S. No.	Activity	Marks
1.	Participation in preparation of Camp	5
2.	Presentation of report of survey/ creative work	20
3.	Participation in Community Awareness Programme	15
4.	Participation in organizational process/community living/cultural and aesthetic activities	10
	Total Marks	50

SECOND YEAR B.Sc. B.Ed.

COURSE	NOMENCLATURE
GC 2	General English
EL 6	**Physics (I)**
	Physics (II)
	Physics (III)
	Physics Practical
EL 7	**Chemistry I**
	Chemistry II
	Chemistry III
	Chemistry Practical
EL 8	**Zoology I**
	Zoology II
	Zoology III
	Zoology Practical
EL 9	**Botany I**
	Botany II
	Botany III
	Botany Practical
EL 10	**Mathematics I**
	Mathematics II
	Mathematics III
PEC 3	**Language Across the Curriculum**
PEC 4	**Learning & Teaching**
AEC 3	Yoga & Sports
AEC 4	Action Research
PC 1	Pedagogy of General Science
PC 2	Pedagogy of Physics
PC 3	Pedagogy of Chemistry

PC 4	Pedagogy of Biology
PC 5	Pedagogy of Mathematics
TEP 1	Pre- Practice Teaching (Internal Practical)
	1. Micro Teaching
	2. Unit Plan & Blue Print
	3. Observation of Demonstration lesson
	4. Lesson Plan(Related one Pedagogy Subject) Seven Lesson in Which one Technology based lesson is compulsory
	5. Simulated Teaching
	6. Criticism (only one Pedagogy subject)
	7. TLM workshop
	8. Case Study & Project work

GENERIC COURSE

GC-2GENERAL ENGLISH

Marks :100

Duration : 3 Hours **External :100**

Objectives:

An essentially language based course that aims at making students study English prose with a view to enlarge their comprehension of the language and develop all the four skills (R/W/L/S/). It also aims at giving them basic skills in grammar, widening their vocabulary and teaching them to write simple and correct English.

The question paper will consist of 100 multiple choice questions of 1 mark each (OMR Sheet system)

1. **Comprehension and Vocabulary** **[Total 50 Marks]**

Texts:

(A) The Many Worlds of Literature ed: Jasbir Jain: Macmillan India **30 Marks**
(Questions based on content from the prescribed text)

(B) Learning How to Fly: Life Lessons for the Youth by A P J Kalam (RUPA PUB.)
(Questions based on content from the prescribed text) **20 Marks**

2. **Basic Language Skills: Grammar and Usage** **[Total 50 Marks]**

Parts of Speech (Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, & Interjection) **5 Marks**

Determiners **3 Marks**

Voice (Active & Passive) **2 Marks**

Reported Speech (Direct & Indirect) **2 Marks**

Tenses **5 Marks**

Modals **4 Marks**

Phrasal Verbs **4 Marks**

Synonyms & Antonyms **4 Marks**

Translation (Hindi to English) **5 Marks**

Types of Sentences (Assertive / Declarative, Interrogative, Imperative and Exclamatory) **3 Marks**

3. **Comprehension and Composition**

Letter (Formal & Informal) **3 Marks**

Unseen Passage **10 Marks**

(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.)

Recommended Reading

1. Thomson & Martinet: A Practical English Grammar (OUP)
2. Wren &Martin : High School English Grammar and Composition(S.CHAND.PUB.)
3. Raymond Murphy: Essential Grammar in Use: A self Study reference and practice book for elementary students of English 4th Edition.(CUP)
4. J. C. Nesfield : English Grammar : Composition and Usage (Macmillan)

PHYSICS

Each theory paper in the annual examination shall have three sections.
Section A shall contain one compulsory question of 5 marks having 10 parts. Two parts shall be set from each unit. The candidate is required to answer each part in about 20 words.
Section B shall contain five compulsory questions of 5 marks each with internal choice .One question with internal choice will be set from each unit .The answer may be given in approximately 250 words.
Section C shall contain four descriptive questions covering all units and candidate has to answer any two questions of ten marks each. The answer may be given in approximately 500 words. There can be two parts in a question from this section.
In total the candidate has to answer eight questions in each theory paper.

PAPER-I

KINETIC THEORY, THERMODYNAMICS AND STATISTICAL PHYSICS

Marks :50
External :40
Internal :10

UNIT – I

Ideal Gas: Kinetic Model, Deduction of Boyle.s law, Review of the kinetic model of an ideal gas, Interpre-tation of temperature, Brownian motion, Estimate of the Avogadro number, Equipartition of energy, specific heat of monatomic gas, extension to di and triatomic gases, Behaviour at low temperatures, Adiabatic expansion of an ideal gas. Application to atmospheric physics (derivation of barometric equation)
Real Gas: Van der Waals model; equation of state, nature of Van der Waals forces, comparison with experimental P-V curves. The critical constants, gas and vapour. Joule-Thomson expansion of an Ideal gas and Van der Waals gas; Constancy of U+pV, Joule coefficients, Estimates of J-T cooling, adiabatic expansion of an ideal gas.
Liquification of gases : Joule Expansion, Joule-Thomson and adiabatic cooling, Boyle temperature and inversion temperature, principles of regenerative cooling and cascade cooling, Liquification of hydrogen and helium, meaning of efficiency.

UNIT - II

Transport phenomena in gases: Molecular collisions, mean free path and collision cross-sections, Estimates of molecular diameter and mean free path, Experi-mental determination of mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.

Maxwellian distribution of speeds in gas: Derivation of distribution of speeds and velocities, experimental verification, distinction between mean, rms and the most probable speed values. Doppler broadening of spectral lines.

UNIT - III

The laws of thermodynamics: The Zeroth law, Various indicator diagrams, work done by and on the system, First law of thermodynamics, internal energy as a state function. Carnot cycle and its efficiency, Carnot theorem and the second law of thermo-dynamics, Different versions of the second law, Reversible and irreversible changes.

Practical cycles used in internal combustion engines. Entropy, principle of increase of entropy. Thermodynamic scale of temperature; its identity with the perfect gas scale. Impossibility of attaining absolute zero; third law of thermodynamics.

Thermodynamic relationships: Thermodynamic variables; extensive and intensive, Maxwell.s general relationships; applications to J-T cooling and adiabatic cooling in a general system, Van der Waals gas, and the Clausius-Clapeyron heat equation.

Thermodynamic Potentials: Relation to the thermo-dynamic variables, Equilibrium of thermodynamic systems, Cooling due to adiabatic demagnetization.

UNIT - IV

Statistical basis of the thermodynamics:

Probability and thermodynamic probability, principle of equal a *priori* probabilities, probability distribution and its narrowing with the increasing n, average properties, Accessible and inaccessible states, distri-bution of particles with a given total energy into a discrete set of energy states.

Phase space representation: The mu space; its division into sheets of energy, phase cells of arbitrary size, onedimensional oscillator, free particles, the functions F(E) and W(E), definition of probability.

Black Body Radiation: Spectral distribution of BB radiation; pure temperature dependence, Stefan-Boltzmann law, Wien.s displacement law, Rayleigh-Jeans law and the ultraviolet catastrophy, Pressure of radiation, Planck.s hypothesis, mean energy of an oscillator and the Planck.s law, complete fit with the experiment. Interpretation of specific heats of gases at low temperature.

UNIT-V

The bridge of Statistical physics with thermo-dynamics: Thermal equilibrium between two subsystems, beta parameter and its identity with $(kT)^{-1}$**,** probability and entropy, Boltzmann entropy relation, statistical interpretationof the second law of thermo-dynamics. Boltzmann canonical distribution law; rigorous form of equipartition of enerty.

Transition to quantum statistics: 'h. as a natural constant and its implications, cases of particles in a box and simple harmonic oscillator, Setting phase-cell size as nature.s constant

(Planck.s constant h); quantization of energy. Indistinguishability of particles and its consequences. Bose-Einstein and Fermi-Dirac conditions, applications to liquid helium, free electrons in a metal, and photons in blackbody chamber, Fermi level and Fermi energy.

Text and Reference Books:

1. B.B. Laud, "Introduction to Statistical Mechanics" (Macmillan 1981)
2. F. Reif, "Statistical Physics" (McGraw-Hill, 1988)
3. K. Huang, "Statistical Physics" (Wiley Eastern, 1988)

PAPER-II
OPTICS

Marks :50
External :40
Internal :10

UNIT-I

Format's Principle : Principle of experiments path, the aplantic points of a sphere and other applications.

General theory of image formation : Cardinal points of an system; general relationship; thick lenses and lens combinations, telephoto lenses.

Aberration in images : Chromatic aberration ; achro-matic combination of lenses in contact and separated lenses.

Monochromatic aberrations and their redu-ction; spherical mirrors and schmidt corrector plates; oil immersion objective, meniscus lenses.

Optical instruments : Entrance and exit pupils, need for a multiple lens eye pieces. Common type eye pieces.

UNIT – II

Interference of Light: The principle of superposition ; two slit interference, coherence requirement for the sources, localized fringes in this films, transition from fringes of equal thickness to those of equal inclination, Newton.s rings, Michelson interferrometer its uses for determination of wavelength, wavelength difference and standari-zation of meter. Intensity distribution in multiple beam interference, Febry-Perot interferrometer and etalon. Lummer Gehrke plate, Lloyds mirror.

UNIT – III

Diffraction of light Fresnel diffraction : Half period zones, circular aper-ture and obstacles; straight edge, explanation of recti-linear propagation, Zone plate with multi focii

Fraunhofer diffraction : Diffraction at a slit, a circular aperture and a circular disc, resolution of images; Rayleigh criterion. Resolving power of a telescope and microscope, outline of phase contrast microscopy.

Diffraction grating : Diffraction at N parallel slits, plane diffraction grating, concave grating resolving power of grating and prisms.

UNIT – IV

Polarization of light Double refraction and optical rotations : Double refra-ction in uniaxial crystals, explanation interms of electromagneties theory, Malus Law, Phase retarda-tion plates, rotation of plane of polarization, origin of optical rotation in liquids and in crystals. Babinet Compen-sator, Polarimters and their applications in measure-ment of specific rotation.

Dispersion and Scattering : Theory of dispersion of light, absorption band and anomalous dispersion theory of Rayleigh Scattering.

UNIT - V

LASER

Laser System : Purity of spectral line; Coherence length and coherence time, spatial coherence of a source; Einstein.s A and B coefficients; Coherence of induced emissions, conditions for laser action, exis-tance of a metastable state, population inversion by pumping and cavity. He-Ne and Ruby Laser

Application of lasers : Spatial coherence and direction-ality, estimates of Laser and non linear optics : Polari-zation P including higher order terms in E and gene-ration of harmonics. Momentum mismatch and choice of right crystal and direction for compensation.

Recommended Books

1. Principle of Optics : B. K. Mathur (IIIrd edition)
2. Text book of Optics : Subrahmanyam and Brijlal (S.Chand and Co.)
3. Optics : Jankins and White (McGraw Hill)
4. Text book of Optics : D. P. Khandelwal
5. Universities Optics Vol. I & II : Whittkar and Yarwood
6. Optics : Ajay Ghatak (Tata McGraw Hill)

PAPER-III
ELECTRONICS

Marks :50
External :40
Internal :10

UNIT-I

Voltage and current sources, Open and Short Circuits, Kirchoff.s laws, Voltage and current divider rules, Mesh and node analysis, Principle of superposition, Thevenin.s and Norton.s theorem, Maximum Power transfer theorem.

Semiconductor diodes:
p-n junction diodes, I-V characteristics, diode as a rectifier, half wave, full wave and bridge rectifiers, clippers and
clampers, Zener, varactor diode and their applications, Optoelctronic diodes: LED and Photo-diodes.

Bipolar Junction Transistors (BJT) :
Basic construction of pnp and npn transistors and their operation, Input and output characteristics of CB, CE and CC configurations, Biasing methods, active, saturation and cutoff regions, load line concepts, Graphical analysis of CE configuration and phase relationship.

Field effect transistors:
Basic constructions of JFET and MOSFET, Drain characteristics of JFET, biasing of JFET, operating regions,pinch-off voltage.

UNIT-II

General amplifier characteristics, Two port analysis of a transistor, definition of h- parameters, current gain,voltage gain and power gain of an amplifier, Input and output resistances, Analysis of CB, CE and CC amplifiersfor current gain, voltage gain, input and output impedences using h – parameters, Decibel power, Classifications ofamplifiers, class A, B, AB and C amplifiers (graphical treatment only), RC coupled transistor amplifier, Gainfrequency response, and high frequency limitations. Transformer coupled amplifer.

UNIT III

Feed back amplifiers:

Basics of Negative feedback, Merits and demerits of negative feedback and its applications, Voltage seriesamplifier (Emitter follower) and Current series amplifier (CE amplifier with and without bypass capacitor).

Oscillators:
Positive feedback, Barkhausen criterion, Phase shift oscillator, Colpitt.s and Hartley oscillators, and Crystal oscillator.

