FACULTY OF SCIENCES

SYLLABUS

For

Bachelor of Science

(Semester I)

(Under Credit Based Continuous Evaluation Grading System)

Session: 2023-24



The Heritage Institution

KANYA MAHA VIDYALAYA JALANDHAR (AUTONOMOUS)

KANYA MAHA VIDYALAYA JALANDHAR (AUTONOMOUS)

SCHEME AND CURRICULUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAMME

Bachelor of Science Credit Based Continuous Evaluation Grading System (CBCEGS) (Session: 2023-2024)

Bachelor of Science (Semester I)													
Course Name	Hours Per	Credits	Total Credit	Course		Course Total		tal rks	Paper	Ext.		CA	Examination Time
	Week		creat	Code		Type		I KJ		L	P		(in Hours)
Chemistry	2-0-0	2-0-0	7	BSMM- 1084	Ι	С	175	50	Chemistry (Inorganic Chemistry)	40	-	10	3
	3-0-0	3-0-0		BSNM- 1084	II			75	Chemistry (Organic Chemistry)	60	-	15	3
	0-0-4	0-0-2			Р			50	Chemistry (Practical)	-	40	10	3.5

Bachelor of Science

(SEMESTER-I)

Session: 2023-24

COURSE CODE: BSMM/BSNM-1084(I)

COURSE TITLE: CHEMISTRY (INORGANIC CHEMISTRY)

Course outcomes:

Students will be able to

CO1: Predict electronic properties of atoms using current models and theories in chemistry, sketch the probability density curves, boundary surface diagrams and shapes of orbitals and write the electronic configuration of atoms.

CO2: identify the periodic trends in physical and chemical properties of elements, describe the arrangement of the elements in the Periodic Table& change from metallic to nonmetallic character.

CO3: describeVBT, VSEPR theory and predicts the geometry of simple molecules&molecular orbital theory of homonuclear diatomic molecules

CO4: explain, predict & draw structures of simple ionic compounds.

Bachelor of Science

(SEMESTER-I)

Session: 2023-24

COURSE CODE: BSMM/BSNM-1084(I)

COURSE TITLE: CHEMISTRY (INORGANIC CHEMISTRY)

Exam Time: 3Hrs. Credit(L-T-P): 2-0-0 Max. Marks: 50 (Theory: 40, CA: 10)

Instructions for the Paper Setter

Eight questions of equal marks (eight marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from UNITs I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

I. Atomic Structure

Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of ψ^1 and ψ 2, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s,p,d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements and ions.

UNIT-II

II. Periodic Properties

Position of elements in the periodic table; effective nuclear charge and its calculations. Atomic and ionic radii, ionization energy, electron affinity and electronegativity –definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour.

UNIT-III

III. Chemical Bonding

Covalent Bond –Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridizationand shapes of simple inorganic molecules and ions. BeF_2 , BF_3 , CH_4 , PF_5 , SF_6 , IF_7 , $SnCI_2$, XeF_4 , BF_4 , $SnC1_6$. Valence shellelectron pair repulsion (VSEPR) theory to NH₃, H₃O+, SF_4 , CIF_3 , ICl_2 and H₂O. MO theory, homonuclear (elements and ions of 1st and 2nd row), and heteronuclear (BO, CN^- , CO, NO^+ , CO^+ , CN), diatomic molecules, multicenter bonding in electron deficient molecule (Boranes). Percentage ionic character from dipole moment and electronegativity difference.

UNIT-IV

IV. Ionic Solids

Concept of close packing, Ionic structures, (NaCI type, Zinc blende, Wurtzite, CaF_2 and antifluorite, radius ratio rule and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born–Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule. Metallic bond– free electron, valence bond and band theories.

Weak Interactions -Hydrogen bonding, Vander Waals forces

Books Suggested:

1. Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 3rd edition, Pubs: John Wiley Sons. 1995.

2. Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman Hall Ltd., 1991.

3. Shriver, D.E., Alkins, P.W., Langford, C.H., Inorganic Chemistry; 4th edition, Oxford Publisher: Oxford University Press, 2006.

