UNIVERSITY OF POONCH RAWALAKOT AJK

Faculty of Basic & Applied Sciences

Semester BS(1st)

Subject: Environmental Science	**Course Code: GEN-3102**
Course Structure: Lectures: 2 Lab:1	**Credit Hours: 3(2+1)**
Prerequisites: Environmental Chemistry	**Course Instructor: Sadaf Jamshad**

Course Outline:

- The human environment; the lithosphere, biosphere and hydrosphere; the nature and composition of natural waters
- Pollution: definition, classification and impact on habitats; Air pollution: Sources and effect of various pollutants (inorganic, organic), control, remediation; Photochemical smog; Smog; Acid rain: Theory of acid rain; Adverse effects of acid rains; Chlorofluorocarbons and its effects; Water pollution: Major sources of water pollution its impact; Prevention, control remediation; Heavy metal pollution; Tanneries; Hospital waste; Treatments of sewage, sludge, and polluted waters; Soil pollution: major sources of soil pollution and its impact; Prevention, control remediation; Noise pollution.
- Ozone layer: Formation; Mechanism of depletion; Effects of ozone depletion
- Greenhouse effect: causes, impacts.

Lab:

Examination of water for

- Total dissolved solids.
- pH and Conductance.
- Alkalanity.
- Hardness of water
- Determination of phosphates and sulphates

Recommended Books

- Newman, E.I. 2001. Applied Ecology.Blackwell Science. UK
- Mooney, H.A. and Saugier, B. 2000. Terrestrial Global Productivity.Academic Press, UK.
- Eugene, E.D. and Smith, B.F. 2000. Environmental Science: A study of interrelationships. McGraw Hill. USA.
- French, H. 2000. Vanishing Borders: Protecting the Planet in the Age of Globalization. W.W. Norton and Company, NY.
- Hall, C.A.S. and Perez, C.L. 2000. Quantifying Sustainable Development.Academic Press, UK.
- Bazzaz, F.A. 2004. Plants in changing environments: Linking physiological, population, and community ecology. Cambridge Univ. Press.
- Bush, M.B. 1997. Ecology of a changing planet.Prentice Hall, UK.

- Marsh, M.W. and Grossa Jr., J.M. 1996 Environmental geography: Science, land use, and earth systems. John Wiley and Sons.
- Lambers, H., T. L. Pons and F. Stuart. 2008. Plant Phyiological Ecology

Course Objectives:

- To understand and provide updated knowledge of environmental problems
- To provide a basic introduction sustainable environmental management.
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COURSE BREAKUP DETAIL

Weeks	Lecture No.	Topic of Lectures	Activity
Week 1	1	The human environment	Class
	2	the lithosphere, biosphere and hydrosphere	Class
		Examination of water for Total dissolved solids	Practical
Week 2	1	the nature and composition of natural waters	Class
	2	Pollution: definition, classification and impact on habitats	Class
		Examination of water for Total dissolved solids (performance) + Lab Report	Practical
Week 3	1	Air pollution: Sources and effect of various inorganic pollutants	Class
	2	Air pollution: Sources and effect of various organic pollutants	Class
		Examination of water for pH	Practical
Week 4	1	Control and remediation of air pollution	Class
	2	Photochemical smog	Class
		Examination of water for pH (performance) + Lab Report	Practical
Week 5	1	Smog	Class
	2	Theory of acid rain	Class
		Examination of water for Conductance	Practical
Week 6	1	Adverse effects of acid rains	Class
	2	Chlorofluorocarbons and its effects	Class
		Examination of water for Conductance (performance) + Lab Report	Practical
Week 7	1	Water pollution: Major sources of water pollution and its impact	Class

	2	Water pollution: Prevention, control remediation	Class
		Examination of water for Alkalinity	Practical
Week 8	1	Heavy metal pollution & Tanneries	Class
	2	Examination of water for Alkalanity (performance) + Lab Report	Practical
		MID TERM EXAM	
Week 9	1	Hospital waste	Class
	2	Treatments of sewage, sludge, and polluted waters	Class
		Examination of water for Hardness of water	Practical
Week 10	1	Soil pollution: major sources of soil pollution and its impact	Class
	2	Soil pollution: Prevention, control remediation	Class
		Examination of water for Hardness of water (performance) + Lab Report	Practical
Week 11	1	Noise pollution	Class
	2	Noise pollution (Contin…)	Class
		Examination of water for Determination of phosphates	Practical
Week 12	1	Ozone layer: Formation	Class
	2	Ozone layer: Formation (Contin….)	Class
		Examination of water for Determination of phosphates (performance) + Lab Report	Practical
Week 13	1	Ozone layer: Mechanism of depletion	Class
	2	Ozone layer: Mechanism of depletion (Contin….)	Class
		Examination of water for Determination of sulphates	Practical
Week 14	1	Ozone layer: Effects of ozone depletion	Class
	2	Ozone layer: Effects of ozone depletion (Contin….)	Class
		Examination of water for Determination of sulphates (Performance) + Lab Report	Practical
Week 15	1	Greenhouse effect: causes	Class
	2	Greenhouse effect: causes (Contin…)	Class
		Practical revision	Class
Week 16	1	Greenhouse effect: impacts	Class
	2	Greenhouse effect: impacts (Contin….)	Class
		Practical revision	Practical

Week 17	1	Presentation	Class
	2	Presentation	Class
		Practical revision	Practical
Week 18	1	Presentation	Class
	2	Presentation	Class
		Practical revision	Practical
Week 19	Terminal Exams		

Signature of Teacher: Chairman:

Course Title	**Analytical Chemistry**	
Course Code	CHM-4302	
Credit hrs.	3(2-1)	
Class	BS	Semester: BS 3rd
Course Instructor	Amna Khatoon	
Learning Objectives	To provide students the basic knowledge of Analytical Chemistry and its importance and applications.	
Contents	Introduction to Analytical Chemistry; Precision, Accuracy, Signal-to-noise ratio, Limits of detection, Errors; Measuring apparatus, Sampling; Expression of quantities and concentrations (Molarity, Normality, Molality, ppm and ppt solutions, percent solutions (w/v, v/w, w/w and v/v) and use of primary and secondary standards; Basic approach to equilibrium. Acid-base, complexometric and redox titrations, gravimetric analysis. **Practical:** Calibration of glassware used for volumetric analysis. Use of analytical balance and calculation of standard deviation. Constructing a calibration curve from a given analytical data using spread sheet software. Calculation of variance, mean, median, coefficient of variance of the data. Determination of hardness of water using EDTA, Determination of chloride in water sample.	
Suggested Readings/Reference Book	1. "Fundamentals of Analytical Chemistry" by Skoog, West, Holler and Crouch. 2. "Analytical Chemistry: An Introduction" by Gary Holmes and Laurie D. D. Kasper. "Principles of Instrumental Analysis" by Douglas A. 3. Vogels, s Text Book of Quantitative Inorganic Analysis by J. Bassett. 4th Ed., The English Language Book Society and Longman. 1978.	

Signature of Course Instructor:_____Chairperson:_____

Detailed Course Breakup

Programme	BS 3rd Semester		
Semester	3rd Semester		
CourseTitle	Analytical Chemistry		
CourseCode	CHM-4302	Credit hrs.	3(2-1)
CourseInstructor	Amna Khatoon		
No.of weeks	19		

COURSEBREAKUP

Weeks	**Topic of Lecture**	Activity
1st	Introduction to Analytical Chemistry	Lectures
	Quantitative and Qualitative analysis	
	Practical: Lab safety rules, personal and instrument safety and lab safety symbols (pictorial diagram)	
2nd	Chemical analysis, classical methods (volumetric and gravimetric)	Lectures & Assignment#1
	Introduction to instrumental methods of analysis	
	Practical: Preparation of stock and diluted solution	
3rd	Brief introduction to optical methods	Lectures
	Brief introduction to electroanalytical methods	
	Practical: Calibration of glassware (pipette, burette and flask) used for volumetric analysis.	
4th	Brief introduction to separation methods	Lectures
	The steps and Applications of a chemical analysis.	
	Practical: Calibration of glassware (pipette, burette and flask) used for volumetric analysis.	
5th	Error in a chemical analysis, Systematic error, types and Sources of systematic error, Estimation of systematic error	Lectures
	Random error, Precision, difference between Accuracy and precision,	
	Quiz1	Quiz#1
6th	Mean, median, mode, variance, coefficient of variance	Lectures
	Continue Practice examples of standard deviation, Variance	

	Practical: Use of analytical balance.	
7th	Limit of detection, signal to noise ratio,	Lectures
	Measuring apparatus, and their uses in chemical analysis	
	Practical: Use of analytical balance.	
8th	Sampling	Lectures & Mid Term Exams
	Practical: Calculation of variance, mean, median, coefficient of variance of the data.	
	Midterm Exams	
9th	Expression of quantities and concentrations (molarity, normality and molality,	Lectures
	ppm and ppt solutions	
	Practical: Calculation of variance, mean, median, coefficient of variance of the data.	
10th	Percent solutions (w/v, v/w, w/w and v/v)	Lectures
	practice examples of Percent solutions	
	Practical: Calculation of standard deviation.	
11th	Use of primary and secondary standards	Lectures & Assignment #2
	Solution, solubilty, saturated, unsaturated, super saturated solution	
	Practical: Constructing a calibration curve from a given analytical data usings pread sheet software.	
12th	Basic approach to equilibrium	Lectures
	Continue.. Basic approach to equilibrium	
	Practical: Constructing acalibration curve from a given analytical data usings preadsheet software.	
13th	Quiz#2	Quiz#2 & Lectures
	Titration, titant, titrand, and its types	
	Practical: Lab Quiz	
14th	Indicator and its uses	Lectures
	Acid-base titration	

	Practical: Determination of hardness of water using EDTA	
15th	Complexometric Titration	Lectures
	Continue.. Complexometric,	
	Practical: Determination of hardness of water using EDTA	
16th	Redox titration	Lectures
	Continue.. redox titration,	
	Practical: Determination of chloride in water sample	
17th	Gravimetric analysis	Lectures
	Continue.. gravimetricanalysis and its applications	
	Practical: Determination of chloride in water sample	
18th	Presentations	Presentations
19th	TerminalExams	Terminal Exams

Signature of Course Instructor: …… Chairperson……...

PHYSICAL CHEMISTRY BS 3rd (CHM 4301)

Course Title	Physical Chemistry
Course Code	CHM 4301
Credit Hours	3(2-1)
Learning objectives	To understand the basics of physical chemistry and its different branches
Contents	**Theory** Quantum chemistry, Solids, Liquids, Gases, Electrochemistry, Kinetics, Surface chemistry , Solutions, Thermodynamics **Practical** **1)** Determination of viscosity and parachor values **2)** Determination of melting and boiling points by boiling point elevation and freezing point depression methods **3)** Determination of heat of neutralization **4)** Determination of heat of solution by solubility method **5)** Determination of refractive index and molar refractivity
Suggested reading	**1.**Physical Chemistry by B.S Bahl **2**.Complete Physical Chemistry by Y.Sharma **3**.Modern Physical Chemistry by Haq Nawaz Bhatti

Teacher Sig. Mehrosh Islam Chairman Sig. ----------

PHYSICAL CHEMISTRY BS 3rd (CHM 4301)

Programme	BS		
Semester	3rd		
Course Title	Physical Chemistry		
Course Code	CHM-4301	Credit Hours	3(2-1)
No of week	19		
Course Instructor	Mehrosh Islam		

Detail of Lectures /Activity

Weeks		Lecture topic	Activity
Ist	Lecture	Introduction to quantum mechanics, Bohr model and its defects, De Broglie relation	Lectures and practical
	Lecture	Classical mechanics and its failure,Dual nature of matter	
	Practical	Introduction to lab equipment	
2nd	lecture	Heisenberg uncertainty principle and its limitations, Atomic orbitals	Lectures and practical
	Lecture	Quantum numbers, Electronic configuration, Paulis exclusion principle	
	Practical	Solutions Preparation	
3rd	Lecture	Gen. Characteristics of liquids, Surface tension, Parachore, Rheochore, Refractive index	Lectures and practical
	Lecture	Specific and molar refraction, Optical activity, Dipole moment,	
	practical	Use of viscometer for viscocity measurements	
4th	Lecture	Gen. Characteristics of solids, Types, Isotropy, Anisotropy	Lectures and practical
	Lecture	Habbit of crystal, Crystal lattice, Crystal system	
	Practical	Determination of Parachor values using viscometer	
5th	Lecture	Characteristics of gases ,Gas laws,	Lectures and practical
	Lecture	Molecular velocities Ideal and real gases.	
	Practical	Determination of molecular weight of compound by freezing point depression method	
6th	Lecture	Derivation of kinetic gas equation, Molecular collision , Collision diameter,	Lectures and practical
	Lecture	Liquefaction of gases Mean free path, Wander wal eq. for gases	
	Practical	Use of refractometer for finding refractive index	
7th	Lecture	Introduction to thermodynamics, System, Surrounding,State function,	Lectures and practical

