

## प्रारूप - 3

(मान्यता प्राप्त क्रीडा/खेल में अपने विश्वविद्यालय की ओर से अन्तर्विश्वविद्यालय प्रतियोगिता में भाग लेने वाले खिलाड़ी के लिये)

विश्वविद्यालय का नाम ..... राज्य स्तर की सेवाओं/पदों पर नियुक्ति के लिए कुशल खिलाड़ियों के लिए प्रमाण-पत्र

प्रमाणित किया जाता है कि श्री/श्रीमती/कुमारी ..... आत्मज/पत्नी/आत्मजा श्री ..... निवास (पूरा नाम) ..... विश्वविद्यालय की कक्षा ..... के विद्यार्थी ने दिनांक ..... से दिनांक ..... तक ..... (स्थान का नाम) में आयोजित अन्तर्विश्वविद्यालय ..... (क्रीडा/खेल-कूद का नाम) प्रतियोगिता/दूर्नामिन्ट में विश्वविद्यालय की ओर से भाग लिया। उनके टीम के द्वारा उक्त प्रतियोगिता/दूर्नामिन्ट में ..... स्थान प्राप्त किया गया। यह प्रमाण-पत्र डीन ऑफ स्पोर्ट्स अथवा इंचार्ज खेल कूद ..... विश्वविद्यालय में उपलब्ध रिकार्ड के आधार पर दिया गया है।

स्थान ..... हस्ताक्षर .....  
दिनांक ..... नाम .....  
पद ..... संस्था का नाम .....  
मुहर .....

नोट : यह प्रमाण-पत्र विश्वविद्यालय के डीन ऑफ स्पोर्ट्स या इंचार्ज खेल-कूद द्वारा ब्यवहृत रूप से किये गये हस्ताक्षर होने पर ही मान्य होगा।

## प्रारूप - 4

(मान्यता प्राप्त क्रीडा/खेल में अपने स्कूल की ओर से राष्ट्रीय खेल-कूद में भाग लेने वाले खिलाड़ी के लिये)

डाइरेक्ट्रेट ऑफ पब्लिक इन्सट्रक्शन्स/निदेशक, शिक्षा, उत्तर प्रदेश ..... राज्य स्तर की सेवाओं/पदों पर नियुक्ति के लिए कुशल खिलाड़ियों के लिए प्रमाण-पत्र

प्रमाणित किया जाता है कि श्री/श्रीमती/कुमारी ..... आत्मज/पत्नी/आत्मजा श्री ..... निवास (पूरा नाम) ..... में ..... स्कूल में कक्षा ..... के विद्यार्थी ने दिनांक ..... से दिनांक ..... तक ..... (स्थान का नाम) में आयोजित स्कूलों के नेशनल गेम्स की ..... (क्रीडा/खेल-कूद का नाम) प्रतियोगिता/दूर्नामिन्ट में ..... स्कूल की ओर से भाग लिया। उनके टीम के द्वारा उक्त प्रतियोगिता/दूर्नामिन्ट में ..... स्थान प्राप्त किया गया।

यह प्रमाण-पत्र डाइरेक्ट्रेट ऑफ पब्लिक इन्सट्रक्शन्स/शिक्षा में उपलब्ध रिकार्ड के आधार पर दिया गया है।

स्थान ..... हस्ताक्षर .....  
दिनांक ..... नाम .....  
पद ..... संस्था का नाम .....  
मुहर .....

नोट : यह प्रमाण-पत्र निदेशक/या अतिरिक्त/संयुक्त या उपनिदेशक डाइरेक्ट्रेट ऑफ पब्लिक इन्सट्रक्शन्स/शिक्षा ..... द्वारा ब्यवहृत रूप से हस्ताक्षर होने पर मान्य होगा।

