Chemistry Syllabus

1.Stoichiometry
Chemical formulas and the mole concept. Avogadro's constant.
Chemical reaction and equations. Mass relationship in reactions.
Calculations.

2.Atomic theory
Nuclear model of atom. Isotopes. Electron arrangement: shells, sub-shells, orbitals.
Electron configuration notation.

3.The Periodic Table of the elements
Electron configurations and the Periodic Table .
Valence configuration of atoms.
Blocks (s, p, d, f) and groups.
Periodic trends: physical properties, chemical properties.

4. Bonding
Ionic bonding.
Covalent bonding. Molecular orbitals and hybridization. Shapes of molecules and ions.
Intermolecular forces. Hydrogen bonding. Metallic bonding.

5.States of matter
Changes of state and kinetic theory. Gases. Gases Lows.

6. Energetics
Exothermic and endothermic reactions.
Standard enthalpy changes of reaction. Calculation of enthalpy change. Hess'law.
Entropy and free energy. Spontaneity of a reaction.

7. Kinetics
Reaction mechanism: collision theory. Activation energy.
Rates of reactions, rate expression. Factors affecting the rate of reaction.
Order of reaction and half-life.

8. Equilibrium law
The equilibrium law. Applications of the equilibrium law.
Calculations involving equilibrium constans.

9. Solutions
Solubility and solubility product constant. Concentrations of solutions.
Dissociation. Dissociation (ionization) constant and the degree of dissociation. Ostwald's Dilution Law**.**

10. Acids and bases
Definitions of acids and bases: Arrhenius, Bronsted-Lowry, Lewis. Properties of acids and bases. Strong and weak acids and bases.
The pH scale, pH calculations. Indicators.

Salt hydrolysis.
Calculations involving acids and bases.

11.Oxidation and reduction
Redox reactions. Definitions: reduction, oxidation, oxidizing agent (oxidant), reducing agent (reductant). Balancing of redox reactions.

12. Electrochemistry
Standard electrode potentials. Galvanic cells. Cell electromotive force (EMF). Electrolysis. Calculations in electrochemistry.

13. Organic chemistry
Isomerism (structural, geometric, optical) and tautomerism in organic compounds.
Functional groups and homologous series.
Multiple bonds.
Shapes of molecules.
Types of reactions in organic chemistry.
Hydrocarbons
Alkanes. Alkenes. Alkynes. Arenes.
Methods for preparation. Physical chemical and chemical properties. Characteristic reactions. Detection.
Halogenoalkanes
Methods for preparation. Physical chemical and chemical properties. Characteristic reactions, detection.
Acohols, phenols and ethers
Methods for preparation. Physical chemical and chemical properties. Characteristic reactions, detection of functional groups. Distinguishing between alcohols and phenols.
Aldehydes and ketones
Methods for preparation. Physical chemical and chemical properties. Characteristic reactions, detection of functional groups. Distinguishing between aldehydes and ketones.
Carboxylic acids
Methods for preparation. Physical chemical and chemical properties. Factors affecting acidity of carboxylic acids. Characteristic reactions, detection of functional group.
Esters
Methods for synthesis of esters, estrification reaction, mechanism of estrification. Physical chemical and chemical properties. Hydrolysis of esters. Lipids and fats.
Amines and amides
Methods for preparation. Physical chemical and chemical properties. Basicity of amines. Characteristic reactions, detection of functional groups.
Amino acids, proteins.
Physical chemical and chemical properties. Condensation of amino acids, formation of peptide bound. Primary secondary tertiary and quaternary structure of proteins.
Carbohydrates
Isomerism. Monosaccharides, disaccharides, polysaccharides.
Synthetic organic polymers
Polymerization and polycondensation processes.
Most commonly used polymers