
    d. ZnO_2 and $ZnCl_2$
    e. CH_4 and CO_2

ANSWER: b
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.1
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.27 - Explain the significance of the law of multiple proportions.

TOPICS: general concepts
matter
KEYWORDS: compound
OTHER: general chemistry

13. Cathode rays are
a. anions.
b. protons.
c. cations.
d. positrons.
e. electrons.
ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.2
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.28 - Describe Thomson's experiment in which he discovered the electron.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: discovery of electron | structure of the atom
OTHER: 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.
ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.1
2.2
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.29 - Describe Rutherford's nuclear model and the makeup of the nucleus.
TOPICS: 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.

ANSWER: a
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.2
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.28 - Describe Thomson's experiment in which he discovered the electron.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: discovery of electron | structure of the atom
OTHER: general chemistry

16. Who discovered the electron?

a. Bohr
b. de Broglie
c. Rutherford
d. Heisenberg
e. Thomson

ANSWER: e
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.2
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.28 - Describe Thomson's experiment in which he discovered the electron.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: discovery of electron | structure of the atom
OTHER: 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.

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.2
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.30 - Describe Rutherford's experiment that led to the nuclear model of the atom.
TOPICS: atomic theory of matter
early atomic theory

18. Who discovered the nucleus of an atom?

a. Thomson
b. de Broglie
c. Rutherford
d. Bohr
e. Heisenberg

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.2
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.30 - Describe Rutherford's experiment that led to the nuclear model of the atom.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: nuclear model of atom | structure of the atom
OTHER: 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.

ANSWER: b
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.2
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.30 - Describe Rutherford's experiment that led to the nuclear

model of the atom.

TOPICS: early atomic theory
atomic theory of matter

KEYWORDS: nuclear model of atom | structure of the atom

OTHER: general chemistry

20. The nucleus of a ^{191}Ir nuclide contains
    a. 191 neutrons and 268 electrons.
    b. 77 protons and 191 neutrons.
    c. 191 protons and 114 electrons.
    d. 191 protons, 77 neutrons, and 191 electrons.
    e. 77 protons and 114 neutrons.

ANSWER: e

POINTS: 1

DIFFICULTY: easy

REFERENCES: 2.3

HAS VARIABLES: True

LEARNING OBJECTIVES: GENE.EBBI.13.31 - Define atomic number, mass number, and nuclide.

TOPICS: early atomic theory
atomic theory of matter

KEYWORDS: atomic symbol

OTHER: general chemistry

21. If two different nuclides have the same atomic number, it must mean that
    a. they have the same atomic mass.
    b. they have the same mass number.
    c. they have the same number of protons.
    d. they have the same number of electrons.
    e. they have the same number of neutrons.

ANSWER: c

POINTS: 1

DIFFICULTY: easy

REFERENCES: 2.3

HAS VARIABLES: False

LEARNING OBJECTIVES: GENE.EBBI.13.31 - Define atomic number, mass number, and nuclide.

TOPICS: early atomic theory
atomic theory of matter

KEYWORDS: nuclear structure

OTHER: general chemistry

22. If two different nuclides have the same mass number, it must mean that

a. the combined number of protons and neutrons are the same.
b. both have the same number of neutrons.
c. both have the same number of electrons.
d. both have the same number of protons.
e. they are isotopes.

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.3
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.31 - Define atomic number, mass number, and nuclide.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: nuclear structure
OTHER: general chemistry

23. The number of protons in a given nucleus determines the
a. mass number.
b. atomic number.
c. number of electrons.
d. number of protons.
e. number of isotopes.

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.3
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.31 - Define atomic number, mass number, and nuclide.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: nuclear structure
OTHER: general chemistry

24. Which nuclide has the same number of protons as $^{14}_{7}\mathrm{N}$?
a. $^{19}_{9}\mathrm{F}$
b. $^{15}_{8}\mathrm{O}$
c. $^{12}_{6}\mathrm{C}$
d. $^{31}_{15}\mathrm{P}$
e. $^{15}_{7}\mathrm{N}$

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.3
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.32 - Write the nuclide symbol for a given nuclide.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: nuclear structure
OTHER: general chemistry

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

a. 18
b. 36
c. 16
d. 34
e. 19

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.3
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.32 - Write the nuclide symbol for a given nuclide.
TOPICS: 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

ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.3
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.32 - Write the nuclide symbol for a given nuclide.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic symbol

OTHER: general chemistry

27. How many neutrons are there in the cobalt-59 nuclide?
    a. 27
    b. 2
    c. 86
    d. 59
    e. 32

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.3
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.32 - Write the nuclide symbol for a given nuclide.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic symbol
OTHER: general chemistry

28. An atom that has the same number of neutrons as ^{59}Ni is
    a. ^{58}Zn.
    b. ^{60}Cu.
    c. ^{57}Cr.
    d. ^{58}Mn.
    e. ^{59}Co.

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.3
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.32 - Write the nuclide symbol for a given nuclide.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic symbol
OTHER: general chemistry

29. Which combination of protons, neutrons, and electrons correctly represents a ^{57}Fe nuclide?
    a. 26 protons, 31 neutrons, 57 electrons
    b. 26 protons, 31 neutrons, 31 electrons
    c. 26 protons, 31 neutrons, 26 electrons

d. 57 protons, 26 neutrons, 57 electrons

e. 57 protons, 26 neutrons, 26 electrons

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.3
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.32 - Write the nuclide symbol for a given nuclide.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic symbol
OTHER: general chemistry

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

a. $^{36}_{16}\mathrm{S}$.

b. $^{35}_{17}\mathrm{Cl}$.

c. $^{40}_{18}\mathrm{Ar}$.

d. $^{32}_{16}\mathrm{S}$.

e. $^{31}_{15}\mathrm{P}$.

