FACULTY OF SCIENCES

SYLLABUS

FOR

B.Sc. (Hons.) Chemistry

(Semester III-VI)

Session: 2018-19

KHALSA COLLEGE AMRITSAR

(An Autonomous College)

(ii) Subject to change in the syllabi at any time.
Please visit the College website time to time.

SCHEME AND SCHEDULE OF COURSES

Eligibility:-The candidate having passed 10+2 Examination (Medical and Non-Medical) from a recognized board.

Semester-III				
S. No.	**Course No.**	**Course Title**	**Max. marks**	**Hrs.**
1.	CHEM -201	Physical Chemistry-III	50	45
2.	CHEM -202	Inorganic Chemistry-III	50	45
3.	CHEM -203	Organic Chemistry-III	50	45
4.	CHEM -204	Inter Disciplinary Course-I (Psychology)	50	45
5.	CHEM -205	Mathematics-III	50	45
6.	CHEM -206	Physics-III	50	45
7.	CHEM -207	Physics Lab-III	50	45
8.	CHEM -208	Physical Chemistry Lab-I	50	45
9	CHEM -209	*Environment Science-I	Non-Evaluative	30
TOTAL			**400**	**390**

Semester-IV				
S. No.	**Course No.**	**Course Title**	**Max. marks**	**Hrs.**
1.	CHEM -210	Physical Chemistry-IV	50	45
2.	CHEM -211	Inorganic Chemistry-IV	50	45
3.	CHEM -212	Organic Chemistry-IV	50	45
4.	CHEM -213	Mathematics-IV	50	45
5.	CHEM -214	Physics –IV	50	45
6.	CHEM -215	Inter Disciplinary Course-II (Geography)	50	45
7.	CHEM -216	Organic Chemistry Lab-II	50	45
8.	CHEM -217	Physics Lab-IV	50	45
9.	CHEM -218	*Environmental Science-II	Non-Evaluative	30
TOTAL			**400**	**390**

B.Sc. (Hons) Chemistry

Semester-III

B.Sc. (Hons) Chemistry Semester-III

CHEM-201: Physical Chemistry-III

4 Hrs./Week **45 hrs.**

Max. Marks: 40+10(Internal Assessment)

Instructions for paper setters and candidates

I. Examiner will make five sections of paper namely Section-I, II, III, IV and V
II. Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.
III. Section-I will consist of eight short questions carrying 1 Mark each.
IV. Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 8 Marks.
V. The students are required to attempt FIVE questions in all, taking ONE Compulsory question of section-I and one question from each section i.e. II, III, IV and V.

UNIT- I

1. Partial Molar Properties and Fugacity **(5 Hrs.)**

Partial molar properties. Chemical potential of a perfect gas, dependence of chemical potential on temperature and pressure, Gibbs- Duhem equation, real gases, fugacity, its importance and determination, standard state for gases.

2. Thermodynamics of Simple Mixtures **(6 Hrs.)**

Ideal and Non-ideal solutions, Chemical potential of liquids. Raoult's law, Henry's law. Thermodynamic functions for mixing of liquids (ideal solutions only). Mixtures of volatile liquids, vapour pressure diagrams. Lever's rule, distillation diagrams. Real solutions and activities, standard states for solvent and solute.

UNIT-II

3. Surface Chemistry **(11 Hrs.)**

Bulk phases and interfacial region, types of interfaces; Surface tension and interfacial tension. Thermodynamics of surfaces, plane interface, curved interface, Laplace and Kelvin equations, the contact angle, capillary rise and surface tension. Surface tension of solutions, Gibbs adsorption equation and its derivation from thermodynamic considerations. Surfactants, Surface films on liquids. criteria for spreading in liquid-liquid systems. (Wetting as contact angle and capitulary action Phenomenon solid-liquid systems).

UNIT- III

4. Thermodynamics of Electrolytic Solutions **(4 Hrs.)**

Activities of ions in solutions, a model of ions in a solution, qualitative idea of Debye-Huckel theory, ionic strength, mean ionic activity coefficient and the Debye-Huckel limiting law for activity coefficients.

5. Electrochemistry- II **(8 Hrs.)**

Interfacial potential difference, the electrodes, potential at interfaces, electrode potentials, galvanic cells, emf, direction of spontaneous reactions. Concentration dependence of emf, equilibrium Constant from

electrode potential, standard electrode potentials and their determination. Measuring activity co-efficient, thermodynamic data from cell emf. The temperature dependence of emf. Applications of emf. Measurements – solubility product, potentiometric titrations, pK and pH measurements of pK and pH. Acid-base titrations. Concentration cells with & without transference

UNIT-IV

6. Colligative Properties **(4 Hrs.)**

Solutions of non-volatile solutes: colligative properties, elevation in boiling point, depression in freezing point, osmosis and osmotic pressure

7. Chemical Kinetics **(7 Hrs.)**

Rate of reaction, rate constant and rate laws, the order of reaction, first, second & third and zero order reactions, half-lives; determination of reaction order. Temperature dependence of reaction rates, reaction mechanism, rate-determining step approximation, steady-state approximation. From rate-law to mechanism, unimolecular reactions, bimolecular reactions.Kinetics of Complex reactions : Reversible first order reactions, consecutive first order reactions, parallel first order reactions, Chain reactions, Explosive/branched chain reactions, catalysis, homogeneous catalysis, autocatalysis, oscillation reactions, bistability. Enzyme catalysis, heterogeneous catalysis.

Suggested Books

ESSENTIAL:

1. Atkins P.W., Physical Chemistry, 7th Edition, Pubs: Oxford University Press (2002).
2. Lavine I. N., Physical Chemistry, 3rd Edition, Pubs: Pearson Eductaion (1988).
3. Adamson A.W., Physical Chemistry of Surfaces, Pubs: John Wiley & Sons (1982)

FURTHER READING:

1. Castellan G.W., Physical Chemistry, 3rd Edn., Pubs: Addison Wisley/Narosa (1985) (Indian Print).
2. Barrow G. M., Physical Chemistry, 6th Edn., Pubs: McGraw Hill, New York (1996).

B.Sc. (Hons) Chemistry Semester-III

CHEM-202: Inorganic Chemistry-III

4 Hrs./Week **45 hrs.**

Max. Marks: 40+10(Internal Assessment)

Instructions for paper setters and candidates

I. Examiner will make five sections of paper namely Section-I, II, III, IV and V
II. Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.
III. Section-I will consist of eight short questions carrying 1 Mark each.
IV. Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 8 Marks.
V. The students are required to attempt FIVE questions in all, taking ONE Compulsory question of section-I and one question from each section i.e. II, III, IV and V.

