

## Chapter 02

### Atoms and the Periodic Table

1. The scientist who determined the magnitude of the electric charge on the electron was

- A. John Dalton.
- B. Robert Millikan.**
- C. J. J. Thomson.
- D. Henry Moseley.
- E. J. Burdge.

*Blooms: 1. Remember*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Structure of the Atom*  
*Topic: Components of Matter*

2. When J. J. Thomson discovered the electron, what physical property of the electron did he measure?

- A. its charge,  $e$
- B. its charge-to-mass ratio,  $e/m$**
- C. its temperature,  $T$
- D. its mass,  $m$
- E. its atomic number,  $Z$

*Blooms: 2. Understand*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Structure of the Atom*  
*Topic: Components of Matter*

3. Which field of study made a big contribution toward understanding the composition of the atom?

- A. Electricity
- B. Radiation**
- C. Solution chemistry
- D. Electrochemistry
- E. Quantum mechanics

*Blooms: 2. Understand*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Structure of the Atom*  
*Topic: Components of Matter*

4. Which of the following is a type of radioactive radiation that has no charge and is unaffected by external electric or magnetic fields?

- A.  $\alpha$  rays
- B.  $\beta$  rays
- C.  $\gamma$  rays**
- D.  $\delta$  rays
- E.  $\varepsilon$  rays

*Blooms: 2. Understand*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Structure of the Atom*  
*Topic: Components of Matter*

5. Which of the following is a type of radioactive radiation that consists of positively charged particles and is deflected away from the positively charged plate?

- A.  $\alpha$  rays**
- B.  $\beta$  rays
- C.  $\gamma$  rays
- D.  $\delta$  rays
- E.  $\varepsilon$  rays

*Blooms: 2. Understand*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Structure of the Atom*  
*Topic: Components of Matter*

6. Which of the following is a type of radioactive radiation that consists of electrons and is deflected away from the negatively charged plate?

- A.  $\alpha$  rays
- B.**  $\beta$  rays
- C.  $\gamma$  rays
- D.  $\delta$  rays
- E.  $\epsilon$  rays

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Atomic Theories  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

7. Which of these scientists developed the nuclear model of the atom?

- A. John Dalton
- B. Robert Millikan
- C. J. J. Thomson
- D. Henry Moseley
- E.** Ernest Rutherford

*Blooms: 1. Remember  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Atomic Theories  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

8. Rutherford's experiment with alpha particle scattering by gold foil established that

- A.** protons are not evenly distributed throughout an atom.
- B. electrons have a negative charge.
- C. electrons have a positive charge.
- D. atoms are made of protons, neutrons, and electrons.
- E. protons are 1840 times heavier than electrons.

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

9. Who is credited with measuring the mass/charge ratio of the electron?

- A. Dalton
- B. Chadwick
- C.** Thomson
- D. Millikan
- E. Rutherford

*Blooms: 1. Remember  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Structure of the Atom*

10. Who is credited with first measuring the charge of the electron?

- A. Dalton
- B. Gay-Lussac
- C. Thomson
- D.** Millikan
- E. Rutherford

*Blooms: 1. Remember  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

11. Millikan's oil-drop experiment

- A. established the charge on an electron.
- B. showed that all oil drops carried the same charge.
- C. provided support for the nuclear model of the atom.
- D. suggested that some oil drops carried fractional numbers of electrons.
- E. suggested the presence of a neutral particle in the atom.

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

12. Who is credited with discovering the atomic nucleus?

- A. Dalton
- B. Gay-Lussac
- C. Thomson
- D. Chadwick
- E. Rutherford

*Blooms: 1. Remember  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Atomic Theories  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

13. Which one of the following statements about atoms and subatomic particles is correct?

- A. Rutherford discovered the atomic nucleus by bombarding gold foil with electrons.
- B. The proton and the neutron have identical masses.
- C. The neutron's mass is equal to that of a proton plus an electron.
- D. A neutral atom contains equal numbers of protons and electrons.
- E. An atomic nucleus contains equal numbers of protons and neutrons.

*Blooms: 2. Understand  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Atomic Theories  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

14. Who discovered the neutron, the subatomic particle having a neutral charge?

- A. Millikan
- B. Dalton
- C. Chadwick
- D. Rutherford
- E. Thomson

*Blooms: 1. Remember  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Atomic Theories  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

15. What is the term for the number of protons in the nucleus of each atom of an element? It also indicates the number of electrons in the atom.

- A. Isotope number
- B. Mass number
- C. Mass-to-charge ratio
- D. Atomic number
- E. Atomic mass units

*Blooms: 1. Remember  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Atomic Theories  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

16. What is the term for the total number of neutrons and protons in the nucleus of each atom of an element?

- A. Isotope number
- B. Mass number**
- C. Mass-to-charge ratio
- D. Atomic number
- E. Atomic mass units

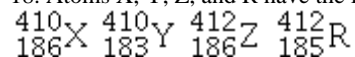
*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

17. Bromine is the only nonmetal that is a liquid at room temperature. Consider the isotope bromine-81,  $^{81}_{35}\text{Br}$ . Select the combination which lists the correct atomic number, number of neutrons, and mass number, respectively.

- A. 35, 46, 81**
- B. 35, 81, 46
- C. 81, 46, 35
- D. 46, 81, 35
- E. 35, 81, 116

*Blooms: 3. Apply  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes  
Subtopic: Elements and the Periodic Table  
Topic: Components of Matter*

18. Atoms X, Y, Z, and R have the following nuclear compositions:



**I**      **II**      **III**      **IV**

Which of the following are isotopes of the same element?

- A. I & II
- B. I & IV
- C. II & IV
- D. III & IV
- E. I & III**

*Blooms: 5. Evaluate  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes  
Topic: Components of Matter*

19. Which isotope is *not* possible?

- A.  $^1_1\text{H}$
- B.  $^2_1\text{H}$
- C.  $^{52}_{24}\text{Cr}$
- D.  $^{25}_{54}\text{Mn}$**

E. All of these isotopes are possible.

*Blooms: 5. Evaluate  
Difficulty: Hard  
Gradable: automatic  
Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes  
Topic: Components of Matter*

20. Atoms of the same element with different mass numbers are called

- A. ions.
- B. neutrons.
- C. chemical groups.
- D. chemical families.
- E.** isotopes.