ANSWER: a
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.3
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.32 - Write the nuclide symbol for a given nuclide.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic symbol
OTHER: general chemistry

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

a. $^{1}_{1}\mathrm{H}$

b. $^{19}_{9}\mathrm{F}$

c. $^{34}_{16}\mathrm{S}$

d. $^{24}_{12}\mathrm{Mg}$

e. $^{4}_{2}\mathrm{He}$

ANSWER: a
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.3
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.32 - Write the nuclide symbol for a given nuclide.
TOPICS: early atomic theory
atomic theory of matter

32. How many neutrons are there in 8 molecules of $^{19}_{9}F_2$?

a. 160
b. 80
c. 3
d. 304
e. 144

ANSWER: a
POINTS: 1
DIFFICULTY: difficult
REFERENCES: 2.3
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.32 - Write the nuclide symbol for a given nuclide.
TOPICS: 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.

ANSWER: b
POINTS: 1
DIFFICULTY: difficult
REFERENCES: 2.3
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.33 - Define and provide examples of isotopes of an element.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: nuclear structure
OTHER: general chemistry

34. Which of the following statements is true concerning the two nuclides ^{16}O and ^{17}O ?

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.

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.3
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.33 - Define and provide examples of isotopes of an element.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: isotope
OTHER: general chemistry

35. Which of the following atomic symbols represents an isotope of ^{94}Mo?

a. ^{93}Nb
b. ^{95}Tc
c. ^{94}Tc
d. ^{95}Mo
e. ^{94}Nb

ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.3
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.33 - Define and provide examples of isotopes of an element.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: isotope
OTHER: general chemistry

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

	Atomic Number	Mass Number
a. I	17	34
II	18	34
b. I	7	14

	II	8	14
c.	I	17	35
	II	17	37
d.	I	17	37
	II	18	38
e.	I	7	15
	II	8	16

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.3
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.33 - Define and provide examples of isotopes of an element.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: isotope
OTHER: 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.

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.3
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.33 - Define and provide examples of isotopes of an element.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: isotope
OTHER: 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.

ANSWER: b
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.3
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.33 - Define and provide examples of isotopes of an element.
TOPICS: 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.

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.3
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.33 - Define and provide examples of isotopes of an element.
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: isotope
OTHER: general chemistry

40. What is the symbol of the nuclide having 13 protons and 14 neutrons?
    a. $^{27}_{13}\mathrm{Si}$
    b. $^{14}_{13}\mathrm{Si}$
    c. $^{27}_{13}\mathrm{Al}$
    d. $^{27}_{14}\mathrm{Si}$
    e. $^{14}_{13}\mathrm{Al}$

ANSWER: c
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.3
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.34 - Write the nuclide symbol of an element. (Example 2.1)
TOPICS: early atomic theory

	atomic theory of matter
KEYWORDS:	atomic symbol
OTHER:	general chemistry

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

a. $^{108}_{48}Cd^{2+}$

b. $^{108}_{46}Pd$

c. $^{108}_{47}Ag^{+}$

d. $^{110}_{48}Cd^{2+}$

e. $^{103}_{45}Rh^{3+}$

ANSWER:	b
POINTS:	1
DIFFICULTY:	easy
REFERENCES:	2.3
HAS VARIABLES:	False
LEARNING OBJECTIVES:	GENE.EBBI.13.34 - Write the nuclide symbol of an element. (Example 2.1)
TOPICS:	general concepts atomic theory of matter

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

a. hafnium

b. nickel

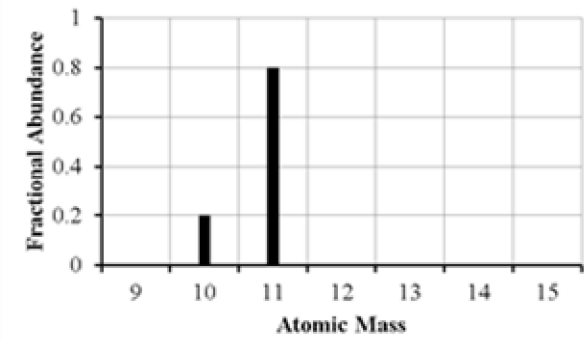
c. mercury

d. argon

e. carbon

ANSWER:	c
POINTS:	1
DIFFICULTY:	easy
REFERENCES:	2.4
HAS VARIABLES:	True
LEARNING OBJECTIVES:	GENE.EBBI.13.35 - Define atomic mass unit and atomic weight.
TOPICS:	early atomic theory atomic theory of matter
KEYWORDS:	atomic mass unit | atomic weight
OTHER:	general chemistry

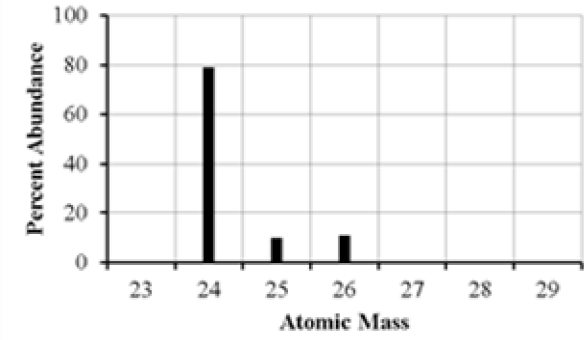
43. The mass spectrum of an element with two naturally occurring isotopes is shown below. What is the best estimate of the element’s atomic mass?



a. 10 amu
b. 11 amu
c. 10.8 amu
d. 10.2 amu
e. 10.5 amu

ANSWER: c
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.4
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.36 - Describe how a mass spectrometer can be used to determine the fractional abundance of the isotopes of an element.
TOPICS: 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.