UNIT-I

1. Chemistry of d-Block Elements: **(2 Hrs.)**

Position in periodic Table, electronic configuration, variation in size, ionization energy, magnetic behavior and Complex formation.

2. General Chemistry of 1st row d-block elements: **(10 Hrs.)**

The Chemistry of Ti and V complexes: Solution Chemistry and complexes of Ti(III), Chemistry of vanadium (V) with emphasis on structure and formation of vanadates. Chemistry of vanadium(IV).

Cr and Mn: Oxidation states and complexes:Isolation of Cr from its chromite ore. Chemistry of Chromium(II); binuclear compounds, Chemistry of Cr(III) complexes; The Chemistry of Cr(VI) chromates, dichromates and peroxo complexes of Cr(IV), Cr(V). Chemistry of Mn(II) and Mn(III) complexes.

Fe and Co, chemistry and complexes: Aqueous and coordination chemistry of Fe(III). Mixed valence compounds of iron. Chemistry of complexes of Co(II) and Co(III). Oxidation of Co(II) by molecular oxygen.

Ni and Cu complexes: Stereochemistry of Ni (II) tetrahedral, square planar, octahedral and five coordinated derivatives. Anomalous structural properties of Ni(II) complexes. Chemistry of Cu(I) compounds and complexes. Stereochemistry of Cu(II) complexes.

UNIT-II

3. Chemistry of 2nd and 3rd row d-block elements: (6 Hrs.)

Comparison of the chemistry of elements of second and third row series with that of elements of the first transition series. Aqueous chemistry of Zr(IV). Zirconium clusters, Chemistry of Nb(V), Dinitrogen complexes of Molybdenun. Mo-Mo and Re-Re quadrupole bonds. Chemistry of complexes of Rh(III), Pt(II) and Pd(II).

4. Non-aqueous Solvents 5 Hrs.

Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.

UNIT-III

5. Chemistry of f-block elements: (11 Hrs.)

Chemistry of Lanthanide Elements, Electronic structure, oxidation states and ionic radii and lanthanide contraction. Electronic absorption and magnetic properties of lanthanides, comparison with transition elements, Chemistry of Thorium and Uranium, their separation from one another, Lanthanide chelates.

Chemistry of Actinides General features and chemistry of actinides, similarities between the later actinides and the later lanthanides. Electronic and magnetic properties of actinides and their general comparison with the lanthanide elements

UNIT-IV

6. Basic Coordination Chemistry (11 Hrs.)

Werner's theory, nomenclature of coordination complexes, chelating agents, metal chelates and chelate effect, names and abbreviations of important ligands, polydentate ligands, polypyrazolyborates , macrocyclic ligands, macrocyclic effect, ketoenolates, tripod ligands, conformation of chelate rings, streochemistry of coordination numbers 2 –12, factors determining kinetic and thermodynamic stability.

Books Recommended

J.E. Huheey, E.A. Keiter, R.L. Keiter, Inorganic Chemistry, 4th Ed, Pearson Education, Singapore, 1999.

J.D.Lee, Concise Inorganic Chemistry, ELBS, Oxford 1994.

Cotton F. A.,Wilkinson G., Murillo C. A., Bochmann M., Advanced Inorg. Chemistry, 6th edn., Pubs: John Wiley India. (2003).

Shriver D. F., Atkins F. W. and Langford C. M., Inorganic Chemistry, 3rd edn., Pubs: Oxford University Press, 1999.

Huheey J. E., Keiter E. A., Keiter R. L., Inorganic Chemistry : Principles of Structure and Reactivity; 4th edn, Pubs: Harper Collins, 1993.

B.Sc. (Hons) Chemistry Semester-III

CHEM-203: Organic Chemistry-III

4 Hrs./Week **45 hrs.**

Max. Marks: 40+10(Internal Assessment)

Instructions for paper setters and candidates

I. Examiner will make five sections of paper namely Section-I, II, III, IV and V
II. Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.
III. Section-I will consist of eight short questions carrying 1 Mark each.
IV. Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 8 Marks.
V. The students are required to attempt FIVE questions in all, taking ONE Compulsory question of section-I and one question from each section i.e. II, III, IV and V.

UNIT-I

1. Organic Compounds of Nitrogen **(8Hrs)**

Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid.

Halonitroarene: reactivity. Structure and nomenclature of amines, physical properties. Stereochemistry of amines.Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase-transfer catalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds nitriles), reductive amination of aldehydic and ketonic compounds. Gabricl-phthalimide reaction, Hoffmann bromamide reaction.

2. Organosulphur Compounds **(4 Hrs.)**

Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine.

UNIT-II

3. Carbohydrates **(11 Hrs.)**

Classification and nomenclature. Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threodiastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters.Determination of ring size of monosaccharides. Cyclic structure of D(+)-glucose. Mechanism of mutarotation.Structures of ribose and deoxyribose.

An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

UNIT-III

4. Amino Acids, Peptides, Proteins and Nucleic Acids (11 Hrs.)

Classification, structure and stereochemistry of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation and reactions of ά-amino acids.

Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis. Structures of peptides and proteins. Levels of protein structure. Protein denaturation.
Nucleic acids : Introduction. Constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical structure of DNA.

UNIT-IV

5. Fats, Oils and Detergents (4 Hrs.)
Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Saponification value, iodine value, acid value. Soaps, synthetic detergents, alkyl and aryl sulphonates.

6. Synthetic Dyes (3 Hrs.)
Colour and constitution (electronic concept). Classification of dyes. Chemistry and synthesis of Methyl orange, Congo red, Malachite green, Crystal violet, Phenolphthalein, Fluorescein, Alizarin and Indigo.

7. Synthetic Polymers (4 Hrs)
Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubbers.

Suggested Books

ESSENTIAL :

1. Morrison R.T. and Boyd P.S., Organic Chemistry, 5thEdn., Pubs: Allyn and Bacon Inc., Boston, 1992.
2. Mukerji S. M., Singh S. P. and Kapoor R. P., Organic Chemistry Vol. I/II, Pubs: Wiley Eastern Ltd., New Delhi, 1985.

