

FE Review - Chemistry

Periodic Table (pg 79 NCEES)

(i) Columns are valence shell e^-

a) Label cols. on pg 79

(ii) Left-to-right

Alkali metals
Alkali earths
Transition metals

Chalcogens
Halogens
Noble elements

a) Label on pg 79

(iii) Elements in same column have similar chemical properties (& physical properties)

Know: Groups (columns)

Periods (rows)

Metals

Non-metals

Metalloids (semi-metals)

Atomic Number	Symbol	Atomic Weight
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semi meta_s

26.981 ← Atomic Mass

 (g/mde)

7m1a

FE Review - Chemistry

- Matter - gas, liquid, solid
 - Heterogeneous/Homogeneous Mixture - Non uniform/uniform
 - Substance - matter with fixed composition
 - Compound - decomposed into simpler substances by chemical means
 - Element - cannot
 - Intensive property - independent on amount material (density)
 - Extensive property - dependent " " (mass)
-

proton	+	$\approx 1 \text{ amu}$	} all have mass.
neutron	()	$\approx 1 \text{ amu}$	
electron	-	$\approx \frac{1}{2000} \text{ amu}$	

e^- mass small relative to other two

Atomic Number = # protons (Z)

Mass Number = # protons + # neutrons (A)

Isotopes = same element different mass number (A)

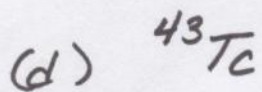
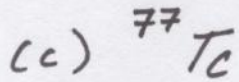
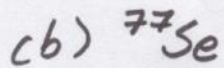
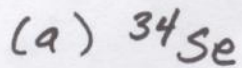
Atom = Neutral species

Ion = Charged species

Cation + ion, attracted to Cathode (-)

Anion - ion, attracted to Anode (+)

An atom with 34 protons, 43 neutrons & 34 electrons would have symbol



Atomic # is 34

Atomic mass $\approx 34 + 43 = 77$

At # 34 is Se (selenium), Col 6

AM ~~78~~ 78.96

~~78.96~~

Element Names

- Need to commit some to memory

H, He, C, N, O, Mg, S.

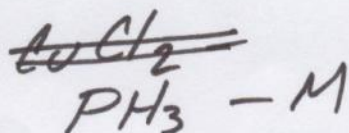
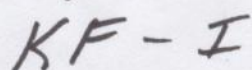
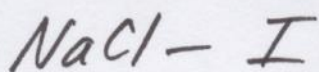
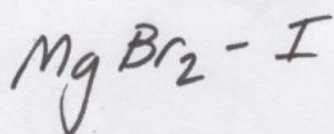
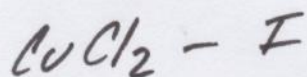
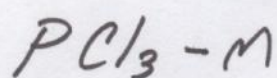
Fe, Na, K, P, Au, Ag, Cu, Pb

Ionic vs Molecular

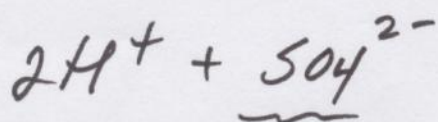
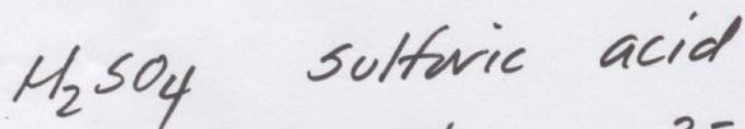
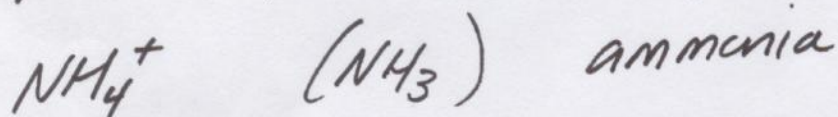
Ionic: ^{if} 2 elements only and Metal + non-metal

Molecular: ^{if} 2 elements and non-metal + non-metal

If more than 2 elements, then need to check known structural, active groups.



Polyatomic groups (memory)



group charge important
in reactions

Mole:

$6.022 \cdot 10^{23}$ ~~atoms~~ things in a mole.

If things is atoms, then 1 mole of "atoms"
"electrons" "electrons".

Review naming conventions

Important examples

HClO - hypochlorous acid

HClO_2 - chlorous acid

→ HClO_3 - chloric acid ← root.

HClO_4 - perchloric

hypo → below

~~H_2CO_3~~ H_2CO_3 ← carbonic

~~HCO_3~~ HCO_3 ← bi-carbonate

CO_3 ← carbonate

Formula weight

Equivalent weight

$$\text{EW} = \frac{\text{MW}}{\Delta \text{oxidation number}}$$

Mole/mass fractions

$$x_i = \frac{m_i}{\sum_{j=1}^n m_j} \quad \left. \vphantom{\sum_{j=1}^n m_j} \right\} \text{For mixtures}$$

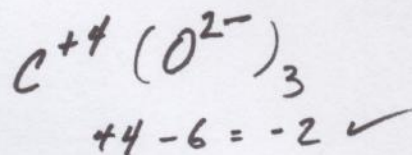
What is oxidation state of C in Na_2CO_3 ?

(a) -4

(b) -2

(c) +2

(d) +4 ← C



A compound is 68.94% O, 31.06% unknown by weight. MW is 69.7 g/mol. What is compound?

(a) NO_2

(b) F_2O_2

(c) B_2O_3

(d) SiO_4

~~NO~~

~~68.94 (mw %)~~

48g O 3mol O

21g ? 1.9m B

Guess "C" & check

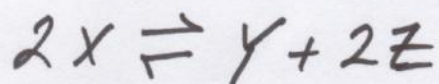
~~The reaction is~~

At equilibrium the gas reaction has following

activities $X = 5.73 \cdot 10^{-2} \text{ m/L}$

$$Y = 2.67 \cdot 10^{-2} \text{ m/L}$$

$$Z = 4.59 \cdot 10^{-2} \text{ m/L}$$



What is Equilibrium constant for this reaction?

(a) $9.8 \cdot 10^{-4} \text{ m/L}$

(b) $1.7 \cdot 10^{-2} \text{ m/L}$

(c) $2.1 \cdot 10^{-2} \text{ m/L}$

(d) $3.7 \cdot 10^{-1} \text{ m/L}$

$$K_{eq} = \frac{[Y][Z]^2}{[X]^2}$$

$$= \frac{(2.67 \cdot 10^{-2})(4.59 \cdot 10^{-2})^2}{(5.73 \cdot 10^{-2})^2}$$

$$= 1.71 \cdot 10^{-2} \text{ m/L}$$

Choose B