SCH4C

**Unit 1: Matter and Qualitative Analysis
 Review Part 1**

***Key Terms***

* Element
* Compound
* Solution
* Mechanical mixture
* Homogeneous / heterogeneous
* Physical Property / Change
* Chemical Property / Change
* Atom
* Proton (p)
* Neutron (n)
* Electron (e-)
* Nucleus
* Billiard Ball Model
* Plum Pudding Model
* Nuclear Model of the Atom
* Atomic number
* Mass number
* Electromagnetic spectrum
* Flame test
* Bohr Model
* Valence electrons
* Octet rule
* Ions
* Ionic charge
* Ionic bond
* Covalent Bond
* *Polar covalent bond*
* *Dipole*
* *Electronegativity difference (ΔEN)*
* *Lewis dot diagram*
* *Lewis structures*
* *Salt*
* *Molecule*

***Systems of Nomenclature***

* *Elements (e.g. chlorine)*
* *Simple binary (e.g. magnesium chloride)*
* *IUPAC (Roman numeral) system (I, II,III…) (e.g. iron (III) chloride)*
* *Greek prefix system )mono, di, tri…) (e.g. carbon tetrachloride)*
* *Polyatomic Ions (e.g. sodium chlorate)*
* *Acids (e.g. hydrochloric acid)*
* *Bases (e.g. sodium hydroxide)*
* *Peroxide (hydrogen peroxide)*
* *Hydrates (sodium carbonate trihydrate)*

***Key Symbols / Formulas***

* *p, n, e-*
* *A-Z-X Notation*
* *ΔEN = EN2 – EN1*
* *Bond classifications 0 -----0.5 ------------ 1.7 ---------------------3.3*

***Key Skills***

* *Classify matter (E, C, S, MM)*
* *Classif*y properties or changes (P vs C)
* Describe models of the atom using words & diagram (Billiard Ball / PP / Nuclear /Bohr)
* Describe properties of p, n, e- (mass, charge, location)
* Draw Bohr Rutherford Diagrams (elements 1-20)
* Predict the ionic charge of elements
* Write ionization equations [Al 🡪 Al3+ + 3e-]
* Predict a type of bond using ΔEN values
* Show how ionic bonds form with ionization nequations OR Lewis dots
* Draw Lewis Structure sof covalent or polar colalent bonds

***Review Questions:***

1. Explain the difference between an observation and an inference using an example.
2. Classify each type of substance below as elements, compounds, solutions or mechanical mixtures.

a) salt water \_\_\_\_\_\_\_\_\_\_\_ e) calcium carbonate \_\_\_\_\_\_\_\_\_\_

b) deionized water (H2O) \_\_\_\_\_\_\_ f) oxygen \_\_\_\_\_\_\_\_\_

c) air \_\_\_\_\_\_\_\_\_\_\_ g) oatmeal cookies \_\_\_\_\_\_\_\_\_\_

d) iron \_\_\_\_\_\_\_\_\_ h) dichlorodifluoromethane (CCl2F2) \_\_\_\_\_\_\_

1. Which substances in question 2 would be considered “pure substances”?
2. Classify each as a physical (P) or chemical (C) property of the sugar glucose:

a) glucose has a density 1.54 g/cm3\_\_\_\_\_

b) glucose undergoes combustion \_\_\_

c) glucose melts at 154oC \_\_\_

d) glucose decomposes to form carbon and water \_\_\_

e) glucose is a white solid at room temperature \_\_\_

1. Describe the experiment that Rutherford used to prove the existence of the nucleus.
2. a) What is a flame test?

b) How a flame test can be used to identify an element.

c) Explain why a flame test works using Bohr’s model of the atom.