PHYSICAL CHEMISTRY BS 3rd (CHM 4301)

	Lecture	Internal energy, Extensive intensive properties, First law, Enthaply	
	practical	Measurement of molecular weight by elevation of boiling point method	
8th	Lecture	Free energy change,Enthalpy change, Cp and Cv	Lectures and MIDS
	Lecture	2nd law, Change in free energy and eq. constant K	
		Mid Term Exams	
9th	Lecture	Intro to Kinetics, rate ,rate law, Velocity constant, elementary and complex reactions	Lectures AND Practical
	Lecture	Order and molecularity. Zero ist and second order reactions	
	Practical	Determination of Heat of neutralization of acid and base	
10th	Lecture	Derivation of kinetic equation for ist and second order reactions	Lectures and Practical
	Lecture	Methods of determining rate of reaction. Arhenius equation, Different theories of reaction rate	
	Practical	Determination of Heat of solution by solubility method	
11th	Lecture	Basic Electrochemistry, Conductors insulators Electrochemical cells and types	Lectures and Practical
	Lecture	Electrolytic and electronic dissociation, EMF	
	Practical	Determination of Percentage composition viscometrically	
12th	Lecture	Specific conductance and its measurement	Lectures and practicals
	Lecture	Cell constant and its determination,	
	Practical	Finding cell constant in lab	
13th	Lecture	Ostwald dilution law	Lectures and practical
	Lecture	Introduction to solutions	
	Practical	Percentage composition using refractive index measurements	
14th	Lecture	Types of solutions Raoults Law	Lectures and practicals
	Lecture	Ideal and non ideal solutions	
	practical	Practicals revision	
15th	Lecture	Colligative properties and their determination	Lectures and practicals
	Lecture	Zeotropic and azeotropic mixtures	
	practical	Practicals Revision	
16th	Lecture	An introduction to surface chemistry	Lectures and practicals
	Lecture	Adsorption and absorption, physical and chemical adsorption	
	Practical	Revision of practicals	

PHYSICAL CHEMISTRY BS 3rd (CHM 4301)

17th	Lecture	Catalysis,types,Enzyme catalysis	Lectures and practicals
	Lecture	Adsorption isotherms	
	Practical	Lab quiz	
18th	Lecture	Class presentations	
	Lecture	Class presentations	
	Lecture	Class presentations	
19th		**Terminal exams**	**Terminal exams**

Teacher Sig. Mehrosh Islam Chairman Sig. ----------

University of Poonch Rawalakot

Faculty of Basic and Applied Sciences

Department of Chemistry

Course Title	Physical chemistry-I
Course Code	CHM-5501
Credit hrs.	4(3-1)
Class	Bs 5th Semester:Fall 2023
No. of week	19
Course instructor	Rubob Mehmood
Learning objectives	Students will be able to figure out the essential theoretical notions and values prevailing the performance and stuffs of matter, including thermodynamics, kinetics and quantum mechanics. Moreover, students should advance the aptitude to analytically estimate experimental data, interpret various spectroscopic techniques, and make connections between molecular-level phenomena and macroscopic properties.
Contents	**Theory** 1. Chemical Kinetics Brief reference to the first and second order rate law, details of third order rate law, half-life period and order of reaction, measurement of the rate of chemical reaction, factors effecting the rate of chemical reaction, Arrhenius theory, theories of reaction rates for unimolecular, bimolecular and termolecular reactions, transition state theories, comparison of collision and transition state theories, Complex reactions. 2. Chemical Thermodynamics First law of thermodynamics, reversibility and maximum work, enthalpy, heat capacity. Joule Thomson effect, effect of temperature on change in enthalpy (Clausius-Claperon equation), second law of thermodynamics, entropy and its calculations, dependence of free energy on pressure and temperature, free energy relationship with equilibrium constant for chemical reactions and other thermodynamic functions, third law of thermodynamics, unattainability of absolute zero of temperature. 3. Kinetic Theory of Gases Ideal and real gases, equations of state for real gases (Beatte-Bridgeman and Varial equation), Maxwell law of molecular velocities, calculations of molecular velocities, Maxwell and Boltzman law of energy distribution, molecular collisions, viscosity of gases and distribution. 4. Molecular Spectroscopy Introduction to spectral Terms, Rotational, vibrational, Electronic Spectroscopy.

	Practicals **Refractometry** 1. To find out the refractive index of the given liquid and also find its molecular refractivity. 2. To calculate the composition of the liquid C which is a mixture of liquids A and B. **Polarimetry** 1. To find out the specific and molecular rotation of the cane sugar polarimetrically. 2. Determination of concentration of optically active substances in solutions. **Colorimetry** 1. To verify Beer's Law for solution of KMnO4 or K2Cr2O7 using colorimeter. 2. Determine the concentration of unknown solution by using colorimeter.
Suggested Readings/Reference books	1. Physical chemistry of BSc by Ghulam Rasool Chaudhary 2. Alberty, R.A and Silbey, R.J., "Physical Chemistry" John Wiley, New York, 1995. 3. Atkins, P.W, "Physical Chemistry" 5th Ed., W.H. Freeman & Company, New York, 1994. 4. Bahl, A. (1961). Essentials of physical chemistry. S. Chand Publishing.

Signature of Course Instructor: **Chairperson_____**

Course breakup for BS 5th

Course Title	Physical chemistry-I
Course Code	CHM-5501
Credit hrs.	4(3-1)
Class	Bs 5th Semester: Fall 2023
No. of week	19
Course instructor	Robab Mehmood

Details of lecture/Activities

Weeks	**Topic of lecture**	Activity
1st	Brief reference to the first and second order rate law	Lectures
	Details of third order rate law	
	Half-life of all orders and	
	Introduction to lab equipment and safety measures	Practical
2nd	Methods to find out order of reaction	Assignment 01/Lectures
	Measurement of the rate of chemical reaction	
	Factors effecting the rate of chemical reaction	
	Preparation of Different solution	Practical
3rd	Arrhenius theory	**Assignment #1**
	Numerical related to Arrhenius equation	
	Theories of reaction rates for unimolecular (Collision theory)	
	To find out the refractive index of the given liquid and also find its molecular refractivity	Practical
4th	Bimolecular reactions (Lindemann Theory)	Lectures
	Transition state theories,	
	Comparison of collision and transition state theories	
	To find out the refractive index of the given liquid and also find its molecular refractivity.	Practical
5th	Gen. Characteristics of solids, and Types.	Lectures
	Isotropy, Anisotropy	
	Habit of crystal, Crystal lattice	
	To find out the refractive index of the given liquid and also find its molecular refractivity.	Practical
6th	Crystal systems	**Quiz #1**
	Isotropy, Anisotropy	
	System, Boundary. Internal energy	
	To calculate the composition of the liquid C which is a mixture of liquids A and B.	Practical
7th	Extensive , intensive properties	Lectures
	Surrounding, State function	
	First law, 2nd law of thermodynamics,	

	To calculate the composition of the liquid C which is a mixture of liquids A and B.	Practical
8th	Enthalpy. reversibility and maximum work	Mid Term Exam
	Heat capacity	**Lectures**
	Joule Thomson effect	
	To calculate the composition of the liquid C which is a mixture of liquids A and B.	Practical
9th	Effect of temperature on change in enthalpy (Clausius-Claperon equation)	Lectures
	entropy and its calculations	
	Dependence of free energy on pressure and temperature.	
	To find out the specific and molecular rotation of the cane sugar polarimetrically.	Practical
10th	Free energy relationship with equilibrium constant for chemical reactions and other thermodynamic functions.	Lectures
	third law of thermodynamics w.r.t unattainability of absolute zero	
	Ideal and real gases,	
	To find out the specific and molecular rotation of the cane sugar polarimetrically. To verify Beer's Law for solution of KMnO4 or $K_2Cr_2O_7$ using colorimeter	Practical
11th	Equations of state for real gases (Beatte-Bridgeman and Varial equation)	**Quiz #2**
	Maxwell law of molecular velocities	Lectures
	calculations of Root mean square velocity	
	To find out the specific and molecular rotation of the cane sugar polarimetrically.	Practical
12th	calculations of mean velocity	Lectures
	Calculation of average velocity	
	Maxwell and Boltzmann law of energy distribution	
	Determination of concentration of optically active substances in solutions.	Practical
13th	Graphical explanation of Maxwell and Boltzmann law of energy distribution	Lectures
	Molecular collisions with types	
	Viscosity of gases	
	Determination of concentration of optically active substances in solutions.	Practical
14th	Methods to find out viscosity of gases	Lectures
	Distribution of gases	
	Introduction to Molecular spectroscopy	

	Determination of concentration of optically active substances in solutions.	Practical
15th	Introduction to spectral Terms	Lectures
	Introduction to spectral Terms (Continue…)	
	Electronic Spectroscopy	
	To verify Beer's Law for solution of KMnO4 or $K_2Cr_2O_7$ using colorimeter.	Practical
16th	Electronic Spectroscopy (Continue..)	Lectures
	Vibrational Spectroscopic terms	
	Vibrational Spectroscopy (mathematical relations)	
	To verify Beer's Law for solution of KMnO4 or $K_2Cr_2O_7$ using colorimeter.	Practical
17th	Rotational Spectroscopy introductory terms	Lectures
	Rigid and non-rigid rotors	
	Rigid and non-rigid rotors (Continue...)	
	To verify Beer's Law for solution of KMnO4 or $K_2Cr_2O_7$ using colorimeter (Performance).	Practical
18th	Presentations	Presentations
	Presentations	
	Presentations	
	Determine the concentration of unknown solution by using colorimeter (Performance).	Practical
19th	Terminal exam	Terminal exam

Signature of Course Instructor: **Chairperson_____**

University of Poonch Rawalakot

Faculty of Basic and Applied Sciences

Department of Chemistry

Course Title	Organic chemistry-I
Course Code	CHM-5502
Credit hrs.	4(3-1)
Class	Bs 5th Semester:Fall 2023
No. of week	19
Course instructor	Amina Khurshid
Learning objectives	This course introduces the basic concepts of GOC of organic Chemistry. Further, it focuses on the preparations and reactions of organic compounds.
Contents	**Theory** Atomic orbitals, hybrid orbitals and molecular orbitals. Organic structures inductive effect; resonance; mesomerism; hyper conjugation; hydrogen bond aromaticity. Ring strain and conformations. Structure-reactivity relationship: Changes in chemical reactivity with change in molecular structure in terms of acid strength. Reactive intermediates: Types, structure, stability, methods of generation reactivity. Introductory Stereochemistry:Historical background and significance; chirality and stereoisomerism; Classification and nomenclature of stereoismers. Drawing and interconversion of Fischer, Newman and Sawhorse projections. Chemistry of Hydrocarbons: Various strategies for the synthesis of hydrocarbons emphasis on modern trends; Characteristic reactions of hydrocarbons and their importance in synthetic organic chemistry. **Organic Chemistry Laboratory-I** a) Functional Group Analysis of organic compounds. b) Analysis of three component mixtures by solubility methods. (5 mixtures at least) c) Introduction to basic lab techniques: distillations, recrystallization, solvent extraction; chromatography (PC, TLC).
Suggested Readings/Reference books	Handrickson, J. B., Cram, D.J. and Hammond, G.S., Organic Chemsitry, 3rd Ed, MacGrawHill, Tokyo, 1970.2.Morrison, R.T., and Boyde, R.N., Organic Chemistry, 6th Ed. Prentice Hall, Englewood Cliffs, New Jersey, 1992.3.March, J., Advanced Organic Chemistry.

