

**Syllabus for the subjects under Part-A and Part-B of the Education  
Common Entrance Test - 2017.**

**PART - A: GENERAL ENGLISH**

(Marks: 25)

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.

PART-A  
GENERAL ENGLISH  
(Marks : 25)

(1 — 5) Read the passage carefully and mark the correct answers :

The lack of sleep might be known better as an adult malady, the affliction of the overworked professional. But, it now appears that children are not shielded from this lifestyle malaise - and it is beginning to tell on their health. Children who get less than eight and a half hours of sleep at night are six times more likely to be obese, reveals a research study by doctors. The research was published during the Insomnia Awareness Week, this April. In fact, shortened sleep, it was found, poses twice the risk of childhood obesity than does eating fried food six times a week. Further, there has been an observable change in the lifestyle of children, who now face multiple demands, many of which cut into their sleep time. There is the pressure of studies, the long travel time to school, and the influence of their parents' lifestyle and routine, all of which inevitably have an impact on them. Among sedentary activities, watching television has a special impact. Children who watch television for an hour and a half or more per day are 19 times more likely to be overweight than those who watch TV for 45 minutes or less.

1. Watching the television for a long duration leads to
  - (1) insomnia
  - (2) greater likelihood of obesity
  - (3) formation of sedentary habits
  - (4) facing multiple demands
2. Sleeplessness in children is contributed to by
  - (1) lack of sufficient sleep
  - (2) multiple demands on their time
  - (3) parental influence on their routine
  - (4) watching the television
3. Lack of sleep is considered
  - (1) the problem of the elders alone
  - (2) the hazard that only the overworked professional faces
  - (3) an affliction of children as well
  - (4) a malaise children are alone faced with
4. Obesity is made more intense by
  - (1) inadequate sleep
  - (2) eating fried foods
  - (3) changes in lifestyle
  - (4) pressure of studies
5. The passage is about
  - (1) child psychology
  - (2) the lifestyle of the adult professional
  - (3) children and their lifestyle
  - (4) insomnia and child health
6. Choose the sentence with appropriate articles.
  - (1) The umpire controls the decisions like the God incarnate.
  - (2) An umpire controls the decisions like God incarnate.
  - (3) The umpire controls the decision like a God incarnate.
  - (4) A umpire controls the decision like God incarnate.
7. Fill in the blanks with appropriate articles.

Don't rely on----- - prophecy of - - astrologer sitting there  
on — - elevated platform.

- (1) the, the, an (2) a, the, an  
(3) the, an, an (4) the, an, the
8. Fill in the blanks with appropriate prepositions.  
Dispose of your books and try to solve the puzzle \_\_\_\_\_ pondering  
it.
- (1) ~~by, above~~ (2) from, at  
(3) by, over (4) on, in
9. Fill in the blanks with appropriate prepositions.  
There was an accident \_\_\_\_\_ crossroads \_\_\_\_\_ midnight last  
night.
- (1) to, at (2) in, on  
(3) in, at (4) at, at
10. Fill in the blank with an appropriate verb form.  
Had you met him, he \_\_\_\_\_ you.
- (1) will have helped (2) will help  
(3) would have helped \_\_\_\_\_ (4) would help
11. Fill in the blank with an appropriate verb form.  
They demanded that he \_\_\_\_\_ immediately.
- (1) resign (2) will resign  
(3) would resign \_\_\_\_\_ (4) shall resign
12. Choose the word spelt correctly.
- (1) influncial (2) controversy  
(3) calender (4) dais
13. Choose a synonym for the word underlined.  
You must expedite the decision-making process.
- (1) defer (2) quicken  
(3) control (4) curtail
14. Fill in the blank with the most suitable word.  
They saw a \_\_\_\_\_ of lions in the forest.
- (1) herd (2) pack  
(3) pride \_\_\_\_\_ (4) crowd
15. Give the appropriate indirect speech form of the following sentence:  
'He said to me, "what are your future plans?'"
- (1) He asked me what my future plans were.  
(2) He asked me what my future plans are.  
(3) He asked me about my future plans.  
(4) He told what my future plans were.
16. Choose the passive voice form of the following sentence:  
"They haven't stamped the letter."
- (1) The letter was not stamped by them.  
(2) The letter had not been stamped by them.  
(3) The letter would not have been stamped by them.  
(4) The letter has not been stamped by them.
17. Choose the appropriate active voice form of the following sentence :  
"We were taught grammar by him."
- (1) He has taught us grammar. (2) His grammar taught us.  
(3) He teaches us grammar. (4) He taught us grammar.
18. "It is never too late to change."  
This sentence can be rewritten as
- (1) It is never so late that one cannot change.

- (2) It is never late that one cannot change.  
 (3) It is never so late to change.  
 (4) It is never so late as to change.
19. "He was only a student but he offered to help his teacher."  
 This sentence can be rewritten as  
 (1) He was only a student and so he offered to help his teacher.  
 (2) In spite of his being only a student, he offered to help his teacher.  
 (3) Because he was only a student, he offered to help his teacher.  
 (4) He offered to help his teacher because he was his student.
20. "John asked what platform the train would leave from."  
 The direct speech form of this sentence is  
 (1) John asked, "what platform had the train left from?"  
 (2) John asked, "what platform did the train leave from?"  
 (3) John asked, "what platform has the train left from?"  
 (4) John asked, "what platform will the train leave from?"
21. "Do have some tea with us" is a/an  
 (1) offer (2) order  
 (3) suggestion (4) alarm
22. Fill in the blank with an appropriate phrase.  
 \_\_\_\_\_ me at the railway station. I will be carrying The Hindu.  
 —(1)— Look at (2) Look out  
 (3) Look for (4) Look after
23. Identify the grammatically acceptable sentence.  
 (1) The teacher doesn't use a chalk piece in the class.  
 (2) I bought a scissor yesterday.  
 (3) He has bought a new pair of trousers.  
 (4) The book is besides the school.
24. Identify the grammatically acceptable sentence.  
 (1) Hardly we had come out of the house, when the phone rang.  
 (2) Hardly did we come out of the house when the phone rang.  
 (3) Hardly had we come out of the house when the phone rang.  
 (4) Hardly had we come out of the house then the phone rang.
25. "Delhi is one of the most populous cities in the world."  
 The sentence can be rewritten as  
 (1) Delhi is more populous than most other cities in the world.  
 (2) There is no city in the world which is as populous as Delhi.  
 (3) Delhi is more populous than any other city in the world.  
 (4) Delhi is as populous as many cities in the world.