*Blooms: 2. Understand*

*Difficulty: Easy*

*Gradable: automatic*

*Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes*

*Subtopic: Structure of the Atom*

*Topic: Components of Matter*

21. How many neutrons are there in an atom of lead whose mass number is 208?

- A. 82
- B.** 126
- C. 208
- D. 290
- E. none of them

*Blooms: 3. Apply*

*Difficulty: Medium*

*Gradable: automatic*

*Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes*

*Subtopic: Structure of the Atom*

*Topic: Components of Matter*

22. An atom of the isotope sulfur-31 consists of how many protons, neutrons, and electrons? (p = proton, n = neutron, e = electron)

- A. 15 p, 16 n, 15 e
- B.** 16 p, 15 n, 16 e
- C. 16 p, 31 n, 16 e
- D. 32 p, 31 n, 32 e
- E. 16 p, 16 n, 15 e

*Blooms: 3. Apply*

*Difficulty: Medium*

*Gradable: automatic*

*Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes*

*Subtopic: Structure of the Atom*

*Topic: Components of Matter*

23. Give the number of protons (p), electrons (e), and neutrons (n) in one atom of chlorine- 37.

- A. 37 p, 37 e, 17 n
- B. 17 p, 17 e, 37 n
- C.** 17 p, 17 e, 20 n
- D. 37 p, 17 e, 20 n
- E. 17 p, 37 e, 17 n

*Blooms: 3. Apply*

*Difficulty: Medium*

*Gradable: automatic*

*Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes*

*Subtopic: Structure of the Atom*

*Topic: Components of Matter*

24. Two isotopes of an element differ only in their

- A. symbol.
- B. atomic number.
- C.** atomic mass.
- D. number of protons.
- E. number of electrons.

*Blooms: 3. Apply*

*Difficulty: Easy*

*Gradable: automatic*

*Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes*

*Subtopic: Structure of the Atom*

*Topic: Components of Matter*

25. The elements in a column of the periodic table are known as
- A. metalloids.
  - B. a period.
  - C. noble gases.
  - D.** a group.
  - E. nonmetals.

*Blooms: 1. Remember*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Elements and the Periodic Table*  
*Subtopic: Periodic Classification of the Elements*  
*Topic: Chemical Periodicity*  
*Topic: Components of Matter*

26. Which of these materials are usually poor conductors of heat and electricity?
- A. Metals
  - B. Metalloids
  - C.** Nonmetals
  - D. Alkaline earth metals
  - E. Alkali metals

*Blooms: 2. Understand*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Elements and the Periodic Table*  
*Subtopic: Periodic Classification of the Elements*  
*Topic: Components of Matter*

27. Which of these elements is most likely to be a good conductor of electricity?
- A. N
  - B. S
  - C. He
  - D. Cl
  - E.** Fe

*Blooms: 2. Understand*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Elements and the Periodic Table*  
*Subtopic: Periodic Classification of the Elements*  
*Topic: Components of Matter*

28. Which of the following is a nonmetal?
- A. Lithium, Li,  $Z = 3$
  - B.** Bromine, Br,  $Z = 35$
  - C. Mercury, Hg,  $Z = 80$
  - D. Bismuth, Bi,  $Z = 83$
  - E. Sodium, Na,  $Z = 11$

*Blooms: 3. Apply*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Elements and the Periodic Table*  
*Subtopic: Periodic Classification of the Elements*  
*Topic: Chemical Periodicity*  
*Topic: Components of Matter*

29. Which of the following is a metal?
- A. Nitrogen, N,  $Z = 7$
  - B. Phosphorus, P,  $Z = 15$
  - C.** Arsenic, As,  $Z = 33$
  - D. Thallium, Tl,  $Z = 81$
  - E. Silicon, Si,  $Z = 14$

*Blooms: 3. Apply*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Elements and the Periodic Table*  
*Subtopic: Periodic Classification of the Elements*  
*Topic: Chemical Periodicity*  
*Topic: Components of Matter*

30. Which of the following is a metalloid?

- A. Carbon, C,  $Z = 6$
- B. Sulfur, S,  $Z = 16$
- C.** Germanium, Ge,  $Z = 32$
- D. Iridium, Ir,  $Z = 77$
- E. Bromine, Br,  $Z = 35$

*Blooms: 3. Apply*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Elements and the Periodic Table*  
*Subtopic: Periodic Classification of the Elements*  
*Topic: Chemical Periodicity*  
*Topic: Components of Matter*

31. A row of the periodic table is called a(n)

- A. group.
- B.** period.
- C. isotopic mixture.
- D. family.
- E. subshell.

*Blooms: 1. Remember*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Elements and the Periodic Table*  
*Subtopic: Periodic Classification of the Elements*  
*Topic: Chemical Periodicity*  
*Topic: Components of Matter*

32. Silicon, which makes up about 25% of Earth's crust by mass, is used widely in the modern electronics industry. It has three naturally occurring isotopes,  $^{28}\text{Si}$ ,  $^{29}\text{Si}$ , and  $^{30}\text{Si}$ . Calculate the atomic mass of silicon.

Isotope	Isotopic Mass (amu)	Abundance %
$^{28}\text{Si}$	27.976927	92.22
$^{29}\text{Si}$	28.976495	4.69
$^{30}\text{Si}$	29.973770	3.09

- A. 29.2252 amu
- B. 28.9757 amu
- C. 28.7260 amu
- D.** 28.0855 amu
- E. 27.9801 amu

*Blooms: 3. Apply*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes*  
*Subtopic: Elements and the Periodic Table*  
*Topic: Components of Matter*

33. Lithium forms compounds which are used in dry cells, storage batteries, and in high-temperature lubricants. It has two naturally occurring isotopes,  $^6\text{Li}$  (isotopic mass = 6.015123 amu) and  $^7\text{Li}$  (isotopic mass = 7.016005 amu). Lithium has an atomic mass of 6.9412 amu. What is the percent abundance of lithium-6?