Signature of Course Instructorr: **Chairperson_____**

Course breakup for BS 5th

Course Title	Organic chemistry-I
Course Code	CHM-5502
Credit hrs.	4(3-1)
Class	Bs 5th Semester: Fall 2023
Course Code	CHM-5502
No. of week	19
Course instructor	Amina Khurshid

Details of lecture/Activities

Weeks	Topic of lecture	Activity
1st	Introduction to organic chemistry	Lectures
	Atomic orbitals hybrid orbitals and molecular orbitals.	
	Organic compounds and inductive effect.	
	Functional group analysis of organic compounds.i.e Alcohol , Halide and carboxylic acid.	Practical
2nd	Resonance and drawing of resonating structures and response hybrid of various compounds.	Assignment 01/Lectures
	Stability of resonating structures.	
	Mesomeric effect	
	Functional group analysis of aldehyde and keone	Practical
3rd	+M effect, electron donating groups	Quiz#1/Lectures
	-M effect, electron withdrawing geoups	
	of Benzene ring and mesomeric effect,+M effect order,-M effect order.	
	Functional group analysis of ester, phenol and amide.	Practical
4th	Concept of hyperconjugation.Hyperconjugation in carbocation	Lectures
	Hyperconjugation in alkene, in free radical	
	Different contributing structures problems	
	Analysis of three components mixture by solubility method.	Practical
5th	Concept of hydrogen bonding and various structures	Lectures
	Effect of hydrogen bonding on solubity and acidity.	
	Aromaticity intro aromatic ,anti aromatic and non aromatic	
	Analysis of three components mixture by solubility method.	Practical
6th	Huckle's rule	Lectures
	Introduction of Ring strain	
	Ring strain and conformations	
	Functional group analysis of organic compounds.	Practical
7th	Structure reactivity relationship:study of acid base strength on various organic structures	Lectures
	Effect of acid base strength on chemical reactivity.	
	Effect of acid base strength on chemical reactivity.	
	Introduction of Lab technique thin layer chromatography.	Practical
8th	Mid Term Exam	Mid Term Exam
	Concept of weak acids and weak bases	Lectures

	Concept of Leaving group w.r.t acid	
	Application of TLC for separation or identification of compounds.	Practical
9th	Concept of srong acids and strong bases,conjugate acid conjugate base	Lectures
	Organic acids and bases	
	Scale of acidity and basicity	
	Introduction of solvent extraction technique.	Practical
10th	Steriochemistry historical background and significance.	Lectures
	Steriochemistry historical background and significance	
	Chirality and sterioisomers of various structures	
	Isolation of plant pigments by solvent extraction.	Practical
11th	Classification and nomenclature of sterioisomers.	Assignment #02/lectures
	Classification and nomenclature of sterioisomers.	
	Drawing and interconversion of Fisher projection	
	Purification by recrystallization.	Practical
12th	Drawing and interconversion of Fisher projection	Lectures
	Drawing and interconversion of Newman and Sawhorse projection.	
	Drawing and interconversion of Newman and Sawhorse projection	
	Purification by recrystallization.	Practical
13th	Practice to check Types of sterioisomers.	Lectures
	Practice to check Types of sterioisomers.	
	Practice on nomenclature of sterioisomers.	
	Separation of organic compounds by distillation.	Practical
14th	Practice on nomenclature of sterioisomers.	Lectures
	Chemistry of hydrocarbons: introduction of hydrocarbons.	
	Nomenclature of hydrocarbons.	
	Separation of organic compounds by distillation.	Practical
15th	Nomenclature of hydrocarbons.	Lectures
	Synthesis of hydrocarbons (alkanes) and emphasis on various stages	
	Synthesis of hydrocarbons(alkanes) and emphasis on various stages	
	Distillation method.	Practical
16th	Synthesis of hydrocarbons (alkenes) and emphasis on various stages	Lectures
	Synthesis of hydrocarbons (alkyne) and emphasis on various stages	
	Reactions of alkanes	
	Separation of plant pigments or to check the completion of reaction during synthesis by Paper chromatography.	Practical
17th	Reactions of alkenes	Lectures
	Reactions of alkenes	
	Reactions of alkynes and importances in organic synthesis.	
	Separation of plant pigments or to monitor the product formation during synthesis.	Practical
18th	Presentations	Presentations
19th	Terminal exam	Terminal exam

Signature of Course Instructor: Chairperson

University of Poonch Rawalakot

Faculty of Basic and Applied Sciences

Department of Chemistry

Course Title	**Inorganic chemistry I**
Course Code	**CHM-5503**
Credit hrs.	**4(3-1)**
Learning Objectives	This course introduces the concept of attainment of stability of atom. Also Focuses on the bonding, Structure of molecule, it also serves to Familiarize the student with the different bonding theories of covalent bonding
Contents	**1. Theories of Covalent Bonding (Structure of Molecules)** A brief history of concept of chemical bond. Nature and types of chemical bonding, Lewis concepts, ionic, covalent, coordinate covalent bond. VSEPR model followed by VB theory (Hybridization and Resonance concept) to explain the structure of molecules of various types. Molecular orbital approach as applied to diatomic and polyatomic molecules. Bonding in electron deficient compounds. Hydrogen bonding. Theories of metal bonds, conductors, semi-conductors and insulators. Effect of temperature and impurities on conductivity. **2. Chemistry of Lanthanides and Actinides Elements** Electronic structure, position in the periodic table, oxidation states, occurrence, extraction separation, General properties, complex formation, Lanthanide and Actinide contraction, Applications. **Practicals** 1.Separation of metal ions by paper chromatography and their identification with the help of locating agents and comparison of Rf values such as • Cu^{+2}/Ni^{+2}, • Al^{+3}/Fe^{+3}, • Ca^{+2}/Ba^{+2} 2. Aqueous Acid-Base Titration • Estimation of CO2. 3. Determine the % age purity of the Commercial sample of sodium chloride.

Suggested Readings/Reference Book	**Reference Material:** • James Huheey, E., "*Inorganic Chemistry*, *Principles of Structure and Reactivity",* 3rd. Ed., Cambridge, Harper International, London, 1983. • Lee J.D., "Concise Inorganic Chemistry", 5 th edition, Black Well Science, 1996. • James Huheey E., "Inorganic Chemistry, Principles of Structure and Reactivity", 3 rd. Ed. Cambridge, Harper International, London, 1983. • Machay K. M. and Machey R. A., "Introduction to modern Inorganic Chemistry", 3 rd Ed. International text book company London, 1981. • Green wood, "Chemistry of the elements", 2nd Ed., Jardan, Hill oxford, 1997. **Practical** Bassett J., "Vogel's text books of quantitative analysis", 4 th Ed., Longman Group Limited, 1978.

Signature of Course Instructorr: **Chairperson_____**

Course breakup for BS 5th

Programme		BS	
Semester		5th	
Course Title		Inorganic Chemisry-I	
Course Code	CHM-5503	Credit Hours	4(3-1)
No of week		19	
Course Instructor		Farrukh Zubair	

Details of lecture/Activities

Weeks	Topic of Lectures	Activity
Week 1	• A brief history of concept of chemical bond	Lectures
	• Nature and types of chemical bonding • Lewis concepts • Separation of metal ion by paper Chromatography and their identification with the help of locating agents and comparison of Rf values	Lectures Practical
Week 2	• Ionic bond • Covalent bond • Coordinate bond • Separation of metal ions by paper chromatography and their identification with the help of locating agents and comparison of Rf values	Lectures Practical
Week 3	• Introduction of VSEPR Theory • Examples of Molecular shapes • Structures of different molecules • Separation of metal ions by paper chromatography and their identification with the help of locating agents and comparison of Rf values	Lectures Assiginment#1 Practical
Week 4	• Concept of hybridization • Concept of resonance with examples	Lectures

	• Introduction of VBT • Estimation of pair of metal ions Cu^{+2}/Ni^{+2}	Practical
Week 5	• Structures of molecules of different types • Introduction of MOT • Explanation of MOT • Estimation of pair of metal ion Al^{+3}/Fe^{+3}	Lectures **Quiz # 1** Practical
Week 6	• Molecular orbital approach as applied to diatomic molecule • Molecular orbital approach as applied to polyatomic molecules • Energy diagrams of different molecules • Estimation of pair of metal ions Ca^{+2}/Ba^{+2}	Lectures **Practical**
Week 7	• Introduction of Electron deficient compound • Bonding in electron deficient compounds • Hydrogen bonding • Estimation of CO2.	Lectures **Practical**
Week 8	• Introduction g metal bond • Theories of metal bond • Conductors **MID TERM EXAM**	Lectures **MID TERM EXAM**
Week 9	• Semi-Conductors • Insulator • Effects of temperature on conductivity • Estimation of CO2.	Lectures **Practical**
Week 10	• Effect of impurities on conductivity • Introduction of lanthanides • Introduction of actinides • Acid base titration	Lectures **Practical**
Week 11	• Electronic structures of Lanthanides elements • Electronic structures of Actinides • Position in periodic table and oxidation states • Acid base titration	Lectures Practical
Week 12	• Occurrence of Lanthanides • Occurrence of Actinides • Extraction of Lanthanides • Acid base titration	Lectures Practical
Week 13	• Extraction of actinides • Separation of Lanthanides • Separation of Actinides • Acid base titration	Lectures **Practical**

Week 14	• General properties of Lanthanides • General properties of Actinides • Complex formation of Lanthanides • Acid base titration	Lectures **Practical**
Week 15	• Complex formation of Actinides • Lanthanide contraction • Actinides contraction Revision Practicles	Lectures **Practical**
Week 16	• Application of Actinides • Application of Lanthanide • Revision exercise of lanthanides and actinides elements • Revision Practicles	Lectures **Practical**
Week 17	Presentation	
Week 18	Presentation	
Week 19	Terminal Exam	Terminal Exam

Signature of Course Instructorr: **Chairperson_____**

University of Poonch Rawalakot

Faculty of Basic and Applied Sciences

Department of Chemistry

Course Title	**Biochemistry I**
Course Code	**CHM-5504**
Credit hrs.	**4(3-1)**
Learning Objectives	❖ To acquaint students with the metabolism of different biomolecules ❖ Students able to know about role of different biomolecules in energy formation
Contents	**Theory** **Carbohydrates metabolism:** Digestion, absorption, and transport of sugars into cells, glycolysis, TCA cycle, Gluconeogenesis, glycogenesis, glycogenolysis. HMP pathway, uronic acid pathway. **Lipids Metabolism:** Digestion, absorption, and transport of lipids, oxidation of saturated and unsaturated fatty acids, biosynthesis of fatty acids, triglycerides, phospholipids, steroids, bile acids, and ketone bodies. **Protein Metabolism:** Digestion of proteins, absorption, and transport of amino acids to cells. Decarboxylation, deamination, transamination, metabolism of essential amino acids. Urea cycle, creatine and uric acid synthesis. Bioenergetics, Oxidative and Substrate level phosphorylation, electron transport chain, chemiosmotic theory. **Nucleic acid metabolism:** Biosynthesis and catabolism of purines, pyrimidines, and their regulation. **Biochemistry Laboratory-I** 1. Determination of the amount of reducing sugar in the biological fluids. 2. Estimation of non-reducing sugars. 3. Determination of saponification value of fats. 4. Determination of Iodine value of fats. 5. Determination of the acid value of fats. 6. Determination of Lactose in milk.