4. Douglas, B. McDamiel, D., Alexander, J., Concepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1994.

5. Miessler, G.L., Larr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004.

6. Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: McGraw-Hill Publishing Company Limited, 1991.

7. Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B. Saunders Company, 1977.

8. Puri, B.R., Sharma, L.R., Kalia, K.C., Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publisher, 2006-07.

9. University General Chemistry, C.N.R. Rao, Macmillan.

10. Inorganic Chemistry, W.W. Porterfield Addison-Wesley.

11. Inorganic Chemistry, A.G. Sharpe, ELBS.

Bachelor of Science

(SEMESTER-I)

Session: 2023-24

COURSE CODE: BSMM/BSNM-1084(II)

COURSE TITLE: CHEMISTRY (ORGANIC CHEMISTRY)

Course outcomes:

Students will be able to

CO1: interpret the bonding, hybridization between different organic compounds, explain the various reaction mechanisms and different electron displacement effects

CO2: interpret the reactions and properties of alkanes, alkenes & alkynes, derive the electrophilic, nucleophilic addition reactions, free radical mechanisms of halogenation of alkanes.

CO3: compare the reactivities of various alkyl and aryl halide, stability of various cycloalkanes

CO4: differentiate between aromatic, anti-aromatic and non-aromatic compounds, explain the effect of various substituents on the reactivity of aromatic compounds

Bachelor of Science (SEMESTER–I) Session: 2023-24 COURSE CODE: BSMM/BSNM-1084(II) COURSE TITLE: CHEMISTRY (ORGANIC CHEMISTRY)

Exam Time:3Hrs. Credit(L-T-P): 3-0-0

Max.Marks:75 (Theory: 60, CA: 15)

Instructions for the Paper Setter

Eight questions of equal marks (twelve marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from UNITs I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

I. Structure and Bonding

Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, Vander Waals interactions, resonance, hyperconjugation, aromticity hydrogen bonding and Inductive and electrometric effects.

II. Mechanism of Organic Reactions

Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents – electrophiles and nucleophiles. Types of organic reactions. Energy considerations.

Reactive intermediates –Carbocations, carbanions, free radicals, carbenes, arenes and nitrenes (with examples). Assigning formal charges on intermediates and other ionic species.

UNIT-II

III. Alkanes

Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey–House reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.

IV. Alkenes and Alkynes

Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes-mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation, oxymercuration reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO₄.

Substitution at the allylic and vinylic positions of alkenes.

Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, metal-ammonia reductions, oxidation and polymerization.

UNIT-III

V. Alkyl and Aryl Halides

Nomenclature and classes of alkyl halides, chemical reactions. Mechanisms of nucleophilic substitution reaction of alkyl halides, SN2 and SN1 reactions with energy profile diagrams. Nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.

VI. Cycloalkanes:

Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring : banana bonds.

UNIT-IV

VII. Arenes and Aromaticity

Nomenclature of benzene derivatives. The aryl group. Aromatic nucleus and side chain. Structure of benzene: Molecular formula and Kekule structure. Stability and carbon carbon bond lengths of benzene, resonance structure, MO picture.

Aromaticity : the Huckel's rule, aromatic ions.

Aromatic electrophilic substitution–general pattern of the mechanism, role of σ and π complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Methods of formation and chemical reactions of alkylbenzenes.

Books suggested:

- 1. Morrison, R.T., Boyd, R.N., Organic Chemistry; 6th edition, Pubs: Prentice-Hall, 1992.
- 2. Solomons, T.W., Fryhle, C.B., Organic Chemistry; 9th edition, Pubs: Wiley India, 2007.
- 3. Wade Jr., L.G., Singh, M.S., Organic Chemistry; 6th edition, Pubs: Pearson education, 2008.
- 4. Mukherji, S.M., Singh, S.P., Kapoor, R.P., Organic Chemistry; Pubs: New Age International, 1985.
- 5. Carey, F.A., Sundberg, R.J., Advanced Organic Chemistry Part B: Reactions and Synthesis.
- 6. Fundamentals of Organic Chemistry, Solomons, John Wiley.
- 7. Introduction to Organic Chemistry, Sireitwieser, Heathcock and Kosover, Macmilan.