ANSWER: b
POINTS: 1
DIFFICULTY: moderate

REFERENCES: 2.4
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.36 - Describe how a mass spectrometer can be used to determine the fractional abundance of the isotopes of an element.
TOPICS: early atomic theory
atomic theory of matter

45. Lithium has two naturally occurring isotopes, ^{6}Li and ^{7}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}Li is greater than ^{6}Li.
b. The abundance of ^{7}Li is less than ^{6}Li.
c. The abundance of ^{6}Li is equal to the abundance of ^{7}Li.
d. Not enough data is provided to determine the correct answer.
e. Based on the atomic mass, only ^{7}Li occurs naturally.

ANSWER: a
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.4
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.36 - Describe how a mass spectrometer can be used to determine the fractional abundance of the isotopes of an element.
TOPICS: 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.

ANSWER: a
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.4
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.37 - Determine the atomic mass of an element from the isotopic masses and fractional abundances. (Example 2.2)
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic weight

OTHER: general chemistry

47. The average atomic mass of Eu is 151.96 amu. There are only two naturally occurring isotopes of europium, ^{151}Eu with a mass of 151.0 amu and ^{153}Eu with a mass of 153.0 amu. The natural abundance of the ^{131}Eu isotope must be approximately

a. 60%.
b. 20%.
c. 50%.
d. 80%.
e. 40%.

ANSWER: c
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.4
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.37 - Determine the atomic mass of an element from the isotopic masses and fractional abundances. (Example 2.2)
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic weight
OTHER: general chemistry

48. Naturally occurring element X exists in three isotopic forms: X-28 (27.979 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

ANSWER: b
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.4
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.37 - Determine the atomic mass of an element from the isotopic masses and fractional abundances. (Example 2.2)
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic weight
OTHER: general chemistry

49. Neon has three naturally occuring 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%

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.4
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.38 - Determine the atomic mass of an element from the isotopic masses and fractional abundances.
TOPICS: 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.

ANSWER: a
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.4
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.37 - Determine the atomic mass of an element from the isotopic masses and fractional abundances. (Example 2.2)
TOPICS: early atomic theory
atomic theory of matter
KEYWORDS: atomic weight
OTHER: 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

ANSWER: b
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.4
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.38 - Determine the atomic mass of an element from the isotopic masses and fractional abundances.
TOPICS: 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.

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.5
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.39 - Identify periods and groups on the periodic table.
TOPICS: early atomic theory
periodic table
KEYWORDS: group
OTHER: 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.

ANSWER: b
POINTS: 1
DIFFICULTY: easy

REFERENCES: 2.5
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.39 - Identify periods and groups on the periodic table.
TOPICS: early atomic theory
periodic table
KEYWORDS: period
OTHER: 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.

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.5
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.40 - Find the main-group and transition elements on the periodic table.
TOPICS: early atomic theory
periodic table
OTHER: general chemistry

55. Which of the following statements is <u>not</u> true about the element iron?
    a. It is a metal.
    b. It is a transition element.
    c. It is in period 4.
    d. It has chemical and physical properties most similar to zirconium.
    e. It is in group VIIIB (group 8).

ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.5
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.40 - Find the main-group and transition elements on the periodic table.
TOPICS: 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. metalloids or semimetals.
c. halogens.
d. transition metals.
e. inner transition metals.

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.5
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.41 - Locate the alkali metal and halogen groups on the periodic table.
TOPICS: 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

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.5
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.41 - Locate the alkali metal and halogen groups on the periodic table.
TOPICS: early atomic theory
periodic table
KEYWORDS: nonmetal
OTHER: general chemistry

58. Which element belongs to the alkali metals?
a. rubidium
b. germanium
c. barium
d. iodine
e. argon

ANSWER: a
POINTS: 1

DIFFICULTY: easy
REFERENCES: 2.5
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.41 - Locate the alkali metal and halogen groups on the periodic table.
TOPICS: 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

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.5
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.42 - Recognize the portions of the periodic table that contain the metals, nonmetals, and metalloids (semimetals).
TOPICS: early atomic theory
periodic table
OTHER: general chemistry

60. Which of the following is a metalloid?

a. oxygen
b. hydrogen
c. silicon
d. carbon
e. copper

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.5
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.42 - Recognize the portions of the periodic table that contain the metals, nonmetals, and metalloids (semimetals).

TOPICS: early atomic theory
periodic table
KEYWORDS: metalloid
OTHER: general chemistry

61. All of the following elements are best classified as metalloids except
    a. Si.
    b. Te.
    c. As.
    d. B.
    e. Ga.

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.5
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.42 - Recognize the portions of the periodic table that contain the metals, nonmetals, and metalloids (semimetals).
TOPICS: early atomic theory
periodic table
KEYWORDS: metalloid
OTHER: 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

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.43 - Determine whether a chemical formula is also a molecular formula.
TOPICS: 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

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.43 - Determine whether a chemical formula is also a molecular formula.
TOPICS: early atomic theory
chemical substance

64. In a particular mass of $KAu(CN)_2$, there are 6.66×10^{20} atoms of gold. What is the total number of atoms in this sample?

a. 1.33×10^{21}
b. 2.00×10^{21}
c. 4.00×10^{21}
d. 3.33×10^{21}
e. 2.66×10^{21}

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.43 - Determine whether a chemical formula is also a molecular formula.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula
OTHER: general chemistry

65. A sample of TNT, $C_7H_5N_3O_6$, has 8.94×10^{21} nitrogen atoms. How many hydrogen atoms are there in this sample of TNT?

a. 1.79×10^{22}

b. 11.92×10^{21}

c. 1.49×10^{22}

d. 8.94×10^{21}

e. 2.09×10^{22}

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.43 - Determine whether a chemical formula is also a molecular formula.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula
OTHER: general chemistry

