क्रमांक 538/अका. / 2019                                         रायपुर, दिनांक 22/ 06 / 2019

प्रति,

प्राचार्य / प्राचार्या
संबद्ध समस्त महाविद्यालय
पं. रविशंकर शुक्ल विश्वविद्यालय
रायपुर (छ.ग.)

विषय :–     स्नातक स्तर भाग–एक के पाठ्यक्रम बाबत्।

संदर्भ :–     संयुक्त संचालक, उच्च शिक्षा का पत्र क्रमांक 2456 / 315 / आउशि / सम / 2019,
             दिनांक 16.05.2019

महोदय / महोदया,

विषयांतर्गत् संदर्भित पत्र के माध्यम से प्राप्त स्नातक स्तर भाग–एक के निम्नलिखित कक्षा / विषयों के परिवर्तित / संशोधित पाठ्यक्रम शिक्षा सत्र 2019–20 से प्रभावशील किया जाता है–

| | | |
|---|---|---|
| 1. | बी.ए. | – आधार पाठ्यक्रम–हिन्दी भाषा, राजनीति, अर्थशास्त्र, संगीत, दर्शनशास्त्र, मानवविज्ञान, गणित, इतिहास, हिन्दी साहित्य, समाजशास्त्र, भूगोल, मनोविज्ञान, संस्कृत, सांख्यिकी, प्राचीन भारतीय इतिहास। |
| 2. | बी.कॉम. | – आधार पाठ्यक्रम–हिन्दी भाषा, वाणिज्य। |
| 3. | बी.एस.सी. | – जैविकी, मानवविज्ञान, बायोटेक्नोलॉजी, कम्प्यूटर साइंस, गणित, भौतिकशास्त्र, प्राणीशास्त्र, सूक्ष्मजीव विज्ञान, वनस्पतिशास्त्र, भूविज्ञान, इलेक्ट्रॉनिकी, रसायन, सांख्यिकी, भूगोल, आधार पाठ्यक्रम–हिन्दी भाषा। |
| 4. | बी.एस.सी. (गृह विज्ञान) | – आधार पाठ्यक्रम–हिन्दी भाषा, एवं गृहविज्ञान। |

उपरोक्त विषयों को शिक्षा सत्र 2019–20 से संशोधित रूप में स्नातक स्तर भाग–एक के लिए प्रभावशील किया जाता है, स्नातक स्तर भाग–दो एवं तीन के पाठ्यक्रम यथावत् रहेंगे।

अतः आपसे अनुरोध है कि पाठ्यक्रम परिवर्तन / संशोधन से महाविद्यालय के शिक्षकों एवं छात्र–छात्राओं को अवगत कराने का कष्ट करेंगे।

संलग्न :– उपरोक्तानुसार।

21.06.19
विशेष कर्तव्यस्थ अधिकारी (अका.)
क्रमशः ........2

# संशोधित पाठ्यक्रम

बी.ए. / बी.एस—सी. / बी.कॉम. / बी.एच.एस.—सी.

भाग — एक (आधार पाठ्यक्रम)

प्रश्न पत्र— प्रथम (हिन्दी भाषा)

(पेपर कोड —0101)                                             पूर्णांक— 75

नोट :—

1.  प्रश्न पत्र 75 अंक का होगा।

2.  प्रश्न पत्र अनिवार्य होगा ।

3.  इसके अंक श्रेणी निर्धारण के लिए जोड़े जायेंगे।

4.  प्रत्येक इकाई के अंक समान होंगे।


## पाठ्य विषय :—

### इकाई—1

क. पल्लवन, पत्राचार, अनुवाद, पारिभाषिक शब्दावली एवं हिंदी में पदनाम

ख. ईदगाह (कहानी) — मुंशी प्रेमचंद

### इकाई—2

क. शब्द शुद्धि, वाक्य शुद्धि, शब्द ज्ञान—पर्यायवाची शब्द, विलोम शब्द, अनेकार्थी शब्द, समश्रुत शब्द, अनेक शब्दों के लिए एक शब्द एवं मुहावरे—लोकोक्तियाँ

ख. भारत वंदना (कविता)— सूर्यकान्त त्रिपाठी निराला

### इकाई—3

क. देवनागरी लिपि — नामकरण, स्वरूप एवं देवनागरी लिपि की विशेषताएँ, हिंदी अपठित गद्यांश, संक्षेपण, हिंदी में संक्षिप्तीकरण

ख. भोलाराम का जीव (व्यंग्य) — हरिशंकर परसाई

### इकाई—4

क. कम्प्यूटर का परिचय एवं कम्प्यूटर में हिंदी का अनुप्रयोग

ख. शिकागो से स्वामी विवेकानंद का पत्र

### इकाई—5

क. मानक हिन्दी भाषा का अर्थ, स्वरूप, विशेषताएँ, मानक, उपमानक, अमानक भाषा

ख. सामाजिक गतिशीलता — प्राचीन काल, मध्यकाल, आधुनिक काल

# आधार पाठ्यक्रम

## FOUNDATION COURSE
### PAPER - II
### ENGLISH LANGUAGE (Paper Code-0102)                    M.M. 75

**UNIT-1 Basic Language skills : Grammar and Usage.**

Grammar and Vocabulary based on the prescribed text.

To be assessed by objective / multiple choice tests.

[Grammar - 20 Marks

Vocabulary - 15 Marks]

**UNIT-2 Comprehension of an unseen passage.**                    05

This should imply not only (a) an understanding of the passage in question, but also (b) a grasp of general language skills and issues with reference to words and usage within the passage and (c) the Power of short independent composition based on themes and issues raised in the passage.

To be assessed by both objective multiple choice and short answer type tests.

**UNIT-3 Composition : Paragraph writing**                    10

**UNIT-4 Letter writing (The formal and one Informal)**                    10

Two letters to be attempted of 5 marks each. One formal and one informal.