Operational Amplifiers:
Characteristics of Operational amplifiers, circuit symbols, ideal and practical op-amp, Inverting and noninvertingconfigurations, Applications of OP-AMP as an adder, subtractor, inverter, scale changer, phase shifter,

UNIT-IV

Binary, Octal, decimal and hexadecimal numbers and their inter conversions, 1.s and 2.s compliments of binarynumbers, addition and subtraction of binary numbers, OR, AND, NOT, NAND, NOR and XOR gates and theirsymbols and truth tables, Boolean algebra, DeMorgan.s theorem, minterms and maxterms, sum of minterms andproduct of maxterms forms of Boolean functions, simplifications of Boolean function using Karnaugh.s map (up to 4-variables)

UNIT-V

Modulation:
Basics of modulation, amplitude and frequency modu-lation, sidebands, Comparison between AM and FM, powerof amplitude modulation and spectrum, AM and FM transmitters (Block diagram and principle of operation only).

Demodulation:
Demodulation of AM and FM waves, linear envelope detector, Hetrodyne and superhetrodyne receiver (Block diagram and principle of operation only)

Cathode Ray Oscilloscope:
Cathode ray tube-theory and construction, Cathode Ray Oscilloscope (Block diagram and operation), Appli-cationof CRO, wave form display, frequency, phase and amplitude determination, Lissajous figures.

Recommended Books:

1. Electronic Devices and Circuit theory by R. Boylestead and L. Nashelsky (Prentice Hall of India).
2. Foundations of Electronics by D. Chattopadhyaya, P.C. Rakshit, B. Saha and N.N. Purkait (New Age
3. Electronic Devices by Allan Mottershed (Prentice Hall of India).
4. Digital fundamentals by Thomas L Floyd (Unuited Book Stall, New Delhi).
5. Electronic fundamentals and applications by John D. Ryder (Prentice Hall of India).
6. Electricity and Magnetism by K.K. Tewari (S. Chand & Company Limited).

PAPER-IV

PHYSICS PRACTICAL

The distribution of marks in the practical examination will be as follows:

(i) Two experiments		48 Marks
For each experiment, distribution of marks will be as follows:		
Figure	:	3
Formula/Theory	:	3
Observation	:	10
Calculation and Result	:	6
Precautions	:	2
(ii) Viva voce		12
(iii) Records		15
	Total	**75 Marks**

MAX. MARKS :75

Students are expected to perform sixteen experiments in all taking eight from each section. One xperiment from Section A and one from Section B shall be set in the examination paper.

LIST OF EXPERIMENTS

Section-A

1. Determination of the size of the Lycopodium grains using Cornu.s method.
2. Determination of wavelength of Mercury light using grating
3. Determination of resolving power of grating
4. Determination of dispersive power of the glass prism
5. Determination of wavelength of sodium light using Fresenel.s biprism
6. Determination of wavelength of sodium light using Newton.s rings
7. Determination of specific rotation of cane sugar solution using polarimeter.
8. Determination of wavelength of ultra sonic wave.
9. Determination of focal length of a high power microscope objective.
10. Measurement of absorption by a solution.
11. Study of aberrations of a thick lens.
12. Study of interference fringes in thin films of the following (not all)

(a) Thermal expansion of a crystal using interference fringes.
(b) Bending of a glass plate under load.

(c) Bending of a rod under load.
(d) Use of Newton.s ring to determine the radii of curvature of surfaces.
(e) Use of fringes in wedge film .
13. Resolving limit of the eye and of a telescope with a variable aperture.
14. Fresnel diffraction at a straight edge and a slit.
15. Fraunhoffer diffraction at a single slit.
16. Resolving limits of grating and prism.
17. Study of polarization of the light by simple refle-ction.
18. Verification of Cauchy.s relation using Prism and Gratting.

Section-B

1. To draw characteristic curves of Common emitter transistor and calculate its hybrid parameters.
2. To study gain and frequency response of a single stage Common emitter amplifier.
3. To determine varactor diode characteristics.
4. To draw characteristics of Zener diode and calcu-late voltage regulation factor.
5. To study ripple factor and internal resistance of a solid state power supply using LR,CR and Pi filter using aCRO
6. To find barrier height of a given solid state diode.
7. Use of p-n junction for the measurement of temperature.
8. Design and construction of phase shift oscillator.
9. Design, build and test of a lograithimic amplifier.
10. Study of a function generator using Operational Amplifier.
11. Study of NAND and NOR circuits (discrete and IC) XOR and De Morgans Theorem.
12 Study of multiplixures and demultiplexures.
13 Study of half adder and full adder circuit.
14. Study RS, D and JK flip - flops.
15. Study of Modulo- 3 , Modulo-5 and Modulo-7 binary counter circuits.
16. Study of characteristics of a thermistor.
17. Determination of solar constant or temperature of an oven through radiation measurement.
18. Resistance thermometry: temperature of a torch bulb filaments from R value, platinum resistance thermometry.

CHEMISTRY

PAPER I
INORGANIC CHEMISTRY

Marks :50
External :40
Internal :10

UNIT -I

Chemistry of Elements of First Transition Series : Characteristic properties of d-block elements (colour variable valency, magnetic and catalytic properties and ability to form complexes). Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

Chemistry of Elements of Second and Third Transition Series : General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii oxidation states, magnetic behaviour, spectral properties stereochemistry.

UNIT - II

Oxidation and Reduction : Use of redox potential data analysis of redox cycle, redox stability in water- Frost, Latimer and Pourbaix diagrams, principles involved in the extraction of the elements.

Coordination Compounds : Werner's coordination theory and its experimental verification, effective atomic number concept, nomenclature of coordination compounds, isomerism in coordination compounds valence bond theory of transition metal complexes, chelate and chelate effects.

UNIT - III

Chemistry of Lanthanides : Electronic structure, oxidation states and ionic radii, lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

Chemistry of Actinides : General feature and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, similarities between the later actinides and the later lanthanides.

UNIT - IV

Gravimetric Analysis : Principles, solubility, formation and preparation of precipitation, colloidal properties, ageing and contamination of the precipitates, co-precipitation and post-precipitation.

Simple Organic Reagents used in Inorganic Analysis : 8-Hydroxyquinoline, Dimethylglyoxime, □-nitroso- □-naphthol, Anthranilic acid, Arsenic acid, Cupron and Cupferron.

UNIT - V

Chromatography : Basic principles, instrumentation and application of adsorption and partition chromatography, ion exchange separation.

Errors in Quantitative Analysis : Accuracy and precision, determinate, indeterminate and accidental errors, precision of a single measurement, precision of mean rejection of result, errors in a derived result methods of checking the accuracy of analysis, significant figures, computation values.

BOOKS RECOMMENDED

1. Text Book of Quantitative Inorganic Analysis : A.I. Vogel (Chapter I, II and XXIII).
2. Text Book of Quantitative Inorganic Analysis : I.M. Kolthoff and E.R. Sandell.
3. Concise Inorganic Chemistry : J.D. Lee.
4. General Inorganic Chemistry : J.A. Duffy.
5. Principle of Inorganic Chemistry : B.R. Puri and L.R. Sharma.
6. Basic Inorganic Chemistry : Cotton and Wilkinson and Gaus. Willey.
7. Inorganic Chemistry (Hindi ed.) : Suresh Ameta, A. Sharma and M. Metha, Himanshu Pub.

PAPER II
ORGANIC CHEMISTRY

Marks :50
External :40
Internal :10

UNIT - I

Alcohols and Epoxides :
Unsaturated alcohols - Vinyl and Allyl alcohol.
Dihydric alcohol - Nomenclature, method of formation and chemical reactions of vicinal glycols.
Pinacol - Pinacolone rearrangement.
Trihydric alcohols - Formation and chemical reactions of glycerol.
Epoxides - Synthesis and reactions of epoxides, orientation of epoxide ring opening.
Phenols - Nomenclature, structure and bonding preparation of phenols, physical properties and acidic character,comparative acidic strength of alcohols and phenols, resonance stabilization of phenoxide ion.
Reactions of phenols - Electrophillic aromatic substitution, acylation and carboxylation, Mechanism of Friesrearrangement, Clasien rearrangement, Gatterman synthesis. Hauben=Hoesch reaction, Ledgerer Manasse reactionand Reimder-Tiemann reaction.

UNIT - II

Aldehydes and Ketones : Synthesis, chemical and physical properties of aromatic aldehydes and ketones,mechanism of nucleophilic addition to carbonyl group with particular emphasis on Benzoin, Aldol, Perkin andKnoevenagel condensations, condensation with ammonia and its derivatives, Witting reation, Mannich reaction.
Use of acetals as protecting group, Oxidation of aldehydes, Baeyer, Villiger oxidation of ketones, Cannizzaroreaction, MPV, Clemmenson, Wolff-Kishner, LiAlH4 and NaBH4 reductions, Halogenation of enolizable ketones.

UNIT- III

Carboxylic Acids and their derivatives : Nomenclature, structure and bonding, acidity of carboxylic acids,effects of substituents on acid strength, mechanism of decarboxylation, Methods

of formation, physical propertiesand chemical reactions of dicarboxylic acids, oxalic, succinic and phthalic acid.
Substituted Acids - Methods of formation and chemical reactions of halo acids, hydroxy acids, malic, tartaric, citricand salicyclic acids.
Unsaturated Acids - Acrylic and cinnamic acids.
Introduction to acids derivatives - Preparation, properties and uses of acid halides, amides, anhydrides and esters.
Interconversion of acid derivatives by nucleophilic acyl substitution. Mechanism of HVZ reaction, Hofmann -bromamide reaction and ester hydrolysis.

UNIT - IV

Organic Compounds of Nitrogen : Preparation and chemical reactions of nitroarenes. Reactivity of nitrosubstituted arenes.
Aromatic amines, classification, preparation, properties and uses of primary amino compounds aniline, acetanilide,nitroanilines.
Secondary amino compounds - diphenylamine and N-methylaniline.
Tertiary amino compounds - Triphenylamine and N,N-dimethylaniline.
Aryl alkyl amine - Benzylamine.
Basic strength of amines - similarities and differences between aliphatic and aromatic amines.
Diazonium salt - formation, properties and synthetic uses of benzene diazonium salt, Diazo coupling and itsmechanism.
Organic Sulphur Compounds : Preparation and properties of thiols, sulphonic acid, sulphonyl chloride,saccharides, chloramine -T. dichloramine-T and sulphonamides.

UNIT -V

Polynuclear Hydrocarbons : Nomenclature of naphthalene and anthracene derivatives, preparation andproperties of napthalene, anthracene, naphthol, naphthylamine, naphthaquinone and anthraquinone.
Mechanism and orientation of electrophilic substitution reaction in naphthalene and naphthalene and anthracene.
Organic Compounds : Preparation, properties and synthetic uses of organo lithium and organo zinc compounds.

BOOKS RECOMMENDED

1. A Text Book of Organic Chemistry : K.S. Tiwari, S.N. Mehrotra and N.K. Vishnoi.
2. Modern Principles of Organic Chemistry : M.K. Jain and S.C. Sharma
3. A Text Book of Organic Chemistry : (Vol. I and II), O.P. Agarwal.
4. A Text Book of Organic Chemistry : B.S. Bahl and Arun Bahl.
5. A Text Book of Organic Chemistry : P.L. Soni.
6. Organic Chemistry : (Vol. I, II and III), S.M. Mukherji, S.P. Singh and R.P. Kapoor
7. Organic Chemistry (Hindi Ed.) : Suresh Ameta, P.B. Punjabi and B.K. Sharma, Himanshu Pub.

PAPER III
PHYSICAL CHEMISTRY

Marks :50
External :40
Internal :10

UNIT I

Thermodynamics-I : Definition of thermodynamic terms system, surrounding, etc. types of systems, intensiveand extensive properties, state and path functions, their differentials, thermodynamics process, concept of heat andwork.

First law of Thermodynamics - Statement, definition of internal energy and enthalpy, heat capacity, heat capacitiesat constant volume and pressure and their relationship. Joule's law, Joule-Thomson coefficient and inversiontemperature, calculation of w, q, dU and dH for the expansion of ideal gases under isothermal and adiabaticconditions for reversible process.

Thermo chemistry : Standard state, standard enthalpy of formation. Hess's law of heat summation and itsapplications, Heat of reaction at constant pressure and at constant volume, Enthalpy of neutralization, bonddissociation energy and its calculation from thermo chemical data, temperature dependence of enthalpy, Kirchhoff'sequation.

UNIT II

Thermodynamics - II : Second law of thermodynamics : need for the law, different statements of the law,Carnot cycle and its efficiency, Carnot theory, thermodynamic scale of temperature.

Concept of entropy : Entropy as a state function, Entropy as a function of V and T, entropy as a function of P andT. Entropy change in physical change. Clausius inequality, entropy as a criteria of spontaneity and equilibrium,entropy change in ideal gases and mixing of gases.

Third Law of Thermodynamics : Nernst heat theorem, statement and concept of residual entropy, evaluationof absolute entropy from heat capacity data. Gibbs and Helmholtz function, Gibbs function (G) and Helmholtzfunction (A) as thermodynamic quantities. A & G as criteria for thermodynamic equilibrium and spontaneity, theiradvantage over entropy change, variation of G and A with P. Vand T.