66. A 2.0-g sample of washing soda, $Na_2CO_3 \cdot 10H_2O$, has 4.2×10^{21} carbon atoms. How many oxygen atoms are present in 2.0g of washing soda?

a. 4.2×10^{22}

b. 4.2×10^{21}

c. 8.4×10^{21}

d. 5.5×10^{22}

e. 1.3×10^{22}

ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.43 - Determine whether a chemical formula is also a molecular formula.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula
OTHER: general chemistry

67. A sample of the mineral troegerite, $(UO_2)_3(AsO_4)_2 \cdot 12H_2O$, has 1.34×10^{21} U atoms. How many arsenic atoms are present in this sample of troegerite?

a. 2.01×10^{22}

b. 1.61×10^{22}

c. 2.68×10^{21}

d. 6.70×10^{22}

e. 8.93×10^{20}

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.43 - Determine whether a chemical formula is also a molecular formula.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula
OTHER: 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.

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.44 - Define ion, cation, and anion.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula | ionic substance
OTHER: general chemistry

69. The species Ag^{+}, Pt^{2+}, and Tl^{3+} are all

a. anions.

b. isotopes.

c. isoelectronic.

d. allotropes.

e. cations.

ANSWER: e
POINTS: 1
DIFFICULTY: easy

REFERENCES: 2.6
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.44 - Define ion, cation, and anion.
TOPICS: 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.

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.44 - Define ion, cation, and anion.
TOPICS: early atomic theory
chemical substance

71. Which of the following statements is true about one formula unit of RuF_2?
a. It is composed of one Ru atom and one F_2 molecule.
b. It is composed of one Ru atom and two F atoms.
c. It is composed of one Ru^{2+} ion and one F_2^{2-} ion.
d. It is composed of one RuF_2 molecule.
e. It is composed of one Ru^{2+} ion and two F^- ions.

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.45 - Classify compounds as ionic or molecular.
TOPICS: early atomic theory
chemical substance

72. Bismuth(III) sulfate is an ionic compound formed from Bi^{3+} and SO_4^{2-}. What is the correct way to represent the formula?
a. $BiSO_4^+$
b. $Bi(SO_4)_2^-$

c. $Bi^{3+}SO_4^{2-}$

d. $Bi_2(SO_4)_3$

e. $Bi_9(SO_4)_{13.5}$

ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.46 - Write an ionic formula, given the ions..
TOPICS: 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.

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.45 - Classify compounds as ionic or molecular.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula | molecular substance
OTHER: 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

ANSWER: e
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.6
HAS VARIABLES: False

LEARNING OBJECTIVES: GENE.EBBI.13.45 - Classify compounds as ionic or molecular.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula | ionic substance
OTHER: 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

ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.47 - Define and provide examples for the term formula unit.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula
OTHER: general chemistry

76. How many oxygen atoms are there in a formula unit of $UO_2(C_2H_3O_2)_2 \cdot NH_4C_2H_3O_2 \cdot 5H_2O$?
a. 4
b. 13
c. 23
d. 9
e. 11

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.47 - Define and provide examples for the term formula unit.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula | ionic substance
OTHER: general chemistry

77. What is the ratio of oxygen atoms to hydrogen atoms in the compound $Fe_4(PO_4)_3(OH)_3 \cdot 12H_2O$?

a. 15:3
b. 27:15
c. 27:27
d. 18:27
e. 25:17

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.47 - Define and provide examples for the term formula unit.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula | ionic substance
OTHER: general chemistry

78. What is the ratio of oxygen atoms to hydrogen atoms in the mineral carnotite, $K_2(UO_2)_3(VO_4)_2 \cdot 3H_2O$?

a. 8:6
b. 8:3
c. 17:3
d. 9:6
e. 17:6

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.47 - Define and provide examples for the term formula unit.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula | ionic substance
OTHER: general chemistry

79. Which statement is <u>incorrect</u> concerning the formation of ionic compounds?

a. Halogens tend to form anions with a charge of –1.
b. Alkali metals tend to form cations with a charge of +1.
c. Metals tend to form cations, while nonmetals tend to form anions.
d. Transition metals tend to form cations with a charge of +3.
e. Noble gases tend not to form ionic compounds.

ANSWER: d
POINTS: 1

DIFFICULTY: easy
REFERENCES: 2.6
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.48 - Specify the charge on all substances, ionic and molecular.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula | ionic compound
OTHER: general chemistry

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

a. $Ba^{2+}OH^-$.
b. BaOH.
c. Ba_2OH.
d. $Ba_2(OH)_3$.
e. $Ba(OH)_2$.

ANSWER: e
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.6
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.49 - Write an ionic formula, given the ions.
TOPICS: early atomic theory
chemical substance

81. Which of the following molecules is a hydrocarbon?

a. H_2O
b. $CH_3CH_2CH_3$
c. $C_6H_{12}O_6$
d. CH_3CH_2OH
e. CH_3OCH_3

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.7
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.50 - Explain what makes a molecule a hydrocarbon.
TOPICS: early atomic theory
chemical substance
KEYWORDS: organic compound

OTHER: general chemistry

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

a. $CH_3CH_2NH_2$

b. $CH_3CH_2OCH_2CH_3$

c. CH_3CH_2OH

d. CH_3CH_2COOH

e. H_2O

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.7
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.51 - Recognize some functional groups of organic molecules.
TOPICS: early atomic theory
chemical substance
KEYWORDS: organic compound
OTHER: general chemistry

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

a. $CH_3CH_2CH_2OH$

b. $CH_3CH_2COCH_2CH_3$

c. CH_3NHCH_3

d. $CH_3OCH_2CH_3$

e. $CH_3CH_2CH_2COOH$

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.7
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.51 - Recognize some functional groups of organic molecules.
TOPICS: early atomic theory
chemical substance
KEYWORDS: organic compound
OTHER: 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

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.7
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.51 - Recognize some functional groups of organic molecules.
TOPICS: early atomic theory
chemical substance
KEYWORDS: organic compound
OTHER: general chemistry

85. How many electrons does a barium ion have?

a. 56

b. 8

c. 54

d. 44

e. 2

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.52 - Learn the rules for predicting the charges of monatomic ions in ionic compounds.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula | ionic substance
OTHER: general chemistry

86. Which of the following statements is <u>false</u>?

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.