## Appendix - 4

## प्रारम्भिक परीक्षा हेतु परीक्षा योजना एवं पाठ्यक्रम

प्रारम्भिक परीक्षा में सामान्य अध्ययन/वैकल्पिक विषय का एक प्रश्नपत्र होगा जो वस्तुनिष्ठ व बहुविकल्पीय प्रकार का होगा। इसमें प्रश्नों की संख्या 120 (वैकल्पिक विषय के 80 प्रश्न तथा सामान्य अध्ययन के 40 प्रश्न) होगा जो कुल 300 अंकों का तथा समय 2 घण्टे का होगा।

## Syllabus

## General Studies

- 1-General Science (High School Standard)
- 2-History of India
- 3-Indian National Movement
- 4-Indian Polity, Economy & Culture
- 5-Indian Agriculture, Commerce & Trade
- 6-World Geography & Indian Geography & Natural resources of India
- 7-Current National and International Important events
- 8-Logic & Reasoning based on General Intelligence.
- 9-Specific knowledge regarding Education, Culture, Agriculture, Industry Trade, Living & Social Traditions of Uttar Pradesh.
- 10-Elementary Mathematics up to 8th level:- Arithmetic, Algebra and Geometry.
- 11-Ecology and Environment.

## वैकल्पिक विषय (Optional Subject)

वैकल्पिक विषयों का पाठ्यक्रम मुख्य परीक्षा की भौति होगा।

## Appendix - 5

## मुख्य (लिखित) परीक्षा हेतु परीक्षा योजना एवं पाठ्यक्रम

- 1- प्रथम प्रश्नपत्र - सामान्य हिन्दी एवं निबन्ध (परम्परागत) समय- 02 घण्टा पूर्णांक - 100 अंक
- 2- द्वितीय प्रश्नपत्र - वैकल्पिक विषय (परम्परागत) समय- 03 घण्टा पूर्णांक - 300 अंक

## Syllabus

## सामान्य हिन्दी

## निर्धारित अंक-50

1- अपठित गद्यांश का संक्षेपण, उससे सम्बन्धित प्रश्न, रेखांकित अंशों की व्याख्या एवं उसका उपयुक्त शीर्षक।

2- अनेकार्थी शब्द, विलोम शब्द, पर्यायवाची शब्द, तत्सम एवं तदन्व, क्षेत्रीय, विदेशी (शब्द भण्डार), वर्तनी, अर्थबोध, शब्द-रूप, सन्धि, समास, क्रियाएँ, हिन्दी वर्णमाला, विराम चिन्ह, शब्द रचना, वाक्य रचना, अर्थ, मुहावरे एवं लोकोक्तियाँ, उत्तर प्रदेश की मुख्य बोलियाँ तथा हिन्दी भाषा के प्रयोग में होने वाली अशुद्धियाँ।

## द्वितीय खण्ड

## हिन्दी निबन्ध

## निर्धारित अंक-50

इसके अन्तर्गत एक खण्ड होगा। इस खण्ड में से एक निबन्ध लिखना होगा। इस निबन्ध की अधिकतम विस्तार सीमा 1000 शब्द होगी। निबन्ध हेतु निम्नवत् क्षेत्र होंगे:-

- 1- साहित्य, संस्कृति
- 2- राष्ट्रीय विकास योजनाएँ/क्रियान्वयन
- 3- राष्ट्रीय-अन्तर्राष्ट्रीय, सामयिक सामाजिक समस्याएँ/निदान
- 4- विज्ञान तथा पर्यावरण
- 5- प्राकृतिक आपदाएँ एवं उनके निवारण
- 6- कृषि, उद्योग एवं व्यापार

## (2) Optional Subjects

## वैकल्पिक विषय

## (द्वितीय प्रश्नपत्र)

परीक्षा योजना- वैकल्पिक विषयों के (परम्परागत) प्रश्नपत्र की रचना हेतु प्रश्नपत्रों के स्वरूप एवं अंकों का विभाजन निम्नवत् है:-

1- प्रश्नों की कुल संख्या-20 होगी। सभी प्रश्न अनिवार्य होंगे। सभी प्रश्न खण्डों में विभाजित रहेंगे।  
खण्ड-अ- के अन्तर्गत प्रश्नपत्र में 05 प्रश्न सामान्य उत्तरीय (उत्तरों की शब्द सीमा 250) एवं प्रत्येक प्रश्न 25 अंक का होगा।

