

TS Ed.CET-2019

Syllabus

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Syllabus for the subjects under **Part A and Part B** of the Education

PART –A: GENERAL ENGLISH

(25 MARKS)

1. Reading Comprehension
2. Correction of Sentences, Articles, Prepositions, Tenses, Spelling, Voice
3. Vocabulary, Synonyms, Antonyms
4. Transformation of Sentences –Simple, Compound and Complex. Direct Speech and Indirect Speech

Syllabus: CBCS General English Syllabus (With effect from 2016-17)

Semester I

Prescribed Text Book for Semesters I & II: *English Made Easy* published by Orient Blackswan
Editors: Prof. E. Suresh Kumar, Prof. Sumita Roy and Prof. A. Karunaker

SHORT FICTION: “The Curb in the Sky” by James Thurber—GRAMMAR:
noun—VOCABULARY: roots, prefix and suffix—SPELLING: wrong spellings—
PUNCTUATION: capitalization—WRITING: guided writing & expansion

PROSE: “Happy People” by W.R. Inge—GRAMMAR: pronoun—
VOCABULARY: roots, prefix & suffix— SPELLING: ‘un’ and ‘dis’ for
antonyms— PUNCTUATION: capitalization—WRITING: sequencing

POETRY: “A Psalm of Life” by Henry Wadsworth Longfellow—GRAMMAR:
auxiliary verbs— VOCABULARY: homonyms, homographs, homophones—
SPELLING: words ending ‘tion’ or ‘sion’— PUNCTUATION: full stop and comma—
WRITING: paragraph, descriptive writing

DRAMA: “The Dear Departed” (an extract) by Stanley Houghton—GRAMMAR:
main verbs and tenses— VOCABULARY: collocation— SPELLING: words
ending ‘tion’ or ‘ment’— PUNCTUATION: question and exclamation marks—
WRITING: dialogue writing

Language & Soft Skills Lab: (Pronunciation, Conversation, Reading, Soft Skills and Values)

PRONUNCIATION: Consonant sounds—Vowels: monophthongs—Vowels:
diphthongs—Varied pronunciations of the same letter

CONVERSATION: Introducing oneself in formal /social contexts—Starting and
controlling a conversation—Describing your college and course of study— Leaving a
message on the answering machine, making an appointment on telephone

READING: Biography of Chindula Yelamm: a Telangana Artisan—Million
March: an Initiative for Statehood—Batukamma: Telangana’s cultural identity—
Husain Sagar Lake: a well known tourist attraction

SOFT SKILLS: Motivation and goal setting—Self confidence—Non-verbal
communication/body language—Interpersonal skills

VALUES: “Well begun is half done”—“Doubt is the beginning of wisdom” —
“Actions speak louder than words” —“Faith will move mountains”

Prescribed Text Book for Semesters I & II: *English Made Easy* published by Orient Blackswan. Editors: Prof. E. Suresh Kumar, Prof. Sumita Roy and Prof. A. Karunaker

SHORT FICTION: “A Visit of Charity” by Eudora Welty—GRAMMAR: Non-finite verbs— VOCABULARY: Simile and metaphor— SPELLING: Use of ‘ie’ and ‘ei’— PUNCTUATION: Semicolon—WRITING: Note taking and note making

PROSE: “Benaras” by Aldous Huxley—GRAMMAR: Adjective— VOCABULARY: Oxymoron and hyperbole— SPELLING: Use of ‘able’ and ‘ible’— PUNCTUATION: Colon and long dash— WRITING: Informal letter

POETRY: “The Sun is Warm” by P.B Shelley—GRAMMAR: Articles— VOCABULARY: Portmanteau words, loan words— SPELLING: Use of ‘-ic’, ‘-ive’, ‘-ity’, ‘-al’, ‘-ance’, ‘-ence’— PUNCTUATION: Hyphen and long dash— WRITING: Formal letter

DRAMA: An extract of Act II, Sc 3 from *Julius Caesar* by Shakespeare— GRAMMAR: Adverb— VOCABULARY: Palindromes— SPELLING: Changes of spelling from noun-verb-adjective-adverb— PUNCTUATION: Inverted commas—WRITING: Business letter

Language & Soft Skills Lab: (Pronunciation, Conversation, Reading, Soft Skills and Values)

PRONUNCIATION: Plosives—Fricatives—Affricates and nasals—Lateral, frictionless continuants, semi vowels

CONVERSATION: Asking for advice/information—Making/accepting/ refusing a request— Conducting a meeting/seeking opinion of team members— Appearing for a job interview/conducting a job interview

READING: Hyderabad city: the heart of Telangana—Burrakatha—Cultural identity of Telangana—Handicrafts of Telangana

SOFT SKILLS: Time management—Leadership—Stress management— Etiquette and grooming

VALUES: “Time and tide wait for no one”— “The pen is mightier than the sword” —
“Practice makes one perfect”— “Necessity is the mother of invention”

Prescribed Textbook for Semesters III & IV: *English in Use*. Eds. T Vijay Kumar, K Durga Bhavani, YL Srinivas. Published by Macmillan.

- 1) **Poem:** Charlotte Brontë “Life”
- 2) **Short Story:** Rabindranath Tagore “A Wrong Man in Workers’ Paradise”
- 3) **Vocabulary:** Synonyms, Antonyms
- 4) **Grammar:** Prepositions (including Prepositional Phrases)

- 1) **Poem:** Kamala Das “Punishment in Kindergarten”
- 2) **Essay:** RK Narayan “Toasted English”

- 3) **Vocabulary:** British /American English Common Words
- 4) **Grammar:** Voice

- 1) **Poem:** Langston Hughes “As I Grew Older”
- 2) **Speech:** BR Ambedkar “Grammar of Anarchy” (Excerpt)
- 3) **Vocabulary:** Phrasal Verbs
- 4) **Grammar:** Concord

Writing-1 (Essay Writing)

- 1) Discursive Essay
- 2) Argumentative Essay
- 3) Vocabulary: Idioms
- 4) Grammar: Connectives

Writing-II (Report Writing)

- 1) Business Reports
- 2) Media Reports
- 3) Vocabulary: Technical Vocabulary (Business Media)
- 4) Grammar: Reported Speech (Including Reporting Verbs)

Poem	Tennyson ‘Flower’
Prose	Ruskin Bond “The Kite maker”
Vocabulary	Commonly Confused Words
Grammar	Determine

Poem	AK Ramanujan “Ecology”
Prose	Henry Histchings “What’s the Language of the Future?” (Excerpt)
Vocabulary	Indianism
Grammar	Framing Questions (including tag questions)

Poem	Roald Dah “Television”
Prose	JK Rowlin “The Fringe Benefits of Failure, and the Importance of Imagination” (Excerpt)
Vocabulary	One -word substitutes
Grammar	Relative Causes

Writing Reviews	Film Review, Book Review
Vocabulary	Technical Vocabulary (Film, Literature)
Grammar	Conditionals

CV Writing	Chronological CV, Functional CV
Vocabulary	Appropriacy
Grammar	Common errors

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Syllabus for the subjects under **Part A and Part B** of the Education

PART – B: GENERAL KNOWLEDGE & TEACHING APTITUDE

Marks:(GK:15 + TA:10) = 25

1. Questions will be designed to test the ability of the candidate's general knowledge of the environment around him and its application to society.
2. Questions will also be designed to test knowledge of current events and of such matters of every day observation and experience in their scientific outlook as is expected of an educated person.
3. The test will also include questions relating to India and its neighboring Countries especially pertaining to History, Culture, Geography, Ecology, Economic, General Policy and Scientific Research.
4. Teaching requires certain characteristics like ability to communicate, ability to deal with Children, ability to recognize individual differences etc., apart from analytical thinking and general intelligence. One who has these characteristics will be able to become a good teacher after training. Questions relating to these aspects will be included to test one's teaching aptitude.

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Part - C
MATHEMATICS (SYLLABUS) (100 Marks)

DIFFERENTIAL CALCULUS:

Successive Differentiation - Expansions of Functions- Mean value theorems. Indeterminate forms - Curvature and Evolutes. Partial differentiation - Homogeneous functions - Total derivative. Maxima and Minima of functions of two variables – Lagrange’s Method of multipliers – Asymptotes - Envelopes.

DIFFERENTIAL EQUATIONS:

Differential Equations of first order and first degree: Exact differential equations – Integrating Factors – Change in variables – Total Differential Equations – Simultaneous Total Differential equations

– Equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$. Differential Equations first order but not first degree: Equations

solvable for y - Equations solvable for x - Equations that do not contain x (or y) – Clairaut’s Equation.

Higher order linear differential equations: Solution of homogeneous linear differential equations with constant coefficients - Solution of non-homogeneous differential equations $P(D)y = Q(x)$ with constant coefficients by means of polynomial operators when $Q(x) = be^{ax}, b\sin ax / b\cos ax, bx^k, Ve^{ax}$. Method of undetermined coefficients - Method of variation of parameters - Linear differential equations with non constant coefficients - The Cauchy- Euler Equation.

Partial Differential equations: Formation and solution- Equations easily integrable - Linear equations of first order - Non linear equations of first order - Charpit’s method - Homogeneous linear partial differential equations with constant coefficient - Non homogeneous linear partial differential equations - Separation of variables.

REAL ANALYSIS:

Sequences: Limits of Sequences - A Discussion about Proofs - Limit Theorems for Sequences - Monotone Sequences and Cauchy Sequences. Subsequences - Lim sup’s and Lim inf’s - Series - Alternating Series and Integral Tests. **Sequences and Series of Functions:** Power Series - Uniform Convergence - More on Uniform Convergence - Differentiation and Integration of Power Series.

Integration: The Riemann Integral - Properties of Riemann Integral - Fundamental Theorem of Calculus.

ALGEBRA:

Groups: Definition and Examples of Groups- Elementary Properties of Groups - Finite Groups; Subgroups -Terminology and Notation -Subgroup Tests - Examples of Subgroups **Cyclic**

Groups:Properties of Cyclic Groups - Classification of Subgroups Cyclic Groups - **Permutation**

Groups: Definition and Notation - Cycle Notation -Properties of Permutations - A Check Digit Scheme Based on D_5 . **Isomorphisms:** Motivation - Definition and Examples - Cayley’s Theorem

Properties of Isomorphisms – Automorphisms - Cosets and Lagrange’s Theorem Properties of Cosets 138 - Lagrange’s Theorem and Consequences - An Application of Cosets to Permutation Groups - The

Rotation Group of a Cube and a Soccer Ball - Normal Subgroups and Factor Groups ; Normal Subgroups - Factor Groups - Applications of Factor Groups - Group Homomorphisms - Definition and

Examples - Properties of Homomorphisms - The First Isomorphism Theorem.