ANSWER: a
POINTS: 1

DIFFICULTY: moderate
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.52 - Learn the rules for predicting the charges of monatomic ions in ionic compounds.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula | ionic substance
OTHER: general chemistry

87. As an ion, sodium has _____ electrons?
    a. 24
    b. 14
    c. 11
    d. 29
    e. 10
ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.52 - Learn the rules for predicting the charges of monatomic ions in ionic compounds.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula | ionic substance
OTHER: general chemistry

88. How many electrons does a sulfide ion have?
    a. 13
    b. 22
    c. 16
    d. 18
    e. 2
ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.52 - Learn the rules for predicting the charges of monatomic ions in ionic compounds.

TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula | ionic substance
OTHER: 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

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.52 - Learn the rules for predicting the charges of monatomic ions in ionic compounds.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula | ionic substance
OTHER: 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^{-}

ANSWER: c
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.52 - Learn the rules for predicting the charges of monatomic ions in ionic compounds.
TOPICS: early atomic theory
chemical substance
KEYWORDS: chemical formula | ionic substance
OTHER: general chemistry

91. The formula for the sulfide ion is
    a. SO_3^{2-}.
    b. SO_4^{2-}.
    c. $S_2O_3^{2-}$.
    d. S^{2-}.
    e. HSO_4^-.

ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.53 - Apply the rules for naming monatomic ions.
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

92. The correct name for Zn^{2+} is
    a. monozinc ion.
    b. zinc ion.
    c. zinc(2) ion.
    d. zinc(I) ion.
    e. zinc.

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.53 - Apply the rules for naming monatomic ions.
TOPICS: early atomic theory
chemical substance

93. The formula of the chlorite ion is
    a. $Cl_2O_3^-$.
    b. ClO_4^-.
    c. Cl^-.
    d. ClO_2^-.
    e. ClO_3^-.

ANSWER: d

POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.54 - Learn the names and charges of common polyatomic ions.
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

94. The name of the SO_4^{2-} ion is
    a. persulfate.
    b. thiosulfite.
    c. sulfite.
    d. sulfate.
    e. sulfide.

ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.54 - Learn the names and charges of common polyatomic ions.
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: 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^-.

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.54 - Learn the names and charges of common polyatomic ions.
TOPICS: early atomic theory

chemical substance
KEYWORDS: ionic compound | nomenclature
OTHER: 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-}.

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.54 - Learn the names and charges of common polyatomic ions.
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature
OTHER: general chemistry

97. All the following ions have the same charge except
    a. sulfate.
    b. dichromate.
    c. chlorate.
    d. sulfide.
    e. sulfite.

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.54 - Learn the names and charges of common polyatomic ions.
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

98. All the following ions have the same charge except
    a. oxide.

b. monohydrogen phosphate.
c. peroxide.
d. permanganate.
e. oxalate.

ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.54 - Learn the names and charges of common polyatomic ions.
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: 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^-.

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.54 - Learn the names and charges of common polyatomic ions.
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: 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.

ANSWER: b
POINTS: 1

DIFFICULTY: moderate
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.55 - Name an ionic compound from its formula. (Example 2.4)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

101. What is the name of the compound whose formula is $Al_2(SO_4)_3$?
a. aluminum sulfate
b. dialuminum tri(sulfur tetraoxygen)
c. aluminum sulfide
d. aluminum persulfate
e. aluminum sulfite
ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.55 - Name an ionic compound from its formula. (Example 2.4)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: 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.
ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.55 - Name an ionic compound from its formula. (Example 2.4)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound

OTHER: general chemistry

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

a. $Gd_2(ClO_2)_3$
b. $Gd(ClO_4)_2$
c. Gd_3Cl
d. $GdCl_3$
e. $Gd(ClO_3)_3$

ANSWER: d
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

104. What is the correct formula for manganese(III) oxide?

a. MnO
b. Mn_2O
c. Mn_3O_2
d. Mn_2O_3
e. MnO_2

ANSWER: d
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.57 - Write the formula of an ionic compound from its name.
TOPICS: chemical formulas

105. What is the correct name for Ga_2S_3?

a. indium(III) sulfide
b. indium sulfide
c. diindium trisulfide
d. indium trisulfide

e. diindium(II) sulfide

ANSWER: a
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.57 - Write the formula of an ionic compound from its name.
TOPICS: chemical formulas

106. What is the formula for calcium nitride?

a. $CaNO_2$
b. $Ca(NO_3)_2$
c. $Ca(NO_2)_2$
d. Ca_3N_2
e. Ca_2N_3

ANSWER: d
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

107. The formula of calcium sulfide is

a. CaS.
b. $CaSO_2$.
c. $CaSO_3$.
d. $CaSO_4$.
e. $Ca(SO_4)_2$.

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name.

(Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

108. What is the formula of calcium nitrite?

a. $Ca(NO_2)_2$
b. Ca_3N_2
c. $Ca_2(NO_2)_2$
d. Ca_2N_3
e. $Ca(NO_2)_3$

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

109. The formula for aluminum bromide is

a. AlB.
b. AlBr.
c. Al_2Br_3.
d. $AlBr_2$.
e. $AlBr_3$.