खण्ड-ब- के अन्तर्गत 05 प्रश्न लघुउत्तरीय (उत्तरों की शब्द सीमा 150) एवं प्रत्येक प्रश्न 15 अंक का होगा।

खण्ड-स- के अन्तर्गत में 10 प्रश्न अतिलघु उत्तरीय (उत्तरों की शब्द सीमा 50) एवं प्रत्येक प्रश्न 10 अंक का होगा।

## वैकल्पिक विषय का पाठ्यक्रम

## Physics

(I) MECHANICS:- Vector algebra: scalar and vector products, vector identities, background of vector calculus, concept of line, surface and volume integrals, physical meaning of gradient, divergence and curl, Gauss and Stoke's theorems.

Centre of mass, rotating frame of reference, Coriolis force, motion of rigid bodies, moment of inertia, theorem of parallel and perpendicular axes, movement of inertia of sphere, ring, cylinder and disc. Angular momentum, torque, central force, Kepler's Law, motion of satellite (including geostationary satellite), Galileo transformation, special theory of relativity, Michelson - Morley experiment, Lorentz transformation equations, variation of mass and length with velocity, time dilation, addition of velocities and mass-energy equivalence relation.

Stream line and turbulent motions, Reynold's number, Stoke's law, Poiseuille's formula, flow of liquid through narrow tube. Bernoulli's formula with applications, surface tension, Stress- strain relationship, Hooke's Law, moduli of elasticity and interrelation between them Poisson's ratio, elastic energy.

(II) THERMAL PHYSICS:- Concept of temperature and the zeroth law, first law of thermodynamics and internal energy, isothermal and adiabatic changes, second law of thermodynamics, Entropy, Carnot cycle and Carnot engine, absolute scale of temperature. Maxwell's thermodynamical relations. The Clausius- Clapeyron equation, porous plug experiment and Joule Thomson effect.

Kinetic theory of gases, Maxwell distribution law of velocities, calculation of mean velocity, root mean square velocity and the Most probable velocity, degrees of freedom, Law of equipartition of energy, specific heats of gases, mean free path, transport phenomena.

Black body radiation, Stefan's law, Newtons law of cooling Wien's law, Rayleigh Jeans law, Planck's law, solar constant.

Production of low temperatures by adiabatic demagnetization.

(III) WAVES AND OSCILLATIONS:- Oscillation, simple harmonic motion, stationary and progressive waves, damped harmonic-motion, forced oscillations and resonance, sharpness of resonance, wave equation, Plane and spherical waves superposition of waves. Fourier analysis of periodic waves- square and triangular waves, phase and group velocities, Beats.

(IV) OPTICS: Cardinal points of a coaxial system, simple problems on combination of thin lenses eyepiece- Ramsdon and Huygens eyepieces.

Huygen's principle, conditions for sustained interference Young double slit experiment division of amplitude and wavefront, Fresnel biprism, Newtons rings, Michelson-interferometer, diffraction by straight edge, single, double and multiple slits. Rayleigh's criterion, resolving power of optical instruments.

Polarization, production and detection of polarized light (linear circular and elliptical) Brewster's law, Huygen's theory of double refraction, optical rotation, polarimeters.

LESERS:- Temporal and spatial coherence, stimulated emission, basic ideas about laser emission, Ruby and He-Ne lasers.

(V) ELECTRICITY AND MAGNETISM:- Gauss law and its applications, electric potential, Kirchoff's laws and their applications, Wheatstone's bridge, Biot-Savart law, Ampere's circuital law, and their applications. Magnetic induction and field strength, magnetic field on the axis of circular coil, Electro magnetic induction, Faraday's and Lenz's law, self and mutual inductances, alternating current, L.C.R. circuits, series and parallel resonance Circuits, quality factor. Maxwell's equations of electromagnetic waves transverse nature of electromagnetic waves, Poynting vector, dia-, para-, ferro-, antiferro- and ferri-magnetism (qualitative approach only), hysteresis.