- A. 92.53%
- B. 86.65%
- C. 49.47%
- D.** 7.47%
- E. 6.015%

*Blooms: 3. Apply*  
*Difficulty: Hard*  
*Gradable: automatic*  
*Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes*  
*Subtopic: Elements and the Periodic Table*  
*Topic: Components of Matter*

34. In the periodic table, atoms are arranged in order of
- A. increasing atomic mass.
  - B.** increasing atomic number.
  - C. physical properties.
  - D. periodicity.
  - E. chemical reactivities.

*Blooms: 2. Understand*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes*  
*Subtopic: Elements and the Periodic Table*  
*Topic: Components of Matter*

35. The elements in Group 7A are known by what name?
- A. Transition metals
  - B.** Halogens
  - C. Alkali metals
  - D. Alkaline earth metals
  - E. Noble gases

*Blooms: 1. Remember*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Elements and the Periodic Table*  
*Subtopic: Periodic Classification of the Elements*  
*Topic: Chemical Periodicity*  
*Topic: Components of Matter*

36. The elements in Group 2A are known by what name?
- A. Transition metals
  - B. Halogens
  - C. Alkali metals
  - D.** Alkaline earth metals
  - E. Noble gases

*Blooms: 1. Remember*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Elements and the Periodic Table*  
*Subtopic: Periodic Classification of the Elements*  
*Topic: Chemical Periodicity*  
*Topic: Components of Matter*

37. The alkali metal elements are found in \_\_\_\_\_ of the periodic table.
- A.** Group 1A
  - B. Group 2A
  - C. Group 3A
  - D. Period 7
  - E. Period 1

*Blooms: 1. Remember*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Elements and the Periodic Table*  
*Subtopic: Periodic Classification of the Elements*  
*Topic: Chemical Periodicity*  
*Topic: Components of Matter*

38. What term defines a mass which is exactly equal to 1/12 the mass of one carbon-12 atom?
- A. Isotope number
  - B. Mass number
  - C. Mass-to-charge ratio
  - D. Atomic number
  - E.** Atomic mass unit

*Blooms: 1. Remember*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes*  
*Topic: Components of Matter*



39. Which of these elements is chemically similar to magnesium?

- A. Sulfur
- B. Calcium**
- C. Iron
- D. Nickel
- E. Potassium

*Blooms: 5. Evaluate  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Elements and the Periodic Table  
Subtopic: Periodic Classification of the Elements  
Topic: Components of Matter*

40. Which of these elements is chemically similar to oxygen?

- A. Sulfur**
- B. Calcium
- C. Iron
- D. Nickel
- E. Potassium

*Blooms: 5. Evaluate  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Elements and the Periodic Table  
Subtopic: Periodic Classification of the Elements  
Topic: Components of Matter*

41. Which of these elements is chemically similar to potassium?

- A. calcium
- B. arsenic
- C. phosphorus
- D. cerium
- E. cesium**

*Blooms: 5. Evaluate  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Elements and the Periodic Table  
Subtopic: Periodic Classification of the Elements  
Topic: Components of Matter*

42. What element is represented by X in the atomic symbol notation  ${}_{78}^{195}\text{X}$  ?

- A. Iridium
- B. Platinum**
- C. Palladium
- D. Selenium
- E. Magnesium

*Blooms: 4. Analyze  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes  
Subtopic: Elements and the Periodic Table  
Topic: Components of Matter*

43. Determine the number of electrons and identify the correct symbol for an atom with 17 protons and 18 neutrons.

- A. 17 electrons,  ${}_{17}^{35}\text{Cl}$**
- B. 18 electrons,  ${}_{18}^{36}\text{Ar}$
- C. 17 electrons,  ${}_{17}^{18}\text{Cl}$
- D. 17 electrons,  ${}_{35}^{17}\text{Cl}$
- E. 18 electrons,  ${}_{36}^{18}\text{Ar}$

*Blooms: 4. Analyze  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

44. Determine the number of protons, electrons, and neutrons for the isotope gold-118. The symbol for gold is Au.

- A. 118 protons, 118 electrons, 79 neutrons
- B. 79 protons, 79 electrons, 118 neutrons
- C. 79 protons, 79 electrons, 39 neutrons**
- D. 118 protons, 118 electrons, 39 neutrons
- E. 79 protons, 39 electrons, 118 neutrons

*Blooms: 4. Analyze*

*Difficulty: Medium*

*Gradable: automatic*

*Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes*

*Subtopic: Structure of the Atom*

*Topic: Components of Matter*

45. Determine the number of protons and identify the correct symbol for an atom with 20 neutrons and 20 electrons.

- A. 20 protons,  $^{20}_{20}\text{Ca}$
- B. 20 protons,  $^{40}_{20}\text{Ca}$**
- C. 20 protons,  $^{40}_{40}\text{Ca}$
- D. 40 protons,  $^{20}_{20}\text{Ca}$
- E. 40 protons,  $^{40}_{40}\text{Ca}$

*Blooms: 4. Analyze*

*Difficulty: Easy*

*Gradable: automatic*

*Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes*

*Subtopic: Structure of the Atom*

*Topic: Components of Matter*

46. Which of these compounds is most likely to be ionic?

- A. KF**
- B.  $\text{CCl}_4$
- C.  $\text{CS}_2$
- D.  $\text{CO}_2$
- E. ICl

*Blooms: 4. Analyze*

*Difficulty: Easy*

*Gradable: automatic*

*Subtopic: Bond Polarity*

*Subtopic: Electronegativity*

*Subtopic: Ionic Bonding and Lattice Energy*

*Topic: Chemical Bonding*

47. Which of these compounds is most likely to be ionic?

- A. GaAs
- B.  $\text{SrBr}_2$**
- C.  $\text{NO}_2$
- D.  $\text{CBr}_4$
- E.  $\text{H}_2\text{O}$