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound

OTHER: general chemistry

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

a. $Fe_2(SO_4)_3$.

b. Fe_2S_3.

c. $Fe_2(SO_3)_3$.

d. $Fe_3(SO_3)_2$.

e. $Fe_3(SO_4)_2$.

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

111. The formula for aluminum sulfate is

a. $Al_3(SO_4)_2$.

b. Al_3S_2.

c. $Al_2(SO_4)_3$.

d. Al_2S_3.

e. $Al_2(SO_3)_3$.

ANSWER: c
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

112. The formula for copper(II) phosphate is

a. $Co_2(PO_4)_3$.

b. $CuPO_4$.

c. $Co_3(PO_4)_2$.

d. $Cu_2(PO_4)_3$.

e. $Cu_3(PO_4)_2$.

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: 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

ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: 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, $Ca(OH)_2$

e. nitric acid, HNO_3

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

115. The formula for aluminum chloride is

a. $AlCl_3$.

b. AlCl.

c. Al_2Cl.

d. $AlCl_4$.

e. $AlCl_2$.

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: 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.

ANSWER: b

POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

117. The formula for magnesium nitride is

a. Mg_2N_3.
b. Mg_3N_2.
c. $MgNO_2$.
d. $Mg(NO_2)_2$.
e. MgN.

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

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

a. 2
b. 5
c. 3
d. 4
e. 1

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True

LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: 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

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

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

a. $Yb(ClO_4)_2$
b. $YbCl_2$
c. $Yb_2(ClO_3)_3$
d. $YbCl_3$
e. $Yb(ClO_3)_3$

ANSWER: e
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance

KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: general chemistry

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

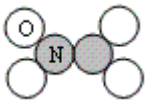
a. EuN
b. Eu_2N_3
c. $Eu(NO_3)_2$
d. $Eu(NO_3)_3$
e. $Eu(NO_2)_3$

ANSWER: a
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.56 - Write the formula of an ionic compound from its name. (Example 2.5)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: 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.

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.58 - Name a binary compound from its formula. (Example 2.6)
TOPICS: early atomic theory
chemical substance
KEYWORDS: ionic compound | nomenclature of simple compound
OTHER: 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

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.59 - Name a binary molecular compound from its molecular model. (Example 2.8)
TOPICS: early atomic theory
chemical substance
KEYWORDS: binary molecular compound | nomenclature of simple compound
OTHER: general chemistry

124. The chemical name for the binary, non-ionic molecule with the formula HI is
a. hydrogen iodide.
b. monohydrogen iodide.
c. hydride iodide.
d. hydrogen iodine.
e. monohydrogen iodine.

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.60 - Name a binary molecular compound from its molecular model.
TOPICS: early atomic theory
chemical substance

125. The formula for hypochlorous acid is
a. $HClO_4$.
b. HClO.
c. HCl.
d. $HClO_2$.
e. HClO.

ANSWER: e
POINTS: 1

DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.61 - Learn the approach for naming binary acids and oxoacids.
TOPICS: early atomic theory
chemical substance
KEYWORDS: acid | nomenclature of simple compound
OTHER: general chemistry

126. Which name–formula pair is incorrect?

a. HNO_3, nitric acid
b. H_3PO_4, phosphoric acid
c. HClO, hypochlorous acid
d. HCl, hydrochloric acid
e. HBr, perchloric acid

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.61 - Learn the approach for naming binary acids and oxoacids.
TOPICS: 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, $MgSO_4 \cdot 7H_2O$
e. dinitrogen tetroxide, N_2O_4

ANSWER: a
POINTS: 1
DIFFICULTY: difficult
REFERENCES: 2.8
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.61 - Learn the approach for naming binary acids and oxoacids.
TOPICS: early atomic theory
chemical substance
KEYWORDS: nomenclature of simple compound
OTHER: general chemistry

128. The oxoanion that comes from nitric acid is

a. $N_2O_3^-$.

b. NO_3^-.

c. HNO_3^-.

d. NO^-.

e. NO_2^-.

ANSWER: b
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.8
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.62 - Write the name and formula of an anion from the acid. (Example 2.9)
TOPICS: early atomic theory
chemical substance
KEYWORDS: acid | nomenclature of simple compound
OTHER: general chemistry

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

$2CO(g) + 2NO(g) \xrightarrow{Rh(s)} 2CO_2(g) + N_2(g)$

a. $NO(g)$

b. $CO(g)$

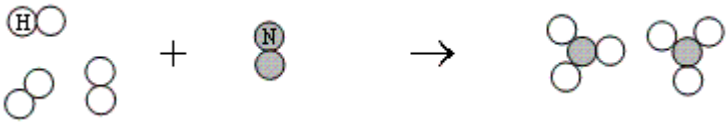
c. $CO_2(g)$

d. $N_2(g)$

e. $Rh(s)$

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.9
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.63 - Identify the reactants and products in a chemical equation.
TOPICS: early atomic theory
chemical equation
KEYWORDS: writing equation
OTHER: general chemistry

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



a. $6H + 2N \rightarrow 2NH_3$
b. $6H + 2N \rightarrow 2HN_3$
c. $2N + 2H_3 \rightarrow 2H_3N$
d. $6H + 2N \rightarrow 2N_3H$
e. $3H_2 + N_2 \rightarrow 2NH_3$

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.9
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.63 - Identify the reactants and products in a chemical equation.
TOPICS: early atomic theory
chemical equation
KEYWORDS: writing equation
OTHER: general chemistry