Introduction to Rings: Motivation and Definition - Examples of Rings - Properties of Rings – Subrings - **Integral Domains:** Definition and Examples –Characteristics of a Ring - Ideals and Factor Rings;

Ideals - Factor Rings - Prime Ideals and Maximal Ideals.

Ring Homomorphisms: Definition and Examples - Properties of Ring – Homomorphisms - The Field of Quotients Polynomial Rings: Notation and Terminology.

LINEAR ALGEBRA:

Vector Spaces: Vector Spaces and Subspaces - Null Spaces, Column Spaces, and Linear Transformations - Linearly Independent Sets; Bases - Coordinate Systems - The Dimension of a Vector Space.

Rank-Change of Basis - Eigen values and Eigenvectors - The Characteristic Equation.

Diagonalization - Eigenvectors and Linear Transformations - Complex Eigen values - Applications to Differential Equations - **Orthogonality and Least Squares:** Inner Product, Length, and Orthogonality - Orthogonal Sets.

NUMERICAL ANALYSIS:

Solutions of Equations in One Variable: The Bisection Method - Fixed-Point Iteration - Newton's Method and Its Extensions - Error Analysis for Iterative Methods - Accelerating Convergence - Zeros of Polynomials and Müller's Method - Survey of Methods and Software.

Interpolation and Polynomial Approximation: Interpolation and the Lagrange Polynomial - Data Approximation and Neville's Method - Divided Differences - Hermite Interpolation - Cubic Spline Interpolation.

Numerical Differentiation and Integration: Numerical Differentiation - Richardson's Extrapolation - Elements of Numerical Integration - Composite Numerical Integration – Romberg Integration - Adaptive Quadrature Methods - Gaussian Quadrature.

Texts:

- Shanti Narayan and Mittal, Differential Calculus
- Zafar Ahsan, Differential Equations and Their Applications
- Kenneth A Ross, Elementary Analysis-The Theory of Calculus
- Joseph A Gallian, Contemporary Abstract algebra (9th edition)
- David C Lay, Linear Algebra and its Applications 4e
- Richard L. Burden and J. Douglas Faires, Numerical Analysis (9e)

1. **Vector Analysis** : Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field and related problems. Vector integration, line, surface and volume integrals. Stokes, Gauss and Greens theorems- simple applications.
2. **Mechanics of Particles** : Laws of motion, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions in two and three dimensions, concept of impact parameter, scattering cross-section,
3. **Mechanics of rigid bodies**: Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler's equation, precession of a top, Gyroscope,
4. **Central forces**: Central forces – definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler's laws, Coriolis force and its expressions.
5. **Special theory of relativity**: Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four vector formalism.
6. **Fundamentals of vibrations**: Simple harmonic oscillator, and solution of the differential equation– Physical characteristics of SHM, torsion pendulum, - measurements of rigidity modulus , compound pendulum, measurement of 'g', combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures
7. **Damped and forced oscillations**: Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with undamped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance. Coupled Oscillators.
8. **Vibrating Strings**: Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones, energy transport, transverse impedance
9. **Vibrations of bars**: Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends ii) bar fixed at the midpoint iii) bar free at both ends iv) bar fixed at one end. Transverse vibrations in a bar- wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.

- 10. Kinetic theory of gases:** Introduction – Deduction of Maxwell's law of distribution of molecular speeds, Transport Phenomena – Viscosity of gases – thermal conductivity – diffusion of gases.
- 11. Thermodynamics:** Basics of thermodynamics-Kelvin's and Clausius statements – Thermodynamic scale of temperature – Entropy, physical significance – Change in entropy in reversible and irreversible processes – Entropy and disorder – Entropy of universe – Temperature- Entropy (T-S) diagram – Change of entropy of a perfect gas-change of entropy when ice changes into steam.
- 12. Thermodynamic potentials and Maxwell's equations:** Thermodynamic potentials – Derivation of Maxwell's thermodynamic relations – Clausius-Clayperon's equation – Derivation for ratio of specific heats – Derivation for difference of two specific heats for perfect gas. Joule Kelvin effect – expression for Joule Kelvin coefficient for perfect and Vanderwaal's gas.
- 13. Low temperature Physics:** Joule Kelvin effect – liquefaction of gas using porous plug experiment. Joule expansion – Distinction between adiabatic and Joule Thomson expansion – Expression for Joule Thomson cooling – Liquefaction of helium, Kapitza's method – Adiabatic demagnetization – Production of low temperatures – Principle of refrigeration, vapour compression type.
- 14. Quantum theory of radiation:** Black body-Ferry's black body – distribution of energy in the spectrum of Black body – Wein's displacement law, Wein's law, Rayleigh-Jean's law – Quantum theory of radiation - Planck's law – deduction of Wein's distribution law, Rayleigh-Jeans law, Stefan's law from Planck's law.

Measurement of radiation using pyrometers – Disappearing filament optical pyrometer – experimental determination – Angstrom pyroheliometer - determination of solar constant, effective temperature of sun.

- 15. Statistical Mechanics:** Introduction, postulates of statistical mechanics. Phase space, concept of ensembles and some known ensembles ,classical and quantum statistics and their differences, concept of probability, Maxwell-Boltzmann's distribution law -Molecular energies in an ideal gas- Maxwell-Boltzmann's velocity distribution law, Bose-Einstein Distribution law, Fermi-Dirac Distribution law, comparison of three distribution laws, Application of B-E distribution to Photons-planks radiation formula, Application of Fermi-Dirac statistics to white dwarfs and Neutron stars.
- 16. Interference:** Principle of superposition – coherence – temporal coherence and spatial coherence – conditions for Interference of light

Interference by division of wave front: Fresnel's biprism – determination of wave length of light. Determination of thickness of a transparent material using Biprism – change of phase on reflection – Lloyd's mirror experiment.

Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) – Colours of thin films – Non reflecting films – interference by a plane parallel film illuminated by a point source – Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) – Determination of diameter of wire-Newton's rings in reflected light with and without contact between lens and glass plate, Newton's rings in transmitted

light (Haidinger Fringes) – Determination of wave length of monochromatic light – Michelson Interferometer – types of fringes – Determination of wavelength of monochromatic light, Difference in wavelength of sodium D_1, D_2 lines and thickness of a thin transparent plate.

- 17. Diffraction:** Introduction – Distinction between Fresnel and Fraunhofer diffraction Fraunhofer diffraction:- Diffraction due to single slit and circular aperture – Limit of resolution – Fraunhofer diffraction due to double slit – Fraunhofer diffraction pattern with N slits (diffraction grating)

Resolving Power of grating – Determination of wave length of light in normal and oblique incidence methods using diffraction grating.

Fresnel diffraction-Fresnel's half period zones – area of the half period zones –zone plate – Comparison of zone plate with convex lens – Phase reversal zone plate – diffraction at a straight edge – difference between interference and diffraction.

- 18. Polarization:** Polarized light : Methods of Polarization, Polarization by reflection, refraction, Double refraction, selective absorption , scattering of light – Brewster's law – Malus law – Nicol prism polarizer and analyzer – Refraction of plane wave incident on negative and positive crystals (Huygen's explanation) – Quarter wave plate, Half wave plate – Babinet's compensator – Optical activity, analysis of light by Laurent's half shade polarimeter.

- 19. Aberrations and Fiber Optics: Introduction** – Monochromatic aberrations, spherical aberration, methods of minimizing spherical aberration, coma, astigmatism and curvature of field, distortion. Chromatic aberration – the achromatic doublet – Removal of chromatic aberration of a separated doublet.

Fiber Optics : Introduction – Optical fibers –Principles of fiber communication – Step and graded index fibers – Rays and modes in an optical fiber – Fiber material – Types of optical fibers and advantages of fiber communication,

- 20. Electrostatics:** Electric Field:- Concept of electric field lines and electric flux, Gauss's law (Integral and differential forms), application to linear, plane and spherical charge distributions. Conservative nature of electric field E, irrotational field. Electric Potential:- Concept of electric potential, relation between electric potential and electric field, potential energy of a system of charges. Energy density in an electric field. Calculation of potential from electric field for a spherical charge distribution.

- 21. Magnetostatics :**Concept of magnetic field B and magnetic flux, Biot-Savart's law, B due to a straight current carrying conductor. Force on a point charge in a magnetic field. Properties of B, curl and divergence of B, solenoidal field. Integral form of Ampere's law, applications of Ampere's law: field due to straight, circular and solenoidal currents. Energy stored in magnetic field. Magnetic energy in terms of current and inductance. Magnetic force between two current carrying conductors. Magnetic field intensity. Ballistic Galvanometer:- Torque on a current loop in a uniform magnetic field, working principle of B.G., current and charge sensitivity, electromagnetic damping, critical damping resistance.

- 22. Electromagnetic Induction:** Faraday's laws of induction (differential and integral form), Lenz's law, self and mutual Induction. Continuity equation, modification of Ampere's law, displacement current, Maxwell equations

23. Electromagnetic waves: Maxwell's equations in vacuum and dielectric medium, boundary conditions, plane wave equation: transverse nature of EM waves, velocity of light in vacuum and in medium, polarization, reflection and transmission. Polarization of EM waves, Brewster's angle, description of linear, circular and elliptical polarization.

24. Atomic Spectra and Models Inadequacy of classical physics: Brief Review of Black body Radiation, Photoelectric effect, Compton effect, dual nature of radiation, wave nature of particles. Atomic spectra, Line spectra of hydrogen atom, Ritz Rydberg combination principle. Alpha Particle Scattering, Rutherford Scattering Formula, Rutherford Model of atom and its limitations, Bohr's model of H atom, explanation of atomic spectra, correction for finite mass of the nucleus, Bohr correspondence principle, limitations of Bohr model, discrete energy exchange by atom, Frank Hertz Expt. Sommerfeld's Modification of Bohr's Theory.

