MARWARI COLLEGE, RANCHI

(AN AUTONOMOUS UNIT OF RANCHI UNIVERSITY FROM 2009)

DEPARTMENT OF CHEMISTRY

COURSES OF STUDY FOR CHEMISTRY SUBSIDIARY

Number of Papers: 8
(4 Theory papers & 4 Practical papers)

Full Marks: 400
(Theory: 300, Practical: 100)

Number of Semesters: 4

B. Sc. Part - I: 200 Marks
(Theory: 150, Practical: 50)

B. Sc. Part - II: 200 Marks
(Theory: 150, Practical: 50)

DISTRIBUTIONS OF MARKS IN CHEMISTRY SUBSIDIARY

SEMESTER	PAPER	FULL MARKS	PASS MARKS	DURATION
I, II, III & IV	Theory	75	25	3 Hrs.
	Practical	25	10	3 Hrs.

B.Sc. Part – I

SEMESTER – I

Paper – 1 (45 lectures)

Full Marks: 75 Time:3 Hrs. Pass Marks: 25

Instructions to Paper Setter

Questions to be set in three groups − A, B & C. Examinees have to answer any five questions, selecting at least one from each group; i.e., 5 x 15 = 75.

GROUP- A (PHYSICAL CHEMISTRY)

1) THERMOCHEMISTRY (5)

Hess's law, Kirchoff's law, Bond energies and their calculation.

2) THERMODYNAMICS (5)

System & surrounding, types of system, heat, work and Internal energy, First law of thermodynamics. Enthalpy, heat capacities, Relation between Cp and Cv. Calculation of W.Q.E and H in isothermal and adiabatic expansion of ideal gas.

3) GASEOUS STATES (5)

Kinetic theory of gases-Postulates, Kinetic gas equation, deduction of gas laws from kinetic gas equation R.M.S. Velocity, Average velocity and Kinetic Energy of Gas molecules. Deviation from ideal behavior, Vander Waal's equation of state.

GROUP - B (INORGANIC) (15)

1) ATOMIC STRUCTURE

a) Bohr's Atomic Model, introduction to spectral lines, Hydrogen atom, .Quantum numbers, Aufbau's principle, Pauli's Exclusion Principle. Hund's rule.

b) Periodicity: electronic lay-out of he periodic table Periodicity of properties e.g ionic, covalent and van-der Waal's radii, Ionization potential, electron affinity and Electro negativity.

GROUP – C (ORGANIC) (15)

1) A) Shape & Structure of organic compounds. Tetracovalency of carbon. Concepts of Hybridization (sp3,sp2 and sp).

B) Classification and nomenclature of organic compounds. Detection and estimation of elements, determination of molecular weight.

C) Elementary idea of electron displacement effect: inductive effect, electromeric effect, resonance and mesomeric effect.

2) ALDEHYDES & KETONES

General Methods of Prepartion, properties of aliphatic aldehydes and ketonic electronic nature of C=O Group.

B.Sc. Part – I

SEMESTER – I

Paper – 2 (Practical)

Full Marks: 25 Time:3 Hrs. Pass Marks: 10

VOLUMETRIC ANALYSIS

1) **A)** Acidimetry and alkalimetry
   B) Use of Potassium permanganate . Potassium dichromate and Sodium Thiosulphate in the estimation of Fe^{++}, Oxalic acid, Cu^{++}

B.Sc. Part – I

SEMESTER – II

Paper – 3 (45 lectures)

Full Marks: 75 Time:3 Hrs. Pass Marks: 25

Instructions to Paper Setter

Questions to be set in three groups − A, B & C. Examinees have to answer any five questions, selecting at least one from each group; i.e., 5 x 15 = 75.

GROUP – A (PHYSICAL)

1) CHEMICAL EQUILIBRIUM (7)

Law of mass Action and its kinetic derivation, Equilibrium constant Relation between Kp, Ke and Kx, Le-Chalelier's Principle.

2) DILUTE SOLUTION (8)

Colligative properties, Osmosis and Osmotic pressure, lowering of vapour pressure, Elevation of boiling point, Depression in freezing point.

GROUP- B (INORGANIC) (15)

1) General Chemistry of Group II, XI and XIV elements.
2) Extraction of the following elements: Silver, Gold, Aluminium, Tin, and Lead.
3) Preparation, properties, Structure and uses of the following compounds: Hydrogen peroxide, Ozone, Silicon, Lunar-Caustic, Purple of cassius, fulmination gold, Stannous chloride, White Lead, Borax, Diborane, Red lead.

GROUP – C (ORGANIC) (15)

1) Alcohols: Definitions, Classification and Distintion between different types of alcohols, Trihydric alcohol-glycerol: i) Total Synthesis from C and H ii) reaction.
2) Carboxylic acids: General methods of preparation, properties of monocarboxylic acid and their derivatives (ester, acid chloride, anhydride, and Amide). Origin of acidic properties and electronic nature of COOH acid group and its derivatives.