Suggested Readings/Reference Book	1. D. Voet, J. G. Voet, C. W. Pratt, "Biochemistry", John Wiley & Sons, New York, 1999. 2. A. L. Lehninger, D. L. Nelson, M. M. Cox, "Principles of Biochemistry", 3rd Ed., WorthPublishers, New York, 2000. 3. G. Zubay, "Biochemistry", W. C. B. Publishers, Toronto, 1998. 4. L. Stryer, "Biochemistry" 5th Ed., W. H. Freeman & Co., 2002. **Practical** 1. D. T. Plummer, "An Introduction to Practical Biochemistry", Tata Mc Graw-HillPublishing company Ltd. New Delhi, 1988. 2. G. Rajagopal, S. Ramakrishnan, "Practical Biochemistry for Medical Students", OrientLongman Ltd., Hyderabad, 1983. 3. S. P. Singh, "Manual of Biochemistry", CBS Publishers, New Delhi, 1988

Signature of Course Instructorr: **Chairperson**_____

Course breakup for BS 5th

Programme		BS	
Semester		5th	
Course Title		Biochemistry-I	
Course Code	CHM-5504	Credit Hours	4(3-1)
No of week		19	
Course Instructor		Summyia Khalid	

Details of lecture/Activities

Weeks	Topic of Lecture	Activity
1st	Digestion, absorption and transport of sugars into cells	
	Glycolysis	
	TCA cycle	
	1. Determination of the amount of reducing sugar in the biological fluids.	Practical demonstration
2nd	Gluconeogenesis	
	Glycogenesis,	
	Glycogenolysis	
	1. Determination of the amount of reducing sugar in the biological fluids.	Practical Performance
3rd	HMP pathway,	Assignment l
	HMP pathway,	
	Uronic acid pathway	
	2. Estimation of non-reducing sugars.	Practical demonstration
4th	Uronic acid pathway,	
	Bioenergetics,	
	Bioenergetics,	Practical Performance
	2. Estimation of non-reducing sugars.	
	Oxidative and Substrate level phosphorylation,	Quiz I

5th	Electron transport chain	Practical demonstration
	Chemiosmosis theory	
	3. Determination of saponification value of fats.	
6th	Digestion, absorption and transport of lipids,	
	Digestion, absorption and transport of lipids,	
	Oxidation of saturated fatty acid	
	3. Determination of saponification value of fats.	Practical Performance
7th	Oxidation of saturated fatty acid	
	Oxidation of unsaturated fatty acids,	
	Oxidation of unsaturated fatty acids,	
	4. Determination of Iodine value of fats.	Practical demonstration
8th	Biosynthesis of fatty acids,	Mid term exam
	Biosynthesis of triglycerides	
	Biosynthesis of phospholipids	
	4. Determination of Iodine value of fats.	Practical Performance
9th	Biosynthesis of steroids	
	Biosynthesis of bile acids	
	Biosynthesis of ketone bodies.	
	5. Determination of the acid value of fats.	Practical demonstration
10th	Digestion of proteins, absorption and transport of amino acids to cells.	
	Decarboxylation,	
	Deamination	
	5. Determination of the acid value of fats	Practical Performance
11th	Transmination,	Quiz II
	Anabolism of essential amino acids.	
	Anabolism of essential amino acids.	
	6. Determination of Lactose in milk.	Practical demonstration

12th	Anabolism of essential amino acids.	
	Catabolism of essential amino acids.	
	Catabolism of essential amino acids.	
	6. Determination of Lactose in milk.	Practical Performance
13th	Catabolism of essential amino acids.	
	Urea cycle	
	Creatine synthesis.	
	6. Determination of Lactose in milk.	
14th	Uric acid synthesis.	Assignment II
	Biosynthesis purines	
	Catabolism of purines	
	6. Determination of Lactose in milk.	Practical Performance
15th	Biosynthesis of pyrimidines	
	Catabolism of pyrimidines	
	Regulation of pyrimidines biosynthesis	
	Lab revision	
16th	Regulation of pyrimidines biosynthesis	
	Regulation of purines biosynthesis	
	Regulation of purines biosynthesis	
	Lab quiz	
17th and 18th	Presentation and revision	
19th	Terminal exam	

Signature of Course Instructor _____ Chairperson _____

PHYSICAL SECTION

UNIVERSITY OF POONCH RAWALAKOT AJK

Faculty of Basic & Applied Sciences

Subject: Chemical Kinetics **Course Code: CHM-6701**

Course Structure: Lectures: 3/week **Credit Hours: 3**

Prerequisites: Physical Chemistry **Course Instructor: Mehrosh Islam**

Learning objectives	To have a thorough understanding of different reaction types ,Methods of studying reaction rates, their Mechanisms, Factors affecting them.
Contents	**Theory** Higher order reactions, causes of higher order rarity, methods of studying reaction kinetics, physical and chemical methods, potentiometric methods, conductometric methods, Ostwald dilution method and differential methods, Guggensheins method, Kinetics of parallel opposing and consecutive reactions, Steady state approximation, Gas phase reactions, Reactions in solution phase, Conductometric, Dialatometric , Spectrophotometric methods, Chain reactions of hydrogen and bromine, Fast reactions, Plug flow techniques, Photochemical reactions.
Suggested Reading	1. Essentials of Physical Chemistry by BS Bahl 2.Alberty, R.A and Silbey, R.J, 'Physical Chemistry' John Wiley, New York, 1995 3.Chemical kinetics and reaction dynamics by Santosh K.Upadhyay 4.Chemical kinetics James H Espenson

	5.Physical Chemistry 6^{th} edition IRA N. Levine

Schedule for Quizzes and Final Exam:

- Quizzes will be normally announced at least one day in advance, and may be given in lecture or in tutorial.
- Quizzes will usually be closed-book (some might be open-book) and will typically require about 10 minutes to complete.
- A student who misses a quiz for any reason will be assigned a score of zero for that quiz. There will be atleast two quizzes throughout the semester.
- Exams will be conducted on schedule announced by department.
- Midterm and terminal exam will be from the syllabus covered in the whole semester.
- The examinations will focus on understanding and applying the concepts taught in class and practiced in lab/tutorial exercises and assignments.

Grading Policy:

As per institution policy

Teaching Methodology:

Class room lectures on multimedia and whiteboard both, surprise quizzes can be at the start or end of lecture.

Attendance and Assignment Policy:

All students are expected to attend all lectures. Latecomers, coming in class after 10 minutes all be marked absent, must be on time.

Late assignment submission will result in negative marking. Copying will not be tolerated and will be dealt with very seriously.

Note:

Teacher reserves the right to change the lecture schedule, contents and assessment criteria based upon the class situation.

Detail of Lectures /Activity

Weeks	**Lecture Number**	**Topic**	**Activity**
Ist	Lecture Lecture Lecture	Rate equations for ist second third order reactions Higher order reactions and their half life period Numericals of Ist and second order rate equations	Lectures
2nd	Lecture Lecture Lecture	Methods of studying reaction kinetics Physical methods Chemical method of rate	Lectures
3rd	Lecture Lecture Lecture	Methods of studying order of reaction Ostwald isolation method of order Rarity of higher order reactions	Lectures
4th	Lecture Lecture Lecture	Differential and half life method of order Introduction to some complex reactions Kinetics of opposing reactions	Lectures
5th	Lecture Lecture Lecture	Numericals of opposing reactions Consecutive reactions and kinetics Consecutive reactions and kinetics	Lectures

6th	Lecture Lecture Lecture	Steady state Approximation Parallel reactions and their kinetics QUIZ	Lectures & QUIZ
7th	Lecture Lecture Lecture	Spectrophotometry Beers law Spectrophotometric method of rate with examples Conductometric Method of rate	Lectures
8th	Lecture Lecture	Measurement of volume at constant pressue Measurement of pressure at constant volume	Lectures/MIDS
9th	Lecture Lecture Lecture	Powel Plot method of rate Potentiometric method of rate Dilatometric method of rate	Lectures
10th	Lecture Lecture Lecture	Arhenius equation Graphs and numericals An introduction to photochemistry	Lectures
12th	Lecture Lecture Lecture	Hydrogen chlorine reaction mechanism An introduction to surface chemistry Applications of Adsorption Adsorption isotherms	Lectures

13th	Lecture Lecture Lecture	Mechanism of Hydrogen Bromine Reactions Reactions in Solutions Reactions in Solutions	Lectures
14th	Lecture Lecture Lecture	Ficks law and effect of solvent Fast Reactions Relaxation methods to study Fast reactions	Lectures
15th	Lecture Lecture Lecture	Flow methods of fast reactions continuous and stopped flow methods QUIZ	Lectures QUIZ
16th	Lecture Lecture Lecture	Chain reactions Chain reactions (Branched chain) Kinetics of acetaldehyde	Lectures
17th	Lecture Lecture Lecture	Numericals Gas phase reactions Unimolecular gas phase theory	Lectures
18th	Lecture Lecture Lecture	Presentations by students Presentations by students Presentations by students	Assignments and presentations
19th	TERMINAL EXAM		Terminals

Teacher Sig. Mehrosh Islam Chairman Sig. ----------

University of Poonch Rawalakot

Faculty of Basic and Applied Sciences

Department of Chemistry

Course Title	**Molecular Spectroscopy**
Course Code	**CHM-6704**
Credit hrs.	**3(3-0)**
Learning Objectives	The students will acquire basic knowledge of the interaction of radiation with matter and will be able to use the quantum mechanics to understand molecular spectra. The students will recognize the relationship between molecular spectra and molecular properties
Contents	Spectroscopy, electromagnetic radiations, classification of spectroscopy, electromagnetic spectrum, Regions of electromagnetic spectrum, experimental techniques, microwave spectroscopy, rotation of linear system, rotation of rigid rotors, rotation of non rigid rotor, rotation of symmetric tops, rotation of asymmetric tops, kinetic energies of system, quantum mechanical treatment of linear system, symmetric top molecules and asymmetric tops, rotation of spectrum and selection rules for linear system, applications of microwave spectroscopy, ifra red spectroscopy, simple harmonic oscillator, selection rules for anhormonic oscillators, U.V. spectroscopy, electronic spectroscopy, absorption laws, instrumentation(U.V.), Frank condon principle
Suggested Readings/Reference Book	• Barrow, G. M. and Mc Graw- Hill, 1962. Introduction to Molecular Spectroscopy). London. • Banwell, C.N., 1972. Fundamentals of Molecular Spectroscopy (2^{nd} Ed.). Mc Graw-Hill, London.

Signature of Course Instructor **Chairperson**

Course Breakup

Programme	BS		
Semester	7th		
Course Title	Molecular Spectroscopy		
Course Code	CHM-6704	**Credit hrs**	3(3-0)
No. of Weeks	19		
Course Instructor	Dr. Srosh Fazil		

Details of lectures / activities

Weeks	Topic of Lecture	Activity
1st	Spectroscopy	Lectures
	Spectroscopy	
	Electromagnetic Radiations	
2nd	Classification of Spectroscopy	Lectures & Assignments #1
	Regions of Electromagnetic Spectrum	
	Experimental Techniques	
3rd	Experimental Techniques	Lectures
	Microwave Spectroscopy	
	Rotation of Linear System	
4th	Rotation of Rigid Rotors	Lectures
	Rotation of Rigid Rotors	
	Rotation of Non-rigid Rotors	
5th	Rotation of Non-rigid Rotors	Lectures
	Rotation of Symmetric Tops	
	Quiz #1	Quiz #1
6th	Rotation of Asymmetric Tops	Lectures
	Kinetic Energy of Systems	
	Quantum Mechanical Treatment of Linear System	
7th	Quantum Mechanical Treatment of Symmetric & Asymmetric Tops	Lectures
	Rotation Spectrum & Selection Rules for Linear System	
	Rotation Spectrum of Symmetric & Asymmetric Tops	
8th	Mid Term Exam	Mid Term
	Rotation Spectrum of Symmetric & Asymmetric Tops	Lectures
	Applications of Microwave Spectroscopy	
9th	Problems	Lectures
	Problems	
	Ifra- Red spectroscopy, Vibrating Diatomic Molecule,	
10th	Simple harmonic oscillator,	Lectures
	Selection rule for harmonic oscillator	
	Difference in energy levels	
11th	Anharmonic oscillators	Lectures & Assignments #2
	Selection rule for anharmonic oscillator	
	Coupling of rotation and vibration	
	Coupling of rotation and vibration	Lectures

12th	Applications of IR	
	Problems	
13th	Quiz # 2	Quiz # 2 & Lectures
	Problems	
	UV Spectroscopy / Electronic Spectroscopy	
14th	UV Spectroscopy / Electronic Spectroscopy	Lectures
	UV Spectroscopy / Electronic Spectroscopy	
	Absorption laws	
15th	Absorption laws	Lectures
	Absorption laws	
	Instrumentation	
16th	Instrumentation	Lectures
	Frank Condon Principles	
	Frank Condon Principles	
17th	Applications and Problem	Lectures
	Problems	
	Problems	
18th	Presentations	Presentations
19th	Terminal Exam	Terminal Exam

Signature of Course Instructor **Chairperson**

UNIVERSITY OF POONCH RAWALAKOT

Department of Chemistry

Session Fall - 2023

BS 7th

Subject: Statistical Mechanics	**Course Code: CHM-6707**
Course Structure: Lectures: 3/week	**Credit Hours: 3 (3-0)**
Semester: 7th	**Course Instructor: Dr. Faiza Rehman**

Learning Objectives:

Students will be able to learn and understand about basic concepts of Statistical Mechanics with demonstration and mechanisms of Statistical reactions.