Wave Particle Duality de Broglie hypothesis, Experimental confirmation of matter wave, Davisson Germer Experiment, velocity of de Broglie wave, wave particle duality, Complementarity. Superposition of two waves, phase velocity and group velocity, wave packets, Gaussian Wave Packet, spatial distribution of wave packet, Localization of wave packet in time. Time development of a wave Packet; Wave Particle Duality, Complementarity. Heisenberg Uncertainty Principle, Illustration of the Principle through thought Experiments of Gamma ray microscope and electron diffraction through a slit. Time independent and time dependent Schrodinger wave equation. Estimation of ground state energy of harmonic oscillator and hydrogen atom, non-existence of electron in the nucleus. Uncertainty and Complementarities.

Nuclear Physics Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, Liquid Drop model: semi-empirical mass formula and binding energy, Nuclear Shell Model and magic numbers.

Radioactivity: stability of the nucleus; Law of radioactive decay; Mean life and half-life; Alpha decay; Beta decay- energy released, spectrum and Pauli's prediction of neutrino; Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus. Fission and fusion- mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions driving stellar energy (brief qualitative discussions), Classification of Elementary Particles

25. Basic Electronics: Classification of solids in terms of forbidden energy gap. Intrinsic and extrinsic semiconductors, Fermi level, continuity equation – p-n junction diode, half wave and full wave rectifiers and filters, ripple factor, Characteristics of Zener diode and its application as voltage regulator. – p n p and n p n transistors, current components in transistors, CB,CE and CC configurations – concept of transistor biasing, operating point, fixed bias and self-bias transistor as an amplifier — concept of negative feedback and Positive feedback – Barkhausen criterion.

- 26. Digital Principles:** Binary number system, converting Binary to Decimal and vice versa. Binary addition and subtraction (1s' and 2's complement methods). Hexadecimal number system. Conversion from Binary to Hexadecimal – vice versa and Decimal to Hexadecimal vice versa. Logic gates: OR, AND, NOT gates, truth tables, NAND, NOR as universal gates, Exclusive – OR gate, De Morgan's Laws – statement and proof, Half and Full adders.
- 27. Quantum Mechanics:** de Broglie's hypothesis — wavelength of matter waves, properties of matter waves, Properties of matter waves Phase and group velocities. Davisson and Germer experiment. Double slit experiment. Standing de Broglie waves of electron in Bohr orbits. Heisenberg's uncertainty principle for position and momentum (x and p_x), Energy and time (E and t). Gamma ray microscope. Diffraction by a single slit. Position of electron in a Bohr orbit. Particle in a box. Complementary principle of Bohr. Schrodinger time independent and time dependent wave equations. Wave function properties — Significance. Basic postulates of quantum mechanics. Operators, Eigen functions and Eigen values, expectation values. Application of Schrodinger wave equation to particle in one and three dimensional boxes, potential step and potential barrier.
- 28. Nuclear Physics:** Basic properties of nucleus — size, charge, mass, spin, magnetic dipole moment and electric quadrupole moment. Binding energy of nucleus, deuteron binding energy, p-p and n-p scattering (concepts), nuclear forces. Nuclear models — liquid drop model, shell model. Range of alpha particles, Geiger — Nuttall law. Gammow's theory of alpha decay. Geiger — Nuttall law from Gammow's theory. Beta spectrum — neutrino hypothesis, Fermi's theory of β —decay.
- 29. Solid State Physics:** Crystalline nature of matter. Crystal lattice, Unit Cell, Elements of symmetry. Crystal systems, Bravais lattices. Miller indices. Simple crystal structures (S.C., BCC, CsCl, FCC, NaCl diamond and Zinc Blends)

Diffraction of X —rays by crystals, Bragg's law, Experimental techniques - Laue's method and powder method.

1. Atomic structure and elementary quantum mechanics

Black body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Compton effect, De Broglie's hypothesis. Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger's wave equation, and its importance. Physical interpretation of the wave function, significance of ψ and ψ^2 .

2. Chemical Bonding

Ionic solids- lattice and solvation energy, solubility of ionic solids rule, power and polarizability of ions, covalent nature of ionic bond, covalent bond – stereochemistry of inorganic molecules-Common hybridization and shapes of molecules. Molecular orbital theory: Shapes and sign convention of atomic orbital, modes of overlapping. concept of σ and π bonds, criteria for forming molecular orbital from atomic orbital. LCAO concept. types of molecular orbital- bonding, antibonding and non bonding, electron density distribution diagram for H_2^+ , MOED of homonuclear - $H_2, He_2^+, B_2, C_2, N_2, O_2, F_2$ (unhybridized diagrams only) and hetero nuclear diatomic molecules CO, CN, NO, NO⁻ and HF. Bond order and magnetic properties.

3. Periodic properties.

Review of trends in atomic and ionic radii - covalent radii - single, double and triple bond covalent radii, vander Waal radii. radii of cations, anions iso-electronic ions, ionization energy Electropositivity, basic nature, reducing behavior, electron affinity and electro negativity. Methods of determination and evaluation - Pauling's and Mulliken's approach, application in predicting and explaining chemical behavior - nature of bond, bond length and bond angles, diagonal relationship.

4. s-block and p-block elements

Comparative study, salient feature of Hydrides ionic and covalent, polynuclear, complex hydrides, reducing properties, oxides- monoxides and super oxide basicity, oxidizing nature. Complexation tendencies,

Comparative study of group 13 -17.

Hydrides - Classification - ionic, covalent, metallic and complex hydrides. Synthesis of each class of hydrides Structure of (a) covalent hydrides, electron deficient hydrides, Diborane, decaborane. (b) complex hydrides - borohydrides. Reactivity - stability, hydrolysis and reducing properties. Oxides - Classification - a) Normal - acidic, basic amphoteric and neutral, b) mixed, c) suboxide, d) peroxide, e) super oxide. Structure of oxides of C, N, P, S and Cl. Reactivity - thermal stability, hydrolysis. Halides classification ionic, covalent and complex halides. Structure of halides of B, C, Si, N, P, S. Reactivity - stability, hydrolysis. Lewis acid nature of boron trihalides. Oxy -acids - Oxy - acids of B, C, N, P, S and Cl – structure and acidic nature.

Carboranes – nomenclature, classification- closo, nido, and arachno, preparation and structure. Borazole – preparation properties and structure.

Carbonyls –classification – mono and poly nuclear general preparation, structure and bonding in $Ni(CO)_4, Fe(CO)_5$ and $Co_2(CO)_8$.

5. d-block-elements

Chemistry of elements of First Transition series - electronic configuration, metallic nature, atomic and ionic radii, ionization potential-Oxidation state - relative stability of various oxidation states, ionic and covalent character, acidic and basic nature, oxidizing and reducing nature of various oxidation states, redox potential - Frost and Latimer diagrams - stability, disproportionation and comproportionation of different oxidation states. colour d-d transition, colour and spectral behaviour of transition metal ions with respect of d^1-d^2 configuration. Magnetic behavior determination of magnetic moment, Gouy's balance. paramagnetism, diamagnetism. Complexation behaviour, stability of complexes - oxidation states, pi complexes, class a, class-b and class-a/b acceptors. Catalytic properties - important examples.

Chemistry of elements of Second and Third transition series - comparative treatment with their 3d analogues with respect to oxidation state, magnetic behavior, spectral properties. Study of Ti, Cr and Cu triads - Titanium triad - electronic configuration, reactivity of +III and +IV states - oxides, halides. Chromium triad - reactivity of +III and +VI states, Copper triad - reactivity of +I, +II, and +III states.

6. f-block elements

Chemistry of Lanthanides - electronic structure, position in periodic table, oxidation state, Atomic and ionic radii, Lanthanide contraction - cause and consequences, anomalous behaviour of post lanthanides, basicity, Complexation-type of donor ligands preferred, magnetic properties- paramagnetism. Colour and spectra f-f transition. Occurrence and separation-ion exchange method, solvent extraction.

Chemistry of Actinides-General features-electronic configuration, oxidation state, actinide contraction, colour and complex formation. Comparison with lanthanides.

7. Metals

Theories of bonding in metals - Free electron theory - thermal and electrical conductivity of metals, drawbacks. Valence bond theory - explanation of metallic properties and its limitations. Band theory explanation of metallic properties, conductors, semi conductors and insulators. General methods involved in extraction of metals - minerals and ores, ore concentration - electromagnetic

separation, gravity separation - wilfley table, hydraulic classifier, leaching, froth flotation. Calcination and roasting Acid and alkali digestion. Reduction of oxides, carbonates, halides, sulphides, sulphates - smelting, flux, auro reduction, alumino - thermic reduction, hydrometallurgy, electrolytic reduction.

Purification of impure metals- liquation, fractional distillation, zone refining oxidative processes- cupellation bassemmerisation, puddling, poling, thermal decomposition, Amalgamation, Electrolysis. Alloys- Classification, substitutional solid solutions, interstitial solid solutions, intermetallic compounds, Hume - Rothery rules. Preparation of alloys fusion, electro deposition, reduction and compression. Uses ferrous and non-ferrous alloys.

8. Co-ordination chemistry.

Nomenclature of inorganic molecules and complex compounds - A. Simple inorganic molecules - multiplying affixes, structural affixes (i) cations - monotomic homopolyatomic, (ii) anions - monoatomic, homopolyatomic, heteropolyatomic (iii) radicals (iv) isopolyanions (v) heteropolyanions (vi) salts and salt like compound (vii) addition compounds. B. complex compounds -Werner's theory - postulates, experimental evidences. Sidwick's theory—calculation of EAN, limitations. Metal Ligand bondin in transition metal complexes - Valence bond theory - postulates, geometries of coordination number 4 – tetra hedral and square planer and 6 -octahedral. Limitations. Crystal field theory - features.

Splitting of d - orbitals in octahedral, tetrahedral and square planar complexes, crystal field stabilization energy, (elementary treatment diagrams only). Magnetic properties of Transition metal complexes. Types of magnetic behavior spin only formula, calculation of magnetic moments. Electronic spectra of metal complexes d-d transitions, spectro chemical series. Determination of composition of complexes, Job's method and mole ratio method. Stability constants, factors affecting stability of complexes. Isomerism in co-ordination compounds - Structural ionization, hydrate, linkage, coordination, coordination position and polymerization isomerism. Stereoisomerisms- geometrical and optical isomerism.