**UNIT-5 Texts :**                    15

Short prose pieces (Fiction and not fiction) short poems, the pieces should cover a range of authors, subjects and contexts. With poetry if may sometimes be advisable to include pieces from earlier periods, which are often simpler than modern examples. In all cases, the language should be accessible (with a minimum of explanation and reference to standard dictionaries) to the general body of students schooled in the medium of an Indian language.

Students should be able to grasp the contents of each piece; explain specific words, phrases and allusions; and comment on general points of narrative or argument. Formal Principles of Literary criticism should not be taken up at this stage.

To be assessed by five short answers of three marks each.

**BOOKS PRESCRIBED -**

English Language and Indian Culture - Published by M.P. Hindi Granth Academy Bhopal.

# CHEMISTRY

The new curriculam will comprise of Three theory papers of 33, 33 and 34 marks each and practical work of 50 marks. The curricuram is to be completed in 180 working days as per the UGC norms & conforming to the directives of the Govt. of Chhattisgarh.The theory papers are of 60 hrs each duration and the practical work of 180 hrs duration.

# PAPER I

## INORGANIC CHEMISTRY

M.M.33

### UNIT-I

### A. ATOMIC STRUCTURE

Bohr's theory, its limitation and atomic spectrum of hydrogen atom. General idea of de-Broglie matter-waves, Heisenberg uncertainty principle, Schrödinger wave equation, significance of $\Psi$ and $\Psi^2$, radial & angular wave functions and probability distribution curves, quantum numbers, Atomic orbital and shapes of s, p, d orbitals, Aufbau and Pauli exclusion principles, Hund's Multiplicity rule, electronic configuration of the elements.

### B. PERIODIC PROPERTIES

Detailed discussion of the following periodic properties of the elements, with reference to s and p-block. Trends in periodic table and applications in predicting and explaining the chemical behavior.

  a) Atomic and ionic radii,
  b) Ionization enthalpy,
  c) Electron gain enthalpy,
  d) Electronegativity, Pauling's, Mulliken's, Allred Rochow's scales.
  e) Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table.

### UNIT-II

### CHEMICAL BONDING I

**Ionic bond:** Ionic Solids - Ionic structures, radius ratio & co-ordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy Born- Haber cycle, Solvation

energy and solubility of ionic solids, polarising power & polarisabilitry of ions, Fajans rule, Ionic character in covalent compounds: Bond moment and dipole moment, Percentage ionic character from dipole moment and electronegatiity difference, Metallic bond-free electron, Valence bond & band theories.

## UNIT-III
### CHEMICALBONDING II

**Covalent bond**: Lewis structure, Valence bond theory and its limitations, Concept of hybridization, Energetics of hybridization, equivalent and non-equivalent hybrid orbitals. Valence shell electron pair repulsion theory (VSEPR), shapes of the following simple molecules and ions containing lone pairs and bond pairs of electrons: $H_2O$, $NH_3$, $PCl_3$, $PCl_5$, $SF_6$. $H_3O^+$, $SF_4$, $ClF_3$, and $ICl_2^-$ Molecular orbital theory. Bond order and bond strength, Molecular orbital diagrams of diatomic and simple polyatomic molecules $N_2$, $O_2$, $F_2$, CO, NO.

## UNIT-IV
### A. s-BLOCK ELEMENTS
General concepts on group relationships and gradation properties, Comparative study, salient features of hydrides, solvation & complexation tendencies including their function in biosystems and introduction to alkyl & aryls, Derivatives of alkali and alkaline earth metals

### B. p-BLOCK ELEMENTS
General concepts on group relationships and gradation properties. Halides, hydrides, oxides and oxyacids of Boron, Aluminum, Nitrogen and Phosphorus. Boranes, borazines, fullerenes, graphene and silicates, interhalogens and pseudohalogens.

## UNIT-V
### A CHEMISTRY OF NOBLE GASES
Chemical properties of the noble gases, chemistry of xenon, structure, bonding in xenon compounds

### B. THEORETICAL PRINCIPLES IN QUALITATIVE ANALYSIS ($H_2S$ SCHEME)

Basic principles involved in the analysis of cations and anions and solubility products, common ion effect. Principles involved in separation of cations into groups and choice of group reagents. Interfering anions (fluoride, borate, oxalate and phosphate) and need to remove them after Group II.

**REFERENCE BOOKS:**

1. Lee, J. D. Concise Inorganic Chemistry ELBS, 1991.

2. Douglas, B.E. and McDaniel, D.H. Concepts & Models of Inorganic Chemistry Oxford, 1970

3. Atkins, P.W. & Paula, J. Physical Chemistry, 10th Ed., Oxford University Press, 2014.

4. Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications, 1962.

5. Rodger, G.E. Inorganic and Solid State Chemistry, Cengage Learning India Edition, 2002.

6. Puri, B. R., Sharma, L. R. and Kalia, K. C., Principles of Inorganic Chemistry, Milestone Publishers/ Vishal Publishing Co.; 33rd Edition 2016

7. Madan, R. D. Modern Inorganic Chemistry, S Chand Publishing, 1987.

# PAPER: II

## ORGANIC CHEMISTRY

### UNIT-I    BASICS OF ORGANIC CHEMISTRY

Hybridization, Shapes of molecules, Influence of hybridization on bond properties. Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment. Electrophiles and Nucleophiles; Nucleophilicity and basicity; Homolytic and Heterolytic cleavage, Generation, shape and relative stability of Carbocations, Carbanions, Free radicals, Carbenes and Nitrenes. Introduction to types of organic reactions: Addition, Elimination and Substitution reactions.