Course Content:

Introduction to Statistical Mechanics, Historical background, Probability, Various Systems, Ensembles, Concept of states, Distribution of energy, Maxwell Boltzmann Statistics, MBS of independent particles, Partition function Derivations and determination of independent particles, Statistical thermodynamics, Correlation of partition and thermodynamic functions, Applications to chemical equilibrium, Applications to chemical kinetics, Fermi Dirac and Bose Einstein statistics

Text/Reference Books:

1. Introduction to Statistical Mechanics by Robert Swendsen

2. Topics in Statistical Mechanics by Brian Cowan

3. Statistical Mechanics by Werner Krauth

Teacher Sig. ---------- **Chairman Sig. ----------**

Programme		BS	
Semester		7th	
Course Title		Statistical Mechanics	
Course Code	**CHM-6707**	Credit Hours	3(3-0)
No of week		16	
Total no. of lectures		48	
Course Instructor		Dr. Faiza Rehman	

Course log with tentative dates:

Detail of Lectures /Activity Week	**Lecture topic**	**Activity**
1st	Introduction to Statistical Mechanics	Discussion
	Basic Terms	
	Laws of statistical Mechanics	
2nd	Historical background	
	How statistical mechanics started	
	Role of scientists for statistical mechanics study	
3rd	Probability	Assignment 1
	Types of probability	
	Laws of probability	
4th	Various Systems	Group discussion
	Macro system	
	Micro system	
5th	Ensembles	Quiz 1
	Types	
	Examples	
6th	Concept of states	
	Type of states	
	Examples of ststes	
7th	Distribution of energy	Think pair share

	Simple atoms energy distribution	activity
	Complex atoms energy distribution	
8th	Maxwell Boltzmann Statistics	Discussion
	Continue	
	Continue	
9th	MBS of independent particles	Group discussion
	Examples	
	Numericals	
10th	Partition function	
	continue	
	continue	
11th	Derivation of partition function	Discussion
	Continue	
	determination of independent particles	

12th	Statistical thermodynamics	Quiz 2
	Background	
	Basic laws	
13th	Correlation of partition functions	Assignment 2
	Correlation of thermodynamic functions	

	Examples	
14th	Applications to chemical equilibrium	
	Continue	
	Continue	
15th	Applications to chemical kinetics	Think pair share activity
	Continue	
	Continue	
16th	Fermi Dirac statistics	
	Continue	
	Continue	
17th	Bose Einstein statistics	
	Continue	
	Continue	
18th	Presentation	
19th	Terminal Examination	
TERMINAL EXAMINATION		

Instructor signature……..Chairman Sig. ----------

University of Poonch Rawalakot

Faculty of Basic and Applied Sciences

Department of Chemistry

Course Title	**Physical Chemistry Lab III**
Course Code	**CHM-6715**
Credit hrs.	**3(0-3)**
Contents	1. Determination of specific rate constant for the saponification of ethyl acetate conductometrically. 2. Determination of Equilibrium constant for the reversible reaction. 3. Determination of heat of solution of oxalic acid by solubility method using Van't Hoff equation. 4. Acid Base conductometric titration 5. Obtain a spectral absorption curve of a given substance using a spectrophotometer and also find the wave length of maximum absorption. 6. Verify Beer's law for given solution, also measure the unknown concentration.
Suggested Readings/Reference Book	1. Sing, A., "*Advanced experimental physical chemistry"* 1st Ed., Campus Book international, New Delhi, 2005. 2. Findlay, A.and Kitchner, J.A., "*Practical physical Chemistry"* Longman, Green and Co, 1976. 3. Shoemaker, D.P. and Garland, C., "*Experiments in physical chemistry"* McGraw Hill, New York.

Signature of Course Instructor **Chairperson**

Course Breakup

Programme	BS		
Semester	7th		
Course Title	**Physical Chemistry Lab III**		
Course Code	CHM-6715	**Credit hrs**	3(0-3)
No. of Weeks	19		
Course Instructor	Dr. Srosh Fazil		

Details of lectures / activities

Weeks	Topic of Lecture	Activity
1st	Determination of specific rate constant for the saponification of ethyl acetate conductometrically.	Theory
2nd	Determination of specific rate constant for the saponification of ethyl acetate conductometrically.	Performance
3rd	Determination of Equilibrium constant for the reversible reaction.	Theory
4th	Determination of Equilibrium constant for the reversible reaction.	Performance
5th	Determination of heat of solution of oxalic acid by solubility method using Van't Hoff equation.	Theory
6th	Determination of heat of solution of oxalic acid by solubility method using Van't Hoff equation.	Performance
7th	Acid Base Conductometric titration	Theory
8th	No Practical due to Midterm Exam	
9th	Acid Base Conductometric titration	Performance
10th	Obtain a spectral absorption curve of a given substance using a spectrophotometer and also find the wave length of maximum absorption.	Theory
11th	Obtain a spectral absorption curve of a given substance using a spectrophotometer and also find the wave length of maximum absorption.	Performance
12th	Obtain a spectral absorption curve of a given substance using a spectrophotometer and also find the wave length of maximum absorption.	Theory
13th	Obtain a spectral absorption curve of a given substance using a spectrophotometer and also find the wave length of maximum absorption.	Performance
14th	Verify Beer's law for given solution, also measure the unknown concentration.	Theory
15th	Verify Beer's law for given solution, also measure the unknown concentration.	Performance
16 to 18th	Revision	
19th	Terminal Exams	

Signature of Course Instructor **Chairperson**

INORGANIC SECTION

UNIVERSITY OF POONCH RAWALAKOT AJK	
Faculty of Basic & Applied Sciences	
Session 2023	
Subject: Environmental chemistry	**Course Code: CHM-6717**
Course Structure: Lectures: 3 :	**Credit Hours: 3**
Prerequisites: Environmental Chemistry	**Course Instructor: Farakh Zubair**

Course Outline:

Introduction to Environmental Chemistry

The human environment, the litho, bio and hydrosphere's, the nature and composition of natural waters, water pollution, chemistry of soil, composition of the atmosphere, oxides of carbon, sulphur and nitrogen in air pollution, atmospheric monitoring, instrumental methods of environmental chemistry.

Reference Material:

- Bockris R., McMillan, "Environmental Chemistry", USA, 1995
- Manahan S.E.and Milled Grant Press, "Environmental Chemistry", 8 th Ed., CRC Press, New York, 2005.
- Mone and Mone, "Environmental Chemistry", Academic Press,
- Bokrin, "Environmental Chemistry", Ploniusm Press,
- De A.K., Willey Eastern, "Environmental Chemistry", New Dehli, 1990.
- Analysis, Mass and Everser, "Environmental Chemistry", International Text Book Co., Glasgow.
- Gilbert M., "Introduction to Environmental Science and Technology", John Wiley and Sons.
- Forstner U. and Wittman G., "Metal Pollution in Aquatic Environment", Springer Verlag, New York, 1989

Course Objectives:

This course introduces the Environmental chemistry. Also

Focuses on the components of environment, Discuss about air water and soil pollution.

Schedule for Quizzes and Final Exam:

- Quizzes will be normally announced at least one day in advance, and may be given in lecture or in tutorial. Quizzes will usually be closed-book (some might be open-book) and will typically require about 10 minutes to complete. A student who misses a quiz for any reason will be assigned a score of zero for that quiz. There will be at least two quizzes throughout the semester.
- Exams will be conducted on schedule announced by department.
- Midterm and terminal exam will be from the syllabus covered in the whole semester.
- The examinations will focus on understanding and applying the concepts taught in class and practiced in lab/tutorial exercises and assignments.

Grading Policy:

As per institution policy

Teaching Methodology:

Class room lectures on whiteboard both, surprise quizzes can be at the start or end of lecture.

Attendance and Assignment Policy:

All students are expected to attend all lectures. Latecomers, coming in class after 10 minutes all be marked absent, must be on time.

Late assignment submission will result in negative marking. Copying will not be tolerated and will be dealt with very seriously.

Note:

Teacher reserves the right to change the lecture schedule, contents and assessment criteria based upon the class situation.

DETAIL OF LECTURES

No of Weeks	Lecture No	Topic of Lectures	Activity
Week 1	1	• Introduction to environmental chemistry • Basics definitions of terms used in environmental chemistry • Environmental segments	Class Class Class
Week 2	1 2 3	• Introduction of human environment • Components of environment • Types of environment	
Week 3	1 2 3	• Lithosphere • Biosphere • Hydrosphere	Class Class Class Assiginment#1
Week 4	1 2 3	• The nature • and composition of natural water • Water pollution	
Week 5	1 2 3	• Chemistry of soil • Introduction of atmosphere • Composition of atmosphere	**Quiz # 1**
Week 6	1 2 3	• Chemistry of soil • Soil pollution • Major sources	
Week 7	1 2 3	• Prevention of soil pollution • Control of soil pollution • Remediation of soil pollution	
Week 8	1 2 3	• Oxides of carbon • Sources • Harmful effect of oxides of carbon MID TERM EXAM	
	1	• Air pollution	

Week 9	2 3	• Sources of air pollution • Effects of organic pollutants	
Week 10	1 2 3	• .Effect of inorganic pollutants • Control of air pollution • Remediation of air pollution •	
Week 11	1 2 3	• Oxides of sulphur in air pollution • Sources of So_x • Harmful Effect of So_x	
Week 12	1 2 3	• Oxides of Nitrogen • Sources of No_x • Harmful effect of No	
Week 13	1 2 3	• Photochemical smog • Smog, Acid rain • Adverse effect of Acid rain	
Week 14	1 2 3	• Atmospheric monitoring • Control of oxides of carbon • Oxides of sulphur	
Week 15	1 2 3	• Control of organic pollutant • Continue… • Contin….	
Week 16		• Control of Inorganic pollutant • Continue • Continue	
Week 17		Control of Oxide of nitrogen Continue… Continue….	
Week 18		Presentation	
Week 19		Terminal Exams Terminal Exam	

Signature of Teacher:_ Chairman:

University of Poonch Rawalakot

Faculty of Basic and Applied Sciences

Department of Chemistry

Course Title	**Advanced Coordination Chemistry**
Course Code	**CHM-6720**
Credit hrs.	**3(3-0)**
Learning Objectives	Maximize coordination chemistry knowledge of students and advanced topics related to the coordination chemistry
Contents	Kinetics and mechanism of reactions in solution–labile and inert complexes – Ligand displacement reactions in octahedral and square planar complexes – acid hydrolysis, base hydrolysis and anation reactions – trans effect – theory and applications. Electron transfer reactions – electron exchange reactions – complementary and non-complementary types –inner sphere and outer sphere processes – Application of Electron transfer reactions in inorganic complexes - isomerization and racemization reactions of complexes –Molecular rearrangement – reactions of four and six-coordinate complexes – Interconversion between stereoisomers. Reactions of coordinated ligands–Template effect and its application for the synthesis of Macrocyclic ligands – Unique properties, stability, factors that influence complex stability, determination of stability constants, applications of coordination compounds in various fields
Suggested Readings/Reference Book	1. Day, M.C and Selbin,J (1985): Theoretical Inorganic Chemistry, 2nd Edition, Affilia East West Press Pvt.Ltd. 2. Cotton, F. A and Wilkinson,G (2009): Advanced Inorganic Chemistry,4th Edition, A Wiley- Interscience Publication, John–Wiley &Sons, USA. 3. Huheey, J.E (1983): Inorganic Chemistry, 3rd Edition, Harper & Row publisher, Singa

Course Breakup

Programme	BS		
Semester	7th		
Course Title	Advanced Coordination Chemistry		
Course Code	CHM-6720	**Credit hrs**	3(3-0)
No. of Weeks	19		
Course Instructor	Dr. Khurram Liaqat		

Details of lectures / activities

Weeks	Topic of Lecture	Activity
1st	Kinetics and mechanism of reactions in solution–labile and inert complexes	Lectures
	Kinetics and mechanism of reactions in solution–labile and inert complexes	
	Kinetics and mechanism of reactions in solution–labile and inert complexes	
2nd	Ligand displacement reactions in octahedral and square planar complexes	Lectures & Assignments #1
	Ligand displacement reactions in octahedral and square planar complexes	
	acid hydrolysis, base hydrolysis and anation reactions	
3rd	acid hydrolysis, base hydrolysis and anation reactions	Lectures
	trans effect – theory and applications	
	trans effect – theory and applications	
4th	Electron transfer reactions – electron exchange reactions	Lectures
	Electron transfer reactions – electron exchange reactions	
	complementary and non-complementary types –inner sphere and outer sphere processes	
5th	complementary and non-complementary types –inner sphere and outer sphere processes	Lectures
	Application of Electron transfer reactions in inorganic complexes	
	Quiz #1	Quiz #1
6th	Application of Electron transfer reactions in inorganic complexes	Lectures
	Application of Electron transfer reactions in inorganic complexes	
	isomerization and racemization reactions of complexes	
7th	isomerization and racemization reactions of complexes	Lectures
	isomerization and racemization reactions of complexes	
	isomerization and racemization reactions of complexes	
8th	Mid Term Exam	Mid Term
	Molecular rearrangement – reactions of four and six-coordinate complexes	Lectures

	Molecular rearrangement – reactions of four and six-coordinate complexes	
9th	Molecular rearrangement – reactions of four and six-coordinate complexes	Lectures
	Interconversion between stereoisomers	
	Interconversion between stereoisomers	
10th	Interconversion between stereoisomers	Lectures
	Reactions of coordinated ligands	
	Reactions of coordinated ligands	
11th	Reactions of coordinated ligands	Lectures & Assignments #2
	Template effect and its application for the synthesis of Macrocyclic ligands	
	Template effect and its application for the synthesis of Macrocyclic ligands	
12th	Template effect and its application for the synthesis of Macrocyclic ligands	Lectures
	Unique properties	
	Unique properties	
13th	stability	Quiz # 2 & Lectures
	factors that influence complex stability	
	factors that influence complex stability	
14th	factors that influence complex stability	Lectures
	determination of stability constants	
	determination of stability constants	
15th	applications of coordination compounds in various fields	Lectures
	Template effect and its application for the synthesis of Macrocyclic ligands	
	Unique properties	
16th	Unique properties	Lectures
	stability	
	factors that influence complex stability	
17th	factors that influence complex stability	Lectures
	applications of coordination compounds in various fields	
	applications of coordination compounds in various fields	
18th	Presentations	Presentations
19th	Terminal Exam	Terminal Exam

UNIVERSITY OF POONCH RAWALAKOT AJK

Faculty of Basic & Applied Sciences

Session 2023

Subject: ***Introduction to Inorganic Reaction Mechanism***	**Course Code:** ***CHM-6721***
Course Structure: ***Lectures: 3 Lab: 0***	**Credit Hours:** ***3***
Prerequisites: ***Inorganic Chemistry***	**Course Instructor:** ***Sadaf Jamshad***

Course Outline:

- Introduction to Kinetics, rate of reaction and rate laws, Inert and Labile Complexes, classification of Mechanisms, Reaction Mechanisms of metal complexes e.g., substitution and oxidation-reduction (Redox) reactions.