Hard and soft acids and bases

Classification, Pearson's concept of hardness and softness, application of HSAB principles - stability of complexes, predicting the feasibility of a reaction.

ORGANIC CHEMISTRY

9. Stereochemistry of carbon compounds

Molecular representations: Wedge, Fischer, Newman and saw-horse formulae.

Isomerism: Definition of homomers and isomers. Classification of isomers: Constitutional and Stereoisomers - definition and examples. Constitutional isomers: chain, functional and positional isomers and metamerism. Stereoisomers: enantiomers and diastereomers – definitions and examples. Conformational and configurational isomerism- definition.

10. Structural Theory in Organic Chemistry

Brief review of structural theory of organic chemistry, Hybridization, Bond length, bond angle, bond energy, curved arrow notation, drawing electron movements with half headed and double headed arrow. Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents including neutral molecules like H_2O_2 , BF_3 , NH_3 & AlCl_3) Bond polarization: Factors influencing the polarization of covalent bonds, electronegativity - inductive effect. Application of inductive effect, (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonim ions. Resonance or Mesomeric effect, application to (a) acidity phenol, (b) acidity of carboxylic acids. Hyper conjugation and it application to stability to stability of carbonium ions. Free radicals and alkenes.

Types of organic reactions: Addition electrophilic, nucleophilic and free radical Substitution - electrophilic, nucleophilic and free radical. Elimination. Examples (mechanism not required).

11. Acyclic Hydrocarbons

Alkanes– IUPAC Nomenclature of hydrocarbons. Methods of preparation: hydrogenation of alkenes and alkynes Wurtz reaction, Kolbe's electrolysis, Corey-House reaction. Chemical reactivity - inert nature, free radical substitution mechanism, Halogenation examples- reactivity, selectivity and orientation. Conformational analysis of ethane and n-butane.

Alkenes- Preparation of alkenes (a) by dehydration of alcohols (b) dehydrohalogenation of alkyl halides (c) by dehalogenation of 1,2 dihalides(brief mechanism), Zaitsev's rule. Properties: Addition of Hydrogen – heat of hydrogenation and stability of alkenes. Addition of halogen and its mechanism. Addition of HX, Markonikov's rule, addition of H₂O, HOX, H₂SO₄with mechanism and addition of HBr in the presence of peroxide (anti – Markonikov's addition).

Oxidation – hydroxylation by KMnO₄, OsO₄, peracids (via epoxidation), hydroboration, ozonolysis –location of double bond. Dienes – Types of dienes, reactions of conjugated dienes – 1,2 and 1,4 addition of HBr to 1,3 – butadiene and Diels – Alder reaction.

Alkynes– Preparation by dehydrohalogenation of dihalides, dehalogenation of tetrahalides acetylene from CaC₂. Properties: Acidity of acetylenic hydrogen (formation of metal acetylides). preparation of higher acetylenes, Metal-ammonia reductions. physical properties. Chemical reactivity – electrophilic addition of X₂, HX, H₂O (tautomerism), Oxidation (formation of enediol, 1,2 diones and carboxylic acids), reduction and polymerization reaction of acetylene.

12. Benzene and its reactivity

Molecular formula of Benzene, structure of Benzene - open chain structure not possible, proposition of cyclic structure by Kekulé dynamic equilibrium, evidence based on ozonolysis experiment, concept of resonance, resonance energy. Heat of hydrogenation, heat of combustion of Benzene, mention of C-C bond lengths and orbital picture of Benzene.

Concept of aromaticity - aromaticity (definition) Huckl's rule - application to Benzenoid (Benzene, Napthalene, anthracene and Phenanthrace) and Non-Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation).

Reactions General mechanism of electrophilic substitution mechanism of nitration and sulfonation. Mechanism of halogenations, Friedel craft's alkylation and acylation. Orientation of aromatic substitution - Definition ortho, para and meta directing groups. Ring activating and deactivating group with examples (Electronic Interpretation of various groups like NO₂ and Phenolic). Orientation: (i) Amino methoxy and methyl groups, (ii) Carboxy, nitro, nitrile, carbonyl and sulfonic acid groups, (iii) Halogens (Explanation by taking minimum of one example from each type)

13. Arenes and Polynuclear Aromatic Hydrocarbons

Polynuclear hydrocarbons – Structure of naphthalene and anthracene (Molecular Orbital diagram and resonance energy) Reactivity towards electrophilic substitution. Nitration and sulphonation as examples.

Hydroxy compounds

Nomenclature and classification of hydroxyl compounds. Preparation: from carbonyl compounds. Aryl carbinols by hydroxyl methylation. Phenols - (a) by diazotization (b) from sulfonic acid (c) from cumene (d) by hydrolysis of halobenzene. Physical properties Hydrogen bonding (inter molecular and intramolecular) effect of hydrogen bonding on boiling point and water solubility Chemical properties (a) acidic nature of Phenols (b) Formation of aldoxide /phenoxides and their reaction with RX (c) replacement of OH by X using PCl_5 , PBr_3 , SOCl_2 and with HX/ZnCl_2 . Esterification by (a) acid halides, anhydrides and acids (mechanism) (b) Esters of inorganic acids (c) dehydration of alcohols. Oxidation of alcohols by CrO_3 KMnO_4 . Spectral reactions of phenols - (a) Bromination, (b) Kolbe - Schmidt reaction (c) Reimer Tiemann (d) Azo coupling. Identification of alcohols by oxidation - KMnO_4 , Ceric ammonium nitrate - Lucas reagent; Phenols by reaction with FeCl_3 , and by the solubility in NaOH . Polyhydroxyl compounds Pinacol-pinacolone rearrangement Oxidative cleavage ($\text{Pb}(\text{OAc})_4$ & HIO_4).

Carbonyl compounds

Nomenclature of aliphatic and aromatic carbonyl compounds and isomerism. Synthesis of aldehydes & ketones from acid chloride by using 1,3-dithianes, nitriles and from carboxylic acids. Base catalysed reactions with particular emphasis on Aldol, Cannizzaro reaction, Perkin reaction, Benzoin condensation, haloform reaction, Knoevenagel condensation. Oxidation reactions - KMnO_4 oxidation and auto oxidation, reduction - catalytic hydrogenation, Clemmenson's reduction, Wolf-kishner reduction, MPV reduction, reduction with LAH, NaBH_4 . Analysis - 2,4 -DNP test, Tollen's test, Fehlings test, Schiff's test, haloform test (with equations). Introduction to carbonyl compounds.

Nitrogen compounds

Nitro hydro carbons: Nomenclature and classification - nitro hydrocarbons - structure. Tautomerism of nitroalkanes leading to acid and keto form. Preparation on Nitroalkanes. Reactivity - halogenation, reaction with HONO ("Nitrous acid), Nef reaction and Mannich reaction leading to Michael addition and reduction. Aromatic Nitro hydrocarbons: Nomenclature, Preparation of Nitrobenzene by Nitration (mechanism), from diazonium salts. Physical properties, chemical reactivity - orientation of electrophilic substitution on nitrobenzene. Reduction reaction of Nitrobenzenes in different media. Amines (Aliphatic and Aromatic): Nomenclature, classification into 1°, 2°, 3° Amines and Quaternary ammonium compounds. preparative methods - 1. Ammonolysis of alkyl halides 2. Gabriel synthesis 3. Hoffman's bromamide reaction (mechanism). Reduction of Amides and Schmidt reaction. Chemical Properties: (a) Alkylation (b) Acylation (c) Carbylamine reaction (d) Hinsberg separation. Reaction with Nitrous acid of 1°, 2°, 3° (Aliphatic and aromatic amines). Electrophilic substitutions of Aromatic amines - Bromination and Nitration, oxidation of aryl and 3° Amines, diazotization. 6. Diazonium salts Preparation with mechanism. Synthetic importance - (a) Replacement of diazonium group by- OH, X (Cl) Sandmeyer and Gatterman reaction, by fluorine Schiemann's reaction), by iodine, CN, NO_2 , H and aryl groups. Coupling Reaction of diazonium (i) with phenols (ii) with anilines. Reduction to phenyl hydrazines.

14. Heterocyclic Compounds

Introduction and definition: Simple 5 membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole. Importance of ring systems –presence in important natural products like hemoglobin and chlorophyll. Numbering the ring systems as per Greek letter and Numbers. Aromatic character –6-electron system (four-electrons from two double bonds and a pair of non-bonded electrons from the hetero atom). Tendency to undergo substitution reactions.

15. Carbohydrates

Introduction: Classification and nomenclature –classification into mono, oligo and polysaccharides, into pentoses, hexoses etc., into aldoses and ketoses.

Monosaccharides: All discussion to be confined to (+) glucose as an example of aldo hexoses and (-) fructose as example of ketohexoses. Chemical properties and structural elucidation: Evidences for straight chain pentahydroxy aldehyde structure (Acetylation, reduction to n-hexane, cyanohydrin formation, reduction of Tollen's and Fehling's reagents and oxidation to gluconic and saccharic acids). Number of optically active, isomers possible for the structure, configuration of glucose based on D-glyceraldehyde as primary standard (No proof for configuration is required). Evidence for cyclic structure of glucose (some negative aldehyde tests and mutarotation).

Cyclic structure of glucose: Proposition of cyclic structure (Pyranose structure, anomeric Carbon and anomers). Proof for the ring size (methylation, hydrolysis and oxidation reactions). Different ways of writing pyranose structure (Haworth formula and chair conformational formula). Structure of fructose: Evidence of 2 –ketohexose structure (formation of penta acetate, formation of cyanohydrin its hydrolysis and reduction by HI to give 2-Carboxy-n-hexane Same osazone formation from glucose and fructose, Hydrogen bonding in osazones, cyclic structure for fructose (Furanose structure, Haworth formula).

Inter Conversion of Monosaccharides: Aldopentose to aldo hexose –eg: Arabinose to D-glucose, D-mannose (kiliani –Fischer method). Epimers, Epimerisation-Lobry debruyn van Ekenstein rearrangement. Aldohexose –Aldopentose eg: D-glucose to D-arabinose by Ruff's degradation. Aldohexose(+) (glucose) to ketohexose (-)(Fructose) and Ketohexose (Fructose) to aldohexose (Glucose).