### UNIT-II    INTRODUCTION TO STEREOCHEMISTRY

Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral-centres, Diastereoisomers, meso compounds, Relative and absolute configuration: Fischer, Newmann and Sawhorse Projection formulae and their interconversions; Erythrose and threose, D/L, d/l system of nomenclature, Cahn-Ingold-Prelog system of nomenclature (C.I.P rules), R/S nomenclature. Geometrical isomerism: cis–trans, syn–anti and E/Z notations.

### UNIT-III    CONFORMATIONAL ANALYSIS OF ALKANES

Conformational analysis of alkanes, ethane, butane, cyclohexane and sugars. Relative stability and Energy diagrams. Types of cycloalkanes and their relative stability, Baeyer strain theory: Theory of strainless rings, Chair, Boat and Twist boat conformation of cyclohexane with energy diagrams; Relative stability of mono-substituted cycloalkanes and disubstituted cyclohexane.

### UNIT-IV    CHEMISTRY OF ALIPHATIC HYDROCARBONS

#### A. Carbon-Carbon sigma (σ) bonds

Chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Wurtz-Fittig Reaction, Free radical substitutions: Halogenation-relative reactivity and selectivity.

#### B. Carbon-Carbon Pi (л) bonds:

Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations.

Reactions of alkenes: Electrophilic additions and mechanisms (Markownikoff/ Anti - Markownikoff addition), mechanism of oxymercuration-demercuration, hydroboration-oxidation, ozonolysis, reduction (catalytic and chemical), syn and anti-hydroxylation (oxidation). 1,2-and 1,4-addition reactions in conjugated dienes and, Diels-Alder reaction; Allylic and benzylic bromination and mechanism, e.g. propene, 1-butene, toluene, ethyl benzene.

Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.

### UNIT-V    AROMATIC HYDROCARBONS

Aromaticity: Hückel's rule, aromatic character of arenes, cyclic carbocations/ carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directive effects of the groups.

### REFERENCE BOOKS:

1.  Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd.(Pearson Education).

2.  Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

3.  Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

4.  Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds, Wiley: London, 1994.

5. Kalsi, P. S. Stereochemistry Conformation and Mechanism, New Age International, 2005.

6. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.

7. Organic Chemistry, Paula Y. Bruice, 2nd Edition, Prentice-Hall, International Edition (1998).

8. A Guide Book of Reaction Mechanism by Peter Sykes.

# PAPER - III

## PHYSICAL CHEMISTRY          M.M.34

### UNIT-I

### MATHEMATICAL CONCEPTS FOR CHEMIST

Basic Mathematical Concepts: Logarithmic relations, curve sketching, linear graphs, Properties of straight line, slope and intercept, Functions, Differentiation of functions, maxima and minima; integrals; ordinary differential equations; vectors and matrices; determinants; Permutation and combination and probability theory, Significant figures and their applications.

### UNIT-II

### GASEOUS STATE CHEMISTRY

Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path; Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Joule Thompson effect, Liquification of Gases.

Behaviour of real gases: Deviations from ideal gas behaviour, compressibility factor $(Z)$, and its variation with pressure and temperature for different gases. Causes of deviation from ideal behaviour. van der Waals equation of state, its derivation and application in explaining real gas behaviour, calculation of Boyle temperature. Isotherms of real gases and their comparison with van der Waals isotherms, continuity of states, critical state, relation between critical constants and van der Waals constants, law of corresponding states.

### UNIT-III

## A. LIQUID STATE CHEMISTRY

Intermolecular forces, magnitude of intermolecular force, structure of liquids, Properties of liquids, viscosity and surface tension.

## B. COLLOIDS and SURFACE CHEMISTRY

Classification, Optical, Kinetic and Electrical Properties of colloids, Coagulation, Hardy Schulze law, flocculation value, Protection, Gold number, Emulsion, micelles and types, Gel, Syneresis and thixotrophy, Application of colloids.

Physical adsorption, chemisorption, adsorption isotherms (Langmuir and Freundlich). Nature of adsorbed state. Qualitative discussion of BET.

## UNIT-IV

### SOLID STATE CHEMISTRY

Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Crystal defects.

## UNIT-V

### A. CHEMICAL KINETICS

Rate of reaction, Factors influencing rate of reaction, rate law, rate constant, Order and molecularity of reactions, rate determining step, Zero, First and Second order reactions, Rate and Rate Law, methods of determining order of reaction, Chain reactions.

Temperature dependence of reaction rate, Arrhenius theory, Physical significance of Activation energy, collision theory, demerits of collision theory, non mathematical concept of transition state theory.

### B. CATALYSIS

Homogeneous and Heterogeneous Catalysis, types of catalyst, characteristic of catalyst, Enzyme catatysed reactions, Micellar catatysed reactions, Industrial applications of Catalysis.

### REFERENCE BOOKS:

1. Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry 10th Ed., Oxford University Press (2014).

2. Ball, D. W. Physical Chemistry Thomson Press, India (2007).

3. Castellan, G. W. Physical Chemistry 4th Ed. Narosa (2004).

4. Mortimer, R. G. Physical Chemistry 3rd Ed. Elsevier: NOIDA, UP (2009).

5. Engel, T. & Reid, P. Physical Chemistry 3rd Ed. Pearson (2013).

6. Puri, B.R., Sharma, L. R. and Pathania, M.S., Principles of Physical Chemistry, Vishal Publishing Co., 47th Ed. (2016).