Bachelor of Science (SEMESTER–I) Session: 2023-24 COURSE CODE: BSMM/BSNM-1084(P) COURSE TITLE: CHEMISTRY PRACTICAL

Course outcomes

Students will be able to

CO1: separate and identify the various ions present in the mixture

CO2: accurately note down the melting point of organic compounds

CO3: accurately note down the boiling point of organic compounds.

CO4: Differentiate between pure & impure compounds.

Bachelor of Science (SEMESTER–I) Session: 2023-24 COURSE CODE: BSMM/BSNM-1084(P) COURSE TITLE: CHEMISTRY PRACTICAL

Exam Time: 3.5 Hrs

Credit (L-T-P): 0-0-2

Instruction for practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

Inorganic Chemistry: Semi Micro analysis. Cation analysis, Separation and identification of ions from groups I, II, III, IV, V, and VI. Anionic analysis. Four ions with no interference.

Organic Chemistry Laboratory Techniques

Determination of Melting Point

Naphthalene 80–82°C	Cinnamic acid 132.5–133°C
Benzoic acid 121.5–122 ^o C	Salicylic acid 157.5–158°C
Urea 132.5–133°C	Acetanilide 113.5–114°C
Succinic Acid 184.5–185°C	m-dinitro benzene 90°C
P-dichlorobenzene 52°C	Aspirin 135°C
Determination of Boiling Point	

Ethanol 78°C	Cyclo Hexane 81.4°C
Benzene–80°C	Toluene 110°C

Practical Examination						
1) Inorganic Mixture						
2) Melting Point/Boiling point of organic substance						

3) Viva–Voce4) Note Book

Books suggested:

- 1. Vogel's Qualitative Inorganic Analysis, revised, Svehla, Orient Longman.
- 2. Experimental Inorganic Chemistry, W.G. Palmer, Cambridge. Standard Methods of Chemical. Analysis, W.W. Scott: The Technical Press.

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03

02

- 3. Laboratory Manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.
- 4. Vogel's Textbook of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G. Smith and A.R. Tatchell, ELBS.
- 5. Experiments in General Chemistry, C.N.R. Rao and U.C. Aggarwal, East-West Press.

Max. Marks: 50

(Practical: 40, CA: 10)

FACULTY OF SCIENCES

SYLLABUS

For

Bachelor of Science (Semester II)

(Under Credit Based Continuous Evaluation Grading System)

Session: 2023-24



The Heritage Institution

KANYA MAHA VIDYALAYA JALANDHAR (AUTONOMOUS)

KANYA MAHA VIDYALAYA JALANDHAR (AUTONOMOUS)

SCHEME AND CURRICULUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAMME

Bachelor of Science

Credit Based Continuous Evaluation Grading System (CBCEGS) (Session: 2023-2024)

Bachelor of Science (Semester II)													
Course Name	Hours	Credits	Total	Course	Course		Total		Paper	Ext.		CA	Examination
	Veek L-T-P	L-I-P	Credit	Code		Гуре	marks			L	Р		(in Hours)
Chemistry	3-0-0	3-0-0	7	BSMM- 2084	I			75	Chemistry (Inorganic Chemistry)	60	-	15	3
	2-0-0	2-0-0		BSNM		173	50	Chemistry (Physical Chemistry)	40	-	10	3	
	0-0-4	0-0-2		2084	Р			50	Chemistry (Practical)	-	40	10	3.5

Bachelor of Science (SEMESTER–II) SESSION: 2023-24 COURSE CODE: BSMM/BSNM-2084(I) COURSE TITLE: CHEMISTRY (INORGANIC CHEMISTRY)

Course outcomes:

Students will be able to

CO1: explains & compares the trends in atomic and physical properties of group 13, 14, 15, 16, 17 elements

CO2: explain the atomic, physical and chemical properties of alkali metals and alkaline earth metals.

CO3: Interpret the properties of carbides, silicates, interhalogen compounds.