FURTHER READING :

1. Wade L.G.Jr., Organic Chemistry, Pubs:Prentice-Hall,1990.
2. Solomons G., Fundamentals of Organic Chemistry, Pubs: John Wiley,2002.
3. Carey F.A., Organic Chemistry, Pubs: McGraw-Hill, Inc, 2003.
   Streitwisser A., Jr. and Heathcock C.H., Introduction to Organic Chemistry, 3rdEdn., Pubs: MacMillan Pub. Co., N.Y,1992.

CHEM-204: Interdisciplinary Course-I (Psychology)

Time: 4 Hours
Max. Marks: 50
Max. Marks: 40+10(Internal Assessment)

Section A: - Ten Questions will be set in Section A .Students are required to Attempt all the questions in about 50 words. Each question carries 2 marks. **10x2=20 Marks**

Section B: - Eight questions will be set. Students are required to attempt any five out of the eight questions in about 100 words. Each question carries 4 marks. **5x4=20 Marks**

UNIT-I

Personality

a. Knowledge of theories of personality(Eysenck, Freud, Erickson and Big Five)
b. Personality tests

Attitudes

a. Knowledge of the nature of attitudes
b. Identify the components of attitudes (cognitive, affective and behavioral)

Motivation

a. Theories of motivation (Maslow and Herzberg)
b. Differentiate between primary and secondary motivation.

UNIT-II

Goal Setting

a. Understanding Goal Setting (Locke's theory)
b. Goal-Setting Principles

Mental Imagery:

a. Understanding the use Working, Impact, Contribution, Structuring of Mental Imagery in Sport
b. Maximizing the value of Mental Imagery

UNIT- III

Confidence

a. Defining confidence (Vealey)
b. Defining and Developing optimistic mind-set
c. Knowledge of self-efficacy (Bandura)

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Concentration

a. Understanding concentration
b. Components, Strategies of concentration

References:-

1. Human motivation by David C. McClelland, Cambridge University Press
2. Psychology of Motivation by Denis Waitley, Nova Publishers.
3. Theories of Personality by Jess Feist, Gregory J Feist, Irwin/McGraw-Hill.
4. Attitudes and attitude change by William D. Crano, RadmilaPrislin, Psychology Press.
5. Attitudes amd attitude change by William D. Crano, RadmilaPrish, Psychology Prsess.
6. Morgan and King: Introduction to Psychology - Tata McGraw Hill.
7. Social Psychology in Sport by Sophia Jowett, David Lavallee, Human Kinetics.

B.Sc. (Hons) Chemistry Semester-III

CHEM-205: Mathematics-III

Time: 4 Hours Max.Marks:40+10(Internal assessment)

Instructions for paper setters and candidates

1. Examiner will make four sections of paper namely Section-I, II, III, IV.
2. Examiner will set total of SIXTEEN questions, FOUR questions for each section from each unit and carrying FIVE marks each.
3. The students are required to attempt EIGHT questions in all, with TWO questions from each section.

UNIT-I

Integral calculus: (8 Hrs)

Double, triple integrals, determination of C.G. using double and triple integrals. Integration by Trapezoidal and Simpson's rule.

UNIT-II

Differential Equations: (15 Hrs)

Ordinary differential equations. Formation of differential equation, solution of linear differential equation of the first order and the first degree. Solution of homogeneous and non homogeneous differential equations with constant coefficient. The chemical application of the first order differential equations.

Series solution of the Legendre differential equations and Legendre Polynomials. Recurrence and orthognality relation, Rodrigue's Formula.

UNIT-III

Partial differential Equations: (7 Hrs)

Formation of Partial differential equations. Solution by Charpit's Method. Solution of homogeneous partial differential equations with constant coefficients.

UNIT-IV

Complex Analysis: (15 Hrs)

De-Moivre's Theorem and its simple applications, Analytic functions, Cauchy-Riemann Equations, Complex Integration, statements of Cauchy's theorem, Cauchy's Integral formula, Morera's theorem, Taylor's Theorem, Laurent's Theorem, Cauchy's residue Theorem and their simple applications.

Books Recommended:

1. B.S. Grewal- Higher Engineering Mathematics
2. Erwin Kreyszig - Higher Engineering Mathematics
3. Joseph B, Dence- Mathematical techniques in Chemistry
4. B.L. Manocha and H.R. Choudhary- A text book of Engineering Mathematics
5. Margenau Murphy- Mathematics for physicists and Chemists

B.Sc. (Hons) Chemistry Semester-III

CHEM-206: Physics-III

ELECTRICITY AND MAGNETISM

Time: 4 Hours **Total Marks:50**

(Max. Marks: 40+Internal Assessment: 10)

Total Lectures: 60 **Pass Marks: 35%**

Instructions for the Paper Setters:

There will be five sections. Section A will consist of Eight Short Answer Type questions covering the whole syllabus and is compulsory. Sections B, C, D and E will consist of two questions each. The candidates are required to attempt one from each Section. All questions carry equal marks.

UNIT-I

Basic Ideas of Vector Calculus, Introduction to gradient, divergence & curl; their physical significance, Gauss's Divergence and Stoke's theorems (Statement only), Electric charge and its properties, Coulomb's law. Principle of superposition. The electric field due to a point charge and continuous charge distributions, Electric field due to finite and infinite lines of charges. Field due to electric dipole, Field lines, flux, Gauss's law and its applications. Curl of electric field. Relation between potential and electric field. Poisson's and Laplace's equations. Electric potential due to different charge distribution: Wire, Ring etc.