7. Bahl, A., Bahl, B.S. and Tuli, G.D. Essentials of Physical Chemistry, S Chand Publishers (2010).

8. Rakshit P.C., Physical Chemistry, Sarat Book House Ed. (2014).

9. Singh B., Mathematics for Chemist, Pragati Publications.

# PAPER - IV
# LABOBATORY COURSE

### INORGANIC CHEMISTRY

**A.** Semi-micro qualitative analysis (using $H_2S$ or other methods) of mixtures - not more than four ionic species (two anions and two cations, excluding interfering, insoluble salts) out of the following:

Cations : $NH_4^+$, $Pb^{2+}$, $Bi^{3+}$, $Cu^{2+}$, $Cd^{2+}$, $Fe^{3+}$, $Al^{3+}$, $Co^{2+}$, $Ni^{2+}$, $Mn^{2+}$, $Zn^{2+}$, $Ba^{2+}$, $Sr^{2+}$, $Ca^{2+}$, $Na^+$
Anions : $CO_3^{2-}$, $S^{2-}$, $SO_3^{2-}$, $S_2O_3^{2-}$, $NO_2^-$, $CH_3COO^-$, $Cl^-$, $Br^-$, $I^-$, $NO_3^-$, $SO_4^{2-}$

(Spot tests may be carried out wherever feasible)

### B. Acid-Base Titrations

*   Standardization of sodium hydroxide by oxalic acid solution.
*   Determination of strength of HCl solution using sodium hydroxide as intermediate.
*   Estimation of carbonate and hydroxide present together in mixture.
*   Estimation of carbonate and bicarbonate present together in a mixture.
*   Estimation of free alkali present in different soaps/detergents

### C. Redox Titrations

*   Standardization of $KMnO_4$ by oxalic acid solution.
*   Estimation of Fe(II) using standardized $KMnO_4$ solution.
*   Estimation of oxalic acid and sodium oxalate in a given mixture.
*   Estimation of Fe(II) with $K_2Cr_2O_7$ using internal (diphenylamine, anthranilic acid) and external indicator.

### D. Iodo / Iodimetric Titrations

*   Estimation of Cu(II) and $K_2Cr_2O_7$ using sodium thiosulphate solution iodimetrically.
*   Estimation of (a) arsenite and (b) antimony iodimetrically.

- Estimation of available chlorine in bleaching powder iodometrically.
- Estimation of Copper and Iron in mixture by standard solution of $K_2Cr_2O_7$ using sodium thiosulphate solution as titrants.

## ORGANIC CHEMISTRY

1. Demonstration of laboratory Glasswares and Equipments.
2. Calibration of the thermometer. $80°-82°$ (Naphthalene), $113.5°-114°$ (Acetanilide), $132.5°-133°$ (Urea), $100°$ (Distilled Water).)

3. Purification of organic compounds by crystallization using different solvents.
   - Phthalic acid from hot water (using fluted filter paper and stemless funnel).
   - Acetanilide from boiling water.
   - Naphthalene from ethanol.
   - Benzoic acid from water.
4. Determination of the melting points of organic compounds.

   Naphthalene $80°-82°$, Benzoic acid $121.5°-122°$, Urea $132.5°-133°$ Succinic acid $184.5°-185°$, Cinnamic acid $132.5°-133°$, Salicylic acid $157.5°-158°$, Acetanilide $113.5°-114°$, m-Dinitrobenzene $90°$, p-Dichlorobenzene $52°$, Aspirin $135°$.

5. Effect of impurities on the melting point – mixed melting point of two unknown organic compounds.
   - Urea – Cinnamic acid mixture of various compositions (1:4, 1:1, 4:1).
6. Determination of boiling point of liquid compounds. (boiling point lower than and more than 100 °C by distillation and capillary method).
   - Ethanol $78°$, Cyclohexane $81.4°$, Toluene $110.6°$, Benzene $80°$.
i. Distillation (Demonstration)
   - Simple distillation of ethanol-water mixture using water condenser.
   - Distillation of nitrobenzene and aniline using air condenser.
ii. Sublimation
   - Camphor, Naphthalene, Phthalic acid and Succinic acid.
iii. Decolorisation and crystallization using charcoal.
   - Decolorisation of brown sugar with animal charcoal using gravity filtrations crystallization and decolorisation of impure naphthalene (100 g of naphthalene mixed with 0.3 g of Congo red using 1 g of decolorizing carbon) from ethanol.
7. Qualitative Analysis

Detection of elements (N, S and halogens) and functional groups (Phenolic, Carboxylic, Carbonyl, Esters, Carbohydrates, Amines, Amides, Nitro and Anilide) in simple organic compounds.

## PHYSICAL CHEMISTRY

1. Surface tension measurements.
   - Determine the surface tension by (i) drop number (ii) drop weight method.
   - Surface tension composition curve for a binary liquid mixture.
2. Viscosity measurement using Ostwald's viscometer.
   - Determination of viscosity of aqueous solutions of (i) sugar (ii) ethanol at room temperature.
   - Study of the variation of viscosity of sucrose solution with the concentration of solute.
   - Viscosity Composition curve for a binary liquid mixture.
3. Chemical Kinetics
   - To determine the specific rate of hydrolysis of methyl/ethyl acetate catalysed by hydrogen ions at room temperature.
   - To study the effect of acid strength on the hydrolysis of an ester.
   - To compare the strengths of HCl & $H_2SO_4$ by studying the kinetics of hydrolysis of ethyl acetate.
4. Colloids
   - To prepare colloidal solution of silver nanoparticles (reduction method) and other metal nanoparticles using capping agents.

## Note: Experiments may be added/ deleted subject to availability of time and facilities

## PRACTICAL EXAMINATION

**05 Hrs.**
**M.M. 50**

Three experiments are to be performed

1. Inorganic Mixture Analysis, four radicals two basic & two acid (excluding insoluble, Interfering & combination of acid radicals) OR Two Titrations (Acid-Bases,Redox and Iodo/Iodimetry)

**12 marks**

2. Detection of functional group in the given organic compound and determine its MPt/BPt.

**8 marks**

O R

Crystallization of any one compound as given in the prospectus along with the determination of mixed MPt.

O R

Decolorisation of brown sugar along with sublimation of camphor/ Naphthlene.