Chemical Equilibrium : Equilibrium constant and free energy, thermodynamic derivation of law of mass action,distribution law and phase rule, Le Chatelier.s principle, Nernst.s distribution law for solute, principle of extractionof solute from solution and washing of precipitates.

Reaction isotherm and reaction isochore - Clapeyron equation and Clausius - Clapeyron equation, applications,partial molar quantities, partial molar volume and its distribution, chemical potential and its physical significance,Gibbs-Duhem equation.

UNIT III

Macromolecules : Nomenclature, classification, properties of polymer, mass of macro-molecules, numberaverage and weight average molecular mass, determination of molecular weight by osmotic pressure. viscosity andlight scattering and sedimentation (ultra centrifuge) methods.

Surface Chemistry : Sorption at surfaces, physical and chemical adsorption, Freundlich, Langmuir and Gibbsadsorption isotherms and their derivation, Streaming potential electrophoresis and electrosmosis.

UNIT IV

Phase Equilibrium : Statement and meaning of the terms - phase, component and degree of freedom, derivationof Gibb.s phase rule, phase equilibrium of one component system- water CO2 and S - system.

Phase equilibria of two component system - Solid - liquid equilibria, simple eutectic, Bi-Cd, Pb-Ag systems,desilverization of lead.

Solid solutions - Compound formation with congruent melting point (Mg - Zn) and incongruent melting point,(NaCl - H2O), (FeCl3 - H2O) and (CuSO4 - H2O) systems, freezing mixtures, acetone - dry ice.

Liquid - liquid mixtures: Ideal liquid mixtures, Raoult.s and Henry.s law, Non -ideal system, azeotropes: HC1 -H2O and ethanol - water systems.

Partially miscible liquids: phenol - water, trimethylamine - water, nicotine - water systems, lower and upperconsolute temperature, effect of impurity on consulate temperature.

Immiscible liquids, steam distillation.

UNIT V

Electrochemistry : Types of reverse electrode : gas - metal ion, metal-metal ion, metal-insoluble salt - anion andredox electrodes, electrode reactions, Nernst - equation, derivation of cell E.M.F. and single electrode potentialstandard hydrogen electrode-reference electrodes - standard electrode potential sign conventions, electrochemicalseries and its significance electrolytic and Galvanic cells- reversible and irreversible cells, conventionalrepresentation of electrochemical cells. EMF of a cell and its measurements, computation of cell EMF. Calculationof thermodynamic quantities of cell reactions (AG, AH and K) polarization over potential and hydrogen overvoltage. Concentration cell with or without transport, liquid junction potential application of concentration cells,valency of ions, solubility product and activity coefficient, potentiometric titrations.

Ionic Equilibria - Arrhenius theory of electrolyte and its application Ostwald.s dilution law, its uses andlimitations. Debye - Huckle theory of strong electrolytes, asymmetric electrophoretic. Debye- Falkenhagen andWein effects, Activity coefficient, mean activity coefficient, ionic strength, Debye- Huckel limiting law.

BOOKS RECOMMENDED

1. Principles of Physical Chemistry : B.R. Puri and L.R. Sharma.
2. A Text Book of Physical Chemistry : A.S. Negi and S.C. Anand.
3. A Text Book of Physical Chemistry : Kundu and Jain.

4. Physical Chemistry (Hindi Ed.) : Suresh Ameta, R.C. Khandelwal, R. Ameta and J. Vardia, Himanshu Pub.

CHEMISTRY PRACTICALS

Distribution of Marks

Exercises	Marks
1. Volumetric Estimation OR Gravimetric Analysis	10
2. Determination of R1 values and identification of given organic compounds using thin layer/paper chromatography	7
3. Identification of given organic compounds through functional group analysis	7
4. Physical Chemistry Experiments	10
5. Vice-voce	8
6 Records	8

Total 50 marks

LIST OF EXPERIMENTS

1. **Volumetric Analysis** : Any one of the following exercise may be given in the examination :
(a) Determination of acetic acid in commercial vinegar using NaOH
(b) Determination of alkali content- antacid tablet using HC1.
(c) Estimation of calcium content in chalk as calcium oxalate using permanganate.
(d) Estimation of hardness of water by EDTA.
(e) Estimation of ferrous and ferric ions by dichromate methods.
(f) Estimation of copper using thiosulphate.
(g) Estimation of Mg2, Ca2 or 2÷complexometrically.

Gravimetric Analysis :
Analysis of Cu as CuSCN and Ni as Ni (dimethylgioxime)
Note: ***Candidates are required to prepare standard solutions by proper weighing.***
2. Thin Layer Chromatography :
Determination of Rf values and identification of organic compounds.
(a) Separation of green leaf pigments (spinach leaves may be used)
(b) Preparation and separation of 2,4 dinitrophenyihydrazones of acetone, 2- butanol, hexane-2- and 3-onesusing toluene and light petroleum(40: 60)
(c) Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5)

Paper Chromatography: Determination of Rf values and identification of organic compounds in a mixture ofamino acids / monosaccharides.

3. Identification of Organic Compounds:

An organic compound from the following list be given for systematic identification:

(i) Carboxylic acids- Oxalic, Tartaric, Citric, Succinic, Benzoic, Cinnamic, Salicylic, Phthalic acids,Formic, Acetic, Propanoic and Butanoic acids.

(ii) Phenols- Phenol, Resorcinol, Hydroquinone, p-Cresol, □-Naphthol, □-Naphthol.

(iii) Alcohols- Methyl, Ethyl, Propyl, Isopropyl, n- butyl, isobutyl & tert. butyl alcohol.

(iv) Carbohydrates- Glucose, Fructose, Cane sugar and Starch.

(v) Aldehydes- Formaldehyde, Acetaldehyde and Benzaldenyde.

(vi) Ketones- Acetone, Methyl ethyl ketone, Acetophenone and Benzophenone.

(vii) Nitro compounds - Nitrobenzene, p-Nitrotoluefle and m- Dinitrobenzene.

(vii) Amino compounds - Aniline, o-, m-and p-toluidine, á- Naphthylamine and □-Naphthylamine.

(ix) Anilides - Acetanilide and Benzanilide.

(x) Amides - Acetamide, Benzamide and Urea.

(xi) Esters - methyl acetate, Ethyl acetate.

(xii) Thioamide - Thiourea.

(xiii) Hydrocarbons - Benzene, Toluene, Naphthalene and Anthracene.

(xiv) Halogen containing compounds - Chloroform, Chloral hydrate, Iodoform, Chlorobenzene, p-Dichorobenzeen and p-Dibromobenzene.

4. Physical Chemistry Experiments: Any one of the following experiments may be given in the examination.

Distribution Law

(i) To study the distribution of iodine between water and CCl4.

(ii) To study the distribution of benzoic acid between benzene and water.

(iii) To study the distribution of acetic acid between benzene and water

Phase Equilibrium

(i) To study the effect of a solute (e.g. NaCl, succinic acid) on the critical solution temperature of twopartially miscible liquids (e.g. Phenol water system) and to determine the concentration of that solute inthe given phenol-water system.

(ii) To construct the phase diagram of two components (e.g. diphenylamine- benzophenone) system bycooling curve method.

Adsorption :

(i) To study the adsorption of acetic acid by activated charcoal and test the validity of Freundlichy or
Langmuir adsorption isotherm.

(ii) To study the adsorption of oxalic acid by activated charcoal and test the validity of Freundlich or
Langmuir adsorption isotherm.

Analysis of sugars:

1. Action of salivary amylase on starch
2. Effect of temperature on the action of salivary amylase on starch.
3. Differentiation between a reducing and a nonreducing sugar.

Virtual experiments (any two)

(i) Various type of titrations

(ii) Chromatographic separation of compounds from leaf or flower extract / dyes / amino acid / saccarides etc.

(iii) Some photochemical reactions

(iv) Isoelectric precipitation of proteins: casein from milk.

(v) Any other virtual experiment related to the content of syllabus and availability of theexperimental facilities.

BOOKS RECOMMENDED

1. Practical Chemistry - Giri, Bajpai and Pandey, S. Chand & Co. Ltd., New Delhi.
2. Laboratory Manual in Organic Chemistry, R.K. Bansal, Willey Eastern.
3. Experimental Organic Chemistry, Vol. I and II, P.R. Singh, D.S. Gupta and K.S. Bajpai, Tata McGraw Hill.
4. Experiments in Physical Chemistry - J.C. Ghose, Bharti Bhawan.
5. Experiments in General Chemistry, N.r. Rado and U.C. Agarwal, Eastern Press.
6. Practical Chemistry - Suresh Ameta and P.b. Punjabi, Himanshu Publication.

ZOOLOGY

The second year TDC examination shall consist of three theory papers, each of three hoursduration and a practical examination of five hours duration.

Pattern of question paper in the annual examination and distribution of marks:
Each theory paper in the annual examination shall have three sections i.e. A,B, and C. Insection A, total 10 questions will be set in the paper, selecting at least two from each unit. Thesequestions to be answered in a word or so. All questions are compulsory. Each question carries0.5 mark, total 05 marks.
In section B, there shall be total 10 questions, selecting two questions from each unit, fivequestions to be answered by the student selecting at least one from each unit. Answer shouldbe given in approximately 250 words. Each question carries 05 marks, total 25 marks.
In section C, 04 descriptive type questions will be set in the examination paper from fiveunits of the syllabus of the paper, selecting not more than one question from a unit. Eachquestion may have two sub divisions. Students are required to answer any two questionsapproximately in 500 words. Each question is of 10 marks, total 20 marks.

ZOOLOGY

PAPER-I
LIFE AND DIVERSITY OF ANIMALS-II (VERTEBRATES)

Marks :50
External :40
Internal :10

UNIT-I

1 Characteristics and classification of Protochordates and Agnatha upto orders withexamples emphasizing their biodiversity, economic importance and conservation.
2 Type study- *Herdmania.*

3 Affinities of *Amphioxus* and importance of Ammocoete larva.

UNIT-II

4 Characteristics and classification of Pisces (after Berg) and Amphibia upto orders withexamples emphasizing their biodiversity, economic importance and conservation.
5 Type study- *Scoliodon,* Fish Migration, Parental care in Amphibian.

UNIT-III

6 Characteristics and classification of Reptiles upto orders with examples emphasizingtheir biodiversity, economic importance and conservation.
7 Type study- *Calotes.* Identification of poisonous and non-poisonous snakes, venom, antivenom, medicinal significance of venom.
8 *Sphenodon*: Characteristics and affinities.

UNIT-IV

9 Characteristics and classification of Aves upto orders with examples emphasizing theirbiodiversity economic importance and conservation.
10 Type study - *Columba,* flight adaptations, perching mechanism, types of feathers.
11 Bird migration.

UNIT-V

12 Characteristics and classification of Mammalia upto orders with examples emphasizingtheir biodiversity, economic importance and conservation.
13 Type study – *Rattus*, (Digestive, respiratory and urinogenital systems only).
14 Dentition, hair and thermoregulation; integumentary derivatives.

ZOOLOGY
PAPER-II
GENETICS AND BIOTECHNOLOGY

Marks :50
External :40
Internal :10

UNIT-I

1 Light and electron microscope structure of chromosome (from nucleosome toorganization of chromatids. Morphological classification of chromosome).
2 Extra-chromosomal inheritance.
3 Chromosomal theory of sex determination, hormonal theory of sex determination, X andY chromosomes, gynandromorphs.

UNIT-II

4 Brief history of genetics, mendelian laws and their significance.
5 Linkage and crossing over : kinds of linkage – complete and incomplete linkage, linkage groups, significance of linkage.
6 Genetic interaction: Complimentary gene, duplicate genes,supplementary gene andepistasis.
7 Multiple-gene inheritance, ABO blood group, Rh factor.

UNIT-III

8 Concept of gene, mucon, recon,cistron, gene expression -lac-operon and trip-operon.
9 Genetic engineering: Restriction enzymes, Palindrome sequences, cloning vehicle, CDNA.
10 Applications of genetic engineering. Hybridoma technology.

UNIT-IV

11 Mutations: Definition, gene mutation, chromosomal mutation, chromosomal aberrations,somatic and germ mutations, numerical alterations of chromosomes, molecular basis ofmutation, mutagenic agents
12 Polytene and lamp-brush chromosomes.
13 Eugenics and genetic counselling.

UNIT-V

14 Medicines and biotechnology: Microbes in medicine, antibiotics, vaccines, enzymes andantigens.
15 Food and dairy microbiology: Fermented food production, dairy products, foodpreservation, microbial spoilage, alcoholic beverages, and vinegar.
16 Role of Biotechnology in health care.

ZOOLOGY
PAPER-III
APPLIED ZOOLOGY AND MICROBIOLOGY

Marks :50
External :40
Internal :10

UNIT - I

1 History, general account and scope of sericulture. Distribution of mulberry and non-mulberry silkworm.
2 Life history of *Bombyx mori*.
3 Rearing techniques of silkworm
(a) Brief account of environmental conditions of rearing and programming of mulberrycultivation.
(b) Rearing of silk worm.
4 Reeling of silk yarn.
5 Brief idea of diseases of silk worm.

