

(c) Composition of complex (Job's Method)

V. Use of conductometric & Potentiometric analysis

- a) Application of conductometric titration in the determination of
- Dissociation constant of weak acid
 - Basicity of weak acid.
 - Hydrolysis constant of salts derived from weak acid & strong base and vice versa
 - Velocity constant of saponification of ethyl acetate.
- b) Application of potentiometric analysis in the determination of
- Solubility & solubility product of sparingly soluble salt
 - pH soluble salts
 - instability constant of complex.

VI. Data analysis

Errors, classification of errors, elimination & minimization of errors, accuracy, Precision, Mean deviation, standard deviation, Relative standard deviation, Median, Average deviation from mean, co-efficient of variation, Reflection of data, statistic test of data – F. Test, T. Test, correlation, Regression.

Books Suggested

- Fundamentals of Analytical Chemistry – D.O. Skoog, D.M. West.
- Qualitative Analysis, Vogel.
- Analytical Chemistry – C.D. Christian, J. Wiley.
- Analytical Chemistry Principle – J.H. Kennedy, W.B. Saunders.
- Quantitative Analysis, Vogel.

Sessional Internal Assessment (SIA) Full Marks – 30 Marks

A – Internal written Examination – 20 Marks (1 Hr)

B – Written Assignment – 05 Marks

C – Over All Performance including Regularity – 05 Marks

Pass Marks = 17

(c) Composition of complex (Job's Method)

V. Use of conductometric & Potentiometric analysis

- a) Application of conductometric titration in the determination of
- i) Dissociation constant of weak acid
 - ii) Basicity of weak acid.
 - iii) Hydrolysis constant of salts derived from weak acid & strong base and vice versa
 - iv) Velocity constant of saponification of ethyl acetate.
- b) Application of potentiometric analysis in the determination of
- i) Solubility & solubility product of sparingly soluble salt
 - ii) pH soluble salts
 - iii) instability constant of complex.

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Chemistry
M.Sc
 Semester – II
 Core Course – 7
 (Group Theory & Bioinorganic)

Full Marks – 70

Time : 03 Hours

1. Eight questions are to be set at least one question from each chapter.
2. Question 1 will be objective type question (MCQ)/True-False/Fill in the blanks etc 10 question of 1 mark each (Compulsory)
3. Any Four questions out of the remaining Seven questions to be answered 15 marks each.

- I. Symmetry and Group Theory in Chemistry** 12 Hrs.
 Symmetry elements and symmetry operation, definitions of group, subgroup, relation between order of a finite group and its subgroup. Conjugacy relation and classes. Point symmetry group. Schonflies symbols. Representation of groups by matrices (Representation for the C_n , C_{nv} , C_{nh} , D_{nh} etc. groups to be worked out explicitly) Character of a Representation. The great orthogonality theorem (without proof) and its importance. Character tables their use; spectroscopy.

Bio Inorganic

- I. Metal Ions in Biological Systems** 05 Hrs.
 Concept of essentiality. Essential & trace metals role of metals ion in biological process. Active and passive transport of metal ion, across bio membrane Na^+/K^+ pump, Bio ligands, chemistry of physiological buffers.
- II. Bioenergetics and ATP Cycle** 06 Hrs.
 DNA polymerization, glucose storage, phosphoglucomutase activity, Role of phosphate and glucose oxidation, Glycolysis, Krebs cycle and aconitase activity, metal complexes in transmission of energy; chlorophylls, photosystem I and photosystem II in cleavage of water, Model system of chlorophyll, Dark reaction photosynthesis in bacteria.
- III. Transport and Storage of Dioxygen** 08 Hrs.
 Heme proteins and oxygen uptake, structure and function of haemoglobin, myoglobin, hemocyanins and hemerythrin, model synthetic complexes of iron, cobalt and copper, bohr effect cyanide poisoning and its remedy.
- IV. Electron Transfer in Biology** 06 Hrs.
 Structure and function of metalloproteins in electron transport processes – cytochromes and ion-sulphur proteins, synthetic models.
 Nitrogenase : Biological Nitrogen fixation, molybdenum nitrogenase, spectroscopic and otherevidence, other nitrogenases model system.
- V. Biochemistry of non-metals** 05 Hrs.
 Non-metals in structure use, biomineralisation, biological role of some trace non-metal B, Si, S, Se, As, F, Cl, Br, I biological importance of nitric oxide. (NO).

Chemistry
M.Sc.
Semester – III
Core Course – 12
Industrial Chemistry

Full Marks – 70

Time : 03 Hours

1. Eight questions are to be set at least one question from each chapter.
2. Question 1 will be objective type question (MCQ)/True-False/Fill in the blanks etc 10 question of 1 mark each (Compulsory)
3. Any Four questions out of the remaining Seven questions to be answered 15 marks each.