3. Any one physical experiment that can be completed in two hours including calculations.

**14 marks**

4. Viva
**10 marks**

5. Sessionals
**06 marks**

In case of Ex-Students two marks will be added to each of the experiments

## REFERENCE TEXT:

1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009.
2. Ahluwalia, V. K., Dhingra, S. and Gulati, A. College practical Chemistry, University Press.
3. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
4. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012)
5. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).
6. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. Experiments in Physical Chemistry 8th Ed.; McGraw-Hill: New York (2003).
7. Halpern, A. M. & McBane, G. C. Experimental Physical Chemistry 3rd Ed.; W.H. Freeman & Co.: New York (2003).

# PHYSICS

## OBJECTIVES OF THE COURSE

The undergraduate training in physics is aimed at providing the necessary inputs so as to set forth the task of bringing about new and innovative ideas/concepts so that the formulated model curricula in physics becomes in tune with the changing scenario and incorporate new and rapid advancements and multi disciplinary skills, societal relevance, global interface, self sustaining and supportive learning.

It is desired that undergraduate i.e. B.Sc. level besides grasping the basic concepts of physics should in addition have broader vision. Therefore, they should be exposed to societal interface of physics and role of physics in the development of technologies.

## EXAMINATION SCHEME:

1. There shall be 2 theory papers of 3 hours duration each and one practical paper of 4 hours duration. Each paper shall carry 50 marks.
2. Numerical problems of at least 30% will compulsorily be asked in each theory paper.
3. In practical paper, each student has to perform two experiments one from each groups as listed in the list of experiments.
4. Practical examination will be of 4 hours duration- one experiment to be completed in 2 hours.

   The distribution practical marks as follows:

   | Experiment | : 15+15=30 |
   |---|---|
   | Viva voce | : 10 |
   | Internal assessment | : 10 |

5. The external examiner should ensure that at least 16 experiments are in working order at the time of examination and submit a certificate to this effect.

# B.Sc. Part-I
## Paper-I
### MECHANICS, OSCILLATIONS AND PROPERTIES OF MATTER
#### (Paper code 0793)

**Unit-1** Cartesian, Cylindrical and Spherical coordinate system, Inertial and non-inertial frames of reference, uniformly rotating frame, Coriolis force and its applications. Motion under a central force, Kepler's laws. Effect of Centrifugal and Coriolis forces due to earth's rotation, Center of mass (C.M.), Lab and C.M. frame of reference, motion of C.M. of system of particles subject to external forces, elastic, and inelastic collisions in one and two dimensions, Scattering angle in the laboratory frame of reference, Conservation of linear and angular momentum, Conservation of energy.

**Unit-2** Rigid body motion, rotational motion, moments of inertia and their products, principal moments & axes, introductory idea of Euler's equations. Potential well and Periodic Oscillations, case of harmonic small oscillations, differential equation and its solution, kinetic and potential energy, examples of simple harmonic oscillations: spring and mass system, simple and compound pendulum, torsional pendulum.

**Unit-3** Bifilar oscillations, Helmholtz resonator, LC circuit, vibrations of a magnet, oscillations of two masses connected by a spring. Superposition of two simple harmonic motions of the same frequency, Lissajous figures, damped harmonic oscillator, case of different frequencies. Power dissipation, quality factor, examples, driven (forced) harmonic oscillator, transient and steady states, power absorption, resonance.

**Unit-4** E as an accelerating field, electron gun, case of discharge tube, linear accelerator, E as deflecting field- CRO sensitivity, Transverse B field, $180°$ deflection, mass spectrograph, curvatures of tracks for energy determination, principle of a cyclotron. Mutually perpendicular E and B fields: velocity selector, its resolution. Parallel E and B fields, positive ray parabolas, discovery of isotopes, elements of mass spectrography, principle of magnetic focusing lens.

**Unit-5** Elasticity: Strain and stress, elastic limit, Hooke's law, Modulus of rigidity, Poisson's ratio, Bulk modulus, relation connecting different elastic- constants, twisting couple of a cylinder (solid and hallow), Bending moment, Cantilever, Young modulus by bending of beam.

Viscosity: Poiseulle's equation of liquid flow through a narrow tube, equations of continuity. Euler's equation, Bernoulli's theorem, viscous fluids, streamline and turbulent flow. Poiseulle's law, Coefficient of viscosity, Stoke's law, Surface tension and molecular interpretation of surface tension, Surface energy, Angle of contact, wetting.

## TEXT AND REFERENCE BOOKS:

1. E M Purcell, Ed Berkely physics course, vol. Mechanics (Mc. Gr. Hill) R P Feynman.
2. R B Lighton and M Sands, the Feynman lectures in physics, vol I (B) publications, Bombay, Delhi, Calcutta, Madras.
3. D P Khandelwal, Oscillations and waves (Himalaya Publishing House Bombay).
4. R. K. Ghosh, The Mathematics of waves and vibrations (Macmillan 1975).
5. J.C. Upadhyaya- Mechanics (Hindi and English Edition.)
6. D.S. Mathur- Mechanics and properties of matter.
7. Brijlal and Subramanium- Oscillations and waves. Resnick and Halliday- Volume I
8. Physics Part –1: Resnick and Halliday.

## Paper-II
## ELECTRICITY, MAGNETISM AND ELECTROMAGNETIC THEORY

**Unit-1** Repeated integrals of a function of more than one variable, definition of a double and triple integral. Gradient of a scalar field and its geometrical interpretation, divergence and curl of a vector field, and their geometrical interpretation, line, surface and volume integrals, flux of a vector field. Gauss's divergence theorem, Green's theorem and Stoke's theorem and their physical significance. Kirchoff's law, Ideal Constant-voltage and Constant-current Sources. Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem and Maximum Power Transfer theorem.