UNIT-II

6 History, scope and general practices of pearl culture.
7 Rearing of pearl oyster:
(a) Indigenous methods of pearl culture.
(b) Modern methods of pearl culture.
8 Economic Importance of pearl and pearl culture.
9 Brief idea of diseases and enemies of pearl culture.

UNIT-III

10 Fin-fish culture and fisheries:
(a) Culturable fresh water fishes of India.
(b) Inland, marine and estuarine fisheries.
(c) Preservation of fishes.
(d) Economic importance of fishing industry.

UNIT-IV

11 Concepts of basic microbiology and its significance, theory of spontaneous generation,gram theory of fermentation and disease, work of Louis Pasteur.
12 General account of classification, structural organization, physiology and multiplication ofbacteria.
13 General account of classification, structural organization, physiology and multiplication ofbacteria.
14 Brief idea of Industrial, Medical and Environmental microbiology.

UNIT-V

15 DNA and RNA viruses
16 **AIDS:** Causative agents, Transmission, Pathogenicity, Prevention and Laboratorydiagnosis of infections and treatment

ZOOLOGY - PRACTICAL

S.No.	Exercise	
1	Major dissection	10
2	Minor dissection	05
3	Mounting/Applied Zoology exercise	04
4	Spots	15
5	Viva-voce	08
6	Record	08
		Total :- 50

Major Dissection marks will be given only if virtual dissection is available otherwise marks may be givenaccording to availability of dissection alternate.

General survey of Vertebrates (Museum specimens)

A Urochordata : *Ciona, Pyrosoma, Doliolum, Salpa,*
B Cephalochordata : *Amphioxus*
C Agnatha : *Petromyzon*, Ammocoete larva
D Pisces : *Echeneis, Sphyrna, Torpedo, Pristis, Labeo,Clarias, Anabas, Hippocampus* (male and female),*Chimaera, Anguilla, Protopterus.*
E Amphibia : *Ichthyophis, Axolotl* larva, *Salamander, Bufo, Rana,Hyla, Pipa, Amphiuma, Alytes.*
F Reptilia : *Testudo, Trionyx, Hemidactylus, Draco, Calotes,Chamaeleon, Varanus, Phrynosoma, Heloderma,Naja, Vipera, Typhlops, Bungarus, Hydrophis, Eryx,*models of Dinosaurs.
G Aves : *Columba, Psittacula, Passer, Bubo,* model of*Archaeopteryx*
H Mammalia : *Pteropus, Rhinopoma, Felis, Erinaceous, HystrixCrocedura, Manis.*

PREPARED SLIDES :

1 Cephalochordata : *Amphioxus*: T.S. through buccal region, T.S. throughpharynx showing gonads, T.S. through caudal region.
2 Pisces : Placoid, cycloid and Ctenoid scales, V.S. of skin.
3 Amphibia : V.S. of skin, T.S. of testis, T.S. of kidney and T.S. ofliver.
4 Reptilia : V.S. of skin and T.S. of stomach.

5 Aves : T.S. of intestine, T.S. of liver, T.S. of ovary, filoplumeW.M.
6 Mammalia : T.S. of pancreas, T.S. of thyroid gland, L.S. of pituitarygland, T.S. of stomach, T.S. of intestine, L.S. of kidney,
T.S. of testis and ovary and V.S. of skin, T.S. of lung.

PERMANENT PREPARATIONS: Unstained placoid scales, spicules of *Herdmania.*

DISSECTION (Virtual): Virtual dissection will be done (if facility of virtual ismade available by University
Herdmania : Neural complex.
Scoliodon : Alimentary canal, scroll valve *in situ*, afferent andefferent branchial arteries, eye muscles, internal ear.
Digital animals : Arterial, venous and urino-genital systems.

OSTEOLOGY :
Identification of disarticulated skeleton of *Rana*, *Varanus, Gallus* and *Oryctolagus*. Palates ofbirds.

GENETICS:
Drosophila : Life cycle and its culture. Identification of wild and mutant *Drosophila.*

APPLIED ZOOLOGY:
1 Identification of different stages (from egg to adult) of silkworm.
2 Tools used in silk worm rearing.
3 Mounting of mouth parts and sting apparatus of honey bee.
4 Identification of cultivable varieties of shell fish and fin fish.
5 Gram staining of microbes.

The teacher concerned will provide e-materials to practical in the form of video ordemonstrations or written materials including dissections.

REFERENCE BOOKS (LATEST EDITIONS):

LIFE AND DIVERSITY OF ANIMALS (VERTEBRATES)
1 Ayyar, E.K. and T.N. Ananthakrishnan, Manual of Zoology, Vol.II (Chordata), S.Viswanathan (Printers and Publishers) Pvt. Ltd. , Madras.
2 Jordan, E.L. and P.S.Verma, Chordate Zoology and Elements of Animal Physiology, S. Chand &Co. Ltd., Ram Nagar, New Delhi (English and Hindi Editions).
3 Parker and Haswell, Text Book of Zoology, Vol.II (Chordata), A.Z.T.B.S. Publishers andDistributors, New Delhi- 110051.
4 Waterman, Allyn J. et.al., Chordate Structure and Function, Mac Millan and Co., New York.
5 Kotpal, RL, Modern Text Book of Zoology- Vertebrates, Rastogi Publications, Meerut (Englishand Hindi Editions).
6 Ganguly, BB, Sinha, AK and Adhikari, S : Biology of Animals, Vol.II, New Central Book Agency(P) Ltd. Kolkatta.
7 Alexander, R.M.: The Chordates (Cambridge University Press).
8 Monielth, A.R: The Chordates (Cambridge University Press).

9 Young, J.Z : Life of Vertebrates (Oxford University PressL)
10 Waterman, A.J: Chrodata - Structure and Function (Macmillan Co.).

GENETICS AND BIOTECHNOLOGY:

11 Verma, P.S. and V.K.Agarwal, Genetics, S.Chand & Co.
12 Lewis, C.D. and Lewin, R., Biology of Gene, McGraw Hill, Toppan Co. Ltd.
13 Gunther S. Stent, Molecular Genetics, macmillan Publishing Co. Inc.
14 Goodenough, V., Genetics, New York Holt, Rinchart and Winston.
15 Gardner, Principles of Genetics, Wiley Eastern Pvt., Ltd.
16 Winchester, Genetics, Oxford IBH Publications
17 Stickberger, Genetics, MacMillan Publications.
18 Pai, A.C., Foundations of Genetics, McGraw Hill Publications.
19 R.A.Meyers (Endocrinology.): Molecular Biology and Biotechnology, VCH Publishers.
20 Glick : Molecular Biotechnology.
21 R.W.Old and S.B. Primrose: Principles of Gene Manipulation and Introduction to Genetic Engineering.
22 Gupta PK : Elements of Biotechnology, Rastogi Publications, Meerut.

APPLIED ZOOLOGY AND MICROBIOLOGY :

23 Jhingran, VG, Fish and Fisheries of India. Hindustan Publishing Corporation, New Delhi.
24 Kovaleve, PA, Silkworm Breeding Stocks, Central Silk Board, Merine Drive, Bombay.
25 Roger, A. Morse, The ABC and XYZ of Bee Culture, A.I. Root and Co., Medina, Ohio 44256.
26 Metcalf CL and WP Flint, Destructive and Useful Insects, Tata McGraw Hill publishing Co. Ltd.,New Delhi- 110051
27 Sharma PD, Microbiology, Rastogi Publications Meerut.
28 Shukla and Upadhyaya : Economic Zoology (Rastogi Publishers)
29 Venkitaraman : Economic Zoology (Sudarshana Publishers)

PRACTICAL:

30 Verma, PS, A manual of practical Zoology Vertebrates S.Chand and Co. Ltd., Ram Nagar, NewDelhi (English and Hindi Editions).
31 Lal, SS : Practical Zoology Vertebrates, Rastogi Publication, Meerut (English and Hindi Editions).

BOTANY
THEORY

PAPER-I
TAXONOMY AND EMBRYOLOGY OFANGIOSPERMS

Marks :50
External :40
Internal :10

Unit-1

Taxonomic categories; concept of species, genus and family; Herbarium techniques. Systems of classifi-cation ofBentham and Hooker, Engler and Prantl, Hutchinson and Takhtajan.

Unit-2

International rules of nomenclature, range of floral structure, floral variation, and economic importance ofRanunculaceae, Brassicaceae, Papaveraceae, Capparidaceae, Caryophyllaceae, Malvaceae, Ruta-ceae,Cucurbitaceae, Myrtaceae, Leguminosae, Rosa-ceae, Apiaceae (Umbelliferae).

Unit-3

Range of floral structure, floral variation and economic importance of Rubiaceae, Asteraceae, Primulaceae,Solanaceae, Asclepiadaceae, Convolvulaceae, Apocy-naceae, Acanthaceae, Lamiaceae, (Labiatae), Euphorbiaceae,Poaceae(Graminae).

Unit-4

Classical theory of morphology of flower; Primitive stamens and carpel; Microsporogenesis, Megasporo-genesis,Structure and development and male and female gametophytes, Fertilization, Nutrition of Embryo sac.

Unit-5

Structure, development and types of endosperm and embryo, Polyembryony, Apomixis, Experimental embryology;Culture of anther, endosperm and embryo.

Note :
The paper setter is required to set questions of 3 types contained in 3 Sections (**Section A-** 10 questions, **Section B**-10 questions and **Section C**- 4 questions) from the 5 units of each paper. There will be 10 questions in **Section A**which will be asked from all the 5 units, i.e., 2 questions from each unit. These questions have to be answered inone word or a few words only. Each question will be of half mark . All the questions in **Section A** are compulsory.
In **Section B,** 10 questions will be set from the 5 units, i.e., 2 questions from each unit. Students are required toattempt at least 1 question from each unit. Each question will carry 5 marks . The answers of each question shouldbe given in about 250 words. In **Section C** there will be 4 descriptive type questions set from all the 5 units, notmore than 1 question from each unit. These questions may also have sub-divisions. The students are required toanswer 2 questions, each in approximately 500 words. Each question will carry 10 marks .

In short, pattern of question paper and distribution of marks for UG classes will be as under :
Section A : 10 questions, 2 questions from each unit, short answer, all questions compulsory.
Total marks **: 05**

Section B : 10 questions, 2 question from each unit, 5 question to be attempted, at least 1 from each unit, answerapproximately in 250 words.
Total marks : **25**

Section C : 04 questions (question may have sub-division), not more than 1 question from each unit, descriptivetype, answer in about 500 words, 2 questions to be attempted. Total marks : **20**

PAPER II
ANATOMY OF ANGIOSPERMS, ECONOMIC BOTANY AND ETHNOBOTANY

Marks :50
External :40
Internal :10

Unit-1

Plant anatomy : Introduction, organization of meri-stems; theories related to their organization; cell wall grossmicroscopic structure and chemistry.

Unit-2

Tissue and tissue systems; Parenchyma, Collenchyma, Sclerenchyma, Xylem, Phloem, Secretory structures andperiderm.

Unit-3

Primary and Secondary Structure : Structure of root, stem and leaf. Primary and secondary anomalous structurewith special reference to *Aristolochia, Salva-dora, Bignonia, Achyranthes, Amaranthus, Boerhaavia, Mirabilis,Chenopodium Dracaena, Tinospora.*

Unit-4

Study the economic botany of the following :
Cereals : *Triticum, Zea*
Pulses : *Glycine max, Cajanus cajan*
Fibres : Classification; *Gossypium, Crotalaria, Corchorus;* artificialfibres.
Wood : Classification, mechanical properties; *Shorea, Tectona, Pinus,Cedrus.*
Paper : Raw materials and manufacture.
Sugar : Sugarcane, Beet.

Unit-5

Study of economic uses of the following :

Medicinal Plants : *Rauwolfia, Datura, Cinchona,Papaver.*
Beverages : Alcoholic; Non-alcoholic: teaand coffee.
Spices and : *Coriandrum, Cuminum, Ferula,*
Condiments *Curcuma, Trigonella, Elettaria,*
Capsicum, Piper, Zingiber.
Oil : *Arachis, Cocos, Helianthus*.
Ethnobotany : Introduction; Aims and
Objectives; knowledge ofimportant plants of variousgroups from Ethnobotanicalpoint of view as food, fodderand Medicine with specialreference to Rajasthan.