UNIT-II

Electric Currents and Fields of Moving Charges Conductors in the electrostatic field, Capacitors, Current and current density, drift velocity, expression for current density vector, Equation of continuity. Ohm's Law and expression for electrical conductivity, limitations of Ohm's law, Dielectrics, Non Polar and Polar Molecules, Polarisation of Dielectric, Polarization Vector 'P', Atomic polarizability, Dielectric Constant

UNIT-III

Magnetic Effect of Electric Current, Direction of Field Lines due to current Flowing in a straight Conductor, Magnetic Field Density, Magnitude of Magnetic Flux, Magnetic and Lorentz Forces, Biot-Savart's Law, Magnetic Field Due to along Straight Conductor, Magnetic Field Intensity at point on the axis of a current loop. Variation of Field along the axis of the coil, Magnetic Field intensity inside a long Solenoid, Ampere's Circuital Law: Line Integral of Magnetic Field,

UNIT-IV

Some Important Terms associated with Magnetic Materials, Torque on current Loop, Magnetic Dipole in a Magnetic Field , Potential Energy of Magnetic Dipole, Force on Magnetic Dipole In Non-Uniform Magnetic Field, Magnetic Dipole Moment of an Atom, Expression of orbital Magnetic dipole moment of Electron, Electron Spin Magnetic Moment , Diamagnetism ,

Langevin's theory of diamagnetic behaviour, Paramagnetism and Langevin's Theory of Paramagnetic Susceptibility, Ferromagnetism, Domain theory of Magnetism,

Reference Books:

1. Electricity & Magnetism-T.S. Bhatia and Gurpreet Singh, Vishal Publishing Co.
2. Introduction to Electrodynamics -D.J. Griffiths, Pearson Prentice Hall, New Delhi.
3. Berkeley Physics Course Vol. II (Electricity & Magnetism)-E.M.Purcell, Mc Graw hill, New York.

B.Sc. (Hons) Chemistry Semester-III

CHEM-207: Physics Lab-III

Time: 4 Hours **Total Marks:50**

General Guidelines for Practical Examination

I. The distribution of marks is as follows: **Marks: 40; Internal Assessment: 10**

i) One experiment **20 Marks**

ii) Brief Theory **5 Marks**

iii) Viva–Voce **10Marks**

iv) Record (Practical file) **5 Marks**

II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. In a single group no experiment be allotted to more than three examinee in any group.

1. To determine low resistance with Carey-Foster's Bridge after calibrating the bridge wire.
2. To determine low resistance with Carey-Foster's Bridge without calibrating the bridge wire.
3. To study the magnetic field produced by a current carrying solenoid using a search coil and calculate permeability of air.
4. To study the induced e.m.f. as a function of the velocity of the magnet.
5. To determine unknown Capacitance by flashing and quenching of a neon lamp.
6. Determination of permittivity of a air and relative permittivity by measuring capacitance using de–Sauty's bridge.
7. To study the variation of magnetic field with distance along the axis of coil carrying current by plotting a graph.
8. To study the working of household energy meter.
9. To determine the heating efficiency of an electric kettle with varying input voltages.

10. To study the resonance in series LCR circuit for different R values and calculate Q value.

11. To determine the magnetic dipole moment of a bar magnet and horizontal intensity of earth's magnetic field using a deflection magnetometer.

12. To measure the charge sensitivity of a moving coil Ballistic galvanometer using a known capacitor.

13. To measure the magnitude and direction of earth's magnetic field using earth inductor.

14. To study the variation of resistance of a filament of a bulb with temperature.

Reference Books :

1. Practical Physics, Volume-I, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications

2. Practical Physics, C. L. Arora, S. Chand & Co.

B.Sc. (Hons) Chemistry Semester-III

CHEM-208: PHYSICAL CHEMISTRY Lab-I

4 Hrs./Week **45 hrs.**

Max. Marks: 40+10(Internal Assessment)

1. Liquids and Solutions

(i) To determine relative viscosities of aqueous solutions of glycerol at different concentrations. Calculate partial molar volume of glycerol at infinite dilution from density measurement.

(ii) To determine viscosity-average molecular weight, number-average molecular weight and mean diameter of polyvinyl alcohol molecule from intrinsic viscosity data.

2. Thermochemistry

(i) To determine heat capacity of a calorimeter and heat of solution of a given solid compound.

(ii) To determine heat of solution of Solid calcium chloride and calculate lattice energy of calcium chloride using Born-Haber cycle.

(iii) To determine heat of hydration of copper sulphate.

3. Distribution Law

To determine distribution (i.e. partition) coefficient of a solute between water and a non-aqueous solvent.

4. Surface Phenomena

To study the adsorption of acetic acid/oxalic acid from aqueous solution on charcoal. Verify Freundlich and langmuir adsorption isotherms.

5. Colorimetery

To verify Lambert-Beer law.

Suggested Books

1. Levitt, B.P., Findlay A Practical Physical Chemistry; 9th edition, Pubs: Longman Group Ltd., London & New York (1978).
2. Khosla, B.D., Garg, V.C., Gulati, A., Senior Practical Physical Chemistry; 11th edition, Pubs: R.Chand & Co., New Delhi (2002).
3. Das, R.C., Behra, B., Experimental Physical Chemistry; Pubs: Tata McGraw Hill Publishing Co. Ltd. (1983).
4. Vogel's Textbook of Quantitative Chemical Analysis (revised by Jeffery, Bassett, Mendham and Denney), 5th Edn., Pubs: ELBS (1989).
5. Svehla G.,Vogel's Qualitative Inorganic Analysis (revise), 6th Edn., Pubs: Orient Longman, New Delhi (1987).
6. Christian G.D., Analytical Chemistry, Pubs: John Wiley & Sons Inc., New York (1994).
7. Fifield F.W. and Kealey D., Principles and Practice of Analytical Chemistry, 5th Edn., Blackwell Science (2000).

B.Sc. (Hons) Chemistry Semester-III

CHEM-209/ESL-221

ENVIRONMENTAL STUDIES–I (COMPULSORY)

Theory Lectures: 1½ Hours/ Week

Section–A: (12 Marks): It will consist of five short answer type questions. Candidates will berequired to attempt three questions, each question carrying four marks. Answer to any of thequestions should not exceed two pages.

Section–B: (16 Marks): It will consist of four essay type questions. Candidates will be requiredto attempt two questions, each question carrying eight marks. Answer to any of the questionsshould not exceed four pages.

Section–C: (12 Marks): It will consist of two questions. Candidate will be required to attemptone question only. Answer to the question should not exceed 5 pages.

1. The Multidisciplinary Nature of Environmental Studies:

- Definition, scope & its importance.
- Need for public awareness.

2. Natural Resources:

- Natural resources and associated problems:

a) Forest Resources: Use of over exploitation, deforestation, case studies. Timber extraction, Mining, dams and their effects on forests and tribal people.

b) Water Resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food Resources: World food problems, change caused by agriculture and overgrazing, effects or modern agriculture, fertilizer-pesticide problem, salinity, case studies.

e) Energy Resources: Growing of energy needs, renewable and non-renewable energy resources, use of alternate energy sources, case studies.

f) Land Recourses: Land as a resource, land degradation, soil erosion and desertification.