**Unit-2** Coulomb's law in vacuum expressed in Vector forms, calculations of E for simple distributions of charges at rest, dipole and quadrupole fields. Work done on a charge in a electrostatic field expressed as a line integral, conservative nature of the electrostatic field. Relation between Electric potential and Electric field, torque on a dipole in a uniform electric field and its energy, flux of the electric field.
Gauss's law and its application: E due to (1) an Infinite Line of Charge, (2) a Charged Cylindrical Conductor, (3) an Infinite Sheet of Charge and Two Parallel Charged Sheets, capacitors, electrostatic field energy, force per unit area of the surface of a conductor in an electric field, conducting sphere in a uniform electric field.

**Unit-3** Dielectric constant, Polar and Non Polar dielectrics, Dielectrics and Gauss's Law, Dielectric Polarization, Electric Polarization vector P, Electric displacement vector D. Relation between three electric vectors, Dielectric susceptibility and permittivity, Polarizability and mechanism of Polarization, Lorentz local field, Clausius Mossotti equation, Debye equation,

Ferroelectric and Paraelectric dielectrics, Steady current, current density J, non-steady currents and continuity equation, rise and decay of current in LR, CR and LCR circuits, decay constants, AC circuits, complex numbers and their applications in solving AC circuit problems, complex impedance and reactance, series and parallel resonance, Q factor, power consumed by an a AC circuit, power factor.

**Unit-4** Magnetization Current and magnetization vector M, three magnetic vectors and their relationship, Magnetic permeability and susceptibility, Diamagnetic, paramagnetic and ferromagnetic substances. B.H. Curve, cycle of magnetization and hysteresis, Hysteresis loss.

Biot-Savart's Law and its applications: B due to (1) a Straight Current Carrying Conductor and (2) Current Loop. Current Loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole). Ampere's Circuital law (Integral and Differential Forms).

**Unit-5** Electromagnetic induction, Faraday's law, electromotive force, integral and differential forms of Faraday's law Mutual and self inductance, Transformers, energy in a static magnetic field. Maxwell's displacement current, Maxwell's equations, electromagnetic field energy density. The wave equation satisfied by E and B, plane electromagnetic waves in vacuum, Poynting's vector.

## TEXT AND REFERENCE BOOKS:

1. Berkeley Physics Course, Electricity and Magnetism, Ed. E.M. Purcell (Mc Graw - Hill).
2. Halliday and Resnik, Physics, Vol. 2.
3. D J Grifith, Introduction to Electrodynamics (Prentice-Hall of India).
4. Raitz and Milford, Electricity and Magnetism (Addison-Wesley).
5. A S Mahajan and A A Rangwala, Electricity and Magnetism (Tata Mc Graw-hill).
6. A M Portis, Electromagnetic fields.
7. Pugh & Pugh, Principles of Electricity and Magnetism (Addison-Wesley).
8. Panofsky and Phillips, Classical Electricity and Magnetism, (India Book House).
9. S S Atwood, Electricity and Magnetism (Dover).

## PRACTICALS

### Minimum 16 (Eight from each group)

Experiments out of the following or similar experiments of equal standard

**GROUP-A**

1. Study of laws of parallel and perpendicular axes for moment of inertia.
2. Moment of inertia of Fly wheel.
3. Moment of inertia of irregular bodies by inertia table.
4. Study of conservation of momentum in two dimensional oscillations.
5. Study of a compound pendulum.
6. Study of damping of a bar pendulum under various mechanics.
7. Study of oscillations under a bifilar suspension.
8. Study of modulus of rigidity by Maxwell's needle.
9. Determination of Y, k, η by Searl's apparatus.
10. To study the oscillation of a rubber band and hence to draw a potential energy curve from it.
11. Study of oscillation of a mass under different combinations of springs.
12. Study of torsion of wire (static and dynamic method).
13. Poisson's ratio of rubber tube.
14. Study of bending of a cantilever or a beam.
15. Study of flow of liquids through capillaries.
16. Determination of surface tension of a liquid.
17. Study of viscosity of a fluid by different methods.

**GROUP-B**

1. Use of a vibration magnetometer to study a field.
2. Study of magnetic field B due to a current.
3. Measurement of low resistance by Carey-Foster bridge.
4. Measurement of inductance using impedance at different frequencies.
5. Study of decay of currents in LR and RC circuits.
6. Response curve for LCR circuit and response frequency and quality factor.
7. Study of waveforms using cathode-ray oscilloscope.
8. Characteristics of a choke and Measurement of inductance.
9. Study of Lorentz force.
10. Study of discrete and continuous LC transmission line.
11. Elementary FORTRAN programs, Flowcharts and their interpretation.
18. To find the product of two matrices.
19. Numerical solution of equation of motion.
20. To find the roots of quadratic equation.

There shall be three compulsory papers. Each paper of 50 marks is divided into five units and each unit carry equal marks.

# B.Sc. Part-I
# MATHEMATICS
## PAPER - I
## ALGEBRA AND TRIGONOMETRY

**UNIT-I** Elementary operations on matrices. Inverse of a matrix. Linear independence of row and column matrices, Row rank, column rank and rank of a matrix. Equivalence of column and row ranks. Eigenvalues, eigenvectors and the characteristic equations of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix.

**UNIT-II** Application of matrices to a system of linear (both homogeneous and nonhomogeneous) equations. Theorems on consistency of a system of linear equations. Relation between the roots and coefficients of general polynomial equations in one variable. Transformation of equations. Descarte's rule of signs. Solutions of cubic equations (Cardons method), Biquadratic equation.

**UNIT-III** Mappings, Equivalence relations and partitions. Congruence modulo n. Definition of a group with examples and simple properties. Subgroups, generation of groups, cyclic groups, coset decomposition. Lagrange's theorem and its consequences. Fermat's and Euler's theorems. Normal subgroups, Quotient group, Permutation groups. Even and odd permutations. The alternating groups An. Cayley's theorem.