(VI) MODEREN PHYSICS: Bohr's theory of hydrogen atom, electron spin, Pauli's exclusion principle, optical and X-ray spectra, spatial quantization and Stern-Gerlach experiment, vector model of the atom, spectral terms, fine structure of spectral lines J-J and L-S coupling, Zeeman effect, Raman effect, photoelectric effect, Compton effect, de Broglie waves, wave-particle duality, Uncertainty principle, postulates of quantum mechanics, Schrodinger wave equation and its applications to (i) particle in a box (ii) motion across a step potential (iii) one dimensional harmonic oscillator, and eigen values, Einstein's and debye theory of specific heat of solids. Band theory of solids energy band, Kronig-Penny model in one dimension, energy gap, distinction between metals, semiconductors and insulators, variation of Fermi level with temperature and effective mass.

Radio activity, alfa, beta and gamma radiations, elementary theory of alpha decay, nuclear binding energy, Semi empirical mass formula, nuclear fission and fusion and nuclear reactors elementary particles, particle accelerator, cyclotron, linear accelerator, Elementary idea's of super conductivity. (VII) ELECTRONICS:- Intrinsic and extrinsic semiconductors, PN, junction, Zener diode, and their characteristics, unipolar and bipolar transistors solar cells, use of diode and transistor for rectification, amplification, oscillation, modulation and detection, waves. Logic gates and their truth tables, some applications.

## Chemistry

(A) Physical chemistry Gaseous-state: Molecular velocity of gases, mean free path and collision diameter, liquification of gases joule thomson effect in ideal and nonideal gases, Joule Thomson coefficient, inversion temperature, Deviation from ideal gas behavior

vander waals equation of state, Law of corresponding state, critical constants and their relations with-vander waals constants

**Liquid state:-** surface Tension, effect of temperature on surface tension, viscosity, effect of temperature and pressure on viscosity.

**Solid State:-** symmetry in crystal systems, Miller indices close packing, coordination number, structure of NaCl and CaF<sub>2</sub>, crystal-defects.

**Thermodynamics:-** first law of thermodynamics and its limitations, enthalpies of a system, heat of reaction formation, combustion and neutralization, Hess's law and its application bond energy and resonance energy, heat capacities at constant volume and constant pressure, relationship between. Cp and Cv extensive and intensive properties, statement of second law of thermodynamics Carnot cycle, concept of entropy, variation of entropy with temperature and volume/pressure, concept of free energy: Helmholtz and Gibbs free energies, Gibbs - Helmholtz equation, thermodynamic criteria of equilibrium, Clapeyron-clausius equation and its application, van't hoff equation and Gibbs-Duhem equation.

**Dilute solution:-** Ideal and non ideal solutions, Raoult's Law colligative properties (thermodynamic treatment) Lowering of vapour pressure, osmotic pressure, elevation of boiling point and depression of freezing point in solution, abnormal colligative properties molecular weight determination by colligative properties.

**Surfacephenomenon-** physical and chemical adsorption Freundlich adsorption isotherm Langmuir adsorption isotherm.

**Colloidal State** - Coagulation, Coagulation Value Gold-number, Hardy-Schulze rule, stability of colloids, zeta potential

**Chemical Kinetics-Molecular** and order of reaction, rate of reaction Zero first second and third order reactions and their determination effect of temperature on reaction velocity, energy of activation, catalysis, criteria of catalysis, enzymes catalysis, primary salt effect in ionic reactions.

**Chemical equilibrium-** Law of mass action and its application to homogeneous and heterogeneous equilibria, relationship between Kp and Kc. Le chatelier principle and its application to chemical equilibrium, degree of dissociation and abnormal; molecular Weight hydrolysis of salts, Bronsted & Lewis acid and base. pH, buffer solution, solubility and solubility Product of sparingly soluble salts:-

**Electrochemistry-** Electrolytic conductance-equivalent, specific and molecular conductances, variation of conductances with dilution of solutions, Kohlrausch's law of independent migration of ions, factors affecting the conductances, types of single electrode and their potentials, EMF of the cell, Nernst equation. EMF and equilibrium constant, concept of concentration cell With and without transference, liquid junction potential chemical cells without transference, fuel cells