**TS Ed.CET-2017**

**Syllabus for the subjects under Part-A and Part-B of the Education  
Common Entrance Test - 2017.**

**PART - B:**

**GENERAL KNOWLEDGE & TEACHING APTITUDE**

(Marks: 15+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 neighbouring Countries especially pertaining to History, Culture, Geography, Ecology, Economics, General Policy and Scientific Research.
4. Teaching requires certain characteristics like ability to communicate, ability to deal with Children, ability to recognise 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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**DIFFERENTIAL EQUATIONS**

Linear differential equations of order one - Differential equations reducible to linear form- Exact differential equations- Integrating factors- Change of variables- Simultaneous differential equations- Orthogonal trajectories

Differential equations of the first order but not of the first degree

Equations solvable for  $p$ - Equations solvable for  $y$ - Equations solvable for  $x$ - Equations that do not contain  $x$  (or  $y$ )- Equations of the first degree in  $x$  and  $y$  - Clairaut's equation- Solution of homogeneous linear differential equations of order  $n$  with constant

Coefficients- Solution of the non-homogeneous linear differential equations with constant

coefficients by means of polynomial operators- Method of undetermined coefficients- Method of variation of parameters- Linear differential equations with non-constant coefficients- The Cauchy-Euler equation

Solution of a system of linear equations with constant coefficients- An equivalent triangular system. Degenerate Case:  $p_1(D) p_4(D) - p_2(D) p_3(D) = 0$ .

**SOLID GEOMETRY**

Equation of plane in terms of its intercepts on the axis- Equations of the plane through the given points- Length of the perpendicular from a given point to a given plane- Bisectors of angles between two planes- Combined equation of two planes- Orthogonal projection on a plane

Equations of a line- Angle between a line and a plane- The condition that a given line may lie in a given plane- The condition that two given lines are coplanar- Number of arbitrary constants in the equations of a straight line- Sets of conditions which determine a line- The shortest distance between two lines- The length and equations of the line of shortest distance between two straight lines- Length of the perpendicular from a given point to a given line- Intersection of three planes- Triangular Prism

Definition and equation of the sphere- Equation of the sphere through four given points- Plane sections of a sphere- Intersection of two spheres- Equation of a circle. Sphere through a given circle- Intersection of a sphere and a line- Power of a point- Tangent plane- Plane of contact- Polar plane- Pole of a plane- Conjugate points- Conjugate planes- Angle of intersection of two spheres- Conditions for two spheres to be orthogonal- Radical plane- Coaxial system of spheres- Simplified form of the equation of two spheres

Definitions of a cone- vertex- guiding curve- generators- Equation of the cone with a given vertex and guiding curve- Enveloping cone of a sphere- Equations of cones with vertex at origin are homogeneous- Condition that the general equation of the second degree should represent a cone- Condition that a cone may have three mutually perpendicular generators Intersection of a line and a quadric cone- Tangent lines and tangent plane at a point- Condition that a plane may touch a cone- Reciprocal cones- Intersection of two cones with a common vertex- Right circular cone- Equation of the right circular cone with a given vertex- axis and semi-vertical angle

Definition of a cylinder- Equation to the cylinder whose generators intersect a given conic and are parallel to a given line- Enveloping cylinder of a sphere- The right circular cylinder- Equation of the right circular cylinder with a given axis and radius

The general equation of the second degree and the various surfaces represented by it- Shapes of some surfaces- Nature of Ellipsoid- Nature of Hyperboloid of one sheet

## **GROUPS AND RINGS**

Binary operations- Definitions and properties, Groups-Definition and elementary properties- Finite groups and group composition tables- Subgroups and cyclic subgroups- Permutations-Functions and permutations -groups of permutations- cycles and cyclic notation- even and odd permutations- The alternating groups- Cyclic groups - Elementary properties-The classification of cyclic groups - sub groups of finite cyclic groups. Isomorphism - Definition and elementary properties- Cayley's theorem- Groups of cosets- Applications- Normal subgroups - Factor groups - Criteria for the existence of a coset group- Inner automorphisms and normal subgroups- factor groups and simple groups- Homomorphism- Definition and elementary properties- The fundamental theorem of homomorphisms- applications

Definition and basic properties of rings- Fields- Integral domains- divisors of zero and Cancellation laws- Integral domains- The characteristic of a ring- some non

commutative rings- Examples- Matrices over a field- The real quaternions - Homomorphism of Rings - Definition and elementary properties- Maximal and Prime ideals- Prime fields, Rings of polynomials, Polynomials in an indeterminate form, the evaluation of homomorphism.

### **REAL ANALYSIS**

The completeness properties of  $\mathbb{R}$ , Applications of the Supremum property.

Sequences and Series - Sequences and their limits- limit theorems- Monotonic Sequences- Sub-sequences and the Bolzano-Weirstrass theorem-The Cauchy's Criterion -Properly divergent sequences- Introduction to series- Absolute convergence- test for absolute convergence- test for non-absolute convergence

Continuous Functions-continuous functions- combinations of continuous functions- continuous functions on intervals- Uniform continuity.

The derivative- The mean value theorems- L'Hospital Rule- Taylor's Theorem

Riemann integration - Riemann integral - Riemann integrable functions- Fundamental theorem

### **LINEAR ALGEBRA**

Vector spaces, General properties of vector spaces- Vector subspaces- Algebra of subspaces-linear combination of vectors- Linear span- linear sum of two subspaces- Linear independence and dependence of vectors- Basis of vector space- Finite dimensional vector spaces- Dimension of a vector space- Dimension of a subspace- Linear transformations- linear operators- Range and null space of linear transformation- Rank and nullity of linear transformations- Linear transformations as vectors- Product of linear transformations- Invertible linear transformation

The adjoint or transpose of a linear transformation- Sylvester's law of nullity- characteristic values and characteristic vectors - Cayley- Hamilton theorem- Diagonalizable operators- Inner product spaces- Euclidean and unitary spaces- Norm or length of a vector- Schwartz inequality- Orthogonality- Orthonormal set- complete orthonormal set- Gram - Schmidt orthogonalisation process

### **MULTIPLE INTEGRALS AND VECTOR CALCULUS**

Multiple integrals - Introduction, the concept of a plane- Curve- line integral- Sufficient condition for the existence of the integral- The area of a subset of  $\mathbb{R}^2$  - Calculation of double integrals- Jordan curve – Area- Change of the order of integration- Double integral as a limit- Change of variable in a double integration. Lengths of Curves, Surface areas, Integral expression for the length of a curve, Surfaces, Surface areas.

Vector differentiation- Ordinary derivatives of vectors- Space curves- Continuity- Differentiability- Gradient- Divergence- Curl operators- Formulae involving these operators- Vector integration- Theorems of Gauss and Stokes- Green's theorem in plane and applications of these theorems

## Part – C

PHYSICAL SCIENCE:

PHYSICS

(Marks: 50)