16. Amino acids and proteins

Introduction: definition of amino acids, classification of amino acids alpha, beta and gamma amino acids. Natural and essential amino acids definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples –Glycine, Alanine, valine and Leucine) by following methods: a) From halogenated Carboxylic acid b) Malonic ester synthesis c) strecker's synthesis. Physical properties: Optical activity of naturally occurring amino acids: L –configuration, irrespective of sign of rotation. Zwitter ion structure –salt like character, solubility, melting points, amphoteric character, definition of isoelectric point. Chemical properties: General reactions due to amino and carboxyl groups –Lactams from gamma and delta amino acids by heating peptide bond (amide linkage). Structure and nomenclature of peptides and proteins, peptide synthesis.

PHYSICAL CHEMISTRY

17. Gaseous State

Deviation of real gases from ideal behavior. Vander Waals equation of state. Critical phenomenon. PV-isotherms of real gases, continuity of state. Andrew's isotherms of CO₂. The vander Waal's equation and critical state. Derivation of relationship between critical constants and van der Waal's constants. Experimental determination criteria constants. The law of corresponding states, reduced equation of states. Joule Thomson effect and inversion temperature of a gas. Liquid action of gases: i) Linde's method based on Joule Thomson effect ii) Claude's method based on adiabatic expansion of a gas.

18. Liquid State

Intermolecular forces, structure of liquids (qualitative description). Structural differences between solids, liquids and gases. Liquid crystals, the mesomorphic state: Classification of liquid crystals into Smectic and Nematic, differences between liquid crystal and solid / liquid. Application of liquid crystals as LCD devices, lubricants and in digestion/ assimilation of food.

19. Solid state

Laws of Crystallography – (i) Law of Constancy of interfacial angles (ii) Law of Symmetry, Symmetry elements in crystals (iii) Law of rationality of indices. Definition of space lattice, unit cell. Bravais Lattices and Seven Crystal systems structure of NaCl (Bragg's method and Powder method). Defects in crystals. Stoichiometric and non stoichiometric defects. Band theory of semiconductors: Extrinsic and intrinsic semi conductors, n-type and p-type and their applications in photo electro chemical cells.

20. Dilute Solutions & Colligative Properties

Dilute Solutions, Colligative Properties, ideal and non ideal solution. Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis - laws of osmotic pressure, its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, Van'thoff factor, degree of dissociation and association of solutes.

21. Colloids & surface chemistry

Definition of colloids. Classification of colloids. Solids in liquids (sols): preparations and properties – Kinetic, Optical and Electrical: stability of colloids Protective action. Hardy-Schultz law, Gold number. Liquids in liquids (emulsions): Types of emulsions, preparation and emulsifier. Liquids in solids(gels); Classification, preparations and properties, inhibition, General applications of colloids.

22. Solutions

Liquid - liquid mixtures, ideal liquid mixtures, Raoult's and Henry's laws. Non ideal systems. Azeotropes HCl-H₂O and C₂H₅OH - H₂O systems. Fractional distillation,. Partially miscible liquids- Phenol – Water, Trimethyl amine – Water and Nicotine –Water systems. Lower upper consolute temperatures. Effect of impurity on consolute temperature. Immiscible liquids and steam distillation.

23. Chemical Kinetics

Rate of reaction, Factors influencing the rate of a reaction -concentration, temperature, pressure, solvent, light and catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions- Zero order, first order, second order, pseudo first order, half life and mean life. Determination of order of a reaction- differential method, method of integration, half life method and isolation method. Radio active decay as first order phenomenon. Arrhenius equation and concept of activation energy. Theories of chemical kinetics: effect of temperature on rate of reaction. Simple collision theory based on hard sphere model.

24. Thermodynamics

Definition of Thermodynamic terms: System, surroundings. types of systems, and intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.

First law of Thermodynamics: Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law - Joule. Thomson coefficient and inversion temperature. Calculation of w,q, dU and dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process. Temperature dependence of enthalpy - Kirchoffs equation. Second law of thermodynamic need for the law, different statements of the law. Carnot cycle and its efficiency, Carnot Theorem. Thermodynamic scale of temperature. Concept of entropy, entropy as a state function, entropy as a function of V and T, entropy is a function of P & T entropy change in physical processes. Gibbs and Helmholtz functions(G) and Helmholtz functions(A) as thermodynamic quantities. A&G as a criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G with P, V and T.

25. Electrochemistry & EMF

Electrical transport – conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of specific and equivalent conductance with dilution. Migration of ions and Kohlrausch's law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsagar's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf's method for attackable electrodes. Applications of conductivity measurements: Determination

of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Electrolyte and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells. EMF of a cell and its measurement. Computation of EMF. Types of reversible electrodes- the gas electrode, metal-metal ion, metal-insoluble salt and redox electrodes. Electrode reactions, Nernst equation, cell EMF and single electrode potential, standard Hydrogen electrode – reference electrodes (calomel electrode) – standard electrode potential, sign conventions, electrochemical series and its significance. Applications of EMF measurements, Calculation of thermodynamic quantities of cell reactions (G , H and K). Determination of pH using hydrogen electrode, glass electrode and quinhydrone electrode, Solubility product of AgCl. Potentiometric titrations.

26. Photochemistry

Introduction to photochemical reactions, Difference between thermal and photochemical reactions, Laws of photo chemistry-Grothaus -Draper law, Stark –Einstein's Law of photo chemical equivalence. Quantum yield. Examples of photo chemical reactions with different quantum yields. Photo chemical combinations of H_2-Cl_2 and H_2-Br_2 reactions, reasons for the high and low quantum yield. Problems based on quantum efficiency, Consequences of light absorptions. Singlet and triplet states. Jablonski diagram Explanation of internal conversion, inter-system crossing, Phosphorescence, fluorescence.

GENERAL CHEMISTRY

Molecular spectroscopy

Introduction to electromagnetic radiation, interaction of electromagnetic rations with molecules, various types of molecular spectra.

Rotational spectroscopy (Microwave spectroscopy)

Rotational axis, moment of inertia, classification of molecules (based on moment of inertia), rotational energies, selection rules, determination of bond length of rigid diatomic molecules eg. HCl.

Infra red spectroscopy

Energy levels of simple harmonic oscillator, molecular vibration spectrum, selection rules. Determination of force constant. Qualitative relation of force constant to bond energies. Anharmonic motion of real molecules and energy levels. Modes of vibrations in polyatomic molecules. Characteristic absorption bands of various functional groups. Finger print nature of infrared spectrum.

Electronic spectroscopy:

Bonding and antibonding molecular orbitals, electronic energy levels of molecules (σ , π , n), types of electronic transitions: σ - σ^* , n - σ^* , n - π^* , π - π^* with suitable examples. Selection rules, Terminology of chromophore, auxochrome, bathochromic and hypsochromic shifts. Absorption characteristics of chromophores: diene, enone and aromatic chromophores. Representation of UV-visible spectra.

Photochemistry

Introduction to photochemical reactions, Differences between thermal and photochemical reactions, Laws of photo chemistry –Grotthus – Draper law, Stark – Einstein's Law of photo chemical equivalence. Quantum yield. Examples of photo chemical reactions with different quantum yields. Photo chemical combinations of H_2 – Cl_2 and H_2 – Br_2 reactions, reasons for the high and low quantum yield. Problems based on quantum efficiency, Consequences of light absorptions. Singlet and triplet states. Jablonski diagram Explanation of internal conversion inter-system crossing, Phosphorescence, fluorescence.

TS EdCET-2019

BIOLOGICAL SCIENCES:

BOTANY
(Syllabus)

(Marks: 50)

A) Microbial Diversity of Lower Plants

1. General characters of Cyanobacteria Cell structure, thallus organization and their significance as biofertilizers with special reference to *Oscillatoria*, *Nostoc* and *Anabaena*
2. Lichens: Structure and reproduction; ecological and economic importance.
3. Viruses: Structure, replication and transmission; plant diseases caused by viruses and their control with reference to Tobacco Mosaic and Rice Tungro.
4. Bacteria: Structure, nutrition, reproduction and economic importance. An outline of Bacterial blight of Rice.
5. General account of Mycoplasma with reference to Little leaf of brinjal and Papaya leaf curl
6. General characters, structure, reproduction and classification of algae (Fritsch).
7. Structure and reproduction of *Volvox*, *Oedogonium*, *Chara*, *Ectocarpus*, *Polysiphonia*.
8. Economic importance of algae in Agriculture and Industry.
9. General characters and classification of fungi (Ainsworth).
10. Structure and reproduction of *Albugo*, *Mucor*, *Saccharomyces*, *Penicillium* and *Puccinia*
11. General account of mushroom cultivation.

B) Bryophytes, Pteridophytes and Gymnosperms

1. Structure, reproduction, life cycle and systematic position of *Marchantia*, *Anthoceros* and *Polytrichum*.
2. Evolution of Sporophyte in Bryophytes.
3. Structure, reproduction, life cycle and systematic position of *Rhynia*, *Lycopodium*, *Equisetum* and *Marsilea*.
4. Stelar evolution, heterospory and seed habit in Pteridophytes.
5. Distribution and economic importance of Gymnosperms.
6. Morphology of vegetative and reproductive parts, systematic position and life cycle of *Pinus* and *Gnetum*.
7. Introduction to Fossils and fossilization ; Importance of fossils.
8. Geological time scale.
9. A General account on Bennettitales:.

C) Taxonomy of Angiosperms and Medicinal Botany

1. Salient features of Bentham & Hooker's and Engler & Prantle's classification.
2. Nomenclature and Taxonomic resources: An introduction to ICBN, Vienna code - a brief account. Concept of Herbarium.
3. Systematic study and economic importance of plants belonging to the following families:
Polypetalae : Annonaceae, Capparidaceae, Rutaceae, Fabaceae (Faboideae/papilionoideae, Caesalpinioideae, Mimosoideae), Cucurbitaceae
Gamopetalae: Apiaceae, Asteraceae, Asclepiadaceae, Lamiaceae
Monochalmydeae: Amaranthaceae, Euphorbiaceae, Monocotyledons: Orchidaceae and Poaceae.