Recommended Books

- Cotton F.A. and Wilkinson G., "Advanced Inorganic Chemistry", 5 th Ed, John Wiley & Sons, New York, 1988.
- Benson D., "Mechanisms of Inorganic Reactions in Solution", McGraw Hill, London, 1969
- Atwood J.D., "Inorganic and organometallic reaction mechanism", Brook/ Cole publishing company, California, 1985.

Course Objectives:

- The overall goal has been to provide students with a solid, compact introduction to the field of Kinetics and mechanisms of Inorganic reactions in homogeneous solution.

Schedule for Quizzes and Final Exam:

- Quizzes will be normally announced at least one day in advance, and may be given in lecture or in tutorial. Quizzes will usually be closed-book (some might be open-book) and will typically require about 10 minutes to complete. A student who misses a quiz for any reason will be assigned a score of zero for that quiz. There will be at least two quizzes throughout the semester.
- Exams will be conducted on schedule announced by department.
- Midterm and terminal exam will be from the syllabus covered in the whole semester.
- The examinations will focus on understanding and applying the concepts taught in class and practiced in lab/tutorial exercises and assignments.

Grading Policy:

- As per institution policy

Teaching Methodology:

- Classroom lectures on whiteboard both, surprise quizzes can be at the start or end of lecture.

Attendance and Assignment Policy:

- All students are expected to attend all lectures. Latecomers, coming in class after 10 minutes all be marked absent, must be on time.
- Late assignment submission will result in negative marking. Copying will not be tolerated and will be dealt with very seriously.

Note:

- Teacher reserves the right to change the lecture schedule, contents and assessment criteria based upon the class situation.

Detail of Lectures

Weeks	Lecture No.	Topic of Lectures	Activity
Week 1	1	Introduction of chemical kinetics	Lectures
	2	Zero Order Reactions Lectures	
	3	First order reactions	
Week 2	1	Cases of first order reactions	Lectures
	2	2^{nd} order Reaction	
	3	Cases of 2^{nd} order reaction	
Week 3	1	3^{rd} order reaction	Lectures
	2	Cases of 3^{rd} order reactions	
	3	Cases of 3^{rd} order reaction (contin….)	
Week 4	1	Labile and inert complexes	Lectures
	2	Labile and inert complexes according to MOT	
	3	Labile and inert complexes according to VBT	
Week 5	1	Labile and Inert complexes according to CFT	Lectures
	2	Labile and Inert complexes according to CFT (Contin…)	
	3	Quiz 1	
Week 6	1	Steady state Approximation	Lectures
	2	Steady state approximation case #1	
	3	Steady state approximation case #2	
Week 7	1	Steady state approximation case #3	Lectures
	2	Types of substitution reaction	
	3	Associative and dissociative mechanism	
Week 8	1	**MID TERM EXAM**	Lectures
	2	Factors effecting associative and dissociative mechanism	
	3	Factors effecting associative and dissociative mechanism (Contin….)	

Week 9	1	Difference between associative and dissociative mechanism	Lectures
	2	Substation reactions in octahedral complexes	
	3	Anation reactions case 1	
Week 10	1	Hyrdolysis reactions	Lectures
	2	Acid hydrolysis reactions	
	3	Acid catalyzed reactions	
Week 11	1	Acid catalyzed reactions case 1.1	Lectures
	2	Base hydrolysis reaction	
	3	Factors effecting base hydrolysis reactions	
Week 12	1	Reactions proceeding without breaking M-L bond	Lectures
	2	CaseII	
	3	Substitions reactions in tetrahedral complexes	
Week 13	1	Quiz#2	Lectures
	2	Substition reactions in square planar complexes	
	3	Trans effect and its applications	
Week 14	1	Trans effect theories	Lectures
	2	Contin…Trans effect theories	
	3	Polarization theory	
Week 15	1	Applications of trans effect	Lectures
	2	Redox reactions introduction	
	3	Mechanism of Redox reactions	
Week 16	1	Outer sphere Mechanism & inner sphere mechanism	Lectures
	2	Complemantary Reactions	
	3	Non-Complementary Reactions	
Week 17	1	Organo-Transition Reactions	Lectures
	2	Synthesis of Organo-Transition compounds	
	3	Applications of organo-transition compounds	
Week 18	1	Presentation	Presentation
	2	Presentation	

	3	Presentation	
Week 19	**TERMINAL EXAM**		

Signature of Teacher:_ Chairman:

Dean:_____

University of Poonch Rawalakot

Faculty of Basic and Applied Sciences

Department of Chemistry

Course Title	**Inorganic Chemistry Lab III**
Course Code	**CHM-6730**
Credit hrs.	**3(0-3)**
Contents	**Preparation of inorganic compounds** ▪ To prepare co-ordination compound of $[Cu(NH_3)_4]SO_4$ ▪ To prepare a pure sample of $FeSO_4(NH_4)_2SO_4.6H_2O$ **Conductometric titrations** ▪ To determine the strength of strong acid/weak acid by conductometric titration with strong base ▪ To determine the strength of strong acid/weak by conductometric titration with weak base **Potentiometric titrations** ▪ To determine the concentration of a strong acid using potentiometric titration method.

	▪ To determine the concentration of a weak acid using potentiometric titration method. **Gravimetry** ▪ Gravimetric determination of calcium as calcium oxalate ▪ Gravimetric determination of Iodide by using silver nitrate
Suggested Readings/Reference Book	• Bassett J., "Vogel's text books of quantitative analysis", 4 th Ed., Longman Group Limited, 1978. • Harris D.C., "Quantitative Chemical Analysis", 5 th Edition, Freeman and Company, N.Y, 1999. • Willard H.H., Merritt (Jr) L. L., Dean J.A., and Settle F.A., "Instrumental methods of Analysis", 7 th Ed., Wadsworth Publishing Co., 1988

Signature of Course Instructor **Chairperson**

Course Breakup

Programme	BS		
Semester	7th		
Course Title	**Inorganic Chemistry Lab III**		
Course Code	CHM-6730	**Credit hrs**	3(0-3)
No. of Weeks	19		
Course Instructor	Dr. Khurram Liaqat		

Details of lectures / activities

Weeks	Topic of Lecture	Activity
1st	To prepare co-ordination compound of $[Cu(NH_3)_4]SO$	Theory
2nd	To prepare co-ordination compound of $[Cu(NH_3)_4]SO$.	Performance
3rd	To prepare a pure sample of FeSO4(NH4)2SO4.6H2O	Theory
4th	To prepare a pure sample of FeSO4(NH4)2SO4.6H2O	Performance
5th	To determine the strength of strong acid/weak acid by conductometric titration with strong base	Theory
6th	To determine the strength of strong acid/weak acid by conductometric titration with strong base	Performance
7th	To determine the strength of strong acid/weak by conductometric titration with weak base	Theory
8th	No Practical due to Midterm Exam	
9th	To determine the strength of strong acid/weak by conductometric titration with weak base	Performance
10th	To determine the concentration of a strong acid using potentiometric titration method.	Theory
11th	To determine the concentration of a strong acid using potentiometric titration method.	Performance
12th	To determine the concentration of a weak acid using potentiometric titration method.	Theory
13th	To determine the concentration of a weak acid using potentiometric titration method.	Performance
14th	Gravimetric determination of calcium as calcium oxalate	Theory
15th	Gravimetric determination of calcium as calcium oxalate	Performance
16th	Gravimetric determination of Iodide by using silver nitrate	
17th	Gravimetric determination of Iodide by using silver nitrate	
18th	Revision	
19th	Examination	

Signature of Course Instructor **Chairperson**

Organic section

Course Title	**Name Reactions in Organic Chemistry**	
Course Code	CHM-6734	
Credit hrs.	3(3-0)	
Class	BS	Semester: Fall 2023
Course Instructor	Dr. Naveed Iqbal	
Learning Objectives	The main objective of the course is to make students capable of learning about known mechanism and predicting unseen reaction mechanism,	
Contents	Detailed study of at least twenty name reactions including Arndt-Eistert Synthesis; Blaise Reaction; Bouvealt-Blanc Reaction; Hel-Volhard-Zelinsky reaction; Meerwein-Pondhof-Verley Oxidation; Mannich Reaction; Schotten-Baumen Reaction; Mitsonubo Coupling; Suzuki Coupling; Wittig reaction. Heck reaction, Pollazari reaction, Corey-House synthesis, Simmon-Smith reaction, Streacker synthesis, Micheal reaction, Williamson ether synthesis, Prins reaction, Wurts reaction, Robinson annelation reaction, Hinsberg reaction	
Suggested Readings/Reference Book	March, J., *Advanced Organic Chemistry*, 4th Ed., John Wiley & Sons, New York, 1992. Name Reactions and Reagents in Organic Synthesis 2nd Edition	

Signature of Course Instructor:_____Chairperson: _____

Detailed Course Breakup

Programme	BS 7th Semester		
Semester	Fall-2023		
Course Title	**Name Reactions in Organic Chemistry**		
Course Code	CHM-4302	Credit hrs.	3(2-1)
Course Instructor	Dr. Naveed Iqbal		
No. of week	19		

COURSE BREAKUP

Weeks	**Topic of Lecture**	Activity
1st	Brief Introduction to Name Reactions	Lectures
	Arndt-Eistert Synthesis: Mechanism	
	Arndt-Eistert Synthesis Scope and Application	
2nd	Blaise Reaction Theory and Applications	Lectures
	Bouvealt-Blanc Reaction Theory: Mechanism in detail	
	Bouvealt-Blanc Type Reaction to ketones and Aldehydes	
3rd	Bouvealt-Blanc Type Reaction to alpha beta unsaturated aldehydes and ketones	Lectures & Assignment # 1
	Scope of and Application of the reaction	
	Hel-Volhard-Zelinsky reaction. Theory and Mechanism	
	Hel-Volhard-Zelinsky reaction Scope and Applications	Lectures
	Hel-Volhard-Zelinsky reaction Scope and Applications (Continued)	
	Schotten-Baumen Reaction: Theory and Mechanism	
5th	Schotten-Baumen Reaction: Scope and Application	Lectures
	Meerwein-Pondhof-Verley Oxidation	
	Quiz 1	Quiz # 1
6th	Oppenauer oxidation: Theory and Mechanism	Lectures
	Oppenauer oxidation: Scope and Application	
	Perkin reaction: Theory and Mechanism	
7th	Perkin reaction: Scope and Application	Lectures
	Peterson olefination: Theory and Mechanism	
	Peterson olefination: Application and Scope	
8th	Mid term Exams	Mid Term Exams
	Mannich Reaction: Theory and Mechanism	Lectures
	Mannich Reaction , Scope and Application (Continued)	
9th	Mitsonubo Coupling Mechanism and theory	Lectures
	Mitsonubo Coupling Application Continued	

	Mitsonubo Coupling Scope Application Continued	
10th	Suzuki Coupling: mechanism	Lectures
	Suzuki Coupling Scope and Application	
	Wittig reaction. Theory and Mechanism	
11th		Lectures & Assignment#2
	Wittig reaction. Theory and Mechanism	
	Wittig reaction. Theory and Application	
12th	Heck reaction;	Lectures
	Heck reaction (Continued)	
	Pollazari reaction,	
13th	Corey-House synthesis	Quiz#2 & Lectures
	Corey-House synthesis Vs Wurtz reaction	
	Simmon-Smith reaction	
14th	Streacker synthesis	Lectures
	Williamson ether synthesis	
	Micheal reaction Theory and mechanism	
15th	Micheal reaction, Scope and application	Lectures
	Micheal reaction, Scope and application (Continued)	
	Prins reaction	
16th	Prins reaction (Continued)	Lectures
	Wurts reaction Detailed theory and mechanism	
	Aldol Condensation	
17th	Aldol Condensation application: Robinson Annulation	Lectures
	Hinsberg reaction	
	Three steps synthesis involving the above name reactions	
18th	Four step synthesis involving the above name reactions Presentations	Presentations
19th	Terminal Exams	Terminal Exams

Signature of Course Instructor: …… Chairperson……...