### (SYLLABUS)

- 1. Vector Analysis:** Scalar and Vector fields, Gradient of a scalar field. Divergence and curl of a vector field
- 2. Mechanics of particles:** Laws of motion, Motion of variable mass system. Conservation of energy and momentum.
- 3. Mechanics of Rigid bodies:** Definition of Rigid body, rotational kinematics relations, equation of motion for a rotating body, angular momentum. Eulers equation, precession of a top.
- 4. Central forces:** Central forces - definition and examples, Conservative nature of central forces. Equation of motion under a central force, Gravitational field, motion under inverse square law, derivation of Kepler's laws.
- 5. Fundamentals of vibrations:** Simple harmonic oscillator and solution of the differential equation-physical characteristics of SHM, frequency of loaded spring taking its mass into consideration.
- 6. Damped and forced oscillations:** Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy consideration, comparison with undamped harmonic oscillator.
- 7. 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 both the ends, overtones.
- 8. Kinetic theory of gases:** Deduction of Max Well's law of distribution of molecular speeds - Transport phenomena - Viscosity, thermal conduction and diffusion of gases.
- 9. Thermodynamics:** Heat and work - Internal energy - Indicator Diagrams work done in Isothermal and adiabatic processes - First law of thermodynamic - significance and applications of first law of thermodynamics - Reversible and irreversible process - Carnot's theorem - Carnot's engine, efficiency - Clausius - Clapeyron equation - Second law of thermodynamics, different statements - Thermodynamic scale of temperature-Entropy concept - Entropy and disorder measurement of entropy changes in reversible and irreversible processes - Entropy of universe - Entropy - Temperature diagrams,
- 10. Quantum theory of Radiation:** Block body Fery's black body distribution of energy in the spectrum of a black body - Wien's displacement law, Wien's law; Raleigh Jean law - Quantum theory of radiation - Planck's law deduction of Wien's law, Releigh Jeans law Wien's displacement from Planck's law.
- 11. Statistical thermodynamics:** Introduction of statistical mechanics - statistical equilibrium - probability theorems in statistical thermodynamics - Max Well - Boltzmann distribution law (Statement and expression only) - Application to ideal gas. Quantum Statistics - Phase space - Fermi - Dirac distribution law (statement and expression only) - Application to electron gas - Bose -- Einstein distribution law (statement and expression only) - application to photon gas - comparison of three statistics.
- 12. Interference:** The superposition principle - coherence - temporal and spatial conditions for interference of light. Interference by division of wave front - Fresnel's bipism - determination of wavelength of light chance of

- phase on reflection - determination of thickness of a transparent material using prism. Interference by division of amplitude - oblique incidence of a plane wave on a thin film (the cosine law) - colours of thin films - non reflecting thin films - interference by a plane parallel film illuminated by a point surface - interference by film with two non parallel reflecting surfaces (wedge shaped film)-determination of diameter of wire Newton's rings in reflected and transmitted light. Determination of wavelength of monochromatic light Michelson Interferometer, types of fringes, determination of wavelength of monochromatic light, thickness of a thin plate.
13. **Diffraction:** Fraunhofer diffraction - diffraction due to a single slit and circular aperture. Limit of resolution - two-slit Fraunhofer diffraction - Fraunhofer diffraction pattern with N-slits - The Fourier transform and its properties - the shifting theorem and application of the FT to Fourier diffraction due to single slit, A double slit and the diffraction grating - The diffraction grating normal and oblique incidence determination of wavelength of light.
  14. **Polarization and double refraction:** Polarized light - Brewsters law - Malus Law - phenomenon of double refraction is calcite - Refraction of plane wave incident on a negative crystal like calcite - Nichol prism. Analysis of polarized light by quarter wave plate - Babinet compensator.
  15. **Lasers fiber optics and Holography:** Spontaneous, stimulated emission - Laser principle - population inversion - Einstein coefficients - Types of lasers, He-Ne and Ruby lasers and the application of lasers.
  16. **Electrostatics:** Gauss law and its applications, electric field due to an infinite conducting sheet of charge, uniformly charged sphere and charged cylindrical conductors, mechanical force on a charged conductor, electric potential, potential due to charged spherical conductor, and electric dipole and an infinite line of charge.
  17. **Dielectrics:** An atomic view, potential energy of a dipole in an electric field, polarization and charge density, dielectrics and Gauss's law - Relation between D, E and P-Dielectric constant and susceptibility, Boundary conditions at the dielectric surface.
  18. **Capacitance:** Capacity of concentric spheres and cylindrical condenser, capacity of parallel plate condenser with and without dielectric - electric energy stored by a charged condenser - force between plates of condenser, attracted disc electrometer construction and working.
  19. **Magnetostatics:** Magnetic shell-potential due to magnetic shell - field due magnetic shell - equivalent of electron circuit and magnetic shell - application of field due to magnetic shell - magnetic induction (B) and field (H) - Permeability and susceptibility - Hysteresis loop.
  20. **Moving charge in electric and magnetic fields:** Hall effect, cyclotron, synchrocyclotron and synchrotron - force on a current carrying conductor, force and torque on current loop - Biot Savart's law and calculation of B due to long straight wire, circular current loop and solenoid.
  21. **Electromagnetic induction:** Faraday's law - Lenz's law - expression for induced emf - electromotive force-time varying magnetic fields - Ballistic galvanometer - theory - damping correction - self and mutual inductance, coefficient of coupling, calculation self inductance of a long solenoid - toroid - energy stored in magnetic field principles of transformer.
  22. **Varying and alternating currents:** CR circuits, LR circuits, growth and decay of currents, LCR circuit, critical damping - alternating current, relation

between current and voltage in pure RC and L-vector diagrams LCR circuit power factor, series and parallel resonant circuit - Q - factor.

- 23. Maxwell's equations and electromagnetic wave:** A review of basic laws of electricity and magnetism - displacement current - Maxwell's equations in differential form Maxwell's wave equation. Plane electromagnetic waves transverse nature of electromagnetic waves Poynting theorem, production of electromagnetic waves (Hertz experiment)
- 24. 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.
- 25. Digital Principles**  
Binary number system, converting Binary to Decimal and vice versa. Binary addition and subtraction (1's 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.
- 26. Quantum Mechanics**  
de Broglie's hypothesis – wavelength 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 px), 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.
- 27. 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  $\beta$ -decay.
- 28. 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.  
Introduction, nanoparticles, metal nanoclusters, semiconductor nanoparticles, carbon clusters, carbon nanotubes, quantum nanostructures – nanodot, nanowire and quantum well. Fabrication of quantum nanostructures.

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## Part - C

PHYSICAL SCIENCE:

CHEMISTRY

(Marks: 50)

### (SYLLABUS)

#### Inorganic Chemistry

##### 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  $\psi$  and  $\psi^2$ .

##### 2. Chemical Bonding

Ionic solids - lattice and hydration energy, solubility of ionic solids rule, power and polarisability 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, concepts of sigma and pi 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 -  $H_2$ ,  $He_2^+$ ,  $B_2$ ,  $C_2$ ,  $N_2$ ,  $O_2$ ,  $F_2$  and their ions (unhybridised diagrams only) and heteronuclear 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, van der 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, polymeric, complex hydrides, reducing properties. Oxides - monoxide, peroxide 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) sub oxide, 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 polynuclear, general preparation, structure and bonding in  $\text{Ni(CO)}_4$ ,  $\text{Fe(CO)}_5$  and  $\text{Co}_2(\text{CO})_8$ .

#### 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, and 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, auto reduction, aluminothermic reduction, hydrometallurgy, electrolytic reduction. Purification of impure metals - liquation, fractional distillation, zone refining, oxidative processes - cupellation, baseremission, 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 compounds

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 bonding 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, spectrochemical 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 -1

## 9. Stereochemistry of carbon compounds

Molecular representations: Wedge, Fischer, Newman and Saw-horse formulae. Isomeris: Definition of homomers and isomers. Classification of isomers; Constitutional and Stereoisomers - definition and examples. Constitutional isomers: chain, functional, 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, electro negativity - 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 its 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. Method of preparation: Hydrogenation of alkynes and alkenes, 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.