Note :
The paper setter is required to set questions of 3 types contained in 3 Sections (**Section A-** 10 questions, **Section B**-10 questions and **Section C**- 4 questions)from the 5 units of each paper. There will be 10 questions in **Section A** which will be asked from all the 5 units,i.e., 2 questions from each unit. These questions have to be answered in one word or a few words only. Eachquestion will be of half mark . All the questions in **Section A** are compulsory. In **Section B,** 10 questions will beset from the 5 units, i.e., 2 questions from each unit. Students are required to attempt at least 1 question from eachunit. Each question will carry 5 marks . The answers of each question should be given in about 250 words. In**Section C** there will be 4 descriptive type questions set from all the 5 units, not more than 1 question from eachunit. These questions may also have sub-divisions. The students are required to answer 2 questions, each inapproximately 500 words. Each question will carry 10 marks .
In short, pattern of question paper and distribution of marks for UG classes will be as under :
Section A : 10 questions, 2 questions from each unit, short answer, all questions compulsory.
Total marks **: 05**

Section B : 10 questions, 2 question from each unit, 5 question to be attempted, at least 1 from each unit, answerapproximately in 250 words. Total marks : **25**

Section C : 04 questions (question may have sub-division), not more than 1 question from each unit, descriptivetype, answer in about 500 words, 2 questions to be attempted. Total marks : **20**

PAPER-III
CYTOGENETICS, PLANT BREEDING, EVOLUTION AND BIOSTATISTICS

Marks :50
External :40
Internal :10

Unit-1

Cell Biology - Structure of cell (of both prokaryotes and eukaryotes); membranes; cell organelles, ergasticsubstances. Chromatin- euchromatin, heterochro-matin. Chromosomes - Type and organization; morpho-logy,chemical constituents; Structural changes in chromosomes and their significance.

Unit-2

Cell Division - Amitosis, mitosis, meiosis; synepto-nemal complex; Linkage and crossing over. Gene(Chromosomal) mappping; Sex determination.

Unit-3

Mendel.s laws of inheritance - Monohybrid and dihy-brid ratio, incomplete dominance; Modifications of dihybridratio; cytoplasmic inheritance (Inheritance of plastids and streptomycin resistance in *Chlamy-domonas*); Principlesof plant breeding. Selection, introduction, clonal propagation, hybridization, mutation breeding.

Unit-4

Green Revolution, conservation of germplasm, centres of origin. Cytology in relation to taxonomy; Apomixis;

Unit-5

Evolutionary theories, catastrophism, the Lamarck.s theory, development of Darwin.s theory, Evidences of
evolution, adaptations, natural selection patterns of evolution, origin of species. Elementary study of bio-statistics;

The paper setter is required to set questions of 3 types contained in 3 Sections (**Section A-** 10 questions, **Section B**-10 questions and **Section C**- 4 questions) from the 5 units of each paper.

There will be 10 questions in **Section A**which will be asked from all the 5 units, i.e., 2 questions from each unit. These questions have to be answered inone word or a few words only. Each question will be of half mark . All the questions in **Section A** are compulsory.
In **Section B,** 10 questions will be set from the 5 units, i.e., 2 questions from each unit. Students are required toattempt at least 1 question from each unit. Each question will carry 5 marks . The answers of each question shouldbe given in about 250 words. In **Section C** there will be 4 descriptive type questions set from all the 5 units, notmore than 1 question from each unit. These questions may also have sub-divisions. The students are required toanswer 2 questions, each in approximately 500 words. Each question will carry 10 marks .
In short, pattern of question paper and distribution of marks for UG classes will be as under :
Section A : 10 questions, 2 questions from each unit, short answer, all questions compulsory.Total marks **: 05**
Section B : 10 questions, 2 question from each unit, 5 question to be attempted, at least 1 from each unit, answer**Section C :** 04 questions (question may have sub-division), not more than 1 question from each unit, descriptivetype, answer in about 500 words, 2 questions to be attempted. Total marks : **20**

PRACTICALS
The practical exercises have been divided into following two groups :
Group-I : Taxonomy, Embryology and Economic Botany.

GROUP-I
A) TAXONOMY
1. Ranunculaceae : *Ranunculus, Nigella,Delphinium*
2. Brassicaceae : *Brassica, Raphanus, Iberis*
3. Papaveraceae : *Argemone, Papaver.*
4. Capparidaceae : *Capparis, Cleome.*
5. Caryophyllaceae : *Stellaria, Spergula, Viscaria,Dianthus* (Single*),Gypsophylla.*
6. Malvaceae : *Hibiscus, Althaea*
7. Rutaceae : *Citrus, Ruta, Murraya*
8. Leguminosae : *Pisum, Crotalaria; Cassia,Caesalpinia, Bauhinia,Tamarindus; Acacia, Prosopis,Mimosa.*
9. Myrtaceae : *Callistemon, Eucalyptus*
10. Cucurbitaceae : *Citrullus, Cucumis*
11. Apiaceae : *Coriandrum, Foeniculum*
12. Rubiaceae : *Hamelia*
13. Asteraceae : *Helianthus, Tridax, Launaea,Ageratum.*
14. Primulaceae : *Anagallis.*
15. Apocynceae : *Catharanthus, Nerium,Thevetia.*
16. Asclepiadaceae : *Calotropis, Leptadaenia,Cryptostegia*
17. Solanaceae : *Solanum, Nicotiana, Petunia.*
18. Acanthaceae : *Barleria, Adhatoda, Justicia,Peristrophe.*
19. Lamiaceae : *Ocimum, Salvia*
20. Euphorbiaceae : *Euphorbia, Ricinus*
21 Poaceae : *Triticum.*
The above list of plants is only suggestive and can be replaced depending on local availability.

(B) EMBRYOLOGY SLIDES :

1. Placentation : Types
2. Ovules : Types
(1) T.S. Anther
10. L.S. Mature Seed : Maize/Gram/Pea
11. L.S. bud with anther and gynoecium.
12. Pollinium whole mount.
13. V.S. Cyathium.
14. V.S. *Ficus* inflorescence.

(C) ECONOMIC BOTANY AND ETHNOBOTANY

All plants as prescribed in theory paper.

GROUP-II

(A) ANATOMY

1. Stem : *Boerhaavia, Achyranthes,Bignonia, Chenopodium,Leptadaenia, Nyctanthes, Salvadora, Dracaena, Triticum,Mirabilis, Aristolochia,Amaranthus, Chenopodium.*
2. Root : *Tinospora, Ficus.*

(B) CYTOLOGY

Smear preparation of root tips and onion bud for different stages of mitosis and meiosis.

(C) STATISTICS

Mean, Mode, Median, Standard Deviation. Monohybrid and Dihybrid crosses and test cross.

(D) EMASCULATION

MARKING SCHEME

There shall be a practical examination of five hours duration and the distribution of marks shall be as follows :

	Students	
	Regular	**Ex**
(a) An angiosperm material for anato-mical study with (i) double stained, labelled cellular sector diagram, identification and (iv) special (anatomical/ecological) character (2.5 marks each (i) to (iv).	10	13
2. Economic/ Ethnobotany.	05	06
Description in semi-technical language of given twig, (i) withdiagrams, (ii) description and (iii) identification with characters.	12	14
4. Embryology	05	05
5. Smear preparation for two stagesof cell division.	05	05
6. Genetic exercise Or Emasculation technique.	05	06
7. Statistical exercise.	05	06
8. Spots five (At least one from eachpaper)	10	10

9. Viva-voce	10	10
10. Records and collection.	08	-
Total	**75**	**75**

BOOKS SUGGESTED

Bhojwani, S.S. and Bhatnagar, S.P.: The Embryology of Angiosperms, Vikas Publishing House, Delhi, 1974.
Dutta, S.C.: Hand Book of Systematic Botany, Asia Publishing House, Bombay, 1979.
Gupta, P.K.: Cytology, Genetics and Evolution, Rastogi Publications.
Hill, A.H.: Economic Botany, McGraw Hill Book Co., 1952.
Mitra, J.N. : Elements of Systematic Botany of Angiosperms and Plant Ecology, The World Press Pvt. Ltd.,Calcutta, 1977. Vikas Publishing House, Delhi.
Pandey, B.P.: Economic Botany, S. Chand And Co.Pvt. Ltd., 1988.
Tiagi, Y.D. and Kshetrapal, S. : An Introduction to Taxonomy of Angiosperms. Ramesh Book Depot, Jaipur, 1974.
P.K. Gupta : Genetics.
Sinha, U. and Sinha: Cytogenetics, Plant Breeding and Evolution.
Shukla and Chandel: Cytogenetics and Plant Breeding.
Choudhary, H.K. Elementary Principles of Plant Breeding.

MATHEMATICS
PAPER – I
ADVANCED CALCULUS

Marks :70
External :60
Internal :10

UNIT-I

Continuity: Cauchy definition of continuity of a function of one variable, Notion of limitand continuity of function of two variable (Not Theorems), discontinuous functions andtheir kinds, Properties of continuous functions at a point and in closed intervals.
Derivability: Differentiable functions and their properties including Darboux theorem,Examples of continuous and differentiable functions.

UNIT - II

Partial differentiations, envelopes and evolutes, Maxima and Minima of two variablesand more than two variables including Lagrange's method of undetermined multipliers.

UNIT -III

Evaluation of double and triple integrals, Dirichlet's theorem and Liouville's extension,change of order of integration and volume and surface of solid of revolution.

UNIT - IV

Jacobians, change of independent variables. Vector Calculus: Direction of derivatives,gradient of scalar functions, irrotational Vectors, definition of gradient, divergence of avector, curl of a vector, curl of the product of a scalar and vector, divergence of a vectorproduct.

UNIT - V

Vector Integration: Gauss's theorem, divergence of the product of a scalar and a vector,Stoke's theorem, surface integral of the curl of a vector, Green's theorem (Excluding theproofs of the theorems)

References:

1. Gorakh Prasad : Differential calculus, Pothishala Pvt. Ltd., Allahabad.
2. Gorakh Prasad : Integral calculus, Pothishala Pvt. Ltd., Allahabad.
3. Malik, S.C. : Mathematical Analysis, Wiley Eastern Ltd., New Delhi
4. Shanti Narayan : A Course of Mathematical Analysis, S. Chand andCompany, New Delhi.
5. Jain, P.K. and : An Introduction to Real Analysis by, S. Chand andCompany, New Delhi.
6. Kaushik, S.K. : Principles of Mathematical Analysis.
7. Walter Rudin : A first course in Real Analysis.
8. Sharma Purohit : Elements of Real Analysis.
9. Bhargava, Goyal : Real Analysis.
10. Sharma, Gokhroo : Real Analysis.
11. Spain, B. : Vector Analysis.
12. Bhargava, BanwariLal: Sadish Kalan.
13. Gokhroo, Saini : Sadish Kalan.

MATHEMATICS
PAPER – II
DIFFERENTIAL EQUATIONS

Marks :70
External :60
Internal :10

UNIT - I

Exact differential equations and equations of special forms. Simultaneous differentialequations. Total differential equations.

UNIT – II

Linear differential equations of second order and their solutions by:
(i) The method of finding an integral of the C.F. by Inspection,
(ii) Changing of independent variables,
(iii) Removal of the first derivative,
(iv) Operational factors,
(v) Undetermined coefficients and
(vi) Variation of parameters.

UNIT - III

Linear partial differential equations of first order: Lagrange's method, Integral surfacespassing through a given curve, orthogonal surfaces, Geometric description of Pp+Qq=R.Non-Linear partial differential equations of order one. Special methods of their solutionsapplicable to certain standard forms.

UNIT -IV

Charpit's method of solving non linear partial differential equations of first order,Monge's method of integration of equations Rr + Ss + Tt = V. Higher order homogeneouslinear part of differential equation of the first order.

UNIT - V

Numerical solutions of ordinary differential equations: Introduction about initial valueproblem, boundary value problem, Euler's method, short comings. Euler's modifiedmethod. Picard's method of successive approximation and Picard's method forsimultaneous equations.

References:

1. Ray and Sharma : Differential equation.
2. Bansal, Dhami : Differential equation (Vol. II).
3. Raisinghania, M.D. : Advanced differential equations.
4. Murray A. Daniel : Differential equation.
5. Forsyth, A.R. : A Treatise on Differential equation.
6. Ian N. Sneddon : Elements of Partial differential equations.,Mc Graw–Hill Book Company.
7. Gokhroo, Saini,Kumbhat: Avkal Samikaran.
8. Gokhroo, Saini, Ojha : Partial differential equations.
9. Codington, E.A. : An introduction to ordinary differentialequation by, Prenticehall of India.

MATHEMATICS
PAPER – III
MECHANICS

Marks :65
External :55
Internal :10

UNIT – I

Equilibrium of bodies under three or more forces, Friction, common category.

UNIT –II

Virtual work, Projectile on inclined plane and Impact.

UNIT – III

Velocity and Accelerations (Tangential, normal, radial, transversal), Rectilinear motion,Hooke's law and motion of horizontal and vertical strings.

UNIT –IV

Constrained motion (circular and cycloidal), motion under resisting medium (resistancevaries as velocity and square of velocity).

UNIT –V

Fluid pressure and thrust on immersed plane surfaces. Center of pressure.

References:

1. S. L. Loney : Statics, Macmillan and Company,London.
2. R.S. Verma : A Text book of Statics (Pothishala)
3. Ray & Sharma : A Text book of Hydrostatics
4. N.Sharma : A Text book of Dynamics.
5. M Ray : A Text book of Dynamics.
6. Bhargava & Agrawal : Gati Vigyan

7. Gokhroo, Saini : Uchch Gati Vigyan
8. Gokhroo & Others : Hydrostatics(Hindi Ed.)
9. Gokhroo & Others : Statics (Hindi Ed.)
10. Bhargava & Others : Hydrostatics (Hindi Ed.)
11. Bhargava & Others : Statics (Hindi Ed.)