#### B-Inorganic:

Atomic structure- dual nature of particle, Heisenberd's uncertainty principle, Schrodinger's wave equation atomic orbitals, quantum numbers, shapes of s,p,d orbitals, Aufbau principle and Pauli's exclusion principle, Hund's law, electronic configuration of elements, modern periodic table, periodic properties of the elements and their variation in periodic table, chemical bond- Ionic bond, lattice energy, Born- Haber cycle, salvation energy, Covalent bond (Fajan's rule) Bond order, energy level diagram, of homonuclear and heteronuclear molecules, Hybridisation and shapes of inorganic molecules and ions, valence shell electron pair repulsion theory and its application, stability of nucleus, mass defect and nuclear binding energy, radioactivity, nuclear reactions-fusion and fission, carbon dating.

**S-block elements-**chemistry of lithium and berilium, abnormal behavior and diagonal relationship.

**P-block elements-** chemical reactivity of elements in group, inert pair effect, structure of their hydrides and halides, oxyacids of N, P, S and halogens, interhalogens

**d-block elements:** General characteristics- variable oxidation state, complex formation, magnetic properties, colour and catalytic properties,

coordination compounds-nomenclature, stereo chemistry of metal, complex and isomerisation, effective atomic number and valence bond theory, crystal field theory, crystal field splitting in tetrahedral and Octahedral complexes, crystal field stabilization energy substitution reaction in square planar complexes, electronic spectrum, molecular orbital energy level diagram in tetrahedral and octahedral complexes (bond only) Orgel energy level diagram for d-1 and d\_9 states

**Organometallic chemistry-** Definition, nomenclature and classification of organometallic compounds

**Bioinorganic chemistry-** Structure and function of myoglobin Hemoglobin, chlorophyll and cyano cobalamine-

**f-block elements:** Electronic structure, lanthanide contraction and its consequences, magnetic and spectral properties and their differences from transition metals ion exchange and solvent extraction methods of separation of lanthanides chemistry of actinides.

#### A- ORGANIC CHEMISTRY:-

**1- ORGANIC CHEMISTRY-** Some Basic Principles Techniques:-

(a) Classification of organic compounds

(b) IUPAC Nomenclature of organic compounds

(c) Types of organic reaction

(d) Mechanism of organic reaction- Homolytic & Hetrolytic fission of covalent Bond, carbocations, carbanions carbenes, free Radicals, Electrophile & Nucleophile Sn 1 & Sn 2 reaction

(e) Electronic Displacements in covalent Bond- Inductive effect, electromeric effect Resonance, Hyperconjugation

(f) purification of organic Compounds:- fractional Distillation, chromatography

(g) estimation of elements in organic compounds

#### 2- Isomerism:-

structural & stereo Isomerism, (Geometrical & optical Isomerism) Tautomerism conformation

#### 3- Hydrocarbon:-

**a-** General methods of preparation, physical & chemical properties of Alkane, Alkene & Alkynes, Location of double bonds by ozonolysis of Alkene.

#### b-Aromatic Hydrocarbon:-

**Benzene-** It's structure, resonance Aromaticity preparation & physical and chemical properties of Benzene

Mechanism of electrophilic substitution- nitration, sulphonation, Halogenation, Friedel craft's Alkylation & Acylation. Directive Influence of groups in mono substituted benzene. Carcinogenicity & (Toxicity chemistry of toluene)

#### c- Derivatives of Benzene:-

Preparation, Physical & chemical properties of Phenol, Aniline, Anisole Benzaldehyde & Benzoic Acid

#### 4- Haloalkanes:-

General Methods of preparation, physical and chemical properties preparation and properties of chloroform and Iodoform, Freon

**5- Alcohols:-** classification, General methods of preparation, Physical & chemical properties, mechanism, of dehydration of Alcohol, Denatured spirit, power alcohol, Absolute Alcohol fermentation of Alcohol Properties of Glycerol.

