

## CHEMISTRY FORMULA & REVISION SHEET

### PHYSICAL CHEMISTRY

#### Mole Concept:

Number of moles ( $n$ ) = Given mass / Molar mass

Molarity ( $M$ ) = moles of solute / volume of solution (L)

Molality ( $m$ ) = moles of solute / mass of solvent (kg)

Mole fraction ( $\chi$ ) = moles of component / total moles

#### Atomic Structure:

Energy of electron (Bohr):

$$E_n = -13.6 / n^2 \text{ eV}$$

Velocity of electron:

$$v_n = 2.18 \times 10^6 / n \text{ m/s}$$

Radius of orbit:

$$r_n = n^2 a_0$$

#### Redox Reactions:

Oxidation = Loss of electrons

Reduction = Gain of electrons

Oxidation number rules:

Free element = 0

Monatomic ion = charge on ion

Sum of oxidation states = charge on molecule

#### Thermodynamics:

First law:

$$\Delta U = q - w$$

Work done at constant pressure:

$$w = P\Delta V$$

Heat:

$$q = mc\Delta T$$

Enthalpy:

$$\Delta H = \Delta U + P\Delta V$$

### ORGANIC CHEMISTRY

IUPAC Naming:

Longest carbon chain

Lowest set of locants

Functional group priority:

$\text{COOH} > \text{SO}_3\text{H} > \text{COOR} > \text{COX} > \text{CONH}_2 > \text{CN} > \text{CHO} > \text{CO} > \text{OH} > \text{NH}_2 > \text{C}=\text{C} > \text{C}\equiv\text{C} > \text{Alkane}$

Structural Isomerism:

Same molecular formula, different structure

Geometrical Isomerism:

Cis-trans based on restricted rotation around  $\text{C}=\text{C}$

Conformational Isomerism:

Rotation around single bond

Most stable: staggered

Least stable: eclipsed

General Organic Chemistry (GOC):

Inductive effect:

+I (electron donating)

-I (electron withdrawing)

Resonance:

Delocalization of  $\pi$  electrons

More resonance = more stability

Hyperconjugation:

No bond resonance

Hydrocarbons:

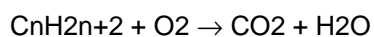
Alkanes:  $\text{C}_n\text{H}_{2n+2}$

Alkenes:  $\text{C}_n\text{H}_{2n}$

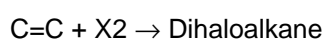
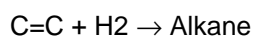
Alkynes:  $\text{C}_n\text{H}_{2n-2}$

Reactions:

Alkane combustion:



Alkene addition:



Markovnikov Rule:

Hydrogen adds to carbon with more hydrogens

Anti-Markovnikov:

Peroxide effect

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## INORGANIC CHEMISTRY

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Chemical Bonding:

Ionic bond: electrostatic attraction

Covalent bond: sharing of electrons

Hybridization:

sp = linear

sp<sup>2</sup> = trigonal planar

sp<sup>3</sup> = tetrahedral

sp<sup>3</sup>d = trigonal bipyramidal

sp<sup>3</sup>d<sup>2</sup> = octahedral

Bond Order:

BO = (Bonding e<sup>-</sup> - Antibonding e<sup>-</sup>) / 2

Formal Charge:

FC = Valence e<sup>-</sup> - (Lone pair e<sup>-</sup> + Bonded e<sup>-</sup>/2)

VSEPR Theory:

Minimize repulsion between electron pairs