I. Portland Cement & Plaster of Paris

Introduction, Raw Materials, Important Process, Parameters for manufacturing good cement Clinker method of manufacturing cement, Dry process vs wet process, sequence of operation, characteristics of constitutional compounds, Additives of cement, Properties and testing of cement, Genral composition of ordinary portland cement, Reaction taking place in the rotary kiln, Thermodynamical changes taking place during cement formation.

Action of some chemicals concrete, Types of Portland cement and its derivatives, other type of cement, prestressed concrete post tensioning curing, Cyseum and its uses, Plaster of Paris, its manufacture & uses.

II. Corrosion

Corrosion and its economical aspects, thermodynamics of corrosion – Pourbaix diagram, Immunity, Corrosivity and Passivation, Mechanism and Kinetics of corrosion Evans diagram, Intrinsic and extrinsic forms of corrosion, Electro chemical method for corrosion testing.

Corrosion prevention thechniques, metallic coatings, organic paints, varnishes, corrosion inhibitors, cathodic and anodic protection, corrosion in industries with reference to thermal power plants, minig and petroleum industries prevention of microbial corrosion.

III. Water Treatment

Sources of Water - Surface water, Graund water, sources of impurities in water, purification of water, insoluble and soluble impurities, bacteria, micro organism, algae oil.

Boiler feed water, defects caused in boiler by priming and forming, caustic embrittlement scale formation due to silica.

Water analysis – Sampling of water, unit and their interrelation, Method of analysis for hardness, acidity alkalinity, chloride, fluoride, sulphat, phosphate, silica different forms of nitrogen dissolved CO_2 , O_2 and H_2S .

IV. Fuel

Definition, Essential requirement of a fuel. Modern concept of a fuel, classification of fuel, methods of processing of various fuel.

Solid fuel – Natural solid fuel, Artificial solid fuel, Wood, Charcoal, Coal, Advantage and disadvantage of solid fuel over liquid and gaseous fuel.

Analysis of coal, Proximate and ultimate analysis, uses of coal in various industry coke, charcoal.

Liquid fuel – Petroleum products, Gasoline, Kerosene oil, fuel oil, Benzols, coal tar, Diesel oil.

Gaseous Fuel – Natural and Artificial Gaseous fuel.

V. Advance Polymers

Solid and gas phase polymerization, Group transfer polymerization, Living free radical polymerization, Butyl rubber, styrene butadiene rubber, Telechelic polymers, Heterochain polymers, Ethylene Propylene diene rubber (EPDM), Thermosetting Resins, Ionomers, Hydrogel. Polymeric liquid, crystals, Polymeric gel, Heat resistant polymers, Multiphase polymeric systems graft and block, co-polymers, conducting polymers, types of conducting polymers, chemical and electro chemical routes of synthesis, Doping and dedoping of conjugated polymers solatrons and polaron formation in conducting polymers.

Bio and natural polymers, Proteins, nucleic acid, lipids, cellulose and polysaccharide. Medicinal and biomedical application of polymers.

VI. Industrial Waste Management

Definition, Classification, source and composition of solid, liquid and gaseous wastes, Hazardous and nonhazardous wastes, special waste material, storage and transport of waste, Transportation and collection system, management of waste, minimization, reuse, recycling, waste utilization and material recovery, treatment of wastes, biological treatment compostion, anaerobic digestion, combustion, incineration and land fills, ultimate disposal.

Book Suggested

1. Industrial chemicals and Environment – Vishal publication, Jharkhand
2. Text book of Polymer Science – Third edition, Fred W. Billmeyer, JR.
3. Analytical chemistry by H. Kaur, Pragati Prakashan, Jharkhand
4. A Text book of Engineering chemistry – M.M Uppal, Khanna, Publisher, New Delhi.
5. The Management of hazardous subs in the environment Applied Science, K.L. Zirm.
6. Bio Conservolia of west Material to industrial products Elsevier, Amsterdam.
7. Industrial chemistry(organic and Inorganic industries) by Dr. B.K. Sharma. Goel publishing house, Meerut.

Sessional Internal Assessment (SIA) Full Marks – 30 Marks

A – Internal written Examination – 20 Marks (1 Hr)

B – Written Assignment – 05 Marks

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Pass Marks = 17

Chemistry
Semester – IV
Core Course – 13
(Pharmaceuticals and Bio Organic)

Full Marks – 70

Time : 03 Hours

1. Eight questions are to be set at least one question from each chapter.
2. Question 1 will be objective type question (MCQ)/True-False/Fill in the blanks etc 10 question of 1 mark each (Compulsory)
3. Any Four questions out of the remaining Seven questions to be answered 15 marks each.

I. Drug –

Introduction classification, drug absorption, metabolism & mode of action.