CHEMISTRY OF HETEROCYCLIC COMPOUNDS

Course Title	Chemistry of heterocyclic compounds
Course code	CHM-6735
Credit hrs.	3(3-0)
Class	BS.7th
Course Instructor	Fazia Sher
Learning Objectives	The overall goal has been to provide students with a solid,compact introduction to the field of chemistry of heterocyclic compounds.
Contents	Introduction.,Nomenclature.' Synthesis and chemistry of upto six membered heterocycles,containing one heteroatom like nitrogen ,oxygen and sulphur.
Suggested Readings/Refrence Book	Young,D.W., *Heterocyclic chemistry*, Palmer,M.H., *Chemistry of Heterocyclic Compounds*,Edward Arnold Publishers,London,1967.

Signature of course Instructor:_____ **Chairperson:_____**

Detailed Course Breakup

Programme	Bs.7th
Course Title	Chemistry of Heterocyclic compounds
Course Code	CHM-6735
Credit hrs.	3(3-0)
No.of week	19
Total No.of Lectures	48
Course instructor	Fazia Sher

Details of Lecture/activities

Weeks	Topic of lecture	
1st	Introduction to Heterocyclic compounds	Lectures
	Classification of heterocyclic compound, homocylic and heterocylic	
	Aromatic heterocyclic compounds,non aromatic Heterocylic compounds	
2nd	Classification on the basis of rings	Lectures
	Hantzsch-widman nomenclature for 3,4 membed ring containg one heteroatom	
	Hantzsch-widman nomenclature for 5,6 membed ring containing one heteroatom	
3rd	Hantzsch-widman nomenclature for 5,6 membed ring containing more than one heteroatom and priority ordre	Lectures &Assignment #1
	Introduction of furan,it's chemistry	
	Resonating structur of furan,synthesis of furan from pentose sugar with mechanism	
4th	Paal knoor synthesis of furan with mechanism	Lectures
	synthesis of furan from ethyl acetoacetate with mechanism	
	Electrophilc substitution rxn. of furan,sulphonation,nitration with mechanism	
5th	Quiz #1	Quiz #1
	Introduction,structre and chemisty of pyrrole	Lectures
	Resonating structure of pyrrole, aromaticity of pyrrole	Lectures
6th	Comparing Reactivity & basicity of pyrrole with 5 membered heterocyclic compound	Lectures
	Paal knorr synthesis of pyrrole with mechanism	
	Synthesis of pyrrole from furan and acetylene with mechanism	
7th	Synthesis of pyrrole from succinamide with mechanism	Lectures
	Electrophilic substitution rxn.of pyrrole.sulphonation,nitration,halogenation with mechanism	
	Friedal craft alkylation,acylation of pyrrole mechanism	
8th	Mid Term	Mid Term
	Synthesis of Quinoline	
	Reactions of Quinoline	
9th	Introduction,structre and chemistry of Thiophene	Lectures
	resosonating structure of pyrrole, aromaticity of thiophene	

	Pall knorr synthesis of thiophene with mechanism	
10th	Synthesis of Thiophene	Lectures
	Electrophilic substitution rxn,of thiophene,sulphonation,nitration,friedal craft alkylation,acylation.	
	Reduction rxn.of thiophene with mechanism	
11th	Diels elder rxn., diazo coupling and carbine rxn.of thiophene with mechanism	Lecture
	Quiz#2	Quiz#2
	Resonating structure ,reactivity basicity of oxazole	Lecture
12th	Robinson gabrial Synthesis of of oxazole with mechanism	Lectures
	Fisher oxazole synthesis with mechanism	
	Reactions of oxazole	
13th	Introduction and chemistry of pyrimidine	Lectures &Assignment#2
	Synthesis of pyrimidine from malonic esters(1,3-dicarbonyl compound)with mechanism	
	Synthesis of pyrimidine from alkyl pyrimidine mechanism	
14th	Electrophilic substitution rxn.of pyrimidine,	Lectures
	Introduction and chemistry of pyridine	
	Resonating structure and properties and reactivity of pyridine	
15th	Hantsch pyridine synthesis mechanism	Lectures
	Synthesis of pyridine from acetylene and HCN mechanism	
	Synthesis of pyridine from Aerolein mechanism	
16th	Electrophilic substitution rxn. of pyridine	Lectures
	Introduction and chemistry of pyrazole	
	Resonating structure and reactivity of pyrazole	
17th	Synthesis of pyrazole from pyrimidine mechanism,from nitrile imine mechanism	Lectures
	Paal knoor synthesis mechanism of pyrazole,	
	Electrophilic substitution rxn.of pyrazole	
18th	Presentations	Presentations
19th	Terminal Exams	Terminal Exams

Signature of Teacher:_____ **Chairman_____**

Course Title	**Organic Synthesis I**	
Course Code	CHM-6736	
Credit hrs.	3(3-0)	
Class	BS	Semester: Fall 2023
Course Instructor	Dr. Naveed Iqbal	
Learning Objectives	The aim of this course is to learn how to employ intermediates, protecting groups and rearrangements in designing organic synthesis.	
Contents	Reactive intermediates Study of carbenes, nitrenes and benzynes with respect to their structure generation, important reactions and synthetic applications. Introduction to Protecting groups Introduction conditions and requirements of a good protecting group Protection of hydroxyl, Amino, Aldehyde and Carboxylic acid. Molecular Rearrangements Introduction to basic concepts; study of following rearrangements: C-C: Wagner-Meerwein rearrangement; pinacol-pinacolone rearrangement; Favorskii rearrangement; benzillic acid rearrangement; benzidine rearrangement. C-N: Hoffmann rearrangement; Beckmann rearrangement; Curtius rearrangement; Losen rearrangement; Wolf rearrangement; Schmidt rearrangement. C-O: Baeyer-Villiger rearrangement; dienone- phenol rearrangement; Dakin rearrangement; cumene-hydroperoxide rearrangement.	
Suggested Readings/Reference Book	March, J., *Advanced Organic Chemistry,* 4th Ed., John Wiley & Sons, New York, 1992. 2. Norman, R.O.C., and Coxon, J.M., *Principles of Organic Synthesis,* 3rd Ed., Blackie Academic and Professional, London, 1993. 3. Warren, S., *Organic Synthesis, The Disconnection Approach*, John Wiley & Sons, Chichester, 1992. 4. Finar, I.L., *Organic Chemistry,* 6th Ed., Vol. 1 & 2, Longman, London, 1973.	

Detailed Course Breakup

Programme	BS 7th semester		
Semester	Fall-2023		
Course Title	Organic Synthesis I		
Course Code	CHM-6736	Credit hrs.	3(3-0)
Course Instructor	Naveed Iqbal		
No. of week	19		

COURSE BREAKUP

Weeks	Topic of Lecture	Activity
1st	Brief Overview of Reactive intermediates:	Lectures
	Carbocations their structural properties briefly	
	Carbanions and Free radicals	
2nd	Carbenes, Structure and States of Carbenes	Lectures
	Generation of Carbenes	
	Generation of Carbenes (Continued)	
3rd	Reactions of Singlet Carbenes; Addition reaction	Lectures & Assignment # 1
	Reactions of Triplet Carbenes; Addition reaction	
	Insertion reaction of Carbenes Singlet and Triplet	
4th	Proof of decomposition of alkyl carbenes	Lectures
	Reimer Tiemann Reaction	
	Simmon Smith Reaction	
5th	Nitrenes: Structure and States	Lectures
	Generation of Nitrenes	
	Quiz 1	Quiz # 1
6th	Generation of Nitrenes (Continued)	Lectures
	Reactions of Singlet and Triplet Nitrenes with alkanes	
	Reactions of Nitrenes with alkenes	
7th	Reactions of Nitrenes with alkenes in innert solevents such as fluoro-alkanes.	Lectures
	Capturing of carbenes and nitrenes as a proof of their existence	
	Multistep synthesis reactions involving carbenes and nitrenes.	
8th	Mid term Exams	Mid Term Exams
	Benzyne Structure and its generation	Lectures
	Selectivity in Benzyne formation: Functional groups effecting Benzyne formation	
9th	Selectivity in Benzyne formation: Functional groups effecting Benzyne formation (Continued)	Lectures

	Reactions of Benzynes: general reactions	
	Reactions of Benzynes (Continued)	
10th	Introduction to protecting groups	Lectures
	Protecting groups for Alcohols	
	Protecting groups for Alcohols (Continued)	
11th	Selective De-protection of Alcohols and phenols	Lectures & Assignment#2
	Protecting groups from amines	
	Protecting groups from amines (Continued)	
12th	Protecting groups for Aldehydes and ketones	Lectures
	Protecting groups for Aldehydes and ketones (Continued)	
	Protecting groups for carboxylic acids	
13th	Protecting groups for carboxylic acids (Continued)	Quiz#2 & Lectures
	Carbon-carbon rearrangement introduction: Wagner-Meerwein And Pinacol rearrangement	
	C-O rearrangement: Baeyer-Villiger rearrangement.	
14th	Dienone- phenol rearrangement	Lectures
	Dakin rearrangement cumene-hydroperoxide rearrangement	
	Practical Applications of C-N Rearrangements reactions.	
15th	Bezidine Rearrangement & Favorskii rearrangement	Lectures
	Presentation	
	Favorskii rearrangement (Continued)	
16th	benzillic acid rearrangement;	Lectures
	benzidine rearrangement.	
	Protecting groups for alcohols	
17th	TBDMS protecting group	Lectures
	Hoffmann and Lossen rearrangement;	
	Beckmann and rearrangement;	
18th	Curtius rearrangement and Schmidt	Presentations
19th	Terminal Exams	Terminal Exams

Signature of Course Instructor: …… Chairperson……...

Biochemistry section

University of Poonch Rawalakot

Faculty of Basic and Applied Sciences

Department of Chemistry

Course Title	**Body organs' structure and physiology**
Course Code	**CHM-6746**
Credit hrs.	**3(3-0)**
Learning Objectives	❖ To acquaint students with the chemistry and Structure of body organ ❖ Students able to know about functions of different body organ
Contents	**Theory** Structure and function of liver, lungs, pancrease, kidney, heart, skeletal muscles and adipose tissues. Blood and other body fluids. General composition of blood, function of blood, blood plasma, plasma protein, composition and functions. Composition, development and functions of red blood cells, white blood cells and platelets. Haemoglobin, chemistry, properties, synthesis, functions and derivatives. Coagulation and clotting of blood. Blood pressure. Blood groups. Composition of urine, extra celluar fluids like cerebrospinal fluid.
Suggested Readings/Reference Book	1.Guyton and Hall, "Text Book of Biochemistry", Barcourt Brace Asia, 1998. 2. M. Gerhard, W. H. Sinnons, " Principles of Medical Biochemistry", 2nd Ed., Mosby, N. Y., 2006. 3. R. R. Seeley, D. Trent, "Anatomy and Physiology", 4th Ed., Mosby-Year Book, Inc., USA., 1998. 4. J. W. Hole, "Essential of Human Anatomy Physiology", 4th Ed., Collin. H. Wheatley. Win. C. Brown Publishers, USA., 1992. 5. Hoffbrand, "Essential Haematology" 5th Ed., 2006.