4. Distinction of Ethnomedicine from Folklore medicine.
5. Outlines of Ayurveda, Sidda, Unani and Homeopathic systems of traditional medicine. Role of AYUSH, NMPB, CIMAP and CDRI.
6. Plants in primary health care: Common medicinal plants –*Tinospora cordifolia*, *Ocimum sanctum*, *Piper longum*, *Terminalia chebula*, *Aloe vera*, *Curcuma longa*.
7. Study of selected plant examples used in traditional medicine as resource of active principles in modern medicine: Structure, usage and pharmacological action of Aswagandha (*Withania somnifera*), Sarpagandha (*Rauwolfia serpentina*), Nela usiri (*Phyllanthus amarus*), Amla (*Phyllanthus emblica*) and Brahmi (*Bacopa monnieri*).

D) Plant Anatomy & Embryology

1. Meristems: Types, histological organization of shoot and root apices and theories.
2. Tissues and Tissue Systems: Simple, complex and special tissues.
3. Leaf: Ontogeny, diversity of internal structure; stomata and epidermal outgrowths.
4. Stem and root anatomy: Vascular cambium - Formation and function.
5. Anomalous secondary growth of Stem - *Achyranthes*, *Boerhaavia*, *Dracaena*
6. Wood structure: General account. Study of local timbers – Teak (*Tectona grandis*), and Neem (*Azadirachta indica*).
7. Another structure, Microsporogenesis and development of male gametophyte.
8. Ovule structure and types; Megasporogenesis; types and development of female gametophyte.
9. Pollination - Types; Pollen - pistil interaction. Fertilization.
10. Endosperm - Development and types. Embryo - development and types

E) Cell Biology and Genetics

2. Plant cell envelopes: Ultra structure of cell wall, molecular organization of cell membranes.
3. Nucleus: Ultra structure, Nucleic acids - Structure of DNA, types and functions of RNA.
4. Chromosomes: Morphology, organization of DNA in a chromosome, Euchromatin and Heterochromatin.
5. Extra nuclear genome: Mitochondrial DNA and Plastid DNA, Plasmids.
6. Cell division: Cell and its regulation; mitosis, meiosis and their significance.
8. Linkage: A brief account and theories of Linkage. Crossing over: Mechanism and theories of crossing over.
9. Gene Organization: Structure of gene & genetic code.
10. Mechanism of transcription in Prokaryotes.

F) Plant Physiology

1. Plant-Water Relations Osmotic and pressure potentials; absorption, transport of water, Ascent of sap; Transpiration; Stomatal structure and movements
2. Mineral Nutrition: Essential macro and micro mineral nutrients and their role; symptoms of mineral deficiency.
3. Mechanism and regulation of enzyme action, factors regulating enzyme activity.
4. Photosynthetic pigments, Red drop and Emerson Enhancement effect; Mechanism of photosynthetic electron Transport, Photophosphorylation, C₃, C₄ and CAM pathways.
5. Biological nitrogen fixation.

6. Respiration: Aerobic and Anaerobic; Glycolysis & Krebs cycle.
7. Physiological effects of phytohormones–Auxins, gibberellins, cytokinins, ABA, ethylene and Brassinosteroids.
8. Physiology of flowering and Photoperiodism.
9. Stress physiology: Concept of water, salt and temperature stresses and plant responses.

Discipline Specific Course:

Animal Diversity - Invertebrates

Brief history of Invertebrates: - Kingdom Animalia; Brief history of Invertebrates

Protozoa: - General characters - Classification up to classes with examples; Type study – *Elphidium*;
Life cycle of *Plasmodium*; Locomotion, Reproduction and Diseases

Porifera: - General characters- Classification of Porifera up to classes with examples ; Type study – *Sycon*;-
Canal system in sponges and Spicules.

Cnidaria :- General characters - Classification of Cnidaria up to classes with examples; Type study – *Obelia* ;
Polymorphism in hydrozoa; Corals and coral reef formation

Platyhelminthes: - General characters;-Classification of Platyhelminthes up to classes with examples; Type
study- *Schistosoma*.

Nemathelminthes: - General characters; Classification of Nemathelminthes up to classes with examples; -Type
study – *Dracunculus*; - Parasitic Adaptations in Helminthes

Annelida: - General characters; Classification of Annelida up to classes with examples; Type study -
Hirudinaria granulosa.; Evolutionary significance of Coelome and Coelomoducts and metamerism

Arthropoda:- General characters; Classification of Arthropoda up to classes with examples;Type study –
Prawn; Mouth parts of Insects; Insect metamorphosis; *Peripatus* - Structure and affinities

Mollusca:- General characters; Classification of Mollusca up to classes with examples;Type study - *Pila* ;
Pearl formation ; Torsion and detorsion in gastropods

Echinodermata:- General characters; Classification of Echinodermata up to classes with examples; Water
vascular system in star fish; - Echinoderm larvae and their significance

Hemichordata:- General characters; Classification of Hemichordata up to classes with examples;
Balanoglossus - Structure and affinities

Ecology, Zoogeography and Animal Behavior

Ecology - I : - Ecosystem structure and functions; Types of Ecosystems –Aquatic and Terrestrial.; Biogeochemical cycles - Nitrogen, Carbon, Phosphorus and Water.; Energy flow in ecosystem.; Food chain, food web and ecological pyramids.; Animal Associations - Mutualism, commensalism, parasitism, competition, predation.

Ecology – II : - Concept of Species, Population dynamics and Growth curves.; Community Structure and dynamics and Ecological Succession.; Ecological Adaptations. ; Environmental Pollution – Sources, Effect and Control measures of Air, Water, Soil and Noise Pollution.; Wildlife conservation - National parks and Sanctuaries of India, Endangered species.; Biodiversity and hotspots of Biodiversity in India.

Zoogeography: - Zoogeographical regions – Palaearctic, Nearctic, Neotropical, Oriental, Australian and Ethiopian regions - their Climatic and faunal peculiarities; Wallace line, Discontinuous distribution; Continental Drift

Animal Behaviour: - Types of Behaviour- Innate and Acquired, Instinctive and Motivated behavior; Taxes, Reflexes, Tropisms;;Physiology and phylogeny of learning, trial and error learning, Imprinting, habituation, Classical conditioning, Instrumental conditioning; - Social behavior, Communication, Pheromones; - Biological rhythms, Biological clocks, Circadian rhythms

Animal Diversity- Vertebrates and Developmental Biology

Urochordata, Cephalochordata, Cyclostomata: - Salient features of Urochordata; - Retrogressive metamorphosis and its significance in Urochordata; - Salient features and affinities of Cephalochordata; - General characters of Cyclostomata; - Comparison of the *Petromyzon* and *Myxine*; - General characters and classification of Chordata upto orders with examples.

Pisces: - General characters of Fishes; - Classification of fishes up to order level with examples; - *Scoliodon* – Respiratory, Circulatory and Nervous system.; - Types of Scales and types of Fins

Amphibia: - General characters of Amphibians; - Classification of Amphibians up to orders with examples.; - . *Rana tigrina* - Respiratory, Circulatory and Nervous system. ; Parental care in amphibian; neoteny and paedogenesis.

Reptilia: - General characters of Reptilia; - Classification of Reptilia up to orders with examples; *Calotes* – Respiratory system, Circulatory and Nervous system.; Temporal fosse in reptiles and its evolutionary importance; - Distinguished characters of Poisonous and Non poisonous snakes.; - Rhyngocephalia.

Aves: - General characters of Aves ; - Classification of Aves up to orders with examples.;-*Columba livia* -, Digestive system, Circulatory systems, Respiratory system and Nervoussystem.; Migration in Birds; Flight adaptation in Birds

Mammalia: - General characters of Mammalia; - Classification of Mammalia up to orders with examples; - Rabbit –Digestive, Respiratory, Circulatory and Nervous system. ; - Dentition in mammals.; Aquatic adaptations in Mammals.

Developmental Biology and Embryology: - Gametogenesis (Spermatogenesis and Oogenesis); - Fertilization ;
- Types of eggs; - Types of cleavages ; - Development of Frog up to formation of primary germ layers; - Formation of Foetal membrane in chick embryo and their functions; - Types and functions of Placenta in mammals - Regeneration in Turbellaria and Lizards

Cell Biology, Genetics & Evolution

Cell Biology : - Cell theory, Differences of Prokaryotic and Eukaryotic cells.; - Ultrastructure of animal cell; - Structure and functions of plasma membrane proteins.; Structure and functions of cell organelles – Endoplasmic reticulum, Golgi body, Ribosomes, Lysosomes, centrosomes, Mitochondria and Nucleus; - Chromosomes – Structure, types, giant chromosomes; - Cell Division - Mitosis, Meiosis.; - Cell cycle and its regulation.

Molecular Biology: - DNA (Deoxyribo Nucleic Acid) – Structure.; - RNA (Ribo Nucleic Acid) - Structure, types.; - DNA Replication .; - Protein Synthesis – Transcription and Translation; - Gene Expression – Genetic Code; operon concept ; Molecular Biology Techniques- Polymerase Chain Reaction, Electrophoresis

Genetics : - Mendals laws of Inheritance and Non-Medelian Inheritance; - Linkage and Crossing over.; - Sex determination and sex-linked inheritance.; - Chromosomal Mutations- Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy. - Gene mutations- Induced versus Spontaneous mutations. - Inborn errors of metabolism. - One gene one enzyme, one gene one polypeptide theory.

Evolution: - Theories of evolution – Lamarckism and Neo-Lamarckism, Darwinism and Neo-Darwinism, Modern synthetic theory. - Evidences of Evolution and Hardy Weinberg Law.- Forces of Evolution – mutation, gene flow, genetic drift, and natural selection. - Isolation – Pre-mating and post mating isolating mechanisms - Speciation: Methods of speciation - Allopatric and sympatric - Causes and Role of Extinction in Evolution.

Physiology and Biochemistry

Physiology

Digestion: - Digestion definition and extra and intracellular digestion. - Digestion of Carbohydrates, Proteins, Lipids and Cellulose. - Absorption and Assimilation of digested food; role of Gastrointestinal hormones in digestion

Respiration: Definition of Respiration and Respiratory mechanisms – External, Internal and cellular. - Respiratory Pigments; Transport of oxygen, Oxygen dissociation curves. Bohr's effect. - Transport of CO₂ – Chloride shift; Regulation of respiration – nervous and chemical

Circulation: - Types of circulation - Open and Closed circulation. - Structure of Mammalian Heart, Types of hearts – Neurogenic and Myogenic; Heart function – Conduction and regulation of heart beat.; - Regulation of Heart rate – Tachycardia and Bradycardia; Blood Clotting mechanism

Excretion: - Classification of Animals on the basis of excretory products- Ammonotelic, Uricotelic, Ureotelic; Structure and function of Nephron. ; - Urine formation, Counter current mechanism.