**UNIT-IV** Homomorphism and Isomorphism of groups. The fundamental theorems of homomorphism. Introduction, properties and examples of rings, Subrings, Integral domain and fields Characteristic of a ring and Field.

**TRIGONOMETRY :**
**UNIT-V** De-Moivre's theorem and its applications. Direct and inverse circular and hyperbolic functions. Logarithm of a complex quantity. Expansion of trigonometrical functions. Gregory's series. Summation of series.

**TEXT BOOK :**
1. I.N. Herstein, Topies in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. K.B. Datta, Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd.New Delhi, 2000.
3. Chandrika Prasad, Text-Book on Algebra and Theory of equations, Pothishala Private Ltd., Allahabad.
4. S.L. Loney, Plane Trigonometry Part II, Macmillan and Company, London.

**REFERENCES :**
1. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, First Course in linear Algebra, Wiley Eastern, New Delhi, 1983.
2. P.B. Bhattacharya, S.K.Jain and S.R. Nagpaul, Basic Abstract Algebra (2 edition), Cambridge University Press, Indian Edition, 1997.
3. S.K. Jain, A. Gunawardena and P.B. Bhattacharya, Basic linear Algebra with MATLAB, Key College Publishing (Springer-Verlag), 2001.
4. H.S. Hall and S.R. Knight, Higher Algebra, H.M. Publications, 1994.
5. R.S. Verma and K.S. Shukla, Text Book on Trigonometry, Pothishala Pvt. Ltd., Allahabad.

**DIFFERENTIAL CALCULUS :**
UNIT-I   $\varepsilon - \delta$ definition of the limit of a function. Basic properties of limits. Continuous functions and classification of discontinuties. Differentiability. Successive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansions.

UNIT-II   Asymptotes. Curvature. Tests for concavity and convexity. Points of inflexion. Multiple points. Tracing of curves in cartesian and polar coordinates.

**INTEGRAL CALCULUS:**
UNIT-III   Integration of transcendental functions. Reduction formulae. Definite integrals. Quadrature. Rectification. Volumes and surfaces of solids of revolution.

**ORDINARY DIFFERENTIAL EQUATIONS :**
UNIT-IV   Degree and order of a differential equation. Equations reducible to the linear form. Exact differential equations. First order higher degree equations solvable for x, y, p. Clairaut's form and singular solutions. Geometrical meaning of a differential equation. Orthogonal trajectories. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations.

UNIT-V   Linear differential equations of second order. Transformation of the equation by changing the dependent variable/the independent variable. Method of variation of parameters. Ordinary simultaneous differential equations.

**TEXT BOOK :**
1.   Gorakh Prasad, Differential Calculaus, Pothishala Private Ltd. Allahabad.
2.   Gorakh Prasad, Integral Calculus, Pothishala Private Ltd. Allahabad.
3.   D.A. Murray Introductory Course in Differential Equations, Orient Longman (India), 1976.

**REFERENCES :**
1.   Gabriel Klambauer, Mathematical Analysis, Marcel Dekkar, Inc. New York, 1975.
2.   Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum's outline series, Schaum Publishing Co. New York.
3.   N. Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow.
4.   P.K. Jain and S.K. Kaushik, An Introduction to Real Analysis, S. Chand & Co. New Delhi, 2000.
5.   G.F. Simmons, Differential Equations, Tata Mc Graw Hill, 1972.
6.   E.A. Codington, An Introduction to Ordinary Differential Equations, Prentics Hall of India, 1961.
7.   H.T.H. Piaggio, Elementary Treatise on Differential Equations and their Applications, C.B.S. Publishe & Distributors, Dehli, 1985.
8.   W.E. Boyce and P.O. Diprima, Elementary Differential Equations and Boundary Value Problems, John Wiley, 1986.
12.   Erwin Kreysizig, Advanced Engineering Mathernatics, John Wiley and Sons, 1999.

# B.Sc. Part-I
## MATHEMATICS
### PAPER - III
### VECTOR ANALYSIS AND GEOMETRY

**VECTOR ANALYSIS :**

UNIT-I    Scalar and vector product of three vectors. Product of four vectors. Reciprocal Vectors. Vector differentiation. Gradient, divergence and curl.

UNIT-II   Vector integration. Theorems of Gauss, Green, Stokes and problems based on these.

UNIT-III  General equation of second degree. Tracing of conics. System of conics. Confocal conics. Polar equation of a conic.

UNIT-IV   Sphere. Cone. Cylinder.

UNIT-V    Central Conicoids. Paraboloids. Plane sections of conicoids. Generating lines. Confocal Conicoids. Reduction of second degree equations.

**TEXT BOOKS :**

1.  N. Saran and S.N. Nigam, Introduction to vector Analysis, Pothishala Pvt. Ltd. Allahabad.
2.  Gorakh Prasad and H.C. Gupta, Text Book on Coordinate Geometry, Pothishala Pvt. Ltd., Allahabad.
3.  R.J.T. Bell, Elementary Treatise on Coordinate Geometry of three dimensions, Machmillan India Ltd. 1994.

**REFERENCES :**

1.  Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York.
2.  Murray R. Spiegel, Vector Analysis, Schaum Publishing Company, New York.
3.  Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 1999.
4.  Shanti Narayan, A Text Book of Vector Calculus, S. Chand & Co., New Delhi.
5.  S.L. Loney, The Elements of Coordinate Geometry, Macmillan and Company, london.
6.  P.K. Jain and Khalil Ahmad, A Text Book of Analytical Geometry of two Dimensions, Wiley Eastern Ltd., 1994.
7.  P.K. Jain and Khalil Ahmad, A Text Book of Analytical Geometry of three Dimensions, Wiley Eastern Ltd., 1999.
8.  N. Saran and R.S. Gupta, Analytical Geometry of three Dimensions, Pothishala Pvt. Ltd. Allahabad.