#### 6. Aldehyde & Ketones:-

General Methods of preparation, Physical & chemical properties, mechanism of Nucleophilic addition. **7- Ether:-** General methods of preparation of ether, physical & chemical Properties of Ether & uses

#### 8- Carboxylic acid and their Derivatives:-

General Methods of preparation physical and properties, Influence of substituents group on acidic nature of carboxylic acid, General methods of preparation & properties of acid, Halide, ester, Amide, & Anhydride

#### 9- Organic compounds containing nitrogen:-

**a- Amines:-** classification, general methods of preparation & properties, basic character of Amines, Distinction between primary secondary and tertiary amines

**b- Nitro Compounds:-**

General methods of preparation & properties of nitro compounds

**c- Cyanides & Isocyanides:-**

General methods of preparation & properties of cyanides & isocyanides

#### 10. Bio-molecules:-

**a- Carbohydrates:-** classification, Molisch's test of carbohydrate, Glucose & fructose: Preparation & properties, open & Ring structure of glucose mutarotation, Anomers.

**b- Proteins:** Alpha Amino acids, peptide bond, polypeptide, protein, structure of protein- Primary, secondary & tertiary structure, denaturation of proteins, Zwitter ion, Iso electric points;

**c- Lipids & hormones;**

oil & fats introduction, difference between oil & fats properties.

steroids- Natural & Artificial steroid Hormones- classification & physiological function

**d- Vitamins-** classification & functions deficiency diseases of vitamins

**e- Nucleic acids-**

Nucleotides & nucleosides, Difference between DNA and RNA primary structure of DNA DNA finger printing

**11- Polymers:-** classification natural & synthetic polymers, methods of polymerisation (addition & condensation) addition polymers-polythene, Teflon, PVC buna-s, Buna-N condensation polymer-Nylon 6, Nylon 6,6, bakelite, methyl melamine, Biodegradable & non biodegradable polymers

#### 12- Chemistry in everyday life:-

**a- chemicals in medicine:-** Analgesic, tranquilizers, Antiseptics, Disinfectant, antimicrobials, antibiotics, antacids, antihistamins. antioxidants

**b- chemicals in foods:** food preservative, artificial sweetening agent,

**c- cleansing agents-** difference between soaps & detergents cleansing action of Soaps.

#### Biology

#### BOTANY

**Section:- (A)-**

#### (1) Plant Diversity-

(a) Classification (Taxonomy) of plants.

(b) Study of habits and habitats, Structure and reproduction of the followings-

(i) Algae

(ii) Bryophyta

(iii) Pteridophyta

(iv) Gymnosperms

(v) Angiosperm with the following families- Cruciferae, Compositae, Malvaceae, Liliaceae and Solanaceae.

(2) Angiosperms- Morphology and Morphological Modifications in roots, stem, leaves etc. Histology, growth, reproduction and development.

#### (3) Plant Physiology-

(i) Water Relations- Transpiration, Translocation.

(ii) Photosynthesis.

(iii) Respiration and metabolism.

(iv) Plant Nutrition (Nutrients, Nitrogen fixation).

(v) Plant growth regulators (Phytohormones).

(vi) Flowering and Stress Physiology

(vii) Plant growth and movements.

(4) Microbiology- (i) Viruses, Phytoplasm, Archaeobacteria, Eubacteria.

(ii) Fungi (general characteristics, classification growth and reproduction, life cycle).

(iii) Economic importance of Micro-organisms.

#### (5) Economic Botany-

(i) Medicinal and Aromatic Plants.

(ii) Food Plants.

(iii) Forage and Fodder Plants.

(iv) Fibre Crops.

(v) Fruit and Vegetable Plants.

(vi) Ethnobotany.

continued

- (vii) Ornamental Plants.  
 (viii) Oil Yielding Plants.  
 (ix) Timber Plants.  
 (x) Miscellaneous uses of Plants.

**(6) Plant Pathology**

- (i) Causes, effects, control and cure of various Plant diseases.  
 (ii) Biological Control of Various Plant weeds, diseases and parasites.