Alkene - 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 H<sub>2</sub>O' HOX, H<sub>2</sub>SO<sub>4</sub> with mechanism and addition of HBr in the presence of peroxide (anti - Markonikv's addition).

Oxidation - hydroxylation by KMnO<sub>4</sub>, OSO<sub>4</sub> 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 Diel's - Alder reaction.

Alkynes - Preparation by dehydrohalogenation of dihalides, dehalogenation of tetrahalides acetylene from CaC<sub>2</sub>. Properties: Acidity of acetylenic hydrogen (formation of metal acetylides). Preparation of higher acetylenes, metal-ammonia reductions. Physical properties. Chemical reactivity - electrophilic addition of X<sub>2</sub>, HX, H<sub>2</sub>O (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 Kekule, 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, Naphthalene, Anthracene and Phenanthrene) and Non-Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation).

Reactions General mechanism of electrophilic substitution mechanism of nitration and sulfonation. Mechanism of halogenation, 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 NO<sub>2</sub> 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 sulfonation 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 aldoxade /phenoxides and their reaction with RX (c) replacement of OH by X using  $\text{PCl}_5$ ,  $\text{PBr}_3$ ,  $\text{SOCl}_2$  and with  $\text{HX}/\text{ZnCl}_2$ . Esterification by (a) acid halides, anhydrides and acids (mechanism) (b) Esters of inorganic acids (c) dehydration of alcohols. Oxidation of alcohols by  $\text{CrO}_3$   $\text{KMnO}_4$ . Special reactions of phenols - (a) Bromination, (b) Kolbe - Schmidt reaction (c) Riemer Tiemann (d) Azo coupling. Identification of alcohols by oxidation -  $\text{KMnO}_4$ , Ceric ammonium nitrate - Lucas reagent; Phenols by reaction with  $\text{FeCl}_3$ , and by the solubility in  $\text{NaOH}$ . Polyhydroxyl compounds - Pinacol - Pinacolone rearrangement, Oxidative cleavage ( $\text{Pb}(\text{OAc})_4$  &  $\text{HIO}_4$ ).

#### 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 -  $\text{KMnO}_4$  oxidation and auto oxidation, reduction - catalytic hydrogenation, Clemmenson's reduction, Wolf-kishner reduction, MPV reduction, reduction with LAH,  $\text{NaBH}_4$ . Analysis - 2,4 - DNP test, Tollen's test, Fechlins test, Scihffs 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  $1^\circ$ ,  $2^\circ$ ,  $3^\circ$  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. 5. 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<sub>2</sub>, 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 letters 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-glyceraldehydes 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 (methylal, hydrolysis 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 and Haworth formula). Inter Conversion of Monosaccharides: Aldopentose to aldo hexose -eg: Arabinose to D-glucose, D-mannose (Kiliani - Fischer method). Epimers, Epimerisation. Lobry de Bruyn 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 into 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 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, Vanderwaal's equation of state. Critical Phenomena: PV - isotherms of real gases, continuity of state, Andrews's isotherms of carbon dioxide. The vander waals equation and the critical state, Derivation of relationship between critical constants and Vander waal's constants. Experimental determination critical constants. The law of corresponding states, reduced equation of state. 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 and Colligative properties

Dilute solutions, colligative properties, ideal and non-ideal solution. Raoult's law, relative lowering of vapor 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't Hoff factor, degree of dissociation and association of solutes.

## **21. Colloids and Surface Chemistry**

Definition of colloids, classification of colloids. Solids in liquids (sols): Preparation 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, preparation and properties, inhibition, general applications of colloids.

## **22. Solutions**

Liquid - liquid mixtures - ideal liquid mixtures, Raoult's and Henry's law. Non-ideal systems. Azeotropes - HCl-H<sub>2</sub>O, ethanol-water systems. Fractional distillation. Partially miscible liquids - phenol-water, trimethyl amine-water, nicotine-water systems, Lower and upper consolute temperature. Effect of impurity on consolute temperature. Immiscible liquids and steam distillation.

## **23. Chemical Kinetics**

Rate of a 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. Radioactive decay as first order phenomenon. Arrhenius equation, and concept of activation energy. Theories of chemical kinetics: effect of temperature on rate of a 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 - Kirchoff's 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  $V$  &  $T$ , entropy as a function of  $P$  &  $T$ , entropy change in physical processes. Gibbs and Helmholtz functions: Gibbs function ( $G$ ) and Helmholtz function ( $A$ ) as thermodynamic quantities.  $A$  &  $G$  as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of  $G$  with  $P, V$  and  $T$ .

## Part - C

BIO- SCIENCE:

BOTANY

(Marks: 50)

### (SYLLABUS)

#### A) 1. **Branches of Botany:**

Virology, Phycology, Mycology, Lichenology, Bryology, Pteridology, Palaeobotany, Histology, Anatomy, Physiology, Pathology, Ecology, Taxonomy, Embryology, Cell Biology, Genetics, Evolution, Biotechnology, Microbiology.

#### B) **Classification of Plant Kingdom:**

2. Classification of plant kingdom and salient features of major groups (Algae, Fungi, Bryophyta, Pteridophyta, Gymnosperms & Angiosperms)
3. Bentham & Hooker's and Engler & Prantle's systems of classifications ; Plant diversity in Angiosperm families - Annonaceae, Malvaceae, Capparidaceae, Rutaceae, Fabaceae, Caesalpiniaceae, Mimosaceae, Cucurbitaceae, Apiaceae, Rubiaceae, Asteraceae, Sapotaceae, Asclepiadaceae, Convolvulaceae, Acanthaceae, Lamiaceae, Amarantaceae, Euphorbiaceae, Orchidaceae, Liliaceae, Palmae and Poaceae.

#### C) **Microbiology:**

4. Structure, replication and transmission of viruses and Mycoplasma ; Diseases caused by viruses in plants and humans.
5. Structure, nutrition and reproduction of bacteria ; useful bacteria , bacterial diseases of plants and Humans.
6. Structure, reproduction, life history and systematic position of *Volvox*, *Oedogonium*, *Chara*, *Vaucheria*, *Ectocarpus*, and *Polysiphonia* ; General account of Bacillariophyceae & Economic importance of algae.
7. Structure, reproduction, life history and systematic position of *Albugo*, *Mucor*, *Penicillium*, *Peziza*, *Puccinia*, and *Alternaria* - plant diseases caused by *Albugo*, *Puccinia* and *Alternaria*
8. Structure, reproduction and economic importance of lichens.

#### D) **Cell Biology:**

9. Prokaryotic and eukaryotic cells; structures and functions of cell organelles.
10. Cell division - mitosis and meiosis

#### E) **Tissue organization and growth:**

11. Tissues and tissue systems in plants ; Histological organization of apical meristems;Stellar evolution in Pteridophytes;
12. Primary structure and secondary growth in roots and stems of dicots and monocots; abnormal secondary growth ; internal structure of dicot and monocot leaves in relation to photosynthesis and water stress.

#### F) **Physiology:**

13. Water relations of plants:  
Importance of water to plants; physical properties of water; Diffusion and Osmosis; Absorption and transport of water; Transpiration - physiology of stomata.
14. Nutrition in plants:  
Autotrophism, heterotrophism and types ; Absorption of mineral elements by plants ; essential macro and micro elements and their role.
15. Photosynthesis: Mechanisms and regulating factors.