Physiology

Muscle Contraction: - Types of Muscles; - Ultra structure of skeletal muscle fibre; - Sliding Filament theory, muscle contraction mechanism and energetics.

Nerve Impulse: - Structure of Neuron; - Nerve impulse - Resting potential and Action potential and Conduction of Nerve impulse ; - Synapse, types of synapses and Synaptic transmission.

Endocrine System: - Endocrine glands - Structure, secretions and functions of Pituitary, Thyroid, Parathyroid, Adrenal glands and Pancreas ; - Hormone action and concept of Secondary messengers ; - Male and Female Hormones, Hormonal control of Menstrual cycle in humans.

Physiology and Biochemistry

Homeostasis and Enzymes: - Concept of Homeostasis.; - Mechanism of Homeostasis.; - Osmoregulation - Water and ionic regulation by freshwater, brackish water and marine animals; - Enzymes: Definition, Classification, Inhibition and Regulation

Biomolecules and Metabolism: - Carbohydrates: Classification and function of Carbohydrates; - Carbohydrate metabolism - Glycolysis, Krebs cycle, , Electron transport and oxidative phosphorylation. ; Proteins: Classification of proteins based on functions and Chemical nature; - Protein Metabolism - Transamination, Deamination and Urea Cycle; - Lipids: Classification of Lipids; Lipid Metabolism - Fatty acid synthesis and Fatty acid oxidation.

Immunology and Animal Biotechnology

Immunology – Basic concepts; antigens and antibodies: - Basic concepts of immunology. - Cells of immune system; - Primary and secondary Organs of immune system; - Types of Immunity – Innate and acquired; - Basic properties of antigens; - Structure, function and types of an antibody. -B and T cell epitopes, haptens, adjuvants.- Antigen-antibody reactions, - T-Cell and B-Cell activation; onoclonal antibodies and their production

UNIT – II Working of an Immune system; Immune system in health and disease: - Structure and functions of major histocompatibility complex. -Basic properties and functions of Cytokines, Interferons and complement proteins. - Humoral and Cell mediated immunity.- Types of hyper sensitivity. - Concepts of autoimmunity and immunodeficiency. - Introduction to Vaccines and types of Vaccines

Animal Biotechnology and Genetically modified organisms: - Concept and Scope of Animal Biotechnology.- Cloning vectors - Plasmids, Cosmids, Lambda bacteriophage, YAC - Cloning- Cloning methods (Cell, Animal and Gene cloning) .Animal Cell culture - Equipment and materials for animal cell culture; applications of cell culture techniques; - Recombinant DNA technology and its applications; - Transgenesis – Methods of Transgenesis.- Production of Transgenic animals and Application of Transgenic animals in Biotechnology. - Stem cells –types and their applications

Part - C

SOCIAL STUDIES:

**GEOGRAPHY
(SYLLABUS)**

(Marks: 35)

I. Principles of Physical Geography:

Interior of the Earth.

Major relief features of the Earth; Mountains, plateaus and plains.

Wegner's theory of continental drift, theory of Isostasy, Earthquakes and Volcanoes.

Chief types of rocks and their characteristics. Weathering and Erosion.
Landforms in Fluvial, Arid, Karst, Glacial and Marine cycles.

Structure and composition of the atmosphere. Distribution of temperature-vertical and horizontal; temperature inversion.

Pressure Belts and Planetary wind systems, Monsoons & Local winds, Precipitation, types of rainfall, Cyclones and anticyclones-tropical and temperate cyclones-an outline of Koppen's classification of climates.

Submarine relief - Distribution of temperature and salinity - Movements of Ocean water: Waves, Tides and Currents - Currents of the Pacific, the Atlantic and the Indian ocean - Ocean deposits.

II. Social and Economic Geography:

Definition, scope and objectives of Economic Geography Physical Environment and Human activities, Concept of Resources, Types of resources, Conservation and management of resources - Distribution, Pattern and growth trends of population in the world; Type of settlements - Urban and Rural, Trends in Urban growth; Agriculture: Distribution of Rice, Wheat, Tea, Coffee, Cotton and Sugarcane; Distribution of major forest types, major fishing grounds of the world; Mineral and power resources : Iron, Bauxite, Coal & Petroleum -Weber's theory of industrial location; Location and distribution of Iron and Steel, Cotton Textiles.

III. Regional Geography of India:

Locational aspects, Major Physiographic regions, climate, drainage, soil types and natural vegetation - pattern and growth trends of population, urbanization - Agriculture: Rice, Wheat, Cotton, Jute, Sugarcane, Tea and Coffee - irrigation and power development in India - Minerals : Iron, coal and petroleum - Composition and Pattern of trade - Resource appraisal of Telangana, Rayalaseema and Coastal Andhra.

IV. Remote Sensing and Geographic Information Systems (GIS):

Basics of Aerial Photography and Remote sensing, components of Remote sensing – Energy source, Platforms, sensors, Electromagnetic radiation, spectral Signatures, orbital characteristics of Sun-synchronous and Geostationary satellites; Remote sensing sensors – Active and passive, sensor characteristics, Cameras, Scanners, Products, Growth and development of remote sensing in India. Geographic Information Systems (GIS) : Definition, functions, components of GIS – Hardware and software, data input and editing, data types – spatial and attribute data – raster and vector, GPS and its applications.

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HISTORY

SOCIAL STUDIES

Part – C (Syllabus)

(Marks 30)

History of India (From Earliest Times to c.700 CE)

Definitions - Nature and Scope of History - History and Its Relationship with other Social Sciences - Geographical Features of India – Sources of Indian History: Pre- History – Paleolithic, Mesolithic, Neolithic, Chalcolithic and Megalithic Cultures.

Indus Valley Civilization - Its Features & Decline; Early Vedic and Later Vedic Civilizations – Vedic Literature – Society – Economy - Polity – Religion.

Rise of New Religious Movements – Charvakas, Lokayathas, Jainism and Buddhism; Mahajanapadas - Rise of Magadha; Alexander’s Invasion and Its Impact.

Foundation of the Mauryan Dynasty; Ashoka and His Dharma – Polity – Administration - Society – Economy – Religion – Literature - Art and Architecture; Disintegration of the Mauryan Empire; Post-Mauryan Kingdoms – Indo-Greeks - Kushanas and Kanishka - Society – Economy – Literature – Art and Architecture; The Satavahanas; Sangam Age – Literary Development.

Gupta Empire: A Brief Political Survey - Polity and Administration, Social and Economic Conditions, Agriculture and Land Grants - Feudalism, Caste System, Position of Women, Education, Literature, Science and Technology, Art and Architecture - Harshavardana and His Achievements.

History of India (c.700-1526 CE)

Rise of Regional States: Pallavas, Chalukyas of Badami, Rashtrakutas, Cholas; Local Self Government under Cholas; Society, Economy, Literature, Art and Architecture; Bhakti Movement in South India: Shaiva Nayanars and Vaishnava Alwars.

Arab Conquest of Sind, Ghaznavids and Ghoris; Foundation of Delhi Sultanate: Iqbal, Khaljis, Tughlaqs, Sayyids and Lodis – Polity, Administration, Society and Economy - Art and Architecture - Growth of Education and Literature – Religious Conditions.

Bhakti and Sufi Movements and their Impact on Society and Culture – Emergence of Composite Culture.

Kakatiyas – Polity – Administration - Society and Economy - Literature and Religion – Art and Architecture – Yadavas – Hoysalas and Pandyas – Brief History.

Vijayanagara – Polity – Administration - Society and Economy – Religion – Art and Architecture – Language and Literature – Bahamanis and their Contribution to the Deccan Culture.

History of India (1526-1857 CE)

Establishment of Mughal Dynasty - Sources – Shershah Sur and His Reforms - Brief Survey of Political History of Mughals – Akbar, Shah Jahan and Aurangzeb - Polity – Administration – Society – Economy – Technological Developments - Religion Hindu- Muslim Relations – Emergence of Composite Culture – Education – Language and Literature – Art and Architecture - Disintegration of Mughal Empire.

Rise of Regional Powers - Marathas – Shivaji and His Administration – Peshwas Sikhs.

Advent of European Powers - Portuguese, Dutch, English and French, Anglo- French Rivalry - Expansion and Consolidation of British Power – Wellesley's Subsidiary Alliance – Dalhousie's Doctrine of Lapse.

Three Stages of Colonialism – Mercantilism - Free Trade Policies – Finance Capital Land Revenue Settlements – Cornwallis and Permanent Revenue Settlement; Thomas Munroe and Ryotwari; Mahalwari System – Changes in the Agrarian Economy and Condition of Peasantry – Famines.

Decline of Rural Cottage Industries and Urban Handicrafts - Growth of Railways, Roads, Communication – Modern Industries – Coal Mines, Textiles, Iron and Steel, etc. - Anti-Colonial Upsurge - 1857 Revolt – Nature, Causes and Results.

History of India (1858-1964 CE)

Queen's Proclamation – Beginning of Colonial Rule – Introduction of Western Education – Role of Christian Missionaries – Press, Communication and Emergence of Middle Classes - Lytton and Rippon: Impact of their Policies.

Socio-Religions Reform Movements – Brahma Samaj - Arya Samaj – Theosophical Society - Ramakrishna Mission - Aligarh Movement; Anti-Caste Movements Jyotibha Phule - Narayana Guru - Periyar Ramaswamy Naicker and Dr. B.R. Ambedkar.

Factors for the Rise of Nationalism – Formation of Indian National Congress – Three Phases of Freedom Struggle: Moderate Phase, Extremist Phase and Gandhian Era Non-Cooperation, Civil Disobedience and Quit Indian Movement; Indian National Army and Subhash Chandra Bose.

Revolutionary Movement: Gadhar Party – Bhagath Singh – Chandra Sekhar Azad and Others; Left-Wing Movement – Rise of Socialist and Communist Parties -Peasant and Workers Movements.

Emergence of Communal Politics and Mohd. Ali Jinnah – Prelude to Partition of India - Sardar Vallabhai Patel and Integration of Princely States into Indian Union Republic of India – Jawaharlal Nehru and His Policies.