*Blooms: 4. Analyze*

*Difficulty: Easy*

*Gradable: automatic*

*Subtopic: Bond Polarity*

*Subtopic: Electronegativity*

*Subtopic: Ionic Bonding and Lattice Energy*

*Topic: Chemical Bonding*

48. Which of these compounds is most likely to be ionic?

- A.  $\text{NCl}_3$
- B.**  $\text{BaCl}_2$
- C.  $\text{CO}$
- D.  $\text{SO}_2$
- E.  $\text{SF}_4$

*Blooms: 4. Analyze*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Bond Polarity*  
*Subtopic: Electronegativity*  
*Subtopic: Ionic Bonding and Lattice Energy*  
*Topic: Chemical Bonding*

49. Which of these pairs of elements would be most likely to form an ionic compound?

- A. Cl and I
- B. Al and K
- C.** Cl and Mg
- D. C and S
- E. Al and Mg

*Blooms: 4. Analyze*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Bond Polarity*  
*Subtopic: Electronegativity*  
*Subtopic: Ionic Bonding and Lattice Energy*  
*Topic: Chemical Bonding*

50. Which of the following contains ionic bonding?

- A.  $\text{CO}$
- B.**  $\text{SrF}_2$
- C. Al
- D.  $\text{OCl}_2$
- E.  $\text{HCl}$

*Blooms: 4. Analyze*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Bond Polarity*  
*Subtopic: Electronegativity*  
*Subtopic: Ionic Bonding and Lattice Energy*  
*Topic: Chemical Bonding*

51. Which of the following is an ionic compound?

- A.  $\text{H}_2\text{S}$
- B.  $\text{NH}_3$
- C.  $\text{I}_2$
- D.**  $\text{KI}$
- E.  $\text{CCl}_4$

*Blooms: 4. Analyze*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Bond Polarity*  
*Subtopic: Electronegativity*  
*Subtopic: Ionic Bonding and Lattice Energy*  
*Topic: Chemical Bonding*

52. An anion is defined as

- A.** a charged atom or group of atoms with a net negative charge.
- B. a stable atom.
- C. a group of stable atoms.
- D. an atom or group of atoms with a net positive charge.
- E. neutral.

*Blooms: 1. Remember*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Electron Configurations of Cations and Anions*  
*Subtopic: Molecules and Ions*  
*Topic: Components of Matter*  
*Topic: Electron Configuration*

53. Which one of these species is an ion?

**A.**  $B^{3+}$

B. NaCl

C. He

D.  $^{14}C$

E. None of these species is an ion.

*Blooms: 2. Understand*

*Difficulty: Easy*

*Gradable: automatic*

*Subtopic: Electron Configurations of Cations and Anions*

*Subtopic: Molecules and Ions*

*Topic: Electron Configuration*

54. Which of these pairs of elements would be most likely to form an ionic compound?

A. P and Br

B. Cu and K

C. C and O

**D.** O and Zn

E. Al and Rb

*Blooms: 4. Analyze*

*Difficulty: Easy*

*Gradable: automatic*

*Subtopic: Bond Polarity*

*Subtopic: Electronegativity*

*Subtopic: Ionic Bonding and Lattice Energy*

*Topic: Chemical Bonding*

55. Which pair of elements would be most likely to form an ionic compound?

A. P and Br

B. Zn and K

**C.** F and Al

D. C and S

E. Al and Rb

*Blooms: 4. Analyze*

*Difficulty: Easy*

*Gradable: automatic*

*Subtopic: Bond Polarity*

*Subtopic: Electronegativity*

*Subtopic: Ionic Bonding and Lattice Energy*

*Topic: Chemical Bonding*

56. What is the formula for the ionic compound formed by calcium ions and nitrate ions?

A.  $Ca_3N_2$

**B.**  $Ca(NO_3)_2$

C.  $Ca_2NO_3$

D.  $Ca_2NO_2$

E.  $CaNO_3$

*Blooms: 4. Analyze*

*Difficulty: Medium*

*Gradable: automatic*

*Subtopic: Chemical Formulas*

*Subtopic: Molecules and Ions*

*Topic: Components of Matter*

57. What is the formula for the ionic compound formed by calcium and selenium?

**A.** CaSe

B.  $Ca_2Se$

C.  $CaSe_2$

D.  $Ca_3Se$

E.  $CaSe_3$

*Blooms: 4. Analyze*

*Difficulty: Easy*

*Gradable: automatic*

*Subtopic: Chemical Formulas*

*Subtopic: Molecules and Ions*

*Topic: Components of Matter*

58. Which is the correct formula for copper(II) phosphate?

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

*Blooms: 4. Analyze  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Chemical Formulas  
Subtopic: Molecules and Ions  
Topic: Components of Matter*

59. The chemical name for  $\text{ClO}_3^-$  is "chlorate ion". What is the common name for  $\text{HClO}_3$ ?

- A. hydrochloric acid
- B. chloroform
- C. hydrogen trioxochloride
- D. chlorous acid
- E. chloric acid**

*Blooms: 3. Apply  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Acid-Base Definitions  
Subtopic: Chemical Formulas  
Subtopic: Molecules and Ions  
Subtopic: Nomenclature  
Topic: Acids and Bases  
Topic: Components of Matter*

60. The formula for magnesium sulfate is

- A.  $\text{MnS}$ .
- B.  $\text{MgS}$ .
- C.  $\text{MnSO}_3$ .
- D.  $\text{MgSO}_4$ .**
- E.  $\text{MnSO}_4$ .

*Blooms: 4. Analyze  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Chemical Formulas  
Subtopic: Ionic Bonding and Lattice Energy  
Subtopic: Molecules and Ions  
Subtopic: Nomenclature  
Topic: Chemical Bonding  
Topic: Components of Matter*

61. The formula for sodium sulfide is

- A.  $\text{NaS}$ .
- B.  $\text{K}_2\text{S}$ .
- C.  $\text{NaS}_2$ .
- D.  $\text{Na}_2\text{S}$ .**
- E.  $\text{SeS}$ .