16. Nitrogen metabolism:  
Biology of nitrogen fixation; importance of nitrate reductase and regulation; ammonium assimilation ; Protein synthesis; ID, 2D and 3D structure of proteins.
17. Lipid metabolism:  
Saturated and unsaturated fatty acids; fatty acid biosynthesis;  $\beta$  - oxidation.
18. Growth and differentiation:  
Seed germination and dormancy- influencing factors; kinetics of growth; plant hormones and mechanisms of action ; phytochromes and their role ; fruit development and ripening.
19. Respiration: types, mechanism and controlling factors.

#### **G) Plant reproduction:**

20. Types of reproduction -- vegetative, asexual and sexual ; evolution of sporophyte in Bryophytes ; Heterospory and seed habit in Pteridophytes.
21. Flower as a modified shoot; pollen-pistil interaction ; self incompatibility.
22. Microsporogenesis ; Megasporeogenesis -Types of embryosacs; development of Mono-, bi- and tetrasporic types.
23. Endosperm types and development.
24. Development of dicot and monocot embryos; polyembryony.

#### **H) Plant resources and their utilization:**

25. Rice, wheat maize, potato, sugarcane, cotton, jute, Groundnut, mustard, coconut, Teak, rosewood, sandalwood, *Terminalia catapa*, tea, coffee, rubber, spices and medicinal plants.

#### **I) Plants and Environment:**

26. Atmosphere (gaseous composition), water (properties of water cycle), light (global radiation & photosynthetically active radiation), temperature, soil (soil profile, physico- chemical properties), and biota.
27. Morphological, anatomical and physiological responses of plants to water (Hydrophytes & Xerophytes), temperature (Thermoperiodicity & Vernalization), light (Photoperiodism, Heliophytes, Sciophytes), and salinity.

## Part- C

# ZOOLOGY

## (SYLLABUS)

### BIOLOGY OF INVERTEBRATES AND CELL BIOLOGY

#### 1.0. Protozoa to Annelida

- 1.1 Phylum Protozoa: General characters and outline classification up to classes. Type study: *Paramecium*
- 1.2 Phylum Porifera: General characters and outline classification up to classes. Type study: *Sycon*; Canal system in Sponges.
- 1.3 Phylum Coelenterate: General characters and outline classification up to classes. Type study: *Obelia*; Polymorphism in Coelenterates; Corals and Coral reef formation.
- 1.4 Phylum Platyhelminthes: General characters and outline classification up to classes. Type study, *Fasciola hepatica*.
- 1.5 Phylum Nematheimintes: General characters and outline classification up to classes. Type study: *Ascaris lumbricoides*.
- 1.6 Phylum Annelida: General characters and outline classification up to classes Type study: Leech; Coelom and coelomoducts in Annelids.

#### 2.0. Arthropoda to Hemichordata

- 2.1 Phylum Arthropoda: General characters and outline classification of up to classes Type study; Prawn; Crustacean larvae; *Peripatus* – Characters and Significance.
- 2.2 Phylum Mollusca: General characters and outline classification of up to classes Type study: *Pila*; Pearl formation in Molluscs.
- 2.3 Phylum Echinodermata: General characters and outline classification of up to classes. Type study: Star fish.
- 2.4 General characters of Hemichordata: structure and affinities of *Balanoglossus*.

#### 3.0. Cell Biology

- 3.1 Cell theory
- 3.2 Ultra structure of Animal cell
- 3.3 Structure of Plasma membrane – Fluid-mosaic mode. Transport functions of Plasma membrane-Passive transport, active transport (Antiport, symport and uniport) and bulk transport.
- 3.4 Structure and functions of Endoplasmic reticulum Golgi body, Ribosomes, lysosomes and Mitochondrion.
- 3.5 Chromosomes – nomenclature types and structure. Giant chromosomes – Polytene and Lampbrush chromosomes.
- 3.6 Cell division – Cell-cycle stages ( $G_1$ , S,  $G_2$  and M phases), Cell-cycle check points and regulation. Mitosis; Meiosis – and its significance.

## 4.0. Biomolecules of the cell

### 4.1. Carbohydrates:

- 4.1.1. Classification of Carbohydrates
- 4.1.2. Structure of Monosaccharides (Glucose and Fructose)
- 4.1.3. Structure of Disaccharides (Lactose and Sucrose)
- 4.1.4. Structure of Polysaccharides (Starch, Glycogen and Chitin)

### 4.2. Proteins:

- 4.2.1. Amino acids: General properties, nomenclature, classification and structure.
- 4.2.2. Classification of proteins based on functions, chemical nature and nutrition, peptide bond and structure (Primary, Secondary, Tertiary and Quaternary structures)

### 4.3. Lipids:

- 4.3.1. Classification. Structure of Fatty acids (Saturated and unsaturated).
- 4.3.2. Triacylglycerols, Phospholipids (Lecithin and cephalin) and Steroids (Cholesterol).

### 4.4. Nucleic acids:

- 4.4.1. Structure of purines, pyrimidines, ribose and deoxyribose sugars.
- 4.4.2. Watson and Crick model of DNA – Nucleoside, Nucleotide, Chargaff's rule.  
Structure of RNA, Types of RNA – rRNA, tRNA and mRNA.

## BIOLOGY OF CHORDATES, EMBRYOLOGY, ECOLOGY AND ZOOGEOGRAPHY

### 1.0. Protochordata to Amphibia

- 1.1. Protochordates: Salient features of Urochordata and Cephalochordata Structure and life-history of *Herdmania*, Significance of retrogressive Metamorphosis.
- 1.2. General organization of Chordates
- 1.3. General characters of Cyclostomes
- 1.4. General characters of fishes, classification up to sub-class level with examples  
Type study – *Scoliodon*: Morphology, respiratory system, circulatory system, excretory system, nervous system and sense organs.
- 1.5.1. Migration in fishes and types of scales
- 1.6. General characters and classification of Amphibia up to order level.
  - 1.5.1 Type study – *Rana*: Morphology, digestive system, respiratory system, circulatory system, excretory system, nervous system and reproductive system.
  - 1.5.2 Parental care in amphibians.

### 2.0. Reptilia to Mammalia

- 2.1. General characters and classification of Reptilia up to order level.
  - 2.1.1 Type study – *Calotes*: Morphology, digestive system, respiratory system, circulatory system, urinogenital system and nervous system.
- 2.2. General characters and classification of Aves up to order level with examples.
  - 2.2.1. Type study – Pigeon (*Columbia livia*) : Exoskeleton, respiratory system, circulating system and excretory system.
  - 2.2.2. Significance of migration in birds
  - 2.2.3. Flight adaptation in birds
- 2.3. General characters and classification of Mammalia up to order level with examples.
  - 2.3.1. Dentition in mammals.