World History (1453-1815 CE)

Fall of Constantinople (1453 C.E.) – Beginning of Modern Age in Europe Geographical Discoveries and Scientific Inventions and their impact on Society – Rise of New Ideas – Spirit of Humanism – Renaissance – Meaning-Causes and Results – Impact of Renaissance on Europe.

Reformation Movement – Causes – Martin Luther, John Calvin and Zwingli; Counter Reformation Movement and Ignatius Loyola – Results of Reformation and Counter Reformation.

Emergence of Nation States – Causes – Spain – Charles V; England – Henry VIII - Glorious Revolution (1688); France under Bourbons – Louis XIV; Era of Enlightened Despotism – Peter the Great and his Policies – Frederick the Great and his Achievements.

End of Feudalism – Industrial Revolution – Causes for Industrialization in England and Europe – Textile Industry – Working Class Movement – American War of Independence (1776) – French Revolution (1789) – Causes, Course, Results and its Impact. Factors for the Rise of Napoleon – Domestic and Foreign Policies – Fall of Napoleon.

World History (1815-1950 CE)

Congress of Vienna (1815) – Principles and Impact; Metternich and his System – 1830 and 1848 French Revolutions: Unification of Italy – Role of Joseph Mazzini, Count Cavour and Garibaldi; Unification of Germany – Role of Bismarck; Significance of the Unification Movements.

Factors responsible for the outbreak of First World War (1914-18) – Results – Treaty of Versailles – Its Provisions and Consequences; Russian Revolution (1917) – Causes – The role of Lenin – Results; League of Nations (1920) – Its Achievements and Failures.

Europe between World Wars: Turkey under Mustafa Kamal Pasha - The Great Economic Depression and its Impact - Mussolini and the Rise of Fascism in Italy - Hitler and Nazism in Germany - Militarism in Japan.

Second World War – Causes and Results; Establishment of United Nations Organization (1945) – Its Aims and Achievements; Cold War and Its Impact; Colonization of Asia - India and China under Colonial Rule, Role of Gandhi in Indian National Movement (1920-1947); Sun-Yat-Sen and His Ideas; Role of Mao-Tse-Tung in Chinese Revolution – 1949.

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SOCIAL STUDIES: Part – C : CIVICS (Syllabus)

Marks : 15

I Political Science - Concepts and Theories:

1. Introduction, definition, scope and importance of political science.
2. Approaches to study of political science - Traditional and Modern.
3. Relation with other social sciences: History, Economics and Sociology.
4. State – theories of origin of the state and nature of the state
5. Nationalism – nation, nationalism, nation – state and right of self – determination.
6. Sovereignty – Nature, evolution, theories, and classifications.
7. Law
8. Liberty
9. Equality
10. Justice
11. Rights and Duties and Human Rights.
12. Democracy and forms of democracy
13. Government – Parliamentary, presidential, unitary and federal.
14. Constitution – written and unwritten; flexible and rigid.
15. Separation of powers –legislature executive and judiciary.
16. Electoral representation and methods of voting.
17. Political parties and types of party system.
18. Public opinion – Public opinion and democracy; public opinion and mass media.

II Indian Government and Politics:

1. Constitutional Development of Indian Councils Act of 1909; government of India Act of 1919 and 1935; Cabinet mission Plan, Mountbatten plan and Indian independence Act.
2. Constituent Assembly and making of the Indian Constitution; Salient features of Indian Constitution.
3. Fundamental Rights; Directive Principles of state policy and Fundamental Duties.
4. Indian Federal System and Centre –State Relations .
5. Parliament of india – Functions and powers; President, Prime Minister and council of Ministers.
6. Judiciary- Supreme Court of India : powers and functions ; High Court in India ; powers and functions.
7. Party system in india- National and regional political parties
8. Government at the state level – Governor ; State Legislature ; Chief Minister
9. National integration and challenges to national integration; Language; religion and communalism; Regionalism; Secessionism and Terrorism.
10. Social Movements – Peasant; Tribal and Women’s Movements.

III International Relations:

1. International Relations- Meaning ; nature and scope ;origin and growth ; modern state system; State and Non-State Actors.
2. Developments in international relations ; Cold War ; End of Cold War ; Bipolarity ; Non-Third World ; Aligned Movement.
3. International Organisations and regional Organisations.; The UNO-evolution, structure, functions and its specialized agencies ; world bank and international monetary fund; SAARC
4. Arms control and Disarmament.
5. India's Foreign Policy- determinants and salient principal.

I. Public Administration - Concepts and Theories

1. Meaning and scope of Public Administration
2. Importance of Public Administration in the context of Globalization, Privatisation & Liberalization.
3. Evolution of Public Administration.
4. Relation with other Social Sciences (with special reference to political Science; Sociology & Economics).
5. Politics & Public Administration - Dichtomy - Woodrow Wilson,
6. Classical Theory:
 - (a) Structures & Principles of Organization - Gulick & Urwick
 - (b) Scientific management - Taylor.
 - (c) Bureaucracy - Weber.
7. Human relations Approach: Elton Mayo
8. Behavioural Approach: Simon (Decision Making), Barnard (Authority & Informal Organisations) and Mc Gregor(Theory X and Theory Y).
9. Comparative Public Administration – Weidner Rigg's
10. Development Administration - Weidner
11. New public administration
12. New Public Management Perspective.
13. Concepts in Administration: Planning, Leadership, Supervision, Communication, Public Relations, Motivation.

II . Public Administration in India;

1. Evolution of Indian administration -• Ancient Medieval Mughal and British Periods - Continuity and Change in Indian Administration after Independence
2. Context of Indian Administration - Social, Economic and Political.
3. Union Government and Administration - President, Prime Minister, Council of Ministers, Central Secretariat, Cabinet Secretariat, Cabinet Committees and Prime Minister's Office.
4. Union and State Relations and Agencies - Administrative Relations -Inter State Council, Finance Commission, All India Service, National Development Council.
5. Public Enterprises in India:
 - a. Forms of Public Enterprises - (i) Department (ii) Corporation and Company.
6. State Government and Administration: Governor, Chief Minister, Council of Ministers, State Secretariat/Directorates, Regional Administration/ General Administration and Chief Secretary.
7. District Administration: Changing Role of District Collector – Special Agencies - DRDA, ITDA.
8. Local Governments - Rural and Urban - Structure and functions - 73rd and 74th Constitutional amendment.
9. Control Over Administration.
 - a) Legislative Control
 - b) Judicial Control
 - c) Citizen's Control - Lok Pal / Lokayukta
 - d) Consumer Protection Forum.
 - e) CVC (Central Vigilance Commission)
10. Administration of Welfare Programmes for Weaker Sections - S.C.s, S.T.s, Women, Minorities.
11. Administrative Reforms, Recommendations of important Commissions and Committees.
12. Good Government and e-Governance.

SOCIAL STUDIES:

**TS EdCET-2019
Part - C
ECONOMICS
(SYLLABUS)**

(Marks: 20)

1. Definitions of economics, micro and macro economics, normative and positive economics, static, dynamic, inductive and deductive approaches, partial and general equilibrium.
 2. Cardinal and ordinal utility approaches
 3. Law of variable proportions
 4. Cost concepts; cost-output relationship; economies of scale
 5. Markets: Perfect competition, monopoly and oligopoly (Kinky demand)
 6. Factor pricing: Marginal productivity theory, Ricardo's rent theory and loanable funds theory of interest rate.
 7. Concepts of national income, Methods of National Income and business cycles.
 8. Economic growth and development; measures of economic development: PQLI, HDI and GDI
 9. Concepts of balanced and unbalanced growth
 10. Sources of public revenue: Tax and non-tax revenue; Direct and indirect taxes; Concept of GST; 14th Finance Commission
 11. Budget and concept of budget deficits, FRBM Act
 12. Canons of good taxation; Effects of public expenditure
 13. Classification and Functions of money; Functions of commercial banks
 14. Functions and credit control methods of RBI; concept of demonetization
 15. Agriculture, Industry, Service sector.
 16. Population growth- causes and problems of overpopulation; Poverty, unemployment
 17. LPG Policy; NITI Aayog.
 18. Social sector: Health and education in India.
 19. Concepts of Balance of trade, balance of payments, Devaluation.
 20. WTO, IBRD and IMF
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PART-C
ENGLISH METHODOLOGY
(Syllabus)

(100 Marks)

CBCS—BA Optional English Syllabus

History of the English Language

- a) Origin and descent of the English Language
- b) Features of Old English
- c) Features of Middle English
- d) Features of Modern English

The Structure of English Language

- a) Word Formation
- b) Change of Meaning
- c) Sentence Structure I : Simple sentence and its constituents
- d) Sentence Structure II : Complex sentence and its constituents

Figures of Speech

- a) Euphemism
- b) Hyperbole
- c) Irony
- d) Metaphor
- e) Metonymy
- f) Oxymoron
- g) Paradox
- h) Personification
- i) Simile
- j) Synecdoche

Literary movements

- a) Renaissance
- b) Reformation
- c) Neo Classicism
- d) Romanticism
- e) Modernism

Elements of literature

- a) Atmosphere
- b) Character
- c) Imagery
- d) Narrative technique
- e) Plot
- f) Point of view
- g) Setting
- h) Story
- i) Symbolism
- j) Tone

English Poetry

Forms of Poetry:

- a) Ballad
- b) Elegy
- c) Epic
- d) Lyric
- e) Ode
- f) Sonnet

16th -17th Century Poetry

Edmund Spenser

“One day I wrote her name upon the strand”
(Sonnet 75)

John Milton

Lycidas

John Donne

“The Anniversary”

17th 18th Century Poetry

Alexander Pope

“Ode on Solitude”

Thomas Gray

“Hymn to Adversity”

William Blake

“London”

18th – 19th Century Poetry

William Wordsworth

“Three Years She Grew”

John Keats

“Ode to a Nightingale”

Robert Browning

“My Last Duchess”

19th - 20th Century Poetry

WB Yeats

“The Second Coming”

TS Eliot

“Love song of Alfred J Prufrock”

Philip Larkin

“Toads”

English Drama

Types of Drama

- a) Tragedy
- b) Comedy
- c) Tragicomedy
- d) Melodrama
- e) Farce
- g) History plays