Instructor Name: Nahida Farooq Khan

Signature of Teacher: Nahida Farooq Khan Chairman"_____

[Course Breakup]

Programme	B.S		
Semester	7th		
Course Title	Body organs' structure and physiology		
Course Code	CHM-6746	Credit hrs.	3(3-0)
Course Instructor	Nahida Farooq Khan		
No. of week	19th		
Total No. of Lectures	48		
Course Instructor	Nahida Farooq Khan		

Details of lecture/Activities

Weeks	**Topic of Lecture**	Activity
1st	Structure and function of liver	
	Structure and function of liver	
	Structure and function of liver	
2nd	Structure and function of lungs	Assignment
	Structure and function of lungs	
	Structure and function of pancrease	
3rd	Structure and function of pancrease	
	Structure and function of kidney	
	Structure and function of kidney	
4th	Structure and function of kidney	
	Structure and function of heart	
	Structure and function of heart	
5th	Structure and function of heart	Quize
	Structure and function of skeletal muscles	
	Structure and function of skeletal muscles	
6th	Structure and function of adipose tissues.	
	Structure and function of adipose tissues.	
	Structure and function of Blood and other body fluids.	
7th	Structure and function of Blood and other body fluids.	
	General composition of blood	
	General composition of blood	
8th	Function of blood	Mid
	Composition and function of blood plasma	
	Composition and function of blood plasma	
9th	Composition and function of plasma protein	
	Composition and function of plasma protein	
	Composition, development and functions of red blood cells	
10th	Composition, development and functions of red blood cells	

	Composition, development and functions of white blood cells	
	Composition, development and functions of white blood cells	
11st	Composition, development and functions of platelets	
	Composition, development and functions of platelets	
	Haemoglobin, chemistry, properties, synthesis, functions and derivatives.	
12nd	Haemoglobin, chemistry, properties, synthesis, functions and derivatives.	
	Haemoglobin, chemistry, properties, synthesis, functions and derivatives.	
	Haemoglobin, chemistry, properties, synthesis, functions and derivatives.	
13rd	Coagulation and clotting of blood.	Assignment
	Coagulation and clotting of blood.	
	Blood pressure	
14th	Blood pressure	
	Blood groups.	
	Blood groups.	
15th	Composition of urine	Quiz
	Composition of extra celluar fluids like cerebrospinal fluid.	
	Composition extra celluar fluids like cerebrospinal fluid.	
16th	Composition, development and functions of platelets Continue Continue	
17th	Presentation	
18th	Presentation	
19th	Terminal exams	

Signature of Teacher: Nahida Farooq Khan Chairman:_____

University of Poonch Rawalakot

Faculty of Basic and Applied Sciences

Department of Chemistry

Instructor Name: Summyia Khalid

Course Title	Biochemical Techniques
Course Code	**CHM-6747**
Credit hrs.	**3(3-0)**
Learning Objectives	❖ To acquaint students with the different techniques ❖ Students able to know about functioning of different techniques
Contents	**Theory** **Extraction, Fractions and purification of macromolecules** Homogenization, solubilization and concentration including ultrasonication, lyphilization, ultradecantation, **purification based on differential solubility techniques**. Ion-exchange chromatography, Gel chromatography, Affinity chromatography. Paper and thin layer chromatography and HPLC. Electrophoresis:Paper and gel electrophoresis. SDS-PAGE, IEF,Two-dimensional electrophoresis. Capillary electrophoresis. **Centrifugation:** Principle, preparative centrifugation. Application of density gradient and different centrifugation. Ultracentrifugation. Sedimentation equilibrium and sedimentation velocity methods applications of analytical centrifugation. **Tracer Techniques**: Detection and measurement of radioactivity, Application of radioisotopes in biological system **UV & Visible spectroscopy**: Basic principle, instrumentation and application

Suggested Readings/Reference Book	1. The tools of Biochemistry by Cooper 2. Principles and techniques of practical Biochemistry by William Edward and Arnold 3. Qualitative problems in Biochemistry by Dawas 4. A Biologist's Physical chemistry by J. Gareth Morris 5. Protein purification, principle and practice by Robert. K. Scope

Signature of Teacher: Summyia Khalid Chairman"_____

[Course Breakup]

Programme	B.S		
Semester	7th		
Course Title	Biochemical Techniques		
Course Code	CHM-6747	Credit hrs.	3(3-0)
No. of weeks	19		
Total No. of Lectures	48		
Course Instructor	Summyia Khalid		

Details of lecture/Activities

Weeks	**Topic of Lecture**	Activity
1st	Homogenization	
	solubilization	
	Ultrasonication	
2nd	Lyphilization	
	ultradecantation	
	purification based on differential solubility techniques	
3rd	Paper Electropheresis	
	Gel electropheresis	
	SDS PAGE	
4th	IEF	
	IEF	
	2 D dimensional electropheresis	
5th	2 D dimensional electropheresis	Quiz 01
	Capillary electrophoresis	
	Capillary electrophoresis	
6th	Paper chromatography	
	thin layer chromatography	
	Column chromatography	
7th	Column chromatography	Assignment 01
	Gel chromatography	
	Gel chromatography	
8th	Ion-exchange chromatography	Mid term exam
	Ion-exchange chromatography	
	Affinity chromatography	
	Affinity chromatography	

9th		
	HPLC	
	HPLC	
10th	Principle of centrifugation	
	Analytical centrifugation	
	Preparative centrifugation	
	Density gradient	
11th	Differential centrifugation	
	Application of density gradient and different centrifugation.	
12th	. Ultracentrifugation.	
	Sedimentation equilibrium	
	sedimentation velocity methods	
13th	Applications of analytical centrifugation	Assignment 02
	Tracer Techniques: Detection and measurement of radioactivity	
	Detection and measurement of radioactivity	
14th	Detection and measurement of radioactivity	Quiz 02
	Detection and measurement of radioactivity	
	Application of radioisotopes in biological system	
15th	Application of radioisotopes in biological system	
	Basic principle of UV & visible spectroscopy	
	Instrumentation of UV & visible spectroscopy	
16th,	Instrumentation of UV & visible spectroscopy	
	Application of UV & visible spectroscopy	
	Application of UV & visible spectroscopy	
	Presentation	
17th , 18th	Presentation	
19th	Terminal exam	

Signature of Teacher:_____ Chairman:

University of Poonch Rawalakot

Faculty of Basic and Applied Sciences

Department of Chemistry

Instructor Name: Summyia Khalid

Course Title	**Molecular Biology**
Course Code	**CHM-6748**
Credit hrs.	**3(3-0)**
Learning Objectives	❖ To acquaint students with the chemistry and biology of macromolecules. ❖ Students able to know about reason of different genetic diseases
Contents	**Theory** DNA, the primary genetic material. Structure, replication in prokaryotes and comparison with eukaryotes. DNA sequencing. Chemical synthesis of polynucleotides. DNA repair and recombination. Control dogma of molecular biology. Different types of RNA and their role in protein synthesis. Transcription and its regulation. Lacoperon model Genetic code, post transcriptional processing, structure of transfer RNA. Protein synthesis inhibitor. Post translational modification. Plasmids, vector and cosmids. In virto mutagenesis: deletion, insertion and substitution. Recombination DNA and genetic diseases.
Suggested Readings/Reference Book	1. Griffiths, J. F. Anthony. et. al ., " Modern genetic analysis: integrating genes and genomes", 2nd Ed., W. H. freeman, New York, 2002. 2. G. Karp, "Cell and Molecular Biology: Concepts & Experiments", 3rd Ed., John Willey Sons, Inc., N.Y., 2002. 3. F. Weaver, F. Robert F, "Molecular biology", Mc Graw-Hill, Boston, 1999. 4. Garrett, H. Reginald, M. Charles, "Molecular aspects of cell biology", Saunders College Publishing, Fort Worth, 1995. 5. T. Strachen, A. P. Read, "Human Molecular Genetics", 2nd Ed., BIOS Scientific Publications Ltd., 2000.

Signature of Teacher: Summyia Khalid Chairman"_____

Course Breakup]

Programme	B.S		
Semester	7th		
Course Title	Molecular Biology		
Course Code	CHM-6748	Credit hrs.	3(3-0)
Course Instructor	Summyia Khalid		
No. of week	19th		
Total No. of Lectures	48		
Course Instructor	Summyia Khalid		

Details of lecture/Activities

Weeks	**Topic of Lecture**	Activity
1st	DNA, the primary genetic material	
	DNA, the primary genetic material. Structure	
	Replication in prokaryotes	
2nd	Replication in eukaryotes.	Assignment
	Replication in Linear Chromosomes	
	DNA sequencing.	
3rd	Chemical synthesis of polynucleotides.	
	DNA repair	
	DNA recombination	
4th	Control dogma of molecular biology.	
	Different types of RNA and their role in protein synthesis.	
	Different types of RNA and their role in protein synthesis.	
5th	Different types of RNA and their role in protein synthesis	Quize
	Transcription in prokaryotes	
	Transcription in Eukaryotes	
6th	Regulation of Transcription	
	Post transcriptional processing	
	Recombination DNA	
7th	Structure of transfer RNA	
	Structure of transfer RNA	
	In vitro mutagenesis: deletion, insertion and substitution.	
8th	In vitro mutagenesis: deletion, insertion and substitution.	Mid Exams
	Post translational modification	
	Post translational modification	
9th	Translation in Prokaryotes	
	Translation in Eukaryotes	
	Post translational modification	
10th	Protein synthesis inhibitor	
	RNA editing	
	RNA splicing	

11st	Genetic code	
	Wobble hypothesis	
	Protein Targeting	
12nd	Protein Targeting	
	Gene expression intro and Lac operon	
	Gene expression in Prokaryotes	
13rd	Gene expression in Prokaryotes	Assignment
	Gene expression in Eukaryotes	
	Gene expression in Eukaryotes	
14th	Genetic Diseases/ Haemophilia	
	Genetic Diseases/ sickle cell anaemia	
	Genetic Diseases/ cystic fibrosis	
15th	Genetic Disease/ Thalasemia	Quiz
	Genetic Disease/ Diabetes	
	Genetic Disease/cancer	
16th	Vectors	
	Plasmids	
	Cosmid	
17th and 18th	Presentation/ Revision	
19th	Terminal exam	

Signature of Teacher: Summyia Khalid Chairman:_____

University of Poonch Rawalakot

Faculty of Basic and Applied Sciences

Department of Chemistry

Instructor Name: Summyia Khalid

Course Title	**Biochemistry Lab III**
Course Code	**CHM-6748**
Credit hrs.	**3(0-3)**
Learning Objectives	❖ To acquaint students about working of different instruments. ❖ Students able to know about protein, fats and enzymes
Contents	1. Estimation of protein by Kjaldahl's method. 2. Determination of protein by spectrophotometrically. 3. Estimation of creative and creation in different biofluids. 4. Effect of pH, temperature, metal ions and time on enzyme activity and stability. 5. Determination of oils and fats using soxhlet apparatus
Suggested Readings/Reference Book	1. D. T. Plummer, "An Introduction to Practical Biochemistry", Tata Mc Graw-Hill Publishing company Ltd. New Delhi, 1988. 2. G. Rajagopal, S. Ramakrishnan, "Practical Biochemistry for Medical Students", Orient Longman Ltd., Hyderabad, 1983. 3. S. P. Singh, "Manual of Biochemistry", CBS Publishers, New Delhi, 1988. 4. A. L. Lehninger, D. L. Nelson, M. M. Cox, "Principles of Biochemistry", 3rd Ed., Worth Publishers, New York, 2000. 5. G. Zubay, "Biochemistry", W. C. B. Publishers, Toronto, 1998

Signature of Teacher: Summyia Khalid Chairman"____

Dean:_____

Course breakup for BS7th

Programme		BS	
Semester		7th	
Course Title		Biochemistry Lab III	
Course Code	CHM-6760	Credit Hours	3(0-3)
No of week		19	
Total no. of lectures		48	
Course Instructor		Summyia Khalid	

Details of lecture/Activities

Weeks		**Topic of Lecture**	**Activity**
1st	General Lab Rules		
2nd	Estimation of protein by Kjaldahl's method. (Demonstration)		
3rd	Performance		
4th	Determination of protein by spectrophotometrically. (Demonstration)		
5th	Performance		Quiz
6th	Estimation of creative and creation in different biofluids. (Demonstration)		
7th	Performance		
8th	Effect of pH, temperature on enzyme activity and stability. (Demonstration)		
9th	Performance		Mid term exam
10th	Effect of metal ions and time on enzyme activity and stability. (Demonstration)		
11th	Performance		
12th	Determination of oils and fats using soxhlet apparatus. (Demonstration)		
13th	Performance		Assignment
14th	Revision		Quiz
15th	Revision		
16th **17th** **18th**	Revision		
19th	Terminal exam		

Signature of teacher_____ Chairman_____