*Blooms: 4. Analyze  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Chemical Formulas  
Subtopic: Ionic Bonding and Lattice Energy  
Subtopic: Molecules and Ions  
Subtopic: Nomenclature  
Topic: Chemical Bonding  
Topic: Components of Matter*

62. The chemical formula for iron(II) nitrate is

- A.  $\text{Fe}_2(\text{NO}_3)_3$ .
- B.  $\text{Ir}(\text{NO}_2)_2$ .
- C.  $\text{Fe}_2\text{N}_3$ .
- D.**  $\text{Fe}(\text{NO}_3)_2$ .
- E.  $\text{Fe}(\text{NO}_2)_2$ .

*Blooms: 4. Analyze*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Ionic Bonding and Lattice Energy*  
*Subtopic: Molecules and Ions*  
*Subtopic: Nomenclature*  
*Topic: Chemical Bonding*  
*Topic: Components of Matter*

63. Which one of the following formulas of ionic compounds is the least likely to be correct?

- A.  $\text{NH}_4\text{Cl}$
- B.  $\text{Ba}(\text{OH})_2$
- C.  $\text{Na}_2\text{SO}_4$
- D.**  $\text{Ca}_2\text{NO}_3$
- E.  $\text{Cu}(\text{CN})_2$

*Blooms: 4. Analyze*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Ionic Bonding and Lattice Energy*  
*Subtopic: Molecules and Ions*  
*Topic: Chemical Bonding*  
*Topic: Components of Matter*

64. What is the formula for lead(II) oxide?

- A.**  $\text{PbO}$
- B.  $\text{PbO}_2$
- C.  $\text{Pb}_2\text{O}$
- D.  $\text{PbO}_4$
- E.  $\text{Pb}_2\text{O}_3$

*Blooms: 4. Analyze*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Ionic Bonding and Lattice Energy*  
*Subtopic: Molecules and Ions*  
*Topic: Chemical Bonding*  
*Topic: Components of Matter*

65. Potassium permanganate is a strong oxidizer that reacts explosively with easily oxidized materials. What is its formula?

- A.  $\text{KMnO}_3$
- B.**  $\text{KMnO}_4$
- C.  $\text{K}_2\text{MnO}_4$
- D.  $\text{K}(\text{MnO}_4)_2$
- E.  $\text{K}_2\text{Mn}_2\text{O}_7$

*Blooms: 4. Analyze*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Ionic Bonding and Lattice Energy*  
*Subtopic: Molecules and Ions*  
*Topic: Chemical Bonding*  
*Topic: Components of Matter*

66. Ferric oxide is used as a pigment in metal polishing. Which of the following is its formula?

- A. FeO
- B. Fe<sub>2</sub>O
- C. FeO<sub>3</sub>
- D. Fe<sub>2</sub>O<sub>5</sub>
- E. Fe<sub>2</sub>O<sub>3</sub>**

*Blooms: 4. Analyze  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Chemical Formulas  
Subtopic: Ionic Bonding and Lattice Energy  
Subtopic: Molecules and Ions  
Topic: Chemical Bonding  
Topic: Components of Matter*

67. What is the name of Mn(CO<sub>3</sub>)<sub>2</sub>?

- A. manganese carbide
- B. magnesium(IV) carbonate
- C. manganese(II) carbonate
- D. magnesium(II) carbonate
- E. manganese(IV) carbonate**

*Blooms: 4. Analyze  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Chemical Formulas  
Subtopic: Ionic Bonding and Lattice Energy  
Subtopic: Molecules and Ions  
Topic: Chemical Bonding  
Topic: Components of Matter*

68. What is the name of Ba(NO<sub>2</sub>)<sub>2</sub>·3H<sub>2</sub>O?

- A. barium nitrite
- B. trihydrobarium(II) nitrite
- C. barium nitrite trihydrate**
- D. barium(II) nitrite trihydrate
- E. barium nitrate trihydrate

*Blooms: 4. Analyze  
Difficulty: Hard  
Gradable: automatic  
Subtopic: Chemical Formulas  
Subtopic: Ionic Bonding and Lattice Energy  
Subtopic: Molecules and Ions  
Topic: Chemical Bonding  
Topic: Components of Matter*

69. What is the formula of hydrobromic acid?

- A. H<sub>2</sub>OBr
- B. HBrO<sub>3</sub>
- C. HBrO
- D. HBr**
- E. HBr·2H<sub>2</sub>O

*Blooms: 3. Apply  
Difficulty: Hard  
Gradable: automatic  
Subtopic: Acid-Base Definitions  
Subtopic: Chemical Formulas  
Subtopic: Nomenclature  
Topic: Acids and Bases  
Topic: Components of Matter*

70. What is the formula of iodous acid?

- A. HI
- B.  $\text{HIO}_3$
- C. HIO
- D.  $\text{HIO}_4$
- E.  $\text{HIO}_2$**

*Blooms: 3. Apply*  
*Difficulty: Hard*  
*Gradable: automatic*  
*Subtopic: Acid-Base Definitions*  
*Subtopic: Chemical Formulas*  
*Subtopic: Nomenclature*  
*Topic: Acids and Bases*  
*Topic: Components of Matter*

71. Iron(III) chloride hexahydrate is used as a coagulant for sewage and industrial wastes. What is its formula?

- A.  $\text{Fe}(\text{Cl}\cdot 6\text{H}_2\text{O})_3$
- B.  $\text{Fe}_3\text{Cl}\cdot 6\text{H}_2\text{O}$
- C.  $\text{FeCl}_3(\text{H}_2\text{O})_6$
- D.  $\text{Fe}_3\text{Cl}(\text{H}_2\text{O})_6$
- E.  $\text{FeCl}_3\cdot 6\text{H}_2\text{O}$**

*Blooms: 3. Apply*  
*Difficulty: Hard*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Ionic Bonding and Lattice Energy*  
*Subtopic: Nomenclature*  
*Topic: Chemical Bonding*  
*Topic: Components of Matter*

72. Which of the following is the oxoanion of bromine called the bromate ion?

- A.  $\text{BrO}_3^-$**
- B.  $\text{BrO}_3^{2-}$
- C.  $\text{BrO}_4^{2-}$
- D.  $\text{BrO}_2^-$
- E.  $\text{BrO}^-$