CO4: Exhaustive understanding of d-block elements belonging to 4th, 5th and 6th period.

Bachelor of Science (SEMESTER–II) SESSION: 2023-24 COURSE CODE: BSMM/BSNM-2084(I) COURSE TITLE: CHEMISTRY (INORGANIC CHEMISTRY)

Exam Time:3Hrs. Credit(L-T-P): 3-0-0

Instructions for the Paper Setter

Eight questions of equal marks (twelve marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from UNITs I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

I. p–Block Elements–I

Comparative study (including diagonal relationship) of groups 13–17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13–16, hydrides of boron–diborane and higher boranes, Borazine, borohydrides, fullerenes.

UNIT-II

II. s-Block Elements

Comparative studies, diagonal relationship, salient features of hydrides, solvation and complexation tendencies.

III. Acids and Bases

Arrhenius, Bronsted-Lowry, the Lux-Flood, solvent system and Lewis concepts of acids and bases.

UNIT-III

IV.p–Block Elements-II

Carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalide, Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.

Max.Marks:75

(Theory: 60, CA: 15)

(10 Hrs)

(5 Hrs)

(5 Hrs)

(10 Hrs)

UNIT-IV

V. Chemistry of Transition Elements

Characteristic properties of d-block elements.Properties of the elements of the first transition series, their simple compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.General characteristics of elements of Second and Third Transition Series, comparative treatment with their 3d analogues in respect of ionic radii, oxidation states, magnetic behaviour.

Books Suggested:

1. Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 2nd edition, Pubs: John Wiley and Sons, 1995.

2. Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman and Hall Ltd., 1991.

3. Shriver, D.E., Atkins, P.W., Inorganic Chemistry; 4th edition, Pubs: Oxford University Press, 2006.

4. Douglas, B., Medaniel, D., Atenander, J., Concepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1994,

5. Porterfeild, W.W., Wesky, A., Inorganic Chemistry; Pubs: Addison-Wesky Publishing Company, 1984.

6. Miessler, G.L., Tarr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004,

7. Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: Tata McGraw-Hill Publishing Company Limited, 1991.

8. Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B.Saunders Company, 1977.

9. Puri, B.R., Sharma, L.R., Kalia, K.K., Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publisher, 2006-07.

10.Inorganic Chemistry, W.W. Porterfield Addison-Wesley.

11. Inorganic Chemistry, A.G. Sharpe, ELBS.

Bachelor of Science (SEMESTER–II) SESSION: 2023-24 COURSE CODE: BSMM/BSNM-2084(II) COURSE TITLE: CHEMISTRY (PHYSICAL CHEMISTRY)

Course outcomes:

Students will be able to

CO1: explain various gaseous laws and their applications.

CO2: acquire the knowledge of structure and intermolecular forces present between solids, liquids and gases, Discuss liquid crystals& its types.

CO3: understand& apply the basic concepts of colloidal state of matter and applications of colloids.

CO4: demonstrate an understanding of basic principles of colligative properties of dilute solutions.

Bachelor of Science (SEMESTER–II) SESSION: 2023-24 COURSE CODE: BSMM/BSNM-2084(II) COURSE TITLE: CHEMISTRY (PHYSICAL CHEMISTRY)

Exam Time: 3Hrs. Credit(L-T-P): 2-0-0 Max.Marks: 50 (Theory: 40, CA: 10)

Note: Log table and Non-Programmable calculators are allowed

Instructions for the Paper Setter

Eight questions of equal marks (eight marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from UNITs I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

I. Gaseous States

Postulates of kinetic theory of gases, deviation from ideal behaviour, van der Waal's equation of state.

Critical Phenomena: PV isotherms of real gases, continuity of states, the isotherms of van der Waal's equation, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state.

Molecular Velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquefaction of gases.

UNIT –II

II. Liquid State

Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases. Liquid crystals: Difference between liquids crystal, solid and liquid.Classification, structure of nematic and cholestric phases. Thermography and seven segment cell.