Synthesis & uses of

Sulpha drug – Sulpha pyridine, Sulpha diazine, Sulpha guanidine.

Antibiotic – Chloromycetin

Antimalarial – Chloroquine, Plasmaquine.

Cardio Vascular drug – Sorbitrate

Anti tuberculous drug – P-amino salicylic acid (PAS), Thiacetazone, Ranitidine.

Anti-histamines or Antiallergic – Cetirizine,

Anti Aid/HIV- Zidovudine (AZT)

Anti-cancer – Cisplatin

(Bio-organic)

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|-------------|--|---------|
| II. | Enzymes and Mechanism of Enzyme Action | 02 Hrs. |
| | Basic considerations, Proximity effects and Molecular adaption. | |
| | Enzymes | 03 Hrs. |
| | Introduction and historical perspective, chemical and biological catalysis, remarkable properties of enzymes like catalytic power, specificity and regulation. Nomenclature and classification, extraction and purification. Fischer's lock and key and Koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors. Affinity labeling and enzyme modification by site-directed mutagenesis. Enzyme kinetics, Michaelis-Menten and Lineweave-Burk plots. Reversible and irreversible Inhibition. | |
| | Mechanism of Enzyme Action | 06 Hrs. |
| | Transition-state theory, orientation and steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Examples of some typical enzyme mechanisms for chymotrypsin, lysozyme and carboxypeptidase A. | |
| III. | Kinds of Reactions Catalysed by Enzymes | 06 Hrs. |
| | Nucleophilic displacement on a phosphorus atom, multiple displacement reactions and the coupling of ATP cleavage to endergonic processes. Transfer of sulphate, addition and elimination reaction. Enolic intermediates in isomerization reactions. P-cleavage and condensation, some isomerization and rearrangement reactions. Enzyme catalyzed carboxylation and decarboxylation. | |

- IV. Co-Enzyme Chemistry** 04 Hrs.
Cofactors as derived from vitamins, coenzymes, prosthetic groups, apoenzymes, Structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, Lipole acid, vitamin B12, Mechanisms of reactions catalyzed by the above cofactors.
- V. Biotechnological Applications of Enzymes** 05 Hrs.
Large-scale production and purification of enzymes, techniques and methods of immobilization of enzymes, effect of immobilization on enzyme activity, application of immobilized enzymes, use of enzymes in feed and drink industry-brewing and cheese-making, syrups from corn starch, enzymes as targets for drug design. Clinical uses of enzymes, enzyme therapy, enzymes and recombinant DNA technology.

Book Suggested

1. Bio-organic Chemistry : A Chemical Approach to Enzyme Action, Hermann Dugas and C. Penny, Springer-Verlag.
2. Understanding Enzymes, Trevor Palmer, Prentice Hall.
3. Enzyme Chemistry : Impact and Application, Ed. Collin J. Suckling, Chapma and Hail.
4. Enzyme Mechanisms Ed. M.I Page and A. Villiams, Royal Society of Chemistry.
5. Fundamentals of Enzymology, N.C. Price and L. Slovens, Oxford University Press.
6. Immobilized Enzymes : An Introduction and Applications in Biotechnology, Michael O. Trevan, John Wiley.
7. Enzymatic Reaction Mechanisms, C. Walsh, W.H. Freeman.
8. Enzyme structure and Mechanism, A. Fersht, W.H. Freeman.
9. Bio-Chemistry : The Chemical Reactions of Living Cells, D.E. MeUler. Academic Press.
10. Introduction to Medicinal Chemistry- Gringuaz
11. Introduction to Medicinal Chemistry – Patrick G.L. Oxford University.

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Chemistry

M.Sc.

Semester – III

Project Work

Full Marks – 100

The paper will consist of

- (a) Field work / Lab work related to the project.
- (b) Preparation of draft copy of dissertation based on the work undertaken.
- (c) Presentation of project work in the seminar on the assigned topic in the Department of Chemistry, Kolhan University, Chaibasa & opened viva there on.

NB : The students will select topics for the project work in consultation with a teacher of the Department.

TOPICS

Project work related to the following Industrial / Socially relevant topics may be given to the students.

- (a) Environmental study such as (i) Analysis of Water, Soil, Air etc.
- (b) Industrial goods analysis such as
 - (i) Analysis of Cement.
 - (ii) Analysis of Haematite.
 - (iii) Analysis of minerals available in Jharkhand State.
 - (iv) Synthesis of useful commercial products based on raw materials available in Jharkhand State such as Lac, Limestone etc.
 - (v) Isolation of constituents of medicinal plants available Jharkhand State.

Each student has to submit draft copy of dissertation work

NB : the seminar will be held in the Department of Chemistry, Kolhan University, Chaibasa.

Project Work = 40 Marks
Written component = 40 Marks
Viva-voce = 20 Marks