*Blooms: 3. Apply*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Ionic Bonding and Lattice Energy*  
*Subtopic: Nomenclature*  
*Topic: Chemical Bonding*  
*Topic: Components of Matter*

73. What types of elements undergo ionic bonding?

- A. two metals
- B. a nonmetal and a metal**
- C. two nonmetals
- D. two Group 1A elements
- E. two noble gases

*Blooms: 2. Understand*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Ionic Bonding and Lattice Energy*  
*Subtopic: Periodic Classification of the Elements*  
*Topic: Chemical Bonding*  
*Topic: Chemical Periodicity*



74. What is the name of  $\text{PCl}_3$ ?
- A. phosphorus chloride
  - B. phosphoric chloride
  - C. phosphorus trichlorate
  - D. trichlorophosphide
  - E. phosphorus trichloride**

*Blooms: 3. Apply*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Covalent Bonding*  
*Subtopic: Molecules and Ions*  
*Subtopic: Nomenclature*  
*Topic: Chemical Bonding*  
*Topic: Components of Matter*

75. The compound,  $\text{P}_4\text{S}_{10}$ , is used in the manufacture of safety matches. What is its name?
- A. phosphorus sulfide
  - B. phosphoric sulfide
  - C. phosphorus decasulfide
  - D. tetraphosphorus decasulfide**
  - E. phosphorus sulfite

*Blooms: 3. Apply*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Covalent Bonding*  
*Subtopic: Molecules and Ions*  
*Subtopic: Nomenclature*  
*Topic: Chemical Bonding*  
*Topic: Components of Matter*

76. Diiodine pentoxide is used as an oxidizing agent that converts carbon monoxide to carbon dioxide. What is its chemical formula?
- A.  $\text{I}_2\text{O}_5$**
  - B.  $\text{IO}_5$
  - C.  $2\text{IO}_5$
  - D.  $\text{I}_5\text{O}_2$
  - E.  $(\text{IO}_5)_2$

*Blooms: 3. Apply*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Covalent Bonding*  
*Subtopic: Molecules and Ions*  
*Subtopic: Nomenclature*  
*Topic: Chemical Bonding*  
*Topic: Components of Matter*

77. What is the name of  $\text{P}_4\text{Se}_3$ ?
- A. phosphorus selenide
  - B. phosphorus triselenide
  - C. tetraphosphorus selenide
  - D. phosphoric selenide
  - E. tetraphosphorus triselenide**

*Blooms: 3. Apply*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Covalent Bonding*  
*Subtopic: Molecules and Ions*  
*Subtopic: Nomenclature*  
*Topic: Chemical Bonding*  
*Topic: Components of Matter*

78. What is the name of  $\text{ClO}^-$  ion?

- A.** hypochlorite
- B. chlorate
- C. chlorite
- D. perchlorate
- E. perchlorite

*Blooms: 3. Apply*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Molecules and Ions*  
*Subtopic: Nomenclature*  
*Topic: Components of Matter*

79. What is the formula for the permanganate ion?

- A.  $\text{MnO}_2^-$
- B.**  $\text{MnO}_4^-$
- C.  $\text{MgO}_4^{2-}$
- D.  $\text{Mn}_2\text{O}_7^-$
- E.  $\text{MgO}_2^{2-}$

*Blooms: 3. Apply*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Molecules and Ions*  
*Subtopic: Nomenclature*  
*Topic: Components of Matter*

80. Tetrasulfur dinitride decomposes explosively when heated. What is its formula?

- A.  $\text{S}_2\text{N}_4$
- B.**  $\text{S}_4\text{N}_2$
- C.  $4\text{SN}_2$
- D.  $\text{S}_4\text{N}$
- E.  $\text{S}_2\text{N}$

*Blooms: 3. Apply*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Molecules and Ions*  
*Subtopic: Nomenclature*  
*Topic: Components of Matter*

81. Which of the following is the empirical formula for hexane,  $\text{C}_6\text{H}_{14}$ ?

- A.  $\text{C}_{12}\text{H}_{28}$
- B.  $\text{C}_6\text{H}_{14}$
- C.**  $\text{C}_3\text{H}_7$
- D.  $\text{CH}_{2.3}$
- E.  $\text{C}_{0.43}\text{H}$

*Blooms: 4. Analyze*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Formula Determination of Unknown Compounds (Empirical and Molecular Formulas)*  
*Subtopic: Molecules and Ions*  
*Subtopic: Nomenclature*  
*Topic: Components of Matter*  
*Topic: Stoichiometry and Chemical Reactions*

82. Which of the following is a molecular formula for a compound with an empirical formula of CH?

- A. C<sub>2</sub>H<sub>6</sub>
- B. C<sub>3</sub>H<sub>9</sub>
- C. C<sub>4</sub>H<sub>10</sub>
- D. C<sub>6</sub>H<sub>6</sub>**

E. None of the answers is correct.

*Blooms: 4. Analyze*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Formula Determination of Unknown Compounds (Empirical and Molecular Formulas)*  
*Subtopic: Molecules and Ions*  
*Subtopic: Nomenclature*  
*Topic: Components of Matter*  
*Topic: Stoichiometry and Chemical Reactions*

83. Which of the following substances is a molecule, but not a compound?

- A. SO<sub>2</sub>
- B. O<sub>2</sub>**
- C. CS<sub>2</sub>
- D. Ar
- E. CO<sub>3</sub><sup>2-</sup>

*Blooms: 5. Evaluate*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Molecules and Ions*  
*Topic: Components of Matter*

84. What is the chemical name of FeSO<sub>3</sub>?

- A. Iron(II) sulfite**
- B. Iron(III) sulfate
- C. Iron sulfate
- D. Iron sulfur trioxide
- E. None of the names is correct.