131. In the following chemical equation, what is the reactant?
$CuSO_4 \cdot 5H_2O(s) \rightarrow CuO(s) + SO_3(g) + 5H_2O(l)$

a. $CuSO_4 \cdot 5H_2O(s)$
b. $H_2O(l)$
c. $CuO(s)$
d. $SO_3(g)$
e. $CuSO_4(s)$

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.9
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.63 - Identify the reactants and products in a chemical equation.
TOPICS: early atomic theory
chemical equation
KEYWORDS: writing equation
OTHER: 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. $2HCl(aq) + Mg(s) \rightarrow MgCl_2(aq) + 2H(g)$

b. $2HCl(aq) + Mg(s) \rightarrow MgCl_2(aq) + H_2(g)$

c. $2HCl(aq) + Mg(s) \rightarrow MgCl(aq) + H_2(g)$

d. $2HCl(aq) + Mg(aq) \rightarrow MgCl_2(s) + H_2(g)$

e. $HCl(aq) + Mg(s) \rightarrow MgCl(aq) + H(g)$

ANSWER: b
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.9
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.64 - Write chemical equations using appropriate phase labels,symbols of reactions conditions, and the presence of a catalyst.
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: 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. $H_2SO_4(aq) + 2NaOH(aq) \rightarrow Na_2S(aq) + 2H_2O(l) + 2O_2(g)$

b. $H_2S(aq) + 2NaOH(aq) \rightarrow Na_2S(aq) + 2H_2O(l)$

c. $H_2SO_4(aq) + NaOH(aq) \rightarrow NaSO_4(aq) + H_2O(g)$

d. $H_2SO_4(aq) + 2NaOH(aq) \rightarrow Na_2SO_4(aq) + 2H_2O(l)$

e. $H_2SO_4(aq) + (NaOH)_2(aq) \rightarrow Na_2SO_4(aq) + 2H_2O(l)$

ANSWER: d
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.9
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.64 - Write chemical equations using appropriate phase labels,symbols of reactions conditions, and the presence of a catalyst.
TOPICS: 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

ANSWER: c
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.10
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.65 - Master techniques for balancing chemical equations. (Example 2.12)
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

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

___$NH_3(g)$ + ___$O_2(g)$ → ___$NO(g)$ + ___$H_2O(g)$

a. 3
b. 2
c. 5
d. 4
e. 1

ANSWER: d
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.10
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.65 - Master techniques for balancing chemical equations. (Example 2.12)
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

136. The complete combustion of propane, C_3H_8, yields carbon dioxide and water:

__ C_3H_8 + __ O_2→ __ CO_2 + __ H_2O

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

a. 6.

b. 3.
c. 7.
d. 4.
e. 5.

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.10
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.65 - Master techniques for balancing chemical equations. (Example 2.12)
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

137. The products of the combustion of acetaldehyde with oxygen are shown in the following equation:
__ CH_3CHO + __ O_2 → __ CO_2 + __ H_2O
When properly balanced, the equation indicates that ____ molecules of O_2 are required to burn 2 molecules of CH_3CHO.

a. 2
b. 6
c. 4
d. 3
e. 5

ANSWER: e
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.10
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.65 - Master techniques for balancing chemical equations. (Example 2.12)
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

138. The complete combustion of octane, C_8H_{18}, yields carbon dioxide and water:
__ C_8H_{18} + __ O_2 → __ CO_2 + __ H_2O
The smallest whole-number coefficient of oxygen in the balanced equation is

a. 24.

b. 26.
c. 22.
d. 23.
e. 25.

ANSWER: e
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.10
HAS VARIABLES: True
LEARNING OBJECTIVES: GENE.EBBI.13.65 - Master techniques for balancing chemical equations. (Example 2.12)
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

139. Energy from the following reaction provided the lift for the moon lander:
__ $(CH_3)_2N_2H_2$ + __ N_2O_4 → __ N_2 + __ H_2O + __ CO_2
When the equation is balanced, the smallest whole-number coefficient of nitrogen is

a. 5.
b. 4.
c. 1.
d. 3.
e. 2.

ANSWER: d
POINTS: 1
DIFFICULTY: difficult
REFERENCES: 2.10
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.65 - Master techniques for balancing chemical equations. (Example 2.12)
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

140. Treatment of sodium borohydride with sulfuric acid is a convenient method for the preparation of diborane:
__ $NaBH_4$ + __ H_2SO_4 → __ B_2H_6 + __ H_2 + __Na_2SO_4
When the equation is balanced, the lowest whole number coefficient for hydrogen is

a. 5.
b. 2.

c. 4.
d. 1.
e. 3.

ANSWER: b
POINTS: 1
DIFFICULTY: difficult
REFERENCES: 2.10
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.65 - Master techniques for balancing chemical equations. (Example 2.12)
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: 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.

ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.10
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.65 - Master techniques for balancing chemical equations. (Example 2.12)
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

142. The complete combustion of phenylhydrazine, $C_6H_5NHNH_2$, with the oxidizer dinitrogen tetraoxide is shown in the following equation:
$\_\_\ C_6H_5NHNH_2 + \_\_\ N_2O_4 \rightarrow \_\_\ CO_2 + \_\_\ H_2O + \_\_\ N_2$
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.

ANSWER: b
POINTS: 1
DIFFICULTY: difficult
REFERENCES: 2.10
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.65 - Master techniques for balancing chemical equations. (Example 2.12)
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

143. The complete combustion of pentane yields carbon dioxide and water. When the equation
__ $C_5H_{12}(l)$ + __ $O_2(g)$ → __ $CO_2(g)$ + __ $H_2O(l)$
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.

ANSWER: e
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.10
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.65 - Master techniques for balancing chemical equations. (Example 2.12)
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: 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

ANSWER: d

POINTS: 1
DIFFICULTY: difficult
REFERENCES: 2.10
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.65 - Master techniques for balancing chemical equations. (Example 2.12)
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

145. When the equation
__ $(CH_3)_2NNH_2$ + __ N_2O_4 → __ N_2 + __ H_2O + __ CO_2
is balanced, the sum of all the coefficients (simplest whole number) is

a. 13.
b. 12.
c. 9.
d. 10.
e. 11.