**(7) Ecology and Environment-**

- (i) Concept of Ecology and Environment  
 (ii) Various Habitats & Ecological Niches.  
 (iii) Ecosystem- Structure and function, Ecosystems stability, carrying capacity, Food-chain, Food -web, Energy flow, Ecological Pyramids, Biomes.  
 (iv) Population, biotic community.  
 (v) Bio-geo-Chemical Cycles.  
 (vi) Ecological Succession.  
 (vii) Natural Resources and their conservation.  
 (viii) Biodiversity and its conservation (In-situ and Ex-situ).  
 (ix) Environmental Pollution- Causes and its ill effects. Air, Water and Soil Pollution. Radioactive pollution, Noise Pollution, Ozone depletion, Acid rain, Eutrophication, Biological magnification, Ocean pollution, Ocean acidification, Control and prevention of various environmental Pollutions. Climate change, global warming and green- house effect, Environmental management. Renewable energy sources, food Security, for rising human population.

**Section - B****Zoology****(1) Animal Diversity-**

- (i) Animal Taxonomy with characteristic features.

**(2) Non-Chordates-**

- (i) Classification of Non-chordate phyla.  
 (ii) Morphology, Anatomy, Nutrition, Respiration and reproduction of the following Non-chordates- Amoeba, Sycon Hydra, Ascaris, Cockroach, Pila and Star-fish.  
 (iii) Parasitic protozoa  
 (iv) Parasitic adaptation in Helminths.  
 (v) Economic importance of insects.

**(3) Chordates-**

- (i) Classification of chordates and various-classes of chordates with characteristic features and examples.  
 (ii) Aquatic adaptation in fishes.  
 (iii) Origin and evolution of terrestrial chordates.  
 (iv) Flying adaptations in birds.  
 (v) Phylogeny of prototheria, Metatheria and eutheria.

**(4) Anatomy of — Frog, Pigeon and Rabbit.****(5) Animal Histology - Study of various tissues.****(6) Animal Physiology and Biochemistry-**

- (i) Nutrition and Digestion.  
 (ii) Respiration and metabolism.  
 (iii) Circulation-blood Heart. & Circulatory system.  
 (iv) Osmo regulation and Excretion.  
 (v) Movement and locomotion.  
 (vi) Nervous co-ordination and integration. Sense Organs.  
 (vii) Chemical co-ordination (Hormones and pheromones).  
 (viii) Immune system.

**(7) Animal Embryology-**

- (i) Gametogenesis  
 (ii) Fertilization in lower and higher animals.  
 (iii) Types of Eggs and cleavage.  
 (iv) Organogenesis.  
 (v) Development of Frog and Metamorphosis.  
 (vi) Foetal membranes in Birds.  
 (vii) Placenta in mammals. Regeneration.  
 (viii) Human reproduction and reproductive physiology.

**(8) Cell Biology (Cytology and Molecular Biology)**

- (i) Prokaryotic and eukaryotic cells- their structure and properties.  
 (ii) Cell division (mitosis and meiosis).  
 (iii) Structure and functions of various cell organelles.  
 (iv) Chromosome structure and their behavior during cell division.  
 (v) Nucleic acids-Molecular structure of DNA and RNA.  
 DNA as genetic material  
 DNA replication and repair.  
 (vi) Genetic: code central dogma, protein synthesis and Gene expression.

**(9) Genetics-**

- (i) Mendel's laws of inheritance.  
 (ii) Co-dominance- and incomplete dominance and interaction of Genes.  
 (iii) Chromosomal theory of inheritance.  
 (iv) Linkage and crossing over.  
 (v) Sex-determination.  
 (vi) Multiple gene inheritance and polypody.  
 (vii) Human genetic disorders.  
 (viii) Mutation.

**(10) Biotechnology-**

- (i) Concepts, principles and scope of Biotechnology.  
 (ii) Tools and techniques in Biotechnology.  
 (iii) Recombinant DNA technology and its applications in human welfare.

- (iv) Tissue culture, somatic hybridization.