Professional Education Course (PEC)
B.Sc.B.Ed. Integrated Course
PEC - 3 LANGUAGE ACROSS THE CURRICULUM

Marks :100
External :80
Internal :20

Objectives: After the completion of the course, the student teacher will be able to: 1. Understand the language background of students as the first or second language users. 2. Create sensitivity to the language diversity that exists in the classroom. 3. Understand the nature of classroom discourse and develop strategies for using oral language in the classroom. 4. Understand the nature of reading comprehension in the content area & writing in specific content areas. 5. Understand interplay of language and society. 6. Understand function of language and how to use it as a tool. 7. Understand language and speech disorders and make remedial measure, too. COURSE

UNIT – I

Language and society

1. Relationship between language and society.
2. Multilingualism- concept, status of Indian classroom language.
3. Verbal Communication.
4. Social stimulation- gestures, emotional and facial expressions, postures and movements, articulate speech, physiognomy.

UNIT- II

Language development

1. Language development in different stages.

2. Speech defects: lisping, slurring, stammering and role of teachers in its resolution.

3. Language acquisition: stages, language and thought.

4. Meta- linguistics: concept, meaning, listening, speaking, reading, comprehension and writing for varying context, language proficiency for teacher.

Unit – III

Developing Listening and Speaking Skills and its barriers and activities

Listening skills –

sub skills of listening – listening for perception – listening for comprehension three phases of listening – listening materials – importance of listening skills – Barriers to listening skills – Activities for developing listening skills :
Activities for developing Listening Skills – Listening materials – Listening to specific information and for general understanding – dictation – listening telephone call – commentaries – listening instructions.

Speaking Skills –

Importance of speaking skills – Barrier to speaking skills, Activities for developing speaking skills, conversation, group discussion, debate, interviews, extempore speech.

Unit – IV

Developing Reading And Writing Skills - Its barriers and activities

Reading Skills – importance – process involved in reading – types of reading – barriers to reading skills –

Activities for developing reading skills – method of teaching reading for beginners – Alphabet – Phonetic – word – phrase and sentence method.

Writing Skills – importance – characteristics of good writing – barriers to writing skills.

Activity for developing writing skills – developing mechanical skill, grammatical skill, judgment skill and discourse skill.

Unit – V

Language At School & laboratory

Distinction between language as a school-subject and language as a means oflearning and communication

The concept of register and style, concept formation, Theories of languagedevelopment

Language as medium, conflicts between home language and medium of language.

Language laboratory – role language laboratory developing language skills – planning and installing of language laboratory – basic materials for language laboratory – effective uses language laboratory.

PRACTICUM (any two)

- Developing a reading comprehension test and administering it.
- Analysis of text books languages and other materials used in differnet subjects
- Project on language environment of school.
- Presentation for Laguage use for notice, co-curricular activities and Anchoring.
- Prepare a report on the status of languages given in the constitution of India and language policies given in Kothari commission, NPE 1986, and POA-1992.
- Visit five schools in the neighbourhood and prepare a report on the three-language formula being implemented in the schools.
- Take a few passages from Science, Social Science and Math's textbooks of Classes VI to VII and analyse : 1. How the different registers of language have been introduced? 2. Does the language clearly convey the meaning of the topic being discussed? 3. Is the language learner-friendly? 4. Is the language too technical? 5. Does it help in language learning? Now write an analysis based on the above issues.

PEC -4 LEARNING AND TEACHING

Marks :100
External :80
Internal :20

Objectives:

- Gain an understanding of the process of learning.
- Understands the Conditions Essential for Facilitating Learning and Retention.
- Apply the Principles and Strategies of Major Approaches to Learning in Classroom Environment.
- Understands the Process of Effective Teaching and Qualities of Effective Teachers.
- Understands various Approaches to Teaching and will be able to apply them in the relevant situations.
- Understands the Principles and Strategies for Creating Conducive Classroom Environment.
- Appreciates the role of a teacher as leader, organizer, a facilitator & a humane reflective practitioner.
- Realize the difficulties in learning and teaching.

Unit I

Concept and Nature of Learning:

- Factors Associated with Learning
- Maxims of Learning and their Educational Implications
- Approaches to Learning (Concept, Associated Concepts Basic Principles and Educational Implications)-Habitual Learning, Associative Learning (Classical and Instrumental Conditioning), Spatial Learning/Cognitive Maps, observational Learning, Learning by Insight, Information Processing Approach, Humanistic Approach, Constructivist Learning Approach.
- Types of Learning-Concept Learning, Skill Learning, Verbal Learning, Learning of Principles and Problem Solving (Meaning, Nature, Stages, Principles and

Approaches/Strategies)

Unit II

Understanding the Components of Learning

- Attention- Meaning, Factors Influencing Attention, Strategies for Enhancing Attention;
- Perception- Meaning, Laws of Perceptual Organization (Gestalt Psychologists'View) and Educational Implications.
- Process of Memory- Sensory Registration, Retention(Storing), Recognition, Recall; Factors Influencing Retention; Strategies for Enhancing Memory.
- Transfer of Learning- Concept, Types, Theories; Strategies for Enhancing Positive Transfer of Learning
- Achievement Motivation- Concept, Intrinsic and Extrinsic Motivation; Strategies for enhancing Achievement Motivation in Students.

Unit III

Understanding the Process of Teaching-Learning:

- Teaching as a Profession
- Teaching as an Art and Science.
- Understanding the Process of Teaching as a Profession
- Identifying the need and importance of classroom teaching-learning Reflective teaching/ practice, Skillful teaching
- Applying the knowledge of Maxims of Teaching
- Role of teacher in identifying classroom related problems

Unit IV

Teacher and Teaching as a profession

- Various Approaches to Teaching: Behaviourist, Cognitivist, Constructivist, Connectionist, Participatory, Cooperative, Collaborative, Personalized, and Holistic.
- Teacher as a Facilitator and Guide/Philosopher/Friend Teachers' commitment towards fulfilling Felt Need of Learners Professional Characteristics of Teacher in Classroom Management.
- Skills & Competencies of a Teacher Communication: Meaning, mode: input/process/output Basic Model of Communication: Sender, Message, Medium, Receiver & Reach; Factors facilitating communication.
- Effective Classroom Management-Principles and Strategies Leadership Qualities in Teachers.

Unit V

Teaching As a Complex Activity

- Concept of Teaching: meaning, definition, characteristics, forms

- Levels of Teaching: memory, understanding, reflective
- Basic teaching skills and competencies
- Strategies and techniques of teaching

Practicum:

Conducts Projects on – Identifying the Learning Difficulties of Students in Different School Subjects and the Possible Reason for them; Providing Remedial Instruction to the Students with Learning Difficulties; Study the Qualities of Effective Teachers through observation, interview, case study etc., Visiting Model Schools and Prepare Reports

References:

a) Benjamin S., Bloom et al. (1964). *Taxonomy of educational objectives*. Longman Group.

b) Bruce Joyce (1985) *Models of teaching* (2nd ed.) Prentice Hall.

c) *Encyclopaedia of Modern Methods of Teaching and Learning* (Vol. 1-5).
d) Gage N.L. *Scientific Basis of art of Teaching*
e) Gavriel Salomon (1981) *Communication and education* Sage.
f) Lieberman, M. (1956) *Education as a profession*. Prentice Hall, Inc.
g) Karthikeyan, C. (2004). *A Text book on instructional technology,* RBSA.
h) Kumar, S. (2014). *Child Development and Pedagogy*, Pearson.
i) Ohles, J.F. (1970). *Introduction to Teaching*. New York: Random House, INC.
j) Siddiqui, Mujibul Hasan (2005). *Techniques of classroom teaching* A.P.H
k) Skinner, E.C. (1984). *Educational Psychology. 4th Edition.* New Delhi.: Prentice Hall of India Pvt. Ltd.

ABILITY ENHANCEMENT COURSE

AEC-3 YOGA & SPORTS

Marks :50
External :40
Internal :10

Objectives: The student teacher will be able to:

(i) Understand the meaning and importance of self-concept and self-esteem.
(ii) Be aware of different factors related to self-concepts and self-esteem. Record a brief history of development of yoga through the ages. Discuss how yoga and yoga practices are important for healthy living.
(iii) Explain some important principles of yoga.
(iv) Explain the different limbs of Astañga yoga.
(v) State the different types of yoga.
(vi) Derive how Hatha yoga and Astañga yoga are complementary to each other.
(vii) Enable the student to have good health.
(viii) Practice mental hygiene.
(ix) Possess emotional stability.
(x) Integrate moral values.
(xi) Attain higher level of consciousness.
(xii) Demonstrate some important asanas and pranayama.

COURSE CONTENT:

Unit I

Introduction to Yoga and Yogic Practices: Yoga: meaning and initiation, what is Yoga? Conceptions of Yoga, History of development of yoga, The streams of Yoga: Astanga yoga Raja yoga, Yogic practices for healthy living

Unit II

Introduction to Yogic Texts: Historicity of yoga as a discipline, Classification of yoga and yogic texts, Hatha yogic practices, Meditational processes .

Unit III

Yoga and Health: Need of yoga for positive health, Role of mind in positive health as per ancient yogic literature, Concept of health, healing and disease yogic perspectives, Potential cause of ill health, Yogic principles of healthy living

Unit IV

Personality Development and Stress Management through Yoga: Yogic Practices for Personality Development: Surya Namaskar, Asanas: Tadasana, Simhasana, Kukkutasana, Akarna Dhanurasana, Matsyasana, Prnayama, Anuloma-Viloma Pranayama, Bhastrika Pranayama, Banda, Uddiyana Bandha, Dhyana (Meditation), What is Stress, Yoga as a Way of Life for Stress Management: Ahara, Vihara, Achara, Vichara, Vyavahara, Yogic Practices for Stress Management; Asanas, Hastottanasana, Padahastasana, Trikonasana, Shashankasana, Ushtrasana, Ardha-matsyendrasana, Bhujangasana,

Makarasana, Sarvangasana, Matsyasana, Shavasana; Pranayama, Bhramari Pranayama, Sheetali Pranayama; Yoga for Healthy Living, Shirshasana, Bakasana, Hamsasana, Mayurasana

UNIT 5

Need of Sports, Sports & Life Philosophy, Sports Values, Personality & Sports Performance ,Well being through Sports Indore & Out dore Games, Rules and Regulations and skills of any one of the Games/events: Hockey, Volleyball, Basketball, Football, Tennis, Table Tennis, Kho-Kho, Track and Field Events.

Practicum:

(i) General guidelines for performance of the practice of yoga for the beginners
(ii) Guidelines for the practice of āsanas
(iii) Guidelines for the practice of prānāyāma
(iv) Guidelines for the practice of meditation
(v) Select yoga practices for persons of average health for practical yoga sessions
(vi) Supine position
(vii) Prone position
(viii) Sitting position
(ix) Standing position
(x) Mudras
(xi) Prānāyāmas
(xii) In addition, school and community based activities may be organised.

References:

1. Adair, J. and Allen, M. (1999). Time Management and Personal Development. London: Hawksmere.

2. NCERT (2015). Yoga: A Healthy Way of Living Upper Primary Stage, New Delhi. (Also available in Hindi)

3. NCERT (2015). Yoga: A Healthy Way of Living Secondary Stage, New Delhi. (Also available in Hindi)

4. Rohrer, J. (2002). ABC of Awareness. Oberurnen: UTD Media.

5. Simanowitz, V. and Pearce, P. (2003). Personality Development. Beckshire: Open University Press.

6. Stevens, N. (2008). Learning to Coach. United Kingdom: How to books.

ABILITY ENHANCEMENT COURSE

AEC 4- ACTION RESERCH

Marks :50
External :40
Internal :10

Objectives:

1. To help the pupil in understanding the basics of Action Research
2. To help the pupil in understanding the process of Action Research
3. To help the pupil in applying the cycles of Action Research in the teaching-learning process.
4. To help the pupil in analyzing the importance of validating Action Research at each step.
5. To help the pupil in applying the methods of Action Research to the teaching learning process.
6. To help the pupil in understanding various data collection tools of Action Research.
7. To help the pupil in developing the skill of constructing appropriate tools while conducting an Action Research.
8. To help the pupil in comprehending the components of Action Research Plan.
9. To help the pupil in distinguishing between quantitative and qualitative data analysis in Action Research.
10. To help the pupil in understanding the features of a good Action Research Report.
11. To help the pupil in analyzing the ways of sharing and reflecting Action Research.
12. To help the pupil in developing the spirit of enquiry in the students.