ANSWER: b
POINTS: 1
DIFFICULTY: difficult
REFERENCES: 2.10
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.65 - Master techniques for balancing chemical equations. (Example 2.12)
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

146. When the equation
__ $C_5H_6N_2OS(s)$ + __ $O_2(g)$ → __ $CO_2(g)$ + __ $H_2O(l)$ + __ $N_2(g)$ + __ $SO_2(g)$
is balanced, the sum of all the coefficients (simplest whole number) is

a. 19.
b. 20.
c. 24.
d. 18.
e. 21.

ANSWER: d
POINTS: 1
DIFFICULTY: difficult

REFERENCES: 2.10
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.65 - Master techniques for balancing chemical equations. (Example 2.12)
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

147. Ammonia can be made by reaction of water with magnesium nitride:
__ $Mg_3N_2(s)$ + __ $H_2O(l)$ → __ $Mg(OH)_2(s)$ + __ $NH_3(g)$
When the equation is properly balanced, the sum of the coefficients is

a. 6.
b. 14.
c. 12.
d. 9.
e. 8.

ANSWER: c
POINTS: 1
DIFFICULTY: moderate
REFERENCES: 2.10
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.65 - Master techniques for balancing chemical equations. (Example 2.12)
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

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

a. $Sn + 4HNO_3 \rightarrow SnO_2 + 4NO_2 + 2H_2O$
b. $2Na_2SO_4 + 3Bi(NO_3)_3 \rightarrow Bi_2(SO_4)_3 + 9NaNO_3$
c. $CH_3CHO + 3O_2 \rightarrow 2CO_2 + 2H_2O$
d. $NH_4NO_3 \rightarrow 2H_2O + N_2$
e. $Na_2CO_3 + 2H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O + CO_2$

ANSWER: a
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.10
HAS VARIABLES: False

LEARNING OBJECTIVES: GENE.EBBI.13.66 - Determine if a chemical reaction is balanced.
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

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

a. $NH_4NO_3 \rightarrow N_2O + 2H_2O$

b. $C_{12}H_{22}O_{11} \rightarrow 12C + 11H_2O$

c. $2NH_4SCN + Ba(OH)_2 \cdot 8H_2O \rightarrow 2NH_3 + 10H_2O + Ba(SCN)_2$

d. $(NH_4)_2Cr_2O_7 \rightarrow N_2O + Cr_2O_3 + 4H_2O$

e. $2Mg + CO_2 \rightarrow 2MgO + C$

ANSWER: d
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.10
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.66 - Determine if a chemical reaction is balanced.
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

150. Which of the following equations is not balanced?

a. $2Sb_2OS_2 + 10O_2 \rightarrow 2Sb_2O_5 + 4SO_3$

b. $(NH_4)_2Cr_2O_7 \rightarrow N_2 + 4H_2O + Cr_2O_3$

c. $C_{12}H_{22}O_{11} + 12O_2 \rightarrow 12CO_2 + 11H_2O$

d. $2NaCl + Pb(NO_3)_2 \rightarrow PbCl_2 + 2NaNO_3$

e. $Fe_3O_4 + 3CO \rightarrow 3Fe + 3CO_2$

ANSWER: e
POINTS: 1
DIFFICULTY: easy
REFERENCES: 2.10
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.66 - Determine if a chemical reaction is balanced.
TOPICS: early atomic theory
chemical equation
KEYWORDS: balancing chemical equation
OTHER: general chemistry

151. Identify the true statement(s) about a nucleus.
1. A nucleus is an atom’s central core.
2. A nucleus is positively charged.
3. A nucleus contains most of an atom’s mass.

a. 1 only
b. 2 only
c. 3 only
d. 1 and 3
e. 2 and 3

ANSWER: d
POINTS: 1
DIFFICULTY: Easy
REFERENCES: 2.2
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.30 - Describe Rutherford's experiment that led to the nuclear model of the atom.
TOPICS: The Structure of the Atom

152. _____ are very light, negatively charged particles that exists in the region around an atom’s positively charged nucleus.

a. Protons
b. Electrons
c. Bosons
d. Positrons
e. Neutrons

ANSWER: b
POINTS: 1
DIFFICULTY: Easy
REFERENCES: 2.2
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.28 - Describe Thomson's experiment in which he discovered the electron.
TOPICS: The Structure of the Atom

153. An important class of molecular substances that contain carbon combined with other elements, such as hydrogen, oxygen, and nitrogen, is _____.

a. organic compounds
b. radioactive isotones
c. radioactive isotopes
d. inorganic compounds
e. stable isotopes

ANSWER: a

Chapter 02 - Atoms, Molecules, and Ions

POINTS: 1
DIFFICULTY: Moderate
REFERENCES: 2.7
HAS VARIABLES: False
TOPICS: Organic Compounds

154. Which of the following is/are true about urea?
1. Urea is a molecular compound in human urine.
2. Urea can be synthesized from ammonia and cyanic acid.
3. Urea belongs to the hydrocarbon group.

a. 1 only
b. 2 only
c. 3 only
d. 1 and 2
e. 1, 2, and 3

ANSWER: d
POINTS: 1
DIFFICULTY: Moderate
REFERENCES: 2.7
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.51 - Recognize some functional groups of organic molecules.
TOPICS: Organic Compounds

155. A _____ is the symbolic representation of a chemical reaction in terms of chemical formulas.
a. chemical bond
b. chemical reagent
c. chemical energy
d. chemical reactant
e. chemical equation

ANSWER: e
POINTS: 1
DIFFICULTY: Easy
REFERENCES: 2.9
HAS VARIABLES: False
LEARNING OBJECTIVES: GENE.EBBI.13.63 - Identify the reactants and products in a chemical equation.
TOPICS: Writing Chemical Equations