B.Sc. Part – I

SEMESTER – II

Paper – 4 (Practical)

Full Marks: 25 **Time:3 Hrs.** **Pass Marks: 10**

1) Qualitative inorganic analysis of mixture containing four radicals

BASIC RADICALS:-

Pb^{2+}, Cu^{2+}, Cd^{2+} , Sn^{2+}, Fe^{2+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Ni^{2+} , Co^{2+}, Zn^{2+}, Mn^{2+}, Ca^{2+} , Ba^{2+}, Sr^{2+}, K^{+}, Mg^{2+} ,Na^{+}, NH_4^{+}.

ACID RADICALS:-

CO_3^{2-}, SO_3^{2-}, SO_4^{2-}, S^{2-}, NO_2^{-}, NO_3^{-}, Halides.

B.Sc. Part – II

SEMESTER – III

Paper – 5 (45 lectures)

Full Marks: 75 Time:3 Hrs. Pass Marks: 25

Instructions to Paper Setter

Questions to be set in three groups − A, B & C. Examinees have to answer any five questions, selecting at least one from each group; i.e., 5 x 15 = 75.

GROUP – A (PHYSICAL)

1) THERMODYNAMICS (5)

Second law of thermodynamics, Conversion of heat into work. Carnot theorem and carnot cycle. Entropy., entropy changes in reversible and irreversible processes. Entropy of expansion of ideal gases. Entropy of mixing of gases.

2) CHEMICAL KINETICS (5)

Rate of reaction, order and molecularity of reaction. First and second order reaction.

3) COLLOIDAL CHEMISTRY (5)

Classification, preparation, purification and properties of colloidal solution. Peeptization of colloids, Protection of colloids. Origin of charge on colloids. Electrophoresis, coagulation, dialysis, Brownianm movement, Gold number.

GROUP- B (INORGANIC)

1) IONIC BOND (6)

Lattice energy, Born-Haber cycle, factors favouring ionic bonds, variable valency, properties of ionic compounds.

2) COVALENT BONDS (7)

Formation of σ and π bonds, hybridization and directional bonding Valence Bond theory, VSEPR theory, Structures and shapes of BF_3, PCl_5, SF_4, $SnCl_2$, H_2O, NH_3 and CH_4 Properties of covalent compounds.

GROUP – C (ORGANIC)

1) CARBOHYDRATES (5)

Classification, nomenclature, structure of glucose and fructose their interconversion, configuration and preliminary treatment of ring structure.

2) ISOMERISM (5)

Structural and stereoisomerism solution of racemic mixtures. Elements of symmetry.

3) HYDROXY ACIDS (5)

Lactic acid, tartaric acid and citric acid- their isolation syntesis, properties, constitution, isomerism of lactic acid and tartaric acid.

B.Sc. Part – II

SEMESTER – III

Paper – 6 (Practical)

Full Marks: 25 **Time:3 Hrs.** **Pass Marks: 10**

Preparation of the following compounds:

- Acetanilide from aniline
- Benzanilide from aniline
- M-Dinitrobezene from nitrobenzene
- Preparation of Benzoic Acid from Ethyl benzoate.

B.Sc. Part – II

SEMESTER – IV

Paper – 7 (45 lectures)

Full Marks: 75 Time:3 Hrs. Pass Marks: 25

Instructions to Paper Setter

Questions to be set in three groups − A, B & C. Examinees have to answer any five questions, selecting at least one from each group; i.e., 5 x 15 = 75.

GROUP – A (PHYSICAL)

1) **CHEMICAL KINETICS** (5)
Determination of order of reaction. Effect of temperature on reaction rate. Activation energy.
2) **CATALYSIS** (5)
Characteristics of catalysts, types of catalysts, enzyme catalyst. Theory of catalysis, autocatalysis.
3) **ELECTROCHEMISTRY** (5)
Equivalent and molecular conductivities. Effect of dilution on different types of conductivities. Experimental determination of conductivities. Conductivity cell and cell constant. Ionic mobility, Kohlrausch law.

GROUP- B (INORGANIC) (15)

1) General discussion of group XIII and XV elements, Preparation,
Properties and uses of the following:
Hydrazin, Hydrazoic acid, Hydroxyl amine, Oxy acids of Phosphorous, Potassium dichromate, and potassium permanganate.
2) **METALS**
Occurrence. Metallurgy, Properties and uses of chromium, manganese, cobalt and nickel and their compounds.

GROUP – C (ORGANIC) (15)

1) **AROMATIC COMPOUNDS**
Benzene and its monosubstituted derivatives : toluence, nitrobenzene, aniline, Benzene diazonium chloride, Phenol, benzaldehyde. Benzene sulphonic acid, benzoic acid (Preparation, properties and uses) Elementary idea of electrophilic substitution in benzene ring.
2) **IMPORTANT REACTIONS**
Perkim reaction, friedel Crafts reaction, Cannizzaro's reaction Kolbe's reaction Sandmeyer's reaction. Reformatsky reaction, Reimer-tiemann reaction.

B.Sc. Part – II

SEMESTER – IV

Paper – 8 (Practical)

Full Marks: 25 **Time:3 Hrs.** **Pass Marks: 10**

Detection of nitrogen, sulphur and halogen in organic compounds and identification of one functional group including.
Monosaccharides (-COOH, phenolic-OH, aedehyde, ketone, nitro, amino and amides)