Unit 1

Basics of Action Research – Types, Approaches & Methods

a) Meaning, Principles, Characteristics, Benefits and Limitations of Action Research

b) Difference between Fundamental and Action Research

c) Identification of Problem in Action Research – Locating, Delimiting Problem, Research questions

d) hypothesis, sampling & delimitation

d) Types of Action Research –Individual teacher action research and Collaborative action research (Meaning, Rationale, uses and limitations)

e) Approaches of Action Research: Qualitative and Quantitative - Concept and Need

f) Methods of Action Research –Experimental and Case Study- Meaning, Purpose, Process and limitations

Unit 2

Process of Action Research

a) Action Research Process –Stephen Kemmi's Action Cycle, Kurt Lewin's Force Field Analysis.

b) Validation of Action research -Concept and types : Self, Peer and Learner

c) Ethics in Action Research

Unit 3

Data Collection- Tools and Techniques

a) Tools for Data Collection – (Characteristics, uses and limitations)

1. Questionnaire –Open and Close ended
2. Artifacts: Documents, Records (Student's journals, logs, audio, videos)

b) Techniques of Data Collection-

1. Interviews –Structured and Unstructured
2. Observation- Participant and Non-Participant

c) Role of teacher in Action Research, Action Research for Professional development of teachers

Unit 4

Planning, Conducting and Reporting Action Research

a) Designing the Action Research Plan (research question, need, significance, aims and objectives, research team, research design, schedule and budget)

b) Analysis of Data: Quantitative- Descriptive Analysis- Percentage, Mean, Correlation and Graphical representation (uses and limitations)

c) Qualitative (Immersion reflecting, standing back analyzing; synthesizing; relation to other work; locating reflecting back; returning for more data Presenting disseminating and sharing).

Unit 5

Reporting Action Research

a) Features of a good quality Action Research Report – Comprehensibility, Authenticity, Truthfulness and Appropriateness.

b) Sharing and Reflecting - Locally, Action Research Communities, Professional Conferences and print and e- Journals.

c) Reflection in Action Research

PRACTICUM :-

a) Design an action research plan.

b) Make a scrap book depicting TWO case studies related to professional growth of teachers while doing action research.

c) Prepare a tool for data collection for an action research project of your relevance.

d) Critically review any action research report for elements of good reporting.

References

Crowder, N.A. (1959). Action Research to Improve School Practices. New York: Columbia University.

NRC, (2001) National Research Council. Mathematics learning study: Center for Education, Division of Behavioral and Social Sciences and Education, Adding it up: Helping children learn mathematics. Edited by J. Kilpatrick et al., Washington, DC: National Academy Prehttp://www.edel.edu/pbl

Lavin, R.E.(1995). Cooperative Learning: Theory, Research and Practice.(2 nd ed). Michigan: Ally & Bacon. Sharma R. A. (1993). Teacher education, Theory, Practice and Research. Meerut : International Publishing house.

Ebel, R.L. (1969). Outdoor Education. Encyclopedia of Educational Research (4th ed.). London: The Macmillan Company, pp. 921-924

Fitchman & Silva (2003). The Reflective Educators' Guide to Classroom Research. California: Corwin Press.

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Pandey,S,K and Sharma, R.S (2008). Encyclopedia of Modern Techniques of Teaching, New Delhi: Commonwealth Publishers.

A Special Education Research and trends (1986) - Edited by Richad J. Maris Burton Blatt, USA Pergamon PressA Special Education Research and trends (1986) - Edited by Richad J. Maris Burton Blatt, USA Pergamon Press

Agrawal, J.C.&1968) Education Research. New Delhi : Arya Book Depot.

Best. J.W. (1982). Research in Education. New Delhi : Prentice Hall of India Pvt.Ltd.

Campbell, W.G.etal (1968). Form & Style in Thesis. Boston : Writing Houston Mifin Co.

Coery,(1953). Action Research to Improve School Practices. New York : Teachers College, Columbia University.

Gattertt, H.E., (1981). Statistics in psychology & Education Vakits Feffer & Simons Ltd.

Gullford, J.P., (1950), Fundamental Statistics in Psychology & Education. McGraw Hill Book Company, Good & Scates, Methods of Research

Fox, D.J., The Research Process in Education.(Holt).

Kual, Lokesh (1988). Methodology of Educational Research New Delhi : Vikas Publishing House Pvt.

Rober, M.W., Travers. An Introduction of Educational Research. New York: The McMillan Company.

Sukhla, Mehrotra & Mehrotra (1970) , Elements of Educational Research : Allied. Publishers Ltd

Curriculum & Pedagogic Studies

PC- 1 PEDAGOGY OF BIOLOGICAL SCIENCE

Marks :50
External :40
Internal :10

Paper Objectives-

To enable the pupil teacher to

- Develop a broad understanding of the principles and procedures used in Biological Science &Developing their skills necessary for preparing Biological Science education in modern society.
- To construct different plans according to need.
- To devise the instructional Design of biological science properly.
- Appraise the biological paradigm in understanding of the subject.
- Use different methods to teach different concepts.

UNIT- I

BASICS OF BIOLOGICAL SCIENCE

- Nature of modern science, impact of science on society, globalization and science, Justification of including science as a school subject, socio cultural perspectives of biological science , worlds eminent scientists and their path tracking discoveries.
- Pedagogy of Biological Science – Integration of knowledge about the learner, The subject discipline, social context of learning, and researches related to different aspects of

learning.

- Different branches of biological science , relation with other subjects ,
- Constructivism in teaching Biological Science, Vygotskiyan Perspective.

UNIT - II

AIMS AND OBJECTIVES OF TEACHING BIOLOGICAL SCIENCE

- Taxonomy and approaches of educational objectives in biological science.
- Objectives in biological science- Blooms Taxonomy and revised Blooms taxonomy.
- Process and product outcomes.
- Concept of entering and terminal behavior.

UNIT- III

PLANNING FOR INSTRUCTION

- Unit plan, year plan and lesson plan
- Ability to convert an unit plan into lesson plan
- Use of teaching-learning material (Audio-Visual aids)
- Improvised apparatus: significance and preparation
- Use of LCD projector and power point presentation
- Use of Bruner's models as concept attainment and advance organizer models in Teaching of Biological science.
- Planning and Implementation of strategies in Teaching concept – Evaluation Approach

UNIT- IV

TEACHING OF BIOLOGICAL SCIENCE &CURRICULUM ORGANIZATION AND LEARNING RESOURCES

- Inductive-Deductive approach
- Edger Dale's con of experiences.
- Major models & methods for Science Instruction- formal &non-formal and co-curricular approaches Lecture cum demonstration, Heuristic, Discussion, Project, Problem Solving, laboratory and Experimental method.
- Innovative Teaching practices in Biological science.
- Principles and approaches for curriculum development, curricular framing according to

local needs.

- Text Books, Science journals, handbooks, other resource materials for Teaching Biological science.
- Organization of Biology laboratory.

UNIT V

EVALUATION IN BIOLOGICAL SCIENCE &PROFESSIONAL DEVELOPMENT OF A BIOLOGY SCIENCE TEACHER

- Measurement and Evaluation- Importance and purpose.
- Types of evaluation
- Achievement Test construction, administration and scoring.
- Characteristics of a good test
- Measuring specific behavioral outcomes- Cognitive, Affective and psychomotor outcomes.
- Diagnostic testing and remedial teaching.

Professional development programmes for a bioscience teacher- Participation in seminar, conferences, online sharing membership of professional organizations, Collaboration of school with colleges, universities and other institutions,

PC-2 PEDAGOGY OF MATHEMATICS

Marks :50
External :40
Internal :10

Objectives

1. To understand the basic concepts associated with academic disciplines
2. To understand place of different disciplines in the school curriculum understand nature, scope & importance of Mathematics at secondary level.
3. To acquaint and formulate aims and instructional objectives in teaching mathematics in Secondary school level as per revised taxonomy.
4. To apply different approaches and methods of teaching mathematics in classroom situations.
5. To set up mathematics club in the school and organize its activities.
6. To use a mathematics laboratory to develop in students an interest in mathematics.
7. To understand the professional competencies, commitments and expectations of mathematics teacher.
8. To develop knowledge of various values of teaching Mathematics
9. To appreciate the role of mathematics in day-to-day life
10. To understand that mathematics is more than formulas and mechanical procedures
11. To channelize, evaluate, explain and reconstruct students'thinking
12. To appreciate the importance of mathematics laboratory in learning mathematics

Unit 1

Basics of Academic Disciplines

a) Meaning of academic disciplines, Relationship between academic disciplines and Mathematics

b) Classification of academic disciplines: Belcher -Belgian typology (pure-hard, pure soft, applied-hard, applied-soft types) with emphasis on nature of knowledge in each type.,

c) Place of Mathematics in the present school curriculum

Unit 2

Introduction to the Teaching of Mathematics& Curriculum

(a) Meaning, Nature & scope of Mathematics

(b) Aims and Objectives of teaching Mathematics at Secondary and Higher Secondary Levels (NCF 2009)

(c) Values of teaching Mathematics (d) Maxims of teaching ,From Known to Unknown ,From Simple to Complex , From Particular to General ,From Concrete to Abstract , From Whole to Part

(e) Approaches of curriculum construction-Concentric and Topical & Text book .

(f)Pedagogical Analysis ,Unit Planning &Lesson planning

Unit 3

Methods and Techniques of Teaching Mathematics

a) Learner Centered methods ---Inductive Deductive (Teaching Generalizations), Analytical Synthetic (Teaching Proofs)

b) Activity centered methods—Problem solving, Lecture cum Demonstration

c) Techniques of teaching Mathematics ---Drill and Review, Assignment in Mathematics

Unit 4

Learning Resources

a) Mathematic Laboratory & Mathematic club (objectives, significance)

b) Textbook – Characteristics and Critical analysis

c) Digital Resources for Teaching Mathematics- Geogebra & Virtual Manipulative (Meaning, Application, Advantages and Limitations)

Unit 5

Professional Development of Teacher

a) Competencies of Mathematics teacher

b) Need and Avenues of Continuous Professional Development

c) Contribution of mathematicians- Aryabhatta, Ramaujan, Euclid, Phythagoras

d) Mathematics teacher merits & demerits, Characteristics& Maths teaching innovation :- team teaching, Program learning, peer group.

Suggested tasks: (Any One)

PRACTICUM :-

a) Plan and implement lessons in mathematics using appropriate methods/approaches to teach :

Generalizations

Theorems/ Proofs

Problem Solving

Lecture cum Demonstration

Take up a problem in mathematics (from any area like number system, geometry etc.). Make a group of 3 or 4 students to discuss about the probable ways of solving

b) Conduct one lesson in the math using manipulative- Physical/ virtual.

c) Assignment: For any one selected topic, prepare Pedagogical Analysis Plan

d) Critically appreciate any one textbook of mathematics.

e) Conduct one lesson in the math using manipulative- Physical/ virtual.

f) Prepare a diagnostic test in mathematics.

g) Critically appreciate any one textbook of mathematics.

h) Collect the names of Mathematicians and Prepare a report about their contribution to Mathematics .

References:

* Boyer, Carl B., (1969): A History of Mathematics; Wiley, New York.
* Content cum Methodology of Teaching Mathematics for B.Ed; NCERT New Delhi.
* Davis David R., (1960); Teaching of Mathematics Addison Wesley Publications.
* Ediger Mariow (2004); Teaching Math Successfully, Discovery Publication.
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* Johan R.E. et.al, (1961): Modern Algebra; First Course, Addison-Wesley Publishing Company INC. USA.
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* Kulshreshtha; Teaching of Mathematics, R. Lal and Sons.
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PC-3 Pedagogy of Physical Science

MARKS :100
EXTERNAL :80
INTERNAL : 20

Objectives

The course will enable the student teachers to -

- Gain insight on the meaning and nature of physical science for determining aims andstrategies of teaching- learning
- Appreciate the fact that every child possess natural curiosity about her natural Surroundings
- Appreciate that science is a dynamic and expanding body of knowledge
- understand the process of science and role of laboratory in teaching- learning situation

* appreciate various approaches of teaching-learning of physical science
* use effectively different activities/ experiments / laboratory experiences for teaching- learning of physical science
* identify the concepts of physical science that are alternatively conceptualized by teachers and students in general
* explore different ways of creating learning situations considering learning needs andcontext of the learner and the relevant concept
*integrate knowledge in physical science with the other school subject
* facilitate development of scientific attitudes in learners
*construct appropriate assessment tools for evaluating leaning of physical science.
* examine the different pedagogical issues in the content of learning physical science.

Unit 1

Nature of Science

Science as a domain of inquiry, as a dynamic and expanding body of knowledge, science as interdisciplinary area of learning (e.g. Thermodynamics, Bimolecular Surface Chemistry, etc.), Science is an international enterprise, tentative nature of science, science promotes skepticism and perseverance.

*Science as a process of constructing knowledge; Scientific methods: a critical view,How science works; Role of science teacher.

*Science and society- Physical science and society; physical science for environment,health, peace and equity.

* Contribution of eminent scientists- Isaac Newton, John Dalton, J.C. Bose, Albert Einstein Niels Bohr, C.V. Raman, De Boglie, Bimla Buti, V. Ramakrishan, etc.