*Blooms: 3. Apply*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Subtopic: Molecules and Ions*  
*Topic: Components of Matter*

85. Polyatomic molecules contain

- A. two different types of atoms.
- B. two of the same types of atoms.
- C. only two atoms of the same or different type.
- D. more than two atoms of the same or different type.**

*Blooms: 2. Understand*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Chemical Formulas*  
*Topic: Components of Matter*

86. Common examples of diatomic molecules from Group 7A elements include

- A. fluorine, hydrogen, and nitrogen.
- B. nitrogen, chlorine, and bromine.
- C. chlorine, bromine, and iodine.**
- D. iodine, lead, and oxygen.

*Blooms: 1. Remember*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Subtopic: Elements and the Periodic Table*  
*Topic: Components of Matter*

87. The fact that when 48.6 g of magnesium completely reacts with 32.0 g of oxygen, exactly 80.6 g of magnesium oxide is formed illustrates

- A. the law of definite proportions.
- B.** the law of conservation of mass.
- C. the law of multiple proportions.
- D. Dalton's description of the atom.

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Atomic Theories  
Topic: Components of Matter*

88. Why was it more difficult to design an experiment that would prove the existence of neutrons than it was to design an experiment that would prove the existence of either protons or electrons?

- A. Neutrons are smaller than either protons or electrons, so their presence is much more difficult to detect.
- B. Because neutrons are 1840 times heavier than protons, they are difficult to separate, and therefore, to count.
- C.** Neutrons do not deflect charged particles.
- D. The similarity of the magnetic and electrical properties of protons and neutrons made them experimentally indistinguishable.

*Blooms: 4. Analyze  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

89. The  $^{80}\text{Br}^-$  ion has

- A. 45 protons, 35 neutrons, 45 electrons.
- B. 35 protons, 45 neutrons, 34 electrons.
- C.** 35 protons, 45 neutrons, 36 electrons.
- D. 45 protons, 35 neutrons, 46 electrons.
- E. 35 protons, 45 neutrons, 46 electrons.

*Blooms: 3. Apply  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes  
Topic: Components of Matter*

90. C(graphite) and C(diamond) are examples of

- A. isotopes of carbon.
- B.** allotropes of carbon.
- C. the law of definite proportions.
- D. different carbon ions.

*Blooms: 3. Apply  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Molecules and Ions  
Topic: Components of Matter*

91. What binary compound would be formed from barium ions and fluoride ions?

- A.  $\text{Ba}_2\text{F}_3$
- B.  $\text{BaF}_3$
- C.  $\text{BaF}$
- D.  $\text{Ba}_2\text{F}$
- E.**  $\text{BaF}_2$

*Blooms: 3. Apply  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Chemical Formulas  
Topic: Components of Matter*

92. The chemical name for  $\text{SO}_3^{2-}$  (aq) is sulfite ion. Therefore, the chemical name of  $\text{H}_2\text{SO}_3$  (aq) is  
A. dihydrosulfuric acid.  
**B.** sulfurous acid.  
C. dihydrogen sulfite.  
D. hyposulfurous acid.  
E. sulfuric acid.

*Blooms: 1. Remember  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Nomenclature  
Topic: Components of Matter*

93. The mass of a neutron is equal to the mass of a proton plus the mass of an electron.  
**FALSE**

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

94. All neutral atoms of tin have 50 protons and 50 electrons.  
**TRUE**

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

95. Copper (Cu) is a transition metal.  
**TRUE**

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Elements and the Periodic Table  
Subtopic: Periodic Classification of the Elements  
Topic: Chemical Periodicity  
Topic: Components of Matter*

96. Lead (Pb) is a main group element.  
**TRUE**

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Elements and the Periodic Table  
Subtopic: Periodic Classification of the Elements  
Topic: Chemical Periodicity  
Topic: Components of Matter*

97. Almost all the mass of an atom is concentrated in the nucleus.  
**TRUE**

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Atomic Theories  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

98. Ionic compounds may carry a net positive or net negative charge.  
**FALSE**

*Blooms: 2. Understand  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Ionic Bonding and Lattice Energy  
Topic: Chemical Bonding*

99. The empirical formula of  $C_6H_6$  is CH.

**TRUE**

*Blooms: 4. Analyze  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Formula Determination of Unknown Compounds (Empirical and Molecular Formulas)  
Topic: Stoichiometry and Chemical Reactions*

100. The empirical formula is the simplest whole number ratio of atoms representing a chemical formula of a molecule.

**TRUE**

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Formula Determination of Unknown Compounds (Empirical and Molecular Formulas)  
Topic: Stoichiometry and Chemical Reactions*

101. Many compounds can be represented with the same empirical formula.

**TRUE**

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Formula Determination of Unknown Compounds (Empirical and Molecular Formulas)  
Topic: Stoichiometry and Chemical Reactions*

102. There is only one distinct empirical formula for each compound that exists.

**TRUE**

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Formula Determination of Unknown Compounds (Empirical and Molecular Formulas)  
Topic: Stoichiometry and Chemical Reactions*

103. The molecular formula is a whole number multiple of the empirical formula.

**FALSE**

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Formula Determination of Unknown Compounds (Empirical and Molecular Formulas)  
Topic: Stoichiometry and Chemical Reactions*

104. The elements in Group 8A are called the \_\_\_\_\_.  
noble gases

*Blooms: 1. Remember  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Elements and the Periodic Table  
Subtopic: Periodic Classification of the Elements  
Topic: Chemical Periodicity  
Topic: Components of Matter*

105. The elements in Group 2A are called the \_\_\_\_\_.  
alkaline earth metals

*Blooms: 1. Remember  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Elements and the Periodic Table  
Subtopic: Periodic Classification of the Elements  
Topic: Chemical Periodicity  
Topic: Components of Matter*

106. The elements in Group 7A are called the \_\_\_\_\_.  
halogens

*Blooms: 1. Remember  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Elements and the Periodic Table  
Subtopic: Periodic Classification of the Elements  
Topic: Chemical Periodicity  
Topic: Components of Matter*

107. The elements in Group 1A are called the \_\_\_\_\_.  
alkali metals

*Blooms: 1. Remember  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Elements and the Periodic Table  
Subtopic: Periodic Classification of the Elements  
Topic: Chemical Periodicity  
Topic: Components of Matter*