□□Role of an individual in conservation of natural resources.

□□Equitable use of resources for sustainable lifestyles.

3. Ecosystem:

□□Concept of an ecosystem.

□□Structure and function of an ecosystem.

□□Producers, consumers and decomposers.

□□Energy flow in the ecosystem.

□□Ecological succession.

□□Food chains, food webs and ecological pyramids.

□□Introduction, types, characteristic features, structure and function of the following ecosystems:

a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

4. Social Issues and Environment:

□□From unsustainable to sustainable development.

□□Urban problems related to energy.

□□Water conservation, rain water harvesting, watershed management.

□□Resettlement and rehabilitation of people; its problems and concerns.Case studies.

□□Environmental ethics: Issues and possible solutions.

□□Climate change, global warning, acid rain, ozone layer depletion, nuclear accidents and holocause. Case studies.

□□Wasteland reclamation.

□□Consumerism and waste products.

□□Environmental Protection Act:

- Air (prevention and Control of Pollution) Act.
- Water (prevention and Control of Pollution) Act.

- Wildlife Protection Act.
- Forest Conservation Act.

Issues involved in enforcement of environmental legislation.

Public awareness.

5. National Service Scheme

- **Introduction and Basic Concepts of NSS:** History, philosophy, aims & objectives of NSS; Emblem, flag, motto, song, badge etc.; Organizational structure, roles and responsibilities of various NSS functionaries.
- **Health, Hygiene & Sanitation:** Definition, needs and scope of health education; Food and Nutrition; Safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan); National Health Programme; Reproductive health.

References/Books:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.

2. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.

3. Down to Earth, Centre for Science and Environment, New Delhi.

4. Jadhav, H. &Bhosale, V. M. 1995. Environmental Protection and Laws.Himalaya Pub.

5. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.

6. Kaushik, A. &Kaushik, C. P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.

7. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.

8. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.

9. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex, Amritsar

10. Kanta, S., 2012. Essentials of Environmental Studies, ABS Publications, Jalandhar.

B.Sc. (Hons) Chemistry

Semester-IV

B.Sc. (Hons) Chemistry Semester-IV

CHEM-210: Physical Chemistry-IV

4 Hrs./Week **45 hrs.**

Max. Marks: 40+10(Internal Assessment)

Instructions for paper setters and candidates

I. Examiner will make five sections of paper namely Section-I, II, III, IV and V
II. Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.
III. Section-I will consist of eight short questions carrying 1 Mark each.
IV. Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 8 Marks.
V. The students are required to attempt FIVE questions in all, taking ONE Compulsory question of section-I and one question from each section i.e. II, III, IV and V.

UNIT-I

1. General features of Spectroscopy (5 hrs.)

Units and conversion factors, Introduction to spectroscopy, Nature of radiation, Energies corresponding to various kinds of radiation, Intensities of spectral lines, selection rules and transition moments, Line widths, Broadening (Book 1)

2. X-ray diffraction (6 Hrs.)

Definition of space lattice, unit cell. Miller indices, Symmetry elements in crystals – X ray diffraction by crystals. Bragg equation. Dimension and contents of unit cell. Structural information from the physical properties of crystals. Neutron and electron diffraction and their applications.

UNIT-II

3. Pure Rotational Spectra (6 Hrs.)

Classification of molecules according to their moment of inertia. Rotational energy levels of hydrogen chloride. Determination of molecular geometry by rotational spectrum, isotopic substitution effects. Stark effect, Estimation of molecular dipole moments, Selection rules, Rotational Raaman Spectra, anisotropic polarizability, specific selection rule in Raman Spectra, Stokes and anti –Stokes lines.

4. Vibrational Spectra (5 Hrs.) **(5 Hrs.)**

Diatomic molecules, Force constants, Fundamental vibration frequencies, anharmonicity of molecular vibrations and its effect on vibrational frequencies, Frequencies of the vibrational transitions of HCl. Vibrational rotation spectra of CO, P,Q and R branches.

UNIT-III

5. Infrared and Raman Spectra (11 Hrs.)

Vibrations of polyatomic molecules. Examples of CO_2, H_2O. Mechanics of measurement of infrared and Raman spectra, absorption of common functional groups, their dependence on chemical environment (bond order, conjugation, H –bonding), Use of group theory to determine the number of active infrared and Raman active lines. Fermi resonance, combination bands and overtones, complications due to interactions of vibrations of similar frequency. Application of IR in structure elucidation, C-H, N-H, O-H vibrations and H-bonding, Far IR region, Metal ligand vibrations, Group frequencies of complex ligands – CN stretching and effect of co-ordination on it. Nitro-nitrito- and C=O ligands and the effect of their co-ordination with metal ions and IR

spectra.

UNIT-IV

6. UV and Visible Spectroscopy (12 Hrs.)

Measurement technique, Beer –Lambert's Law, molar extinction coefficient, and intensity of the electronic transition, Frank Condon Principle, Ground and first excited electronic states of diatomic molecules, relationship of potential energy curves to electronic spectra.

Chromophores, auxochromes, electronic spectra of polyatomic molecules, Woodward rules for conjugated dienes and α, β- unsaturated carbonyl groups, extended conjugated and aromatic sterically hindered systems, red shift, blue shift, hypo and hyperchromic effect.

ESSENTIAL:

1. Atkins P.W., Physical Chemistry, 7th Edition., Pubs: Oxford University Press (2002).
2. Levine I. N., Physical Chemistry, 3rd Edition, Pubs: Pearson Eductaion (1988).
3. Chatwal G. R., anand S.K., Spectroscopy, Himalaya Publishing House (2015)

FURTHER READING

1. Castellan G.W., Physical Chemistry, 3rd Edn., Pubs: Addison Wisley/Narosa (1985) (Indian Print).
2. Barrow G. M., Physical Chemistry, 6th Edn., Pubs: McGraw Hill, New York (1996).

B.Sc. (Hons) Chemistry Semester-IV

CHEM-211: Inorganic Chemistry-IV

4 Hrs./Week **45 hrs.**

Max. Marks: 40+10(Internal Assessment)

Instructions for paper setters and candidates

I. Examiner will make five sections of paper namely Section-I, II, III, IV and V
II. Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.
III. Section-I will consist of eight short questions carrying 1 Mark each.
IV. Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 8 Marks.
V. The students are required to attempt FIVE questions in all, taking ONE Compulsory question of section-I and one question from each section i.e. II, III, IV and V.