(10 Hrs)

(10 Hrs)

UNIT –III

III. Colloidal State

Definition of colloids, classification of colloids. Solids in liquids (Sol): kinetic, optical and electrical properties, stability of colloids, protective action, Hardy Schulze law, gold number. Liquids in liquids (emulsions): Types of emulsions, preparation. Emulsifiers.general applications of colloids.

UNIT -IV

IV.Solutions, Dilute Solutions and Colligative Properties (12Hrs)

Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, Law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.

Books suggested:

1. Atkins, P., Paula, J.de, Atkins Physical Chemistry; 8th edition, Pubs: Oxford University Press, 2008.

2. Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.

3. Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Inc, 1996.

4. Rao, C.N.R., University General Chemistry; Pubs: Macmillan India, 1985.

5. Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; 2nd edition, Pubs: Oxford University Press, 2000.

6. Albert, R.A., Silbey, R.J., Physical Chemistry; 1st edition, Pubs: John Wiley and Sons Inc., 1992.

7. Dogra, S.K., Dogra, S., Physical Chemistry Through Problems; Pubs: Wiley Eastern Limited, 1991.

8. Levine, I.N., Physical Chemistry; 5th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd., 2002.

9. Moore, W. J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd, 1983.

10. University General Chemistry, C.N.R. Rao, Macmillan.

Bachelor of Science (SEMESTER–II) SESSION: 2022-25 COURSE CODE: BSMM/BSNM-2084(P) COURSE TITLE: CHEMISTRY PRACTICAL

Course outcomes:

Students will be able to

- CO1: understand & apply the technique of crystallization.
- CO2: determine the rate of the reactions
- CO3: compare& analyze the viscosity and surface tension of different liquids and solutions
- CO4: application of calorimeter in various thermochemistry experiments.

Bachelor of Science (SEMESTER-II) SESSION: 2023-24 COURSE CODE: BSMM/BSNM-2084(P) COURSE TITLE: CHEMISTRY PRACTICAL

Exam Time: 3.5 Hrs

Max. Marks: 50

Credit (L-T-P): 0-0-2

(Practical: 40, CA: 10)

Instruction for practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

Crystallisation:

Concept of indication of crystalisation. Phthalic acid from hot water (using fluted filter paper and stem less funnel)

Acetanilide from boiling water.

Naphthalene from Ethanol

Benzoic acid from water

Physical Chemistry

- 1. To determine the specific reaction rate of hydrolysis of ethyl acetate catalysed by Hydrogen ions at room temperature.
- 2. To study the effect of acid strength on hydrolysis of an ester.

Viscosity, Surface Tension (Pure Liquids)

- 3. To study the viscosity and surface tension of CCl₄, glycerine solution in water.
- 4. To determine the solubility of benzoic acid at different temperatures and to determine ΔH of the dissolution process.
- 5. To determine the enthalpy of neutralisation of a weak acid/weak base versus strong base/strong acid and determine the enthalpy of ionisation of the weak acid/weak base.
- 6. To determine the enthalpy of dissolution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber cycle.

Practical Examination:

1)	Crystallisation	05
2)	Physical Experiment	10
3)	Viva–Voce	03
4)	Note Book	02

Books suggested :

1. Experimental Organic Chemistry, Vol. I and II, P.R. Singh, D.S. Gupta and K.S. Bajpai, Tata McGraw Hill.

Marks

- 2. Laboratory Manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.
- 3. Vogel's Textbook of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G. Smith and A.R. Tatchell, ELBS.
- 4. Experiments in General Chemistry, C.N.R. Rao and U.C. Aggarwal, East-West Press.
- 5. Experiments in Physical Chemistry, R.C. Das and B. Behra, Tata McGraw Hill.
- 6. Advanced Practical Physical Chemistry, J.B. Yadav, Goel Publishing House.
- 7. Advanced Experimental Chemistry, Vol. I, Physical, J.N. Guru and R. Kapoor, S. Chand and Co.
- 8. Selected Experiments in Physical Chemistry, N.G. Mukherjee, J.N. Ghosh and Sons.
- 9. Experiments Physical Chemistry, J.C. Ghosh, Bharati Bhavan.