BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI - 620 024.

ALLIED CHEMISTRY

(FOR B.Sc. BOTANY, ENVIRONMENTAL SCIENCE, MATHEMATICS, PHYSICS & ZOOLOGY)

ALLIED COURSE I
CHEMISTRY I

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

1. To understand the various the ories of coord ination chemistry.
2. To study the various concepts of resonance and halogen compounds.
3. To study the properties of aromatic compounds and organic reactions.
4. To learn the concepts of solid-state chemistry.

UNIT – I COORDINATIONCHEMISTRYANDINDUSTRIALCHEMISTRY:

1.1 Coordination Chemistry: Nomenclature–Werner's, sidgwick and Pauling's the ories. Chelation-industrial importance of EDTA, Biological role of hemoglobin and Chrophyll.

1.2 Industrial Chemistry: Fuelgases – Watergas, producer gas, LPG gas, Gobar gas and natural gas. Fertilizers – NPK and mixed Fertilizers- soaps and detergents.

UNIT –II ELECTRON DISPLACEMENT EFFECTS AND HALOGEN COMPOUNDS:

2.1 Polareffects: Inductive effect –Relative Strength of Aliphatic monocarboxylic acid and aliphatic amines. Resonance–Condition for resonance. Consequences of resonance – resonance of energy. Basic property of aniline and acidic property of phenol. Hyper conjugation – Heat of hydrogenation – Bond length and dipole moment. Steric effect.

2.2 Halogen containing compounds: Important chloro-hydrocarbons use dassolvents. Pesticides–Dichloromethane, chloroform, carbon tetrachloride, DDT and BHC Types of solvents:-Polar, Non-polar.

UNIT – III AROMATIC COMPOUNDS AND ORGANIC REACTIONS:

3.1 Aromatic compounds: Structure, stability resonance and aromaticity of benzene. Substitution reaction: Nitration, Halogenations, Alkylation. Naphthalene – Isolation, properties and uses.

3.2 Organic reaction: Biuret, Decarboxylation, Benzoin, Perkin, Cannizaro, Claisen and Halo form reactions

3.3 Chemotherapy: Explanation with two examples each for analgesics, antibacterial, anti - inflammatory, antibiotics, antiseptic and disinfectant, anesthetics local and general (Structures not necessary).

UNIT – IV SOLIDSTATE, ENERGETICS AND PHASERULE:

4.1 Solidstate: Typical crystal lattices - unit cell, elements of symmetry, Bragg's equation, Weiss Indices, Miller indices, simple body centered and face centered lattices

4.2 Energetics: First law of thermodynamics – state and path function – need for the second law – carnotscycle and thermo- dynamic scale of temperature, spontaneous and Non–spontaneous processes–entropy – Gibbs free energy.

4.3 Phase rule: Phase, component, degree of Freedom, phase rule definitions – one component system–water system.

UNIT – V CHEMICALEQUILIBRIUMANDCHEMICALKINETICS:

5.1 Chemical equilibrium: Criteria of homo generous and heterogeneous equilibria, - decomposition of HI, N_2O_4, $CaCO_3$+Pd5.

5.2 Chemical Kinetics: Order of reaction and their determinations-activation energy, effects of temperature on reaction rate.

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Assignments and seminar on industrial applications of coordination compounds, describing thermodynamic conditions for Haber and contact process, Arrhenius theory for rate constant of a reaction, Thermodynamic conditions for spontaneous and non-spontaneous processes, mode of action of antibiotic, analgesics and anti-inflammatory drugs.

REFERENCES:

1. Gopalan R, Text Book of Inorganic Chemistry, 2nd Edition, Hyderabad, Universities Press, (India), 2012.
2. Morrison R.T. and Boyd R.N., Bhattacharjee S.K. Organic Chemistry (7th edition), Pearson India, (2011).
3. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35thedition), New Delhi: Shoban Lal Nagin Chandand Co.
4. https://gascnagercoil.in/wp-content/uploads/2020/12/allied-chemistry-book.pdf

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

1. To describe structure and functions of biologically important coordination compounds.
2. To apply eletromeric and resonance effect to predict reactivity and stability of organic compounds
3. To classify the drugs based on their mode of actions.
4. To predict conditions for spontaneous and non-spontaneous reactions.
5. To calculate Gibb's free energy, work function and entropy of a reaction
6. To determine order of chemical reactions

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ALLIED PRACTICALS
VOLUMETRIC AND ORGANIC
QUALITATIVE ANALYSIS

Code: **(Practical)** **Credit: 2**

COURSE OBJECTIVES:

1. To learn the techniques of titrimetric analyses.
2. To know the estimation of several cations and anions.
3. To learn the techniques of qualitative analysis of organic compounds

I Volumetric Analysis:

1. Acidimetry and alkalimetry:

(a) Strongacid VS strongbase (b) Weakacid VS strongbase (c) Determination of hardness of water.

2. Permanganometry:

(a) Estimation off erroussulphate (b) Estimation of oxalic acid

3. Iodometry:

(a) Estimation of potassium dichromate (b) Estimation of potassium permanganate

II. Organic Analysis:

Analyse the following organic Compounds.