Unit 2

Aims and Learning objectives of Physical Science

1. Knowledge and understanding through science ;Nurturing process skills ofscience , developing scientific attitude and scientific temper.
2. Nurturing curiosity, creativity and aesthetic sense in science (Secondary Stage)/ Physics and Chemistry (Higher Secondary stage).
3. Relating Science (Physics/ Chemistry) education to environment (naturalenvironment, artifacts and people), technology and society and appreciating theissues at the interface of

science, technology and society; Imbibing various valuesthrough teaching –learning of Science; Developing problem solving skills.
4. Learning objectives- Meaning; features of a well defined learning objective;Anderson and Krathwohl's taxonomy.
5. Identifying and writing learning objectivities for different content areas inScience/ Physics/ Chemistry consistent with the cognitive development oflearners (e.g Mechanics, Heat, Electricity, magnetism, Light, Acids, Bases andSalts, Thermodynamics, Metallurgy, Physical and Chemical changes, Nature andstate of Matter, etc.); Learning objectives in constructivist perspective.

Unit 3

Pedagogical shift and Approached and strategies of learning Physical Science

1. Pedagogical shift from science as a fixed body of knowledge to the process ofconstructing knowledge; Pedagogical shift in nature of science, knowledge,learners, learning and teachers, assessment, science curriculum and planningteaching -learning experiences (taking examples from science/ Physics/Chemistry, such as Solutions, Chemical Equilibrium, Electrochemistry,Mechanical and Thermal Properties of Matter, Reflection, Refractions, Wavesoptics, etc.)
2.Democratizing Science learning: Critical pedagogy
3.Need of inclusion in all aspects of teaching- learning of physical sciences –science curriculum, approaches, ICT and professional development of teachers.
4.Approaches and Strategies -- Historical background of learning Physical Science;
Essential components of all approached and strategies, selecting appropriateapproach and strategy.
5.Constructivist approach; Collaborative learning approach, Problem solvingapproach; Concept mapping; Experiential learning; Cognitive conflict; Inquiryapproach, Analogy strategy.
6. Facilitating self- study; Communication in Science -- qualities of an effectiveScience communicator, developing communication skills inlearners.

Unit 4

Learning Resources in Physical Science

1.Identification and use of learning resources from immediate environment (e.gNatural pH Indicators, Soaps and Detergents, Baking Soda, Washing Soda,Common Salts, Fruits, Fiber, Pulleys, Projectiles, Lenses and Mirrors,Propagation of Waves in solid, liquid and gas, etc.); Using communityresources
-- bringing community to the class and taking class to the community;Pooling of learning resources in school complex/ block /district level.
2 Improvisation of apparatus, identifying some inexpensive sources ofchemicals, Science kits.
3. Using laboratory as a learning resource, approaches to laboratory work,planning and organizing laboratory work, safety in laboratories, Physicslaboratory, Chemistry laboratory, handling hurdles in utilization of resources.
4.Print and ICT resources -- Textbooks, Journal and Magazines; Dale's cone ofexperiences ; Different forms of ICT and its applications in science education--audio -aids, video -aids, audio-video aids, educational T.V.; Use of computerfor simulation, internet and open learning resources.
5.Factors affecting media selection ICT for inclusive education, skills to bedeveloped in students for meaningful use of ICT.

6. Social networking sites and their use in Science education; Integrating ICT inteaching-learning process taking examples (e.g. Acid, Base, Salt, Dual Natureof Radiation, Radioactivity, etc.)

Unit 5

Planning for teaching- learning of Physical Science&Professional Development .

1. Need of planning teaching-learning experiences; Identification andorganization of concepts – basic principles and factors need to beconsidered for it; Basic elements of a Physical Science lesson withexamples from Science/Physics/Chemistry.
2. Facilitating formation of groups; Planning and organizing activities inPhysical Science, planning laboratory work and ICT application inlearning Science/ Physics/Chemistry.
3. Reflective planning; Unit plan; Developing lesson designs on differenttopics and through various approaches taking examples form UpperPrimary, Secondary and Higher Secondary stage (Physical andChemical Changes, Redox Reaction, Light, Magnetic Effect of ElectricCurrent, etc.)
4. Professional development – Teaching as a profession, need for pre- serviceand in- service professional development programme, major shift in teachereducation programme.
5. Various opportunities for in-service professional development –interactionwith peer teachers, reading, attending training programme, membership ofprofessional organisation, sharing through conferences, seminars and Journals, travel, cultivating science hobbies ,mentoring, teacher‘s exchangeprogramme, acquiring higher qualification, collaborating with universitiesand other schools etc.
6. Role of reflective practices in professional development–questionnaires,research and portfolio.
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PRACTICUM :-

1.Actual experience of Science/Physics/Chemistry laboratory of practicing school(report submission)
2.Planning and conducting experiments for Science/Physics/Chemistry
*Managing records
* Setting-up of apparatus
Storage of chemicals and apparatus
*Safety measures being taken in the laboratories and steps taken by thestudent-teacher
* Design of laboratory – structure and physical facilities
*Designing laboratory experiences for using in teaching-learning process inclassroom situation – two innovative activities and two improvisedapparatus (artifacts).
(3) Report of one Action Research carried out in the practicing school
(4) Report on measures being taken for inclusive teaching-learning and gender issues in practicing school and involvement of the student-teacher
(5) Presentation (s) used for teaching-learning in the class
(6) Report on a case study on identifying and addressing issue of alternative concepts in Physical science
(7) Critical review of a recently published research paper in Science/Physics/Chemistry Education Journal
(8) Critical review of a Textbook of Science/Physics/Chemistry.

PC-4 PEDAGOGY OF GENERAL SCIENCE

Marks :100
External :80
Internal :20

- Develop insight on the meaning and nature of General science for determiningaims and strategies of teaching- learning.
- Appreciate that science is a dynamic and expanding body of knowledge.
- Appreciate the fact that every child possesses curiosity about his/her natural
- Identify and relate everyday experiences with learning of science.
- Appreciate various approaches of teaching- learning of science.
- Explore the process skill in science and role of laboratory in teaching- learning.
- Use effectively different activities / experiments/ demonstrations / laboratory
- experiences for teaching-learning of science.
- Integrate the science knowledge with other school subjects.
- Analyze the contents of science with respect to pots, branches, process skills,
- knowledge organization and other critical issues.
- Develop process-oriented objectives based on the content themes/units.
- Identify the concepts of science that are alternatively conceptualized by teachersand students in general.

Unit-I

Nature and Scope of General Science

Concept, Nature, Need & Importance of Science & Science Teaching.Main discoveries and development of science (special reference to ancient India)

Science as a domain of enquiry, as a dynamic and expanding body of knowledge,science as a process of constructing knowledge. Science as interdisciplinary areaof learning (Physics, chemistry, biology etc) science for environment, health,peace & equity, science and society., Fact, concept, principles, laws and theories-their characteristics in context of general science.

Unit-II

Teaching-learning of social science

Questioning; Collaborative strategies; games, simulations, dramatization, roleplays; Values clarification; problem-solving, Discussion, story-telling,project anddecision-making, use of media and technology, concept mapping.

Methods: Interactive verbal learning; experiential learning through activities,experiments; Investigative field visits.

Planning, organizing and conducting of small community survey.

Unit-III

Teaching-learning of Genral Science

Principles of science and its applications consistent with the stages of cognitivedevelopment of learners.

Pedagogical shift from science as fixed body of knowledge to constructingknowledge, scientific method – observation, enquiry, hypothesis,experimentation, data collection, generalization

(teacher-educator will illustratetaking examples from different stage-specific content arras keeping in mind thevariation , e.g. structure and function, molecular aspects, interaction between living and non-living, biodiversity, etc.): Communication in sciences.
Questioning; Collaborative strategies; simulations, Demonstration, lab Method,Problem Solving, Heuristics Project Method, Inductive and deductive Method,Heuristic, use of media and technology, concept mappingInnovative methods of science teaching.

Unit-IV

ICT & Materials in Teaching-learning of General Science

Use of ICT: Video clips, Power points presentations, films etc.
Planning, preparation and presentation of Instructional Material.
Techniques: Using textbooks and atlas as a part of oral lessons, non-oral working lessons; using medium and large scale maps; using pictures, photographs, satelliteimageries and aerial photographs; using audio-visual aids, CDs, multimedia andinternet; case study approach.
Planning , Organization and activity of science club.

Unit-V

Teaching-learning Resources in General Scienceand Evaluation

People as resource: the significance of oral data.
Types of primary and secondary sources: data from field, textual materials,journals, magazines, newspapers, etc.
Using the library for secondary sources and reference material, such asdictionaries and encyclopedias.
Various teaching aids , Audio-visuals & online resources.
Meaning, concept and construction of Achievement test, diagnostic and remedialtest.
Blue print: Meaning, concept, need and construction.
Open-book tests: Strengths and limitations, Continuous and Comprehensive Evaluation (CCE) in Sciences.Characteristics of Assessment in Sciences

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PC-5 PEDAGOGY OF Chemistry

Marks :100
External :80
Internal :20

Objectives:
Upon completion of the course, the student teacher will be able to:
1) Understand the nature, scope and importance of Physical science with special reference to secondary school content.
2) Understand the aims and objectives of teaching Physical science.
3) State the specific behavioral changes under each objective.
4) Understand and make use of different approaches& methods of teaching Physical science.
5) Prepare objective based lesson plans and use them in their internship.
6) Understand and employ several teaching techniques helpful to develop scientific attitude and scientific method.
7) Plan, use and maintain the physical science laboratory systematically.
8) Understand the principles of text-book construction.
9) Understand the importance of appropriate instructional materials (hardwares andsoftwares) in teaching Physical science and use them by preparing/selecting themin their practice teaching.
10) Understand the importance of principles of curriculum construction in the organisation of Physical science contact.
11) Get mastery in Physical science content and imbibe the special qualities of Physical Science teacher.
12) Prepare and use different tools of evaluation to assess the achievements of students in Physical Science.
13) Develop professionally by attending lectures of professional interest, reading journals, and magazines and enroll as members of professional organisation.
14) Organise co-curricular activities in science i.e. seminars, field trips, exhibitionsdiscussions etc through the science club.
15) Apply the knowledge of physical science to develop scientific thinking and scientific out look.
16) Develop skills in analyzing the content in terms of concepts and in learning experiences.
17) Construct and administer unit test, conduct experiments improves teaching aids.

CONTENT

Unit 1

Meaning, Nature and Impact of Chemistry
Concept of science - Science as process and science as a product;
Nature and Scope of Science
Impact of Science and Technology on modern living.
Scientific Attitude - Meaning definition and importance.
Qualities of a person who possesses scientific attitude.
Scientific Method-Meaning, importance and steps involved (with an illustration).

Unit 2

Aims and Objectives of Teaching Physical Science

Aims of teaching Chemistry in Secondary school:
1 Personal development aim,
2 Learner‘s academic and process skills development aim,
3 Disciplinary aim and
4 Cultural aim.
Objectives of teaching Chemistry:
1 Bases for formulation of objectives
2 Objectives of teaching Chemistry at Secondary level; (To be Discussedkeeping in view of the objectives of teaching Chemistry enunciated in thechemistry syllabi of secondary school of M.P.);Instructional objectives ofteaching physical science and stating them in observable behavioralchanges ; i) Knowledge ii) Understanding, iii) Application, iv) Skill, v)Attitude, vi) Interest, vii) Appreciation.

Unit 3

Approaches and Methods of Teaching Physical Science

Enquiry Approach -Meaning, Uses with Illustrations, Advantages and disadvantages.
Inductive Approach-Meaning, Uses with Illustrations, Advantages and disadvantages.
Deductive Approach-Meaning, Uses with Illustrations, Advantages anddisadvantages.
Problem Solving Approach- Meaning, Uses with Illustrations, Steps, Advantages and disadvantages.
Demonstration Method- Meaning, uses, Advantages and disadvantages.
Lectures-Cum-Demonstration Method- Meaning, uses with Illustration, Advantages and disadvantages.
Laboratory Method- Meaning, uses with Illustration, Advantages and disadvantages.
Guided Discovery Method - Meaning, uses with Illustration, Advantages and disadvantages.
Biographical Method-Meaning, uses with Illustration, Advantages and disadvantages.
Individual Instruction Techniques and Active Learning Strategies.
Concept Mapping: Its use for summarizing a unit and evaluating students understanding

Unit 4

Instructional Design, Resources and Teaching Aid for teaching Physical Science:

Lesson Planning-Meaning, Steps, Importance and Format of Lesson Plan according to active learning strategies.
Unit Plan-Meaning, Steps, Importance and Format of Lesson PlanResource Unit-Meaning, Steps, Importance and Format of Lesson Plan Audio-Visual Aids (Preparation and Use)
I Charts;
ii Models;
iii OHP transparencies;
iv Filmstrips;
v slides;
vi Video tapes;
vii Films;
viii Educational C.D.‘s
Mass Media –

i Television (T.V.);
ii Radio - Meaning and importance.Community Resources and Self learning materials –
iii Meaning and importance.Chemistry Laboratory-Planning,Equipments;
Importance ,, Safety measures & organizing of Laboratory;Importance & organizing library;
Choice of book for library.

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