108. \_\_\_\_\_ are electrons that are deflected away from negatively charged plates.  
 $\beta$  particles

*Blooms: 3. Apply  
Difficulty: Medium  
Gradable: automatic  
Subtopic: Radioactivity and Nuclear Stability  
Topic: Nuclear Chemistry*

109. \_\_\_\_\_ are atoms that have the same atomic number (Z) but different mass numbers (A).  
Isotopes

*Blooms: 3. Apply  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

110. \_\_\_\_\_ have properties that are intermediate between those of metals and nonmetals.  
Metalloids

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Elements and the Periodic Table  
Subtopic: Periodic Classification of the Elements  
Topic: Chemical Periodicity  
Topic: Components of Matter*

111. The elements in Group 8A are called the \_\_\_\_\_.  
noble gases

*Blooms: 1. Remember  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Elements and the Periodic Table  
Subtopic: Periodic Classification of the Elements  
Topic: Chemical Periodicity  
Topic: Components of Matter*

112. \_\_\_\_\_ is defined as a mass exactly equal to one-twelfth the mass of one carbon-12 atom.  
One atomic mass unit

*Blooms: 2. Understand  
Difficulty: Easy  
Gradable: automatic  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

113. What is the name given for the elements in Group 1A in the periodic table?  
Alkali metals

*Blooms: 1. Remember  
Difficulty: Easy  
Gradable: manual  
Subtopic: Elements and the Periodic Table  
Subtopic: Periodic Classification of the Elements  
Topic: Chemical Periodicity  
Topic: Components of Matter*

114. What is the name given for the elements in Group 7A in the periodic table?  
Halogens

*Blooms: 1. Remember  
Difficulty: Easy  
Gradable: manual  
Subtopic: Elements and the Periodic Table  
Subtopic: Periodic Classification of the Elements  
Topic: Chemical Periodicity  
Topic: Components of Matter*

115. Which group is given the name chalcogens?  
Group 6A

*Blooms: 1. Remember  
Difficulty: Easy  
Gradable: manual  
Subtopic: Elements and the Periodic Table  
Subtopic: Periodic Classification of the Elements  
Topic: Chemical Periodicity  
Topic: Components of Matter*

116. The table below describes four atoms.

	Atom A	Atom B	Atom C	Atom D
Number of protons	79	80	80	79
Number of neutrons	118	120	118	120
Number of electrons	79	80	80	79

Which atoms represent the same element?

Atoms A and D represent the same element, and Atoms B and C represent the same element.

*Blooms: 4. Analyze  
Difficulty: Medium  
Gradable: manual  
Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

117. In the early 1900s, Ernest Rutherford performed an experiment with thin foils of gold and alpha particles to probe the structure of the atoms. He observed that most of these alpha particles penetrated the foil and were not deflected. Realizing that atoms are electrically neutral (that is, they have equal numbers of protons and electrons) and that the mass of a proton is significantly greater than the mass of an electron, use Rutherford's data to propose a structural model of an atom. (Answers will vary.) Atoms are mostly empty space. The mass is concentrated mostly at the center of the atom.

*Blooms: 4. Analyze  
Difficulty: Easy  
Gradable: manual  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

118. State the two important experimental results (and the names of the responsible scientists) which enabled the mass of the electron to be determined.

Thomson measured  $m/e$ , the mass-to-charge ratio. Millikan measured  $e$ , the charge. Thus, the mass  $m$  could be calculated.

*Blooms: 2. Understand  
Difficulty: Medium  
Gradable: manual  
Subtopic: Structure of the Atom  
Topic: Components of Matter*

119. Determine the average atomic mass of boron. The natural abundance of  $^{10}\text{B}$  (weighing 10.0129 amu) is 19.9% and the natural abundance of  $^{11}\text{B}$  (weighing 11.0093 amu) is 80.1%.

Show all your work.

$$(10.0129 \text{ amu})(0.199) + (11.0093 \text{ amu})(0.801) = 10.81 \text{ amu}$$

*Blooms: 3. Apply  
Difficulty: Medium  
Gradable: manual  
Subtopic: Atomic Number, Mass Number, Atomic Symbol, and Isotopes  
Topic: Components of Matter*



120. What is the electrostatic attraction called that holds oppositely charged ions together in a compound?  
ionic bond

*Blooms: 2. Understand*  
*Difficulty: Easy*  
*Gradable: manual*  
*Subtopic: Ionic Bonding and Lattice Energy*  
*Topic: Chemical Bonding*

121. What is the law that describes different samples of a given compound that always contain the same elements in the same mass ratio?  
law of definite proportions

*Blooms: 2. Understand*  
*Difficulty: Easy*  
*Gradable: manual*  
*Subtopic: Chemical Formulas*  
*Subtopic: Mass Percent Composition*  
*Topic: Components of Matter*  
*Topic: Stoichiometry and Chemical Reactions*

122. What name is given to the simplest organic compounds which only contain carbons and hydrogens?  
hydrocarbons

*Blooms: 1. Remember*  
*Difficulty: Easy*  
*Gradable: manual*  
*Subtopic: Classes of Organic Molecules (Functional Groups)*  
*Topic: Organic Molecules*

123. What is the name of  $\text{Cu}_2\text{O}$ ?  
Copper(I) oxide

*Blooms: 4. Analyze*  
*Difficulty: Medium*  
*Gradable: manual*  
*Subtopic: Chemical Formulas*  
*Subtopic: Nomenclature*  
*Topic: Components of Matter*

124. Describe the difference between an empirical formula and a molecular formula.  
An empirical formula is the simplest chemical formula that has the smallest possible whole number ratio of atoms in the formula. A molecular formula is the true formula of a molecule which is a whole number multiple of its empirical formula.

*Blooms: 2. Understand*  
*Difficulty: Easy*  
*Gradable: manual*  
*Subtopic: Formula Determination of Unknown Compounds (Empirical and Molecular Formulas)*  
*Topic: Stoichiometry and Chemical Reactions*

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