UNIT- I

1. Coordination Chemistry: Reactions, Kinetics, and Mechanisms (11 Hrs.)

Substitution in square planar complexes. Rate law for Nucleophillic substitution in a square planar complexes, The trans-effect, its synthetic application, I.D. theories of trans effects, Mechanism for Nucleophillic substitution in a square planar complexes, Themodynamic and Kinetic stability, Kinetics and Mechanism of octahedral substitution, Mechanisms of Redox reactions., electron transfer reactions, mechanism of one electron transfer reactions, outer-sphere type reactions, inner sphere type reactions.

UNIT- II

2. Metal- Ligand Bonding in Transition Metal complexes (5 Hrs.)

Valence bond theory for bonding in coordination compounds; concept of multiple bonding and back bonding, inner and outer orbital complexes, strength and weaknesses of valence bond approach.

3. Magnetic Properties of Transition Metal Complexes (7 Hrs.)

Types of magnetic behavior, methods of determining magnetic susceptibility (Gouy's method and Faraday method), spin-only formula, relationship between magnetic susceptibility and magnetic moment, L-S coupling, correlation of μs and μ_{eff} values, Importance of magnetic susceptibility measurements in structure determination of transition metal compounds, Magnetic exchange coupling and spin crossover. variation of magnetic susceptibility with temperature, temperature independent paramagnetism (TIP).

UNIT-III

4. Symmetry and group theory (Part I) (11 Hrs.)

Symmetry elements and symmetry operations, point groups, definitions of group, subgroup relation between orders of a finite group and its subgroup; group multiplication tables, conjugacy relation and classes. Schoenflies symbols, Representation of groups, character of a representation.

UNIT-IV

5. Symmetry and group theory (Part II) (11 Hrs.)

Properties of irreducible representations, the great orthogonality theorem (without proof) and its importance. Character Tables, Symmetry criteria for optical activity, Symmetry restrictions on dipole moment, Hybridization schemes of orbitals.

Books Recommended

1. Cotton F.A., Wilkinson G.W. and Gaus P.L., Basic Inorganic Chemistry, Pubs: John Wiley & Sons ,1987.
2. Lee J.D., Concise Inorganic Chemistry, 4th edition, Pubs: ELBS,1991.
3. Huheey J.E., Keiter E.A., Keiter R.L., Inorganic Chemistry : Principles of Structures and Reactivity; 4th Edition, Pubs: Harper Collins, 1993.
4. F.A. Cotton, Chemical Application of Group Theory, Wiley Eastern.

B.Sc. (Hons) Chemistry Semester-IV

CHEM-212: Organic Chemistry-IV

Heterocyclic Chemistry

4 Hrs./Week **45 hrs.**

Max. Marks: 40+10(Internal Assessment)

Instructions for paper setters and candidates

I. Examiner will make five sections of paper namely Section-I, II, III, IV and V
II. Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.
III. Section-I will consist of eight short questions carrying 1 Mark each.
IV. Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 8 Marks.
V. The students are required to attempt FIVE questions in all, taking ONE Compulsory question of section-I and one question from each section i.e. II, III, IV and V.

UNIT-I

1. Nomenclature of Heterocycles **(5 Hrs)**

Replacement and systematic nomenclature (Hantzsch-Widman system) for monocyclic, fused and bridged heterocycles.

2. Aromatic Heterocycles **(6 Hrs)**

Aromatic resonance energy, structure of six-membered heteroaromatic systems (pyridine, diazines, pyridones and pyrones), structure of five-membered heteroaromatic systems (pyrrole, thiophene, furan, azoles), bicyclic heteroaromatic compounds. Heteroaromatic reactivity and tautomerism in aromatic heterocycles

UNIT-II

3. Non-aromatic Heterocycles **(7 Hrs)**

Strain bond angle and torsional strains and their consequences in small ring heterocycles. Conformation of six-membered heterocycles with reference to molecular geometry, barrier to ring inversion, pyramidal inversion and 1,3-diaxial interaction.

Stereo-electronic effect, anomeric and related effects. Attractive interactions –hydrogen bonding and intermolecular nucleophilic-electrophilic interactions

4. Heterocyclic Synthesis **(4 Hrs)**

Principles of heterocyclic synthesis involving cyclization and cycloaddition reactions

UNIT-III

5. Small Ring Heterocycles **(4 Hrs)**

Three-membered and four-membered heterocycles-synthesis and reactions of aziridines oxiranes, thiiranes, azetidines, oxetanes and thietanes

6. Benzo-Fused Five-Membered Heterocycles **(3 Hrs)**

Synthesis and reactions including medicinal applications of benzopyrroles, Benzofurans and benzothiophenes

7. Meso-ionic Heterocycles **(4 Hrs)**

General classification, chemistry of some important meso-ionic heterocycles of type-A and B and their applications.

UNIT-IV

8. Six-Membered Heterocycleswith One Heteroatom **(5 Hrs)**

Synthesis and reactions of pyrylium salts and pyrones and their comparison with pyridinium & thiopyrylium salts and pyridones.

Synthesis and reactions of quinolizinium and benzopyrylium salts, coumarins and chromones.

9. Six-Membered Heterocycles with Two or More Heteroatoms **(3 Hrs)**

Synthesis and reactions of diazines, triazines, oxadiazoles and thiadiazoles

10. Purines: Synthesis and Reactions **(4 Hrs)**

Approaches for the construction of purine ring, reactions of purines with electrophilic reagents, with nucleophilic reagents, reactions with bases, reactions of C-metallated purines

Books Suggested:

1. Heterocyclic Chemistry, J.A. Joule, K. Mills and G.F. Smith, 3rd edition, Indian reprint, 2004. Chennai Microprint Pvt. Ltd.
2. Heterocyclic Chemistry, T.L. Gilchrist, Longman Scientific Technical
3. Contemporary Heterocyclic Chemistry, G.R. Newkome and W.W. Paudler, Wiley-Inter Science.
4. An Introduction to Heterocyclic Compounds, R.M. Acheson, John Wiley
5. Comprehensive Heterocyclic Chemistry, A.R. Katritzky and C.W. Rees, eds. Pergamon Press.
6. Heterocyclic Chemistry, A. Paquett

B.Sc. (Hons) Chemistry Semester-IV

CHEM-213 Mathematics-IV

4 Hrs./Week **45 hrs.**

Max. Marks: 40+10(Internal Assessment)

Instructions for paper setters and candidates

1. Examiner will make four sections of paper namely Section-I, II, III, IV.
2. Examiner will set total of SIXTEEN questions, FOUR questions for each section from each unit and carrying FIVE marks each.
3. The students are required to attempt EIGHT questions in all, with TWO questions from each section.