1. Complete the following table.

|  |  |  |  |
| --- | --- | --- | --- |
| Subatomic Particle | Charge | Location | Approximate Mass (amu) |
| proton |  |  | 1.0 |
|  | 0 | Nucleus |  |
|  |  |  | ≈ 0 |

1. Explain the difference between each term:

a) atomic mass and mass number

b) atomic number and mass number

c) element and isotope

1. Complete the following table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element | AZX | Protons | Neutrons | electrons |
| potassium |  |  |  |  |
|  | 10847X |  |  |  |
|  |  | 38 | 52 |  |

1. Draw Bohr-Rutherford and Lewis dot diagrams for each element or ion::

a) sodium atom b) sulfur atom c) argon atom

d) calcium atom f) chlorine atom

1. a) Determine how many electrons must be gained or lost to form a stable octet by each. Using this, determine the charge on each ion.

|  |  |  |  |
| --- | --- | --- | --- |
| Atom | # Valence electrons | Electrons gained/lost | Ionic charge |
| Na |  |  |  |
| S |  |  |  |
| Ar |  |  |  |
| Ca |  |  |  |
| Cl |  |  |  |

b) Write an ionization equation for each atom from question 14 a).

1. Which of the following pairs would you expect to form a stable compound? If a stable compound will exist, predict the formula using ionization equations.

a) magnesium and sodium

b) sodium and oxygen

1. Create a table to compare ionic and covalent (molecular) bonding.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Ionic | Polar Covalent | Covalent |
| Definition |  |  |  |
| Electronegativity Range |  |  |  |
| Type on atoms involved |  |  |
| Examples |  |  |  |

1. Which molecule has more polar bonds, water (H2O) or methane (CH4)? Support your answer with a Lewis structure and calculations of electronegativity difference.
2. Draw a Lewis structure for the following molecular compounds.
3. Bromine (Br2)
4. Ammonia (NH3)
5. Carbon dioxide (CO2)
6. Hydrogen peroxide (H2O2)
7. Formaldehyde (CH2O)
8. Carbon tetrachloride (CCl4)
9. Ethane (C2H6)
10. Phosphorus trifluoride (PF3)

**NOMENCLATUIRE REVIEW**

Write the formula or name for each of the following:

## SIMPLE BINARY COMPOUNDS

­sodium oxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ magnesium bromide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

aluminum oxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ silver oxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

barium chloride \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ aluminum carbide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Na3P \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ BeBr2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## IUPAC METHOD (Roman Numerals)­

gold (III) iodide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ antimony (III) oxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

gold (I) oxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ copper (II) bromide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Fe2O3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ CuI2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

MnO2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ SnF4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## GREEK PREFIX METHOD­

carbon dioxide\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ tin monoxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

diarsenic pentoxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ manganese dioxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

SF6 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ CBr4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

SO3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ As2S5 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

SALTS OF POLYATOMIC IONS­

lithium phosphate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ AuNO3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

magnesium phosphate \_\_\_\_\_\_\_\_\_\_\_\_\_ (NH4)3PO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

calcium sulfate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ CuSO3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

iron (III) sulfate trihydrate \_\_\_\_\_\_\_\_\_\_\_ Cu3PO4 • 5H2O\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ACIDS and ELEMENTS

hydrobromic acid \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ chlorine gas \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

HF (aq) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ N2 (g) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ALL TYPES

gold (III) oxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ K2SO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

calcium hydroxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_ CO (Greek) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

sodium bicarbonate \_\_\_\_\_\_\_\_\_\_\_\_\_\_ NaClO3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

iron (II) nitrate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Zn(ClO3)2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

potassium phosphide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ FePO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

magnesium chlorate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ CoSO4• 6H2O\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

barium sulfide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ H2O2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

sodium hydrogen carbonate \_\_\_\_\_\_\_\_\_ (NH4)2CO3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

potassium nitrate dihydrate\_\_\_\_\_\_\_\_\_ MgSO3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

helium gas \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ HCl (aq) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

iodine \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ FeS \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

dinitrogen tetroxide\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ SnO2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ammonium hydroxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ CaCO3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

aluminum sulfate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ NH4NO2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

lead(II) chlorite \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Sb2O3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_