### **3.0. Embryology**

- 3.1. Spermatogenesis, Oogenesis and Fertilization.
- 3.2. Types of eggs
- 3.3. Types of cleavages
- 3.4. Development of frog up to gastrulation and formation of primary germ layers
- 3.5. Foetal membranes and their significance
- 3.6. Placenta : types and functions
- 3.7. Regeneration with reference to Turbellarians and lizards

### **4.0. Ecology and Zoogeography**

- 4.1. Biogeochemical cycles or nutrient cycles – Gaseous cycles of Nitrogen and Carbon; Sedimentary cycle- phosphorus.
- 4.2. Definition of Community – Habitat and ecological niche
  - 4.2.1. Community interactions : Brief account on Competition, predation, mutualism, commensalisms and parasitism.
  - 4.2.2. Ecological succession: Primary and Secondary, seral stages, climax community with examples
- 4.3. Population ecology : Density and dispersions of animal populations
  - 4.3.1. Growth curves and growth of animal populations –r-selected and k-selected species
  - 4.3.2. Population regulation mechanisms – both biotic and abiotic
  - 4.3.3. Growth of human population its control. Future of human population
  - 4.3.4. Zoogeographical realms and their characteristic fauna

## **ANIMAL PHYSIOLOGY, GENETICS & EVOLUTION**

### **1.0. Physiology of Digestion**

- 1.1 Definition of digestion and types of digestion – extra and intracellular.
- 1.2 Digestion of Carbohydrates, proteins, lipids and cellulose digestion.
- 1.3 Absorption and assimilation of digested food materials.
- 1.4 Gastrointestinal hormones – control of digestion.

### **2.0. Physiology of respiration**

- 2.1 Types of respiration – external and internal respiration.
- 2.2 Structure of mammalian lungs and gaseous exchange.
- 2.3 Transport of oxygen – formation of oxyhaemoglobin and affinity of haemoglobin for Oxygen, Oxygen dissociation curves.
- 2.4 Transport of CO<sub>2</sub> – Chloride shift, Bohr effect.
- 2.5 Cellular respiration – Main steps of glycolysis, Krebs's cycle, electron transport, Oxidative phosphorylation and ATP production (Chemosmotic theory).

### **3.0. Physiology of Circulation**

- 3.1 Open and closed circulation.
- 3.2 Structure of mammalian heart and its working mechanism – Heartbeat and cardiac cycle. Myogenic and neurogenic hearts.
- 3.3 Regulation of heart rate – Tachycardia and Bradycardia.

### **4.0. Physiology of Excretion**

- 4.1 Definition of excretion.
- 4.2 Forms of nitrogenous waste material and their formation: classification of animals on the basis of excretory products.
- 4.3 Gross organization of mammalian excretory system and structure of kidney.
- 4.4 Structure and function of Nephron – Counter current mechanism.

### **5.0. Physiology of muscle contraction**

- 5.1 General structure and types of muscles.
- 5.2. Ultra structure of skeletal muscle.
- 5.3. Sliding filament mechanism of muscle contraction.
- 5.4. Chemical changes during muscle contraction – role of calcium, ATP utilization and its replenishment.

### **6.0 Physiology of nerve impulse**

- 6.1. Structure of nerve cell.
- 6.2. Nature of nerve impulse – resting potential and action potential. Properties of nerve impulse – threshold value, refractory period, all or none response.
- 6.3 Conduction of nerve impulse along an axon – local circuit theory and salutatory conduction theory.
- 6.4 Structure of synapse, mechanism of synaptic transmission – electrical and chemical transmissions.

## **7.0. Physiology of Endocrine system**

- 7.1 Relationship between hypothalamus and pituitary gland.
- 7.2 Hormones of hypothalamus.
- 7.3 Hormones of Adenohypophysis and Neurohypophysis.
- 7.4. Hormones of pineal gland, thyroid gland, parathyroid, thymus, adrenal and pancreas.
- 7.5. Endocrine control of mammalian reproduction – Male and female hormones – Hormonal control of menstrual cycle in humans

## **8.0. Physiology of Homeostasis**

- 8.1 Concept of homeostasis and its basic working mechanism.
- 8.2 Mechanism of Homeostasis – giving three illustration viz., Hormonal control of glucose levels, Water and ionic regulation by freshwater and marine animals and temperature regulation in man.

## **Genetics**

Mendel's laws – Law of segregation and independent assortment; Genetic interactions – Incomplete dominance, codominance and epistasis.

Identification of DNA as the genetic material – Griffith's experiment and Hershey – Chase experiment.

Central dogma of molecular biology – Brief account of DNA replication (Semi-conservative method), Replication fork (Continuous and discontinuous synthesis); Transcription – Brief account initiation, elongation and termination in eukaryotes; Translation; Genetic code; gene regulation as exemplified by lac operon.

Human karyotyping, Barr bodies and Lyon hypothesis and Amniocentesis chromosomal disorders – Autosomal and sex chromosomes

### **Organic Evolution:**

Genetic basis of Evolution, Gene pool and gene frequencies, Hardy-Weinberg's Law, Force of destabilization, natural selection, genetic drift, Mutation, Isolation and Migration.

Speciation – Allopatry and sympatry.

## **APPLIED ZOOLOGY**

### **UNIT I**

#### **1.0 Fisheries and Aquaculture**

- 1.1 Capture fisheries – Introduction
- 1.2 Types of fisheries, Fishery resource from Freshwater, Brackish water and Marine habitats.
- 1.3 Finfish and shell fisheries.
- 1.4 Fishing gears and fisheries
- 1.5 Freshwater, Brackish water and Mariculture
- 1.6 Site selection criteria
- 1.7 Aquaculture systems
- 1.8 Induced breeding
- 1.9 Hatchery design and Management
- 1.10 Larval rearing – Nursery ponds, rearing and grow out ponds
- 1.11 Shrimp and Prawn culture
- 1.12 Hatchery systems, Seed transport, Common diseases and control
- 1.13 Post-harvest technology
- 1.14 Preservation and processing – Freezing, solar drying, Canning, salting smoking, By product of fish cool mineral.

### **UNIT II**

#### **2.0. Clinical Science**

##### **2.1. Hematology**

- 2.1.1. Blood composition and functions
- 2.1.2. Blood groups and transfusion problems
- 2.1.3. Blood diseases – Anemia, Leukemia, Leucocytosis, Leucopaenia
- 2.1.4. Biopsy and autopsy – Clinical importance.

##### **2.2 Immunology**

- 2.2.1. Types of immunity – Innate and acquired
- 2.2.2. Antigens – Haptenes and epitopes and their properties
- 2.2.3. Structure and biological properties of human immunoglobulin G (IgG)
- 2.2.4. Hypersensitivity – Immediate and delayed

##### **2.3. Important Human Parasites**

- 2.3.1. Blood parasites (structure and Clinical significance of Plasmodium)
- 2.3.2. Intestinal parasites – Structure and clinical significance Entamoeba, Giardia, Taenia solim, Ancylostoma, Enterobius

### **UNIT - III**

#### **3.0 Animal Biotechnology :**

1. Animal Biotechnology: Scope of Biotechnology, Cloning Vectors – Characteristics of vectors, Plasmids.
2. Gene Cloning – Enzymatic cleavage of DNA, Restriction enzymes (Endonucleases) and Ligation.
3. Transgenesis and Production of transgenic animals (Fish and Goat)
4. Application of Stem Cell technology in cell based therapy (Diabetes and Parkinson's diseases).