Max Marks: 50

**NOTE: The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.**

### UNIT - I Classification and Organization of Computers

History of computer, Generation of computer, Calculator vs. Computer, Digital and Analog computers and its evolution. Major components of digital computers; Memory addressing capability of CPU, Word length and processing speed of computer, Microprocessors, Single chipMicrocomputer, Large and small computers, Users interface, Hardware, software and firmware, multi programming multi user system, Dumb smart and intelligent terminals, computer network and multi processing, LAN parallel processing,Flynn's classification of computers, Control flow and data flow computers

### UNIT - II Central Processing Unit

Parts of CPU- ALU,Control Unit, Registers:Architecture of Intel 8085 microprocessor, Instructions for Intel 8085 microprocessor, Instruction Word size, Various addressing mode,Interrupts,Some special Control signals, Instruction cycle, fetch and execute operation, Timing Diagram, Instruction flow and data flow.

### UNIT - III Memory

Memory hierarchy, Primary andSecondary Memory, Cache memory, Virtual Memory,Direct Access Storage Devices (DASD), Destructive and Nondestructive Readout, Program and data Memory, Memory Management Unit (MMU), PCMCIA Cards and Slots.

### UNIT - IV I/O Devices

I/O devices- Keyboard, Mouse, Monitor, Impact and Non-ImpactPrinters, Plotter, Scanner, other Input/output devices. Scan method of Display- Raster Scan, Vector Scan, Bit Mapped Scan, CRT Controller, I/O Port- Programmable and Non Programmable I/O ports, inbuilt I/O ports- Parallel and Serial ports, USB, IEEE 1394, AGP, Serial data transfer scheme, Micro controller, Signal Processor, I/O processor, Arithmetic Processor.

### UNIT-V SOFTWARE AND PROGRAMMING TECHNIQUES

Application and System Software: Introduction, Example, Difference etc., Introduction to Open Source Software such as Unix/Linux (Ubuntu), Libre office etc., Introduction to Machine Language, Assembly Language and High Level Language, Programming Techniques, Stack, Subroutine, Debugging of programs, Macro, Program Design, Software development, Flow Chart, Multi programming, Multiuser, Multitasking Protection, Operating system and Unix programs, Application packages.

### TEXT BOOKS:

1. Computer Fundamentals, P. K. Sinha, BPB Publications, Sixth Edition.
2. Computer Fundamentals Architecture and Organization, B. Ram, New Age International Publishers, Fifth Edition.
3. Fundaments of Computers, V. Rajaraman, PHI, Sixth Edition.
4. Computers Today, Donald H. Sanders, McGraw-Hill, Third Edition.
5. IBM PC and Clones, B Govindarajalu, McGraw-Hill, Second Edition.
6. UNIX Concepts and Applications, Samitabha Das, Tata McGraw-Hill, Fourth Edition.

# B.Sc. PART - I
## COMPUTER SCIENCE
## PAPER II
## PROGRAMMING IN 'C' LANGUAGE
### (Paper Code - 0806)

**Max Marks: 50**

**NOTE: The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.**

### UNIT-I
Fundamentals of C Programming: Overview of C: History of 'C', Structure of 'C' program. Keywords, Tokens, Data types, Constants, Literals and Variables, Operators and Expressions: Arithmetic operators, Relational operator, Logical operators, Expressions, Operator: operator precedence and associatively, Type casting, Console I/O formatting, Unformatted I/O functions: getch(), getchar(), getche(), getc(), putc(), putchar().

### UNIT- II
**Control Constructs:** If-else, conditional operators, switch and break, nested conditional branching statements, loops: do while, while, for, Nested loops, break and continue, goto and label, exit function.
**Functions:** Definition, function components: Function arguments, return value, function call statement, function prototype, Types of function, Scope and lifetime of variable, Call by value and call by reference. Function using arrays, function with command line argument. User defined function: maths and character functions, Recursive function.

### UNIT-III
Array: Array declaration, One and Two dimensional numeric and character arrays, Multidimensional arrays. String: String declaration, initialization, string manipulation with/without using library function.
Structure, Union and Enum - Structure: Basics, declaring structure and structure variable, typedef statement, array of structure, array within structure, Nested structure, passing structure to function, function returning structure. Union: basics, declaring union and union variable, Enum: declaring enum and enum variable

### UNIT- IV
Pointer: Definition of pointer, Pointer declaration, Using & and * operators. Void pointer, Pointer to pointer, Pointer in math expression, Pointer arithmetic, Pointer comparison, Dynamic memory allocation functions – malloc, calloc, realloc and free, Pointer vs. Array, Array of pointer, Pointer to array, Pointers to function, Function returning pointer, Passing function as Argument to function, Pointer to structure, Dynamic array of structure through pointer to structure.

### UNIT-V
File Handling and Miscellaneous Features: File handling: file pointer, File accessing functions: fopen, fclose, fputc, fgetc, fprintf, fscanf, fread, fwrite, feof, fflush, rewind, fseek, ferror. File handling through command line argument. Introduction to C preprocessor #include, #define, Conditional compilation directives: #if, #else, #elif, #endif, #ifndef etc.

### TEXT BOOKS:
1. Programming in ANSI C, E Balagurusamy, Tata McGraw-Hill, Third Edition.
2. Let Us C, YashwantKanetkar, Infinity Science Press, Eighth Edition.
3. Mastering C, K R Venugopal,Tata McGraw-Hill.
4. The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, Prentice Hall, Second Edition.
5. Applications Programming in ANSI C, R. Johnsonbaugh , Martin Kalin, Macmillan, Second Edition.
6. The Spirit of C, Mullish Cooper, Jaico publishing House.
7. How to solve it by Computer, R G Dromey, Pearson Education.