UNIT-I

Vectors Algebra: (9 Hrs)

Definition of vector and scalar, Scalar and vector product of two vectors, Scalar triple product and vector triple product and their applications, Work done by a force, moment of a force about a point.

UNIT-II

Vector calculus: (12 Hrs)

Vector differentiation and integration of vectors, Vectors operators, Gradient, Divergence and curl. Gauss, Stoke and Green's theorem (statements only) and their applications.

UNIT-III

Laplace Transform: (12 Hrs)

Definition of elementary transforms, transforms of integrals and derivatives. Laplace transforms of periodic functions, Inverse Laplace Transform of elementary functions (Linearity property, Method of partial fractions, First Shifting Property). Solutions of ordinary differential equations with constant coefficients and Simultaneous differential equations using Laplace transforms.

UNIT-IV

Fourier series: (12 Hrs)

Periodic functions, Dirichlet Conditions, Fourier Series and Fourier Coefficient, functions having arbitrary period, Sine and Cosine Series, half range expansions, Fourier integral(definitions), Harmonic Analysis.

Books Recommended:

1. B.S. Grewal – Higher Engineering Mathematics.
2. Erwin Kreyszig - Higher Engineering Mathematics.
3. Joseph B, Dence – Mathematical Techniques in Chemistry.
4. B.L. Manocha and H.R. Choudhary- A Text Book of Engineering Mathematics.
5. Margenau Murphy – Mathematics for Physicists and Chemists.\

B.Sc. (Hons) Chemistry Semester-IV

CHEM-214 Physics-IV

Time: 3 Hours

Max. Marks: 40+10(Internal Assessment)

Total Lectures: 60 **Pass Marks: 35%**

Instructions for the Paper Setters:

There will be five sections. Section A will consist of Eight short answer type questions covering the whole syllabus and is compulsory. Sections B, C, D and E will consist of two questions each. The candidates are required to attempt one from each section. All questions carry equal marks.

UNIT–I

Classification of Solids, Space lattice and translation vectors, basis and Crystal structure, Unit cell, Symmetry operations, Two and Three dimensional Bravais lattices, Structure and Characteristics of Cubic Cells, Lattice planes and Miller indices, Density of atoms in a crystal plane, Diamond and NaCl structures.

UNIT–II

Crystal Diffraction: Bragg's law, Experimental methods for crystal structure studies, Laue equations, Reciprocal lattices of SC, BCC and FCC, Brag's law in reciprocal lattice, Brillouin zones and its construction in two and three dimensions, Structure factor and atomic form factor.

UNIT–III

Lattice vibrations, Monoatomic linear chains, Density of modes, Concept of phonons, Scattering of photons by phonons, Specific heat in solids, Einstein and Debye models of specific heat.

UNIT–IV

Free electron model of metals (Drude Lorentz Classical theory), Sommerfeld quantum theory, Fermi energy, Total and Average energy, Density of states, Three dimensional potential well, Fermi Dirac distribution function, Qualitative discussion of the following: Conductivity and its variation with temperature in semiconductors, Fermi levels in intrinsic and extrinsic semiconductors, band gap in semiconductors, pn junction diode and light emitting diode, zener diode as voltage stablizer.

Books Suggested:

1.Condensed Matter Physics by T.S. Bhatia (Vishal Publishing Co.)
2. Condensed Matter Physics by T.S. Bhatia and V.K. Sharma (S.Vikas and Co.))
3. Introduction to Solid State Physics by C. Kittel (Wiley Eastern)
4. Elements of Modern Physics by S.H. Patil (TMGH, 1985).
5. Solid State Physics by R.K. Puri and V. K. Babbar (S.Chand)

B.Sc. (Hons) Chemistry Semester-IV

CHEM-215 (Inter-disciplinary course-II)

Geography

Time:- 4 Hours **Max. Marks: 50**

Theory: 30 Marks

Internal Assessment: 10 Marks

Practical: 10 Marks

Section A: - It will consist of 10 questions from the entire syllabus. All questions are compulsory. Each question will carry one mark; the total weightage being 10 marks.

(10x1=10 Marks)

Section B: - It will consist of 8 short answer questions upto100 words in length. The students will be required to attempt any 5 questions. Each question will carry 4 marks; the total weightage being 20 marks. **(5x4=20 Marks)**

Section C: - There will be a Practical file work.

Part A: Physical Geography

1. **Exploring the Earth:** The shape of the Earth, The Earth's movements, Day and Night, The Earth's Revolution, Dawn and Twilight, Latitude and Longitude, Longitude and Time, Standard Time and Time Zones, The International Date line.
2. **The Earth's Crust:** The Structure of the Earth, Classification of Rocks, (Igneous, Sedimentary and Metamorphic), Types of Mountains, Types of Plateau, Types of Plains.
3. **The Oceans :** The movements of Ocean currents, The Indian Ocean circulation

Part B: Weather, Climate and Vegetation

1. **Weather:** The Difference between Climate and Weather, The Elements of Weather and Climate, Rainfall, Pressure, Temperature and Humidity, Winds, Sunshine.
2. **Climate:** The Atmosphere, Insulation, Elements of Climate and Factors affecting them, Temperature, Factors affecting temperature, Precipitation, Rainfall, Monsoon.
3. **Vegetation:** Climatic Types and Natural vegetation, World Climatic Types.

Part C: Practical Work

1. **Maps:** Physical (India & World), Types of soil (India), Monsoon.
2. **Maps:** Vegetation (India), Rainfall (World & India), Natural calamities (last 6 months) viz. Earthquake, Flood, Cyclone, Tsunami, Land slide.

Prescribed Text:

a. Certificate Physical & Human Geography by G.C. Leong
b. Oxford India Atlas (Latest Edition)
a. Spectrum- Geography & India

B. Sc. (Hons) Chemistry Semester-IV

CHEM-216: ORGANIC CHEMISTRY Lab-II

4 Hrs./Week **45 hrs.**

Max. Marks: 40+10(Internal Assessment)

A. Thin Layer and Column Chromatography

I. Determination of R_f value and purity of organic compounds by use of thin layer chromatography.
II. To analyse the analgesic drug APC by thin layer chromatography.
III. Separation of mixture of *o*-nitroaniline and *p*-nitroaniline by column chromatography.