## Part - C

**SOCIAL STUDIES:**

**HISTORY**

**(Marks: 30)**

### (SYLLABUS)

#### I. History of India upto 1526 A.D.

1. Pre historic, Paleolithic, Mesolithic and Neolithic culture.
2. Harappa Civilization - origin, extent, urban planning - Nature of polity and economic organization.
3. Rise of new Religious movements: Jainism and Buddhism in 6<sup>th</sup> century B.C.
4. The Mouryan empire - Ashoka's dhamma, its nature and propagation, Mouryan Administration, State, Economy, Art and Architecture.
5. Post-Mouryan period, Socio-cultural developments with special reference to Satavahanas and Kushans.
6. Developments in the Gupta period - Administrative system, society, Economy, Art and Architecture, Literature, Philosophy, Science and Technology.
7. Chalukyan period - Vatapi Chalukyas, Eastern Chalukyas of Vengi, Rashtra Kutas - Development of society, economy and culture, Religious movements.
8. Pallavas and Their contribution to society and culture - Art and Architecture.
9. Rise and fall of Delhi Sultanate- Socio- Economic and Cultural study.
10. Impact of Islam on Indian culture and Bhakti and Sufi movement.
11. Vijayanagar - Bahamani Kingdoms - Society, economy, Art and Architecture.

#### II. History of India (1526-1950 A.D.)

##### A. Later Medieval India:

1. Consolidation, Expansion and Diplomacy under Moghul empire upto 1707.
2. General conditions under Moghul rule:
  - (a) Social conditions: Ulemas Nobility - Zamindars, Peasantry - Artisans - Slaves and status of women.
  - (b) Economic conditions: Agriculture, Trade and Commerce.
3. Study of Art and Architecture, Literature, Education and Fine Arts (1526-1761 A.D).
4. Rise, growth and decline of Marathas - Administration of Sivaji.

##### B. Modern India:

5. Advent of European powers: Portuguese, French and English.
6. Expansion and Consolidation of British empire:
  - (a) Ideologies of expansion: Mercantilism, orientalism; utilitarianism and Evangelicalism.
  - (b) Tools of expansion: War and Diplomacy - Carnatic, Bengal, Subsidiary alliance and Doctrine of Lapse.
7. Economic Changes:
  - (a) Land revenue settlements; permanent settlement, ryotwari and

mahalwari, conditions of peasants, rural indebtedness, and recurrent famines.

- (b) Nature of colonial economy:  
Commercialisation of agriculture and its effects, Decline of cottage industries, causes for poverty in India.
- 8. Social Changes:
  - (a) Spread of western education, (b) Rise of professional classes and the emerging intelligentsia. (c) Growth of the press; English and Indian languages, (d) Indian renaissance (e) Socio-Religious movements (f) Status of women.
- 9. Popular resistance to company rule:
  - a) Peasant and Tribal movements (brief survey)
  - b) Revolt of 1857-causes, nature and results.
- 10. National Movement:
  - a) Emergence of Indian National Movement - Indian National Congress - Moderates, extremists and Revolutionaries.
  - b) Rise of Gandhi-Nature of Gandhian movements.
  - c) Indian polity-(1939-1945) -Quit India movement.
  - d) Subhas Chandra Bose and Indian National Army.
  - e) Emergence of communal trends - Communal politics and partition.
- 11. India 1947-1950.
  - a) Integration of the Indian, Princely States.
  - b) Making of the Constitution and Indian Republic.

### **III. History of Modern World (1453 -1945 A.D)**

- 1. Geographical Discoveries – Renaissance – Reformation – Counter Reformation Movements in Europe – Colonialism – Mercantilism Emergence of Nation States in Europe.
- 2. French Revolution: Causes - Course - Constitutional assembly - National convention - Directory - Effects of the Revolution.
- 3. Emergence of Napoleon Bonaparte - Expansion, Consolidation and downfall.
- 4. Vienna Congress - Concert of Europe - Metternich - Revolutions of 1830 and 1848.
- 5. Second Republic in France - Napoleon III - Paris commune - the rise of III<sup>rd</sup> French Republic.
- 6. National movements: Unification of Italy - Unification of Germany.
- 7. Revolution in Turkey - Balkan wars.
- 7. Scramble for African and Asian colonies - Theories and mechanisms of Imperialism.
- 8. First World War-causes and effects. Treaty of Versailles.
- 9. Rise of Fascism and Nazism.
- 10. League of Nations - Achievements and failures.
- 11. Second World War – causes, course and effect.
- 12. Post Second World War developments - U.N.O, Aims and Objectives.

### **IV. History and Culture of Telangana**

The Kakatiyas – The Qutb Shahis – A Brief Survey of Political History – Society, Economy and Culture – The Asaf Jahis – A Brief Survey of their Political History, Society, Economy and Culture – Salarjung’s Reforms – Adi-Hindu Social Service League – Bhagya Reddy Varma – Political Consciousness in Telangana : Nizam Andhra

Mahasabha, Hyderabad State Congress, Anti-Nizam Movements – Telangana Armed Struggle – Komaram Bhimu – Razakaars – Police Action and Accession of Hyderabad State into Indian Union.

## Part – C

### SOCIAL STUDIES:

### CIVICS

(Marks: 15)

#### I. Political Science - Concepts and Theories:

1. Introduction, definition, scope and importance of political science.
2. Different approaches to the study of political science - Traditional and Modern.
3. Relation with other social sciences: History, Economics, Public Administration, Sociology and Ethics.
4. Society - State - Nation.
5. Sovereignty: Monism and Pluralism.
6. The theories of origin of the State: Diva Right, Social Contract and evolutionary (History).
7. Law, Liberty and Equality:
  - a) Law: Source of law-Concepts of Rule of Law,
  - b) Liberty and Equality - Their relationship,
  - c) Theories of Rights,
  - d) Kinds of rights
8. Classification of Governments: Traditional (Aristollen)  
Modern:
  - a) Democracy: Direct and Indirect democratic devises
  - b) Unitary and Federal
  - c) Parliamentary and Presidential
9. The theory of separation of powers,
10. Organs of Government
  - (A) Legislature : (i) Types - Unicameral, Bicameral (ii) Committee system,
    - (iii) Functions of Legislature (iv) Decline of legislature
  - (B) Executive : (i) Types - Parliamentary and Presidential (ii) Rise of executive in modern times
  - (C) Judiciary : (i) Functions (ii) Independence of Judiciary (iii) Judicial review,
11. Electorate: Methods of representation, voting behaviour.
12. Political parties - Functions - Types of party system.
13. Popular control - Methods of control - Public opinion - Mass media.

#### II. 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 7 Principles of Organisation - 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 Me Gregor(Theory X and Theory Y).
9. Comparative Public Administration - Weidner
10. Development Administration - Weidner
11. New public administration
12. New Public Management Perspective.
13. Concepts in Administration: Planning, Leadership, Supervision, Communication, Public Relations, Motivation.