1. Carbohydrate, 2. Amide, 3. Aldehyde, 4. Ketone, 5. Acid & 6. Amine.

The students may be trained to perform the specific reactions like tests for aliphatic or aromatic, saturated or unsaturated and functional group present and record their observations.

REFERENCES:

1. R.Gopalan, Elements of analytical chemistry, S.Chand, New Delhi, 2000.
2. N.S.Gnanapragasam and G.Ramamurthy, Organic Chemistry lab manual, S.Viswanathan and Co. Pvt. Ltd. Chennai-1998

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

1. To understand the use of volumetric pipette, burette and analytical balance.
2. To explain the principles of volumetric analysis,

3. To prepare standard solution to find out the concentrations of unknown analyte,
4. To understand the selection of indicators and can apply the knowledge in chemical experiments.
5. To understand the fundamental methods and procedures adopted in organic analysis.
6. To perform systematic qualitative organic analysis of common organic compounds.

Note: Scheme for Practical Evaluation.

Organic Qualitative Analysis:	- 20
Volumetric Estimation:	- 35
Record:	- 05
Internal Assessment:	- 40
Total:	**-100**

Volumetric Analysis: - 35

Procedure 5 marks Results

<2%-30marks
2-3% -20marks
3-4% -10marks
>4%-05marks

Organic Qualitative Analysis: - 20

Saturated and unsaturated	- 4marks
Aliphatic or Aromatic	- 4marks
Preliminary reactions with Procedure	- 6marks
Functional group identified Correctly	- 6marks
Total:	**- 20 marks**

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ALLIED COURSE II
CHEMISTRY II

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

1. To learn the basics of nuclear chemistry and metallic bond**.**
2. To understand the properties and applications of carbohydrates, amino acids and proteins.
3. To study the basic concepts of polymers, heterocyclic compounds and stereoisomerism.

UNIT – I NUCLEARCHEMISTRYANDMETALLICBOND:

1.1 Nuclear Chemistry: Fundamental particles of nucleus- isotopes, isobars, isotones and isomers – differences between chemical reactions and nuclear reactions, nuclear fusion and fission-radioactive series.
1.2 Metallic bond: Electron gas, Pauling and band theories, semiconductors – intrinsic, extrinsic – type and p – type semico nductors.
1.3 Compounds of sulphur and sodiumthiosulphate

UNIT – II CARBOHYDRATES, AMINO ACIDS AND PROTEINS:

2.1 Carbohydrates: classification –glucose and fructose–preparation and properties – structure of glucose –Fischer and Haworth cyclic structures.
2.2 Amino acids and proteins: Amino acids – Classification based on structure. Essential and non – essentials amino acids – preparation, properties and uses – peptides (elementary treatment only) – proteins – Classification based on physical properties and biological functions. Structure of proteins–primary and secondary (elementary treatment).

UNIT – III POLYMERS, HETEROCYCLIC COMPOUND AND STEREOISOMERISM:

3.1 Synthetic polymers: preparation, properties and uses of Teflon, epoxy resins, polyester resin.
3.2 Heterocyclic compounds: Furan, pyrrole and pyridine –preparation, properties and uses – basic properties of pyridine and pyrrole.
3.3 Stereoisomerism: Optical isomerism – Lactic and tartaric acid – racemic mixture and resolution. Geometrical isomerism–maleic and fumaricacids.

Unit – IV Surface and photochemistry:

4.1 Surface Chemistry: Emulsions, gels–preparation, properties - Electrophoresis and applications, chromatography – Column, paper and thin layer Chromatography.

4.2 Photochemistry: Laws of photochemistry and applications.

Unit – V ELECTROCHEMISTRY, pH AND BUFFER

5.1 Electrochemistry: Specific and equivalent conductivity–their determination – effect of dilution on conductivity. Ostwald's Dilution law, Kohlrausch law, conductivity measurements, and conduct metric titrations.

5.2 pH and buffer: Importance of Ph and buffers –pH determination by colorimetric and electrometric methods.

UNIT – VI CURRENT CONTOURS (FOR CONTINUOUS INTERNAL ASSESSMENT ONLY):

Assignments and seminar on nuclear radiation, nuclear reactors, structure of carbohydrates and proteins, aromaticity of heterocyclic compounds. Hands on training to determine dissociation constant of acetic acid using conduct meter and to determination of pH of acetic acid sodium acetate buffer by conductivity measurements.

REFERENCES:

1. B.R. Puri, L.R. Sharma, K.C. Kalia, 'Principles of Inorganic Chemistry', 21st edition, Vallabh Publications, 2004-2005.
2. Bahl, B.S. and Bahl, A., Organic Chemistry, (12thedition), New Delhi, Sultan Chand & Co., (2010).
3. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co.
4. https://oms.bdu.ac.in/ec/browse.php?type=UG

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

1. To explain theory of nuclear chemistry and chemical bonding.
2. To classify carbohydrates and proteins.
3. To synthesise polymers and hetero cyclic compounds.
4. To apply conductivity measurements to determine degree of dissociation of weak electrolyte and pH of buffer solution.
5. To explain preparation and applications of emulsion and gels in chromatography.

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