- (v) Genetically modified Organisms, GM. crops (Risk and concerns), Gene Bank and ethical concerns.

**(11) Organic Evolution-**

- (i) concept and principles of evolution.  
 (ii) Origin of life.  
 (iii) Theories of evolution (Lamarck, Darwin).  
 (iv) Evidences for evolution.  
 (v) Neo-Darwinism and synthetic theory of evolution.  
 (vi) Variations.  
 (vii) Human evolution.

**Mathematics**

**1. Relation and functions:** Types of relations: reflexive, Symmetric, transitive and equivalence relations. Equivalence class. One-one and onto functions, composite of functions, inverse of function, Binary operation.

**2. Algebra:**

(i) **Matrices:** Types of matrices, zero matrix, transpose of a matrix symmetric and skew symmetric Matrices. Addition, multiplication & scalar multiplication of matrices. Singular and non-singular matrices. Invariable matrices.

(ii) **Determinants:** Determinants of a square matrix (up to 3x3 matrix) Properties of determinants, Adjoin and inverse of a square matrix. Consistency and number of solutions of system of linear equations by examples. Solving system of linear equations in two or three variables (having unique solutions).

(iii) Theory of equations of degree greater than or equal to two. Arithmatical, Geometrical and Homomonal progressions. Permutations and combinations, Binomial theorem. Sum of exponential and logarithmic series.

(iv) **Probability:** Multiplication theorem on probability, Conditional probability, Independent events. Total probability. Bayes's theorem distribution.

**3. Calculus .**

(i) **Limit of a function:** Continuity & differentiability, derivative of composite functions, and differentiation of different types of functions. Chain rule, Roles theorem and lagrange mean value theorem, Maclaurins & Taylor's series. L. Hospitals rule, partial differentiation, successive differentiation, Leibnitz theorem, equation of tangent & normal to a given curve, Maxima, minima, increasing and decreasing functions.

(ii) **Integration:** Various methods of intergration definite integration as a limit of sum, Basic properties of definite integrals & evaluation of definite integrals. Application in finding the area under simple curves of spheres, cones & cylinders.

(iii) **Differential equations:** Order and degree of a differential equations. Formation of differential equations whose general solution is given. Solution of differential equations of 1st order & 1st degree. Linear differential equations with constant coefficients Homogeneous differential equations.

**4. Co-ordinate geometry of two dimensions:**

Equation of the pair of straight lines in homogeneous and non homogeneous form. Conditions when a non homogeneous equation of 2nd degree represent circle, parabola ellipse and hyperbola. equation of tangents & normals to the above conics. Common tangents to the two conics, Pair of tangents. Chord of contacts, polarlines to the above conics.

**5. Vectors and three dimensional geometry:**

(i) **Vectors:** Vector & scalars. Unit vectors, Direction cosines/ratios of a vector. Multiplication of a Vector by scalar, dot product, cross product of vector and their in physics (work done and moments, angular velocity, projection of a vector on a line. Angle between two vector.)

(ii) **Three dimension Geometry:** Direction cosine/ratios of line joining two points, Cartesian and vector equation of a line. Coplanar and skew lines, shortest distance between two lines, cartesian and vector equation of a plane. Angle between (a) two lines (b) two planes (c) A line and a plane Distance of a point from a plane. Intersection of two line, Intersection of a line of plane & intersection of two plane. Equation of a plane passing through the intersection of two planes.

(iii) **Equation of a sphere, cones cylinders.**

**6. Group:** Examples- especially the group of nth roots of unity, group of residue class modulo n and modulo p where p is a prime. Subgroups, Homomorphism and isomorphisms properties of Homomorphism. Subgroups generated by a subset. Order of element in a group, Cyclic group, Symmetric group - Sn. Lagrange theorem, Fermat's theorem with application point of view. Normal subgroups, Fundamental theorem of Homomorphism, Endomorphism, automorphism, First isomorphism theorem and second isomorphism theorem.

Ring and field with simple examples as  $-(\mathbb{Z}_n, +, \cdot)$  &  $(\mathbb{Z}_p, +)$