B. Qualitative Analysis

To perform qualitative analysis of single organic compound (hydrocarbons, aldehydes, ketones, phenols, carboxylic acids/(derivative), amines, amides, nitro compounds and carbohydrates).

I. Test for elements (other than C, H, O).
II. Functional group determination.
III. Melting point, derivative preparation and R_f value determination.

C. Estimation of organic compounds

I. To estimate the strength of given glucose solution (Fehling method).
II. To estimate acid value, iodine value and soaponification value of a given oil.
III. To estimate percentage of sulphur in given organic compound by Messenger's method.

Suggested Books

1. Vogel A.I., Tatchell A.R., Furnis B.S., Hannaford A.J., Smith P.W.G.,Vogel's Text Book of Practical Organic Chemistry,5th Edn.,Pubs: ELBS, 1989.
2. Pavia D.L., Lampanana G.M., Kriz G.S. Jr., Introduction to Organic Laboratory Techniques, 3rd Edn., Pubs: Thomson Brooks/Cole,2005.
3. Mann F.G., Saunders. P.C.,Practical Organic Chemistry,Pubs:Green & Co. Ltd., London, 1978.
4. Bassett, J., Denney, R.C., Jeffery, G.H., Mendham, J., Vogel's Textbook of Quantitative Chemical Analysis (revised); 5th edition, Pubs: Longman Scientific and Technical,1989.

B.Sc. (Hons) Chemistry Semester-IV

CHEM-217: PHYSICS LAB-IV

Time: 4 Hours **Total Marks:50**

General Guidelines for Practical Examination

I. The distribution of marks is as follows: **Marks: 40; Internal Assessment: 10**

i) One experiment **20 Marks**

ii) Brief Theory **5 Marks**

iii) Viva–Voce **10Marks**

iv) Record (Practical file) **5 Marks**

II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. In a single group no experiment be allotted to more than three examinee in any group.

1. Determination of Resistivity and Band Gap of Semiconductors by Four Probe Method at different temperatures.
2. Finding the energy band gap of semiconductor material of a P-N junction of diode.
3. Study of Characteristics of Silicon and Germanium diode.
4. Study of characteristics of Zener diode.
5. Study of characteristics of light emitting diode.
6. To study the stabilization of output voltage of a power supply with Zener diode with variable input voltage and with variable load resistance.
7. To show the variation of resistance of a thermistor with temperature.
8. To trace the B-H curves for different materials using CRO and find the magnetic parameters from these.
9. To determine Hall coefficient by Hall Effect.
10. To determine Stefan's constant using Boltzmann's Law.
11. To study the dielectric constant of various liquids using dipole meter.

Reference Books :

1. Practical Physics Volume-III, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications
2. Practical Physics, C.L. Arora, S. Chand & Co

CHEM-218/ESL-222 ENVIRONMENTAL STUDIES–II (COMPULSORY)

Theory Lectures: 1½ Hours/ Week

Section–A: (12 Marks): It will consist of five short answer type questions. Candidates will berequired to attempt three questions, each question carrying four marks. Answer to any of thequestions should not exceed two pages.

Section–B: (16 Marks): It will consist of four essay type questions. Candidates will be requiredto attempt two questions, each question carrying eight marks. Answer to any of the questionsshould not exceed four pages.

Section–C: (12 Marks): It will consist of two questions. Candidate will be required to attemptone question only. Answer to the question should not exceed 5 pages.

1. Biodiversity and its Conservation:

- Definition: Genetic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of Biodiversity: Consumptive use; productive use, social, ethical, aesthetic and option
- values.
- Biodiversity of global, National and local levels.
- India as mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to Biodiversity: Habitat loss, poaching of wild life, man wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of Biodiversity: In situ and Ex-situ conservation of biodiversity.

2. Environmental Pollution:

□□Definition, causes, effects and control measures of:

a) Air Pollution
b) Water Pollution
c) Soil Pollution
d) Marine Pollution
e) Noise Pollution
f) Thermal Pollution
g) Nuclear Hazards
h) Electronic Waste

□□Solid Waste Management: Causes, effects and control measures of urban and industrial wastes.

□□Role of an individual in prevention of pollution.

□□Pollution case studies.

□□Disaster Management: Floods, Earthquake, Cyclone and Landslides.

3. Human Population and the Environment

□□Population growth, variation among nations.

□□Population explosion-Family welfare programme.

□□Environment and human health.

□□Human rights.

□□Value education.

□□HIV/AIDS.

□□Women and child welfare.

□□Role of information technology in environment and human health.

□□Case studies.

□□Road Safety Rules & Regulations**:** Use of Safety Devices while Driving, Do's and Don'ts while Driving, Role of Citizens or Public Participation, Responsibilities of Public under Motor Vehicle Act, 1988, General Traffic Signs.

□□Accident & First Aid**:** First Aid to Road Accident Victims, Calling Patrolling Police & Ambulance.

4. National Service Scheme:

- **Entrepreneurship Development:** Definition & Meaning; Qualities of good entrepreneur; Steps/ ways in opening an enterprise; Role of financial and support service Institutions.
- **Civil/Self Defense:** Civil defense services, aims and objectives of civil defense; Needs for self-defense training.

5. Field Visits:

- Visit to a local area to document environmental assets–river/forest/grassland/hill/mountain.
- Visit to a local polluted site–Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems–pond, river, hill slopes etc.
- Contribution of the student to NSS/any other social cause for service of society.

Note: In this section the students will be required to visit and write on the environment of an area/ ecosystem/vi1lage industry/disaster/mine/dam/agriculture field/waste management/hospital etc. with its salient features, limitations, their implications and suggestion for improvement.

References/Books:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.
2. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
3. Down to Earth, Centre for Science and Environment, New Delhi.
4. Jadhav, H. &Bhosale, V. M. 1995. Environmental Protection and Laws.Himalaya Pub.
5. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
6. Kaushik, A. &Kaushik, C. P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
7. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.
8. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.

9. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex, Amritsar
10. Kanta, S., 2012. Essentials of Environmental Studies, ABS Publications, Jalandhar.