Not  
required in  
depth

### III. Indian Government and Politics:

1. Introductory note on Nationalist movement in India: Brief sketch : survey from 1885-1947.
2. Constituent Assembly - Making of the Indian constitution. Salient features of the Constitution - amending procedure.
3. Indian Federation : Union - State relations - recent trends.
4. Fundamental rights, Fundamental duties, Directive principles of state policy.
5. President - Election - powers and functions - council of ministers P.M.
6. Parliament of India - Composition powers and functions.
7. Indian judiciary- Supreme Court-composition powers, functions- judicial review.
9. Indian Party system major national parties - regional parties.
10. State Government Governor Council of ministers-Chief Minister.
11. Social and Economic factors in Indian Politics - Language, Religion, caste Regionalism peasant trade unions, youth, tribal movements, their impact on national integration.

### IV. 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 Office.  
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 - 73<sup>rd</sup> and 74<sup>th</sup> 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.
- V.** Challenges facing our country today;
1. Illiteracy
  2. Casteism
  3. Communalism
  4. Regionalism
  5. Anti-Social Practices
- VI.** United Nations and India's role:
1. Origin, Aims and structure of the United Nations.
  2. Principal organs of the United Nations.
  3. Specialized Agencies of the United Nations.
  4. Political and non-political achievements of the united nations
  5. India's role in the United Nations.

## Part - C

**SOCIAL STUDIES:**

**GEOGRAPHY**

**(Marks: 35)**

### **(SYLLABUS)**

#### **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.

## Part - C

**SOCIAL STUDIES:**

**ECONOMICS**

**(Marks: 20)**

### (SYLLABUS)

- 1) Micro-Macro, Static-Dynamic, Normative and Positive Economics.
- 2) Cardinal and Ordinal approaches, and law of diminishing marginal utility.
- 3) Law of variable proportions, and returns to scale.
- 4) Different concepts of costs and their Inter-relations.
- 5) Concepts of National Income, Consumption, Investment, Business Cycles.
- 6) Meaning of Economic Development and Measure of Economic Development - GNP, PQLI, and HDI, GDI, Development Theories
- 7) Sources of Public revenue.
- 7a) Taxes / VAT, Finance Commission.
  
- 8) Canons and Effects of Public Expenditure.
- 9) Functions and classification of Money.
  
- 10) Budgets and Money supply - concept of Inflation.
- 11) Functions of commercial banks and functions of Reserve Bank of India.
- 12) Methods of Credit control.
- 13) Importance of Agriculture in the Indian Economy,
- 14) Population growth in India - causes - problems of over population.
- 15) Regional disparities - causes of inequalities in Income and Wealth.
- 16) Meaning of a mixed Economy, characteristic features.
- 17) The concept of poverty - causes of poverty in India.
- 18) Types of unemployment - Disguised, Seasonal, Frictional, Structural.
- 19) Objectives of Planning in India - Important achievements and failures of planning India. NITI Aayog.
- 20) Importance of infrastructure.
- 21) Social sector - Literacy rates in India - Progress in Health Status.
- 22) Organized and unorganized sectors in the Indian Economy.
- 23) Structure of the Indian Economy - Agriculture sector, Industry sector and Service sector.
- 24) Economic Reforms, Liberalization, Globalization and Privatization.
- 25) International Trade – Balance of payments, Devaluation, Export promotion, Import substitution, WTO, IMF.

**Part - C**

**ENGLISH METHODOLOGY**

**(Marks: 50+50=100)**

**(SYLLABUS)**

**A) Language Skills**

**(Marks: 50)**

- i) Language functions
- ii) Elements of phonetics
- iii) Grammar
- iv) Phrasal Verbs (idioms)
- v) Writing Skills
- vi) Study Skills
- vii) Reference Skills
- viii) Vocabulary
- viii) Punctuations

**(Questions to be set other than as in Part A General English.)**

**(Marks: 50)**

**B) Syllabus prescribed for Optional English at B.A. Degree level (B.A., ML / Special English) 50 Questions (50 Marks).**

**(1) Language and Literature:**

- (a) Brief Survey of the English Language : Standardization : Word - formation, foreign influences (Latin, French, Scandinavian); Semantic Changes (relevant chapters from the Outline History of the English Language by F.T. Wood)
- (b) Understanding / Comprehension
  - (i) of a literacy prose passage
  - (ii) of a poem

**(2) Forms of poetry: evolution, kinds and variations:**

- Sonnet** : : Wordworth "Scorn not the Sonnet".
- Ode** : : Shelley "Ode to the West Wind"
- Elegy** : : Gray "Elegy Written in a Country Churchyard"
- Ballad** : : Yeats "The Balled of Father Giligen"
- Lyric** : : Robert Burns "A Red, Red Rose"
- Dramatic** : : Browning "My Last Duches"  
Monologue

**(3) Element of Drama :**

- Plot/Structure** : : Farrell Mitchell "The Best Laid Plans"
- Character** : : J.B. Priestly "Mother's Day"
- Dialogue** : : Anton Chekov "The Marriage Proposal"

**(4) Elements of Fiction :**

- Point of View** :: Khushwant Singh "The Interview"
  - Setting/Atmosphere** :: Edgar Allen Poe "The Tell-Talc Heart"
  - Style/Narrative** :: O Henry "The Gift of the Magi"
- Techniques**

**(5) A. Poetry from the Elizabethan age to the Pre-Romantic**

- B. Spenser : : Sonnet "One Day I Wrote Her Name"
- Milton : : "L'allegro"
- Donne : : "The Canonization"
- Pope : : Extract from "The Rape of the Lock"  
(Cantos I & II)
- Blake : : "The School Boy"

- (6) A. Development of drama : 16<sup>th</sup> and 17<sup>th</sup> Century British Drama  
 B. Shakespeare :: Othello
- (7) Prose : Origin and Development of the Essay; kinds  
 B. Bacon :: "Of Youth and Age"  
 Steele :: "One Judicious Flattery"  
 Lamb :: "Dream Children"  
 Chesterton :: "On Lying in Bed"
- (8) A. Fiction: Origin and Development of the Novel  
 B. Jane Austen :: Pride and Prejudice  
 Indian Writing in English - Indian English Literature
- (9) Origin and growth of Indian English Literature.
- (10) Poetry for detailed study.
1. Sri Aurobindo - Thought The Paraclete
  2. Toru Dutt - Sita
  3. Nissim Ezekiel - Very Indian Poem in Indian English
  4. A.K. Ramanujan - The Hindoo: he reads his GITA and is calm at all events.
  5. K.N. Daruwalla - The Epileptic
  6. Gouri Desh Pande - The female of the Species
- (11) DRAMA for detailed study  
 Girish Karnard : Naga Mandala
- (12) FICTION  
 Kushwant Singh: Train to Pakistan.
- (13) American English Language and Literature :  
 The English language in America
- (14) Poetry for detailed study
- 1) Wallace Stevens : Of Modern Poetry
  - 2) Emily Dickenson : "Hope" is Thing with Feathers
  - 3) Robert Frost: Stopping By woods on a snowy Evening
  - 4) Robinson Jeffers : Science
  - 5) Archibald Macleish : "Not Marble Nor The Gilded  
 "Monuments" For Adcle.
  - 6) William Carlos Williams ; The Yachts.
- (15) DRAMA for detailed study  
 Eugene O 'Neill : The Hairy Ape.
- (16) PROSE  
 Theoreau: Walden