Unit 1 – Chapter 2: Atoms, Molecules and Ions

Students should be able to:

1. Discuss the historical developments leading to the modern day model of the atom, including the works of Dalton, Thomson, Rutherford, Bohr, and Avogadro.
2. State the relative charges and masses of protons, neutrons and electrons.
3. Define atomic number, mass number, atomic mass unit
4. Identify the correct number of subatomic particles (protons, neutrons, electrons) for atoms, ions, and isotopes.
5. Represent isotopes using nuclear notation and hyphen notation.
6. Define isotope and calculate the average atomic mass of an atom from isotopic data (relative abundance and atomic mass).
7. State the basic differences between ionic bonds and covalent bonds.
8. Name compounds and write chemical formulas for binary compounds, ternary compounds (those with polyatomic ions), and acids. (No organic naming)
9. Memorize the chemical formulas and charges of designated polyatomic ions and the most common transition metal ions (Ag^+, Zn^{2+}). Polyatomic ions to know: phosphate, sulfate, nitrate, hydroxide, carbonate, chlorate, acetate, ammonium.
10. Name the diatomic elements.
11. Compare and contrast molecules and polyatomic ions.
12. Locate groups and periods on the periodic table.
13. Locate metals, nonmetals and metalloids on the periodic table.

Chapter Two Practice

1. How many protons, neutrons and electrons are in each of the following ions?
   - A. Fe^{3+} (mass # 56) 26 p 30 n 23 e
   - B. Ca^{2+} (mass # 40) 20 p 20 n 18 e
   - C. F^- (mass # 19) 9 p 10 n 10 e
   - D. P^{3-} (mass# 31) 15 p 16 n 18 e
   - E. I^- (mass # 127) 53 p 74 n 54 e

2. Name the family or group of the Periodic Table to which each of the following elements belong:
   - A. Ar noble gas
   - B. Sr alkaline earth metal
   - C. Fe transition metal
   - D. Cl halogen
   - E. Nd lanthanide series
   - F. Rb alkali metal

3. Name each of the following compounds:
   - A. PbI_2 lead (II) iodide
   - B. NH_4Cl ammonium chloride
   - C. Fe_2O_3 iron (III) oxide
   - D. LiH lithium hydride

Ionic
met + non
(+) (−)
solid crystals

E. CsCl cesium chloride
F. NaH sodium hydride
G. $Cr(OH)_3$ chromium (III) hydroxide
H. $NaC_2H_3O_2$ sodium acetate
I. $K_2Cr_2O_7$ potassium dichromate
J. Na_2SO_4 sodium sulfate
K. KH_2PO_4 potassium dihydrogen phosphate

4. Name each of the following compounds:

molecules

A. NI_3 nitrogen triiodide
B. PCl_5 phosphorus pentachloride
C. CO carbon monoxide
D. P_4O_{10} tetraphosphorus decoxide
E. N_2O_4 dinitrogen tetroxide
F. NH_3 ammonia (nitrogen trihydride)

nonmetals

5. Write formulas for each of the following compounds:

A. iron (III) oxide Fe_2O_3
B. hydrogen iodide HI
C. tin (II) fluoride) SnF_2
D. calcium phosphate $Ca_3(PO_4)_2$
E. lead (II) nitrate $Pb(NO_3)_2$
F. sodium cyanide $NaCN$
G. sodium hydrogen sulfate $NaHSO_4$
H. sodium bromate $NaBrO_3$

6. Write formulas for each of the following compounds:

A. rubidium nitrate $RbNO_3$
B. sodium iodate $NaIO_3$
C. dinitrogen tetroxide N_2O_4
D. tin (IV) oxide SnO_2
E. potassium carbonate K_2CO_3
F. iron (III) chloride $FeCl_3$
G. sulfurous acid H_2SO_3
H. magnesium hydroxide $Mg(OH)_2$
I. carbon tetrachloride CCl_4
J. potassium hydrogen phosphate K_2HPO_4
K. potassium permanganate $KMnO_4$
L. potassium chlorate $KClO_3$
M. hypoiodous acid HIO
N. ammonium acetate $NH_4C_2H_3O_2$
O. hydroiodic acid HI

7 Give the names of the following acids

A. H_2SO_3 Sulfurous acid
B. HI hydroiodic acid
C. HBr hydrobromic acid
D. HNO_2 nitrous acid
E. H_3PO_4 phosphoric acid
F. HCl hydrochloric acid

8 Give formulas for the following acids:

A. hydrocyanic acid HCN
B. hydrofluoric acid HF
C. acetic acid $HC_2H_3O_2$
D. sulfuric acid H_2SO_4
E. nitric acid HNO_3
F. hydrosulfuric acid H_2S

9. Give the names of the seven diatomic elements.

hydrogen nitrogen oxygen fluorine
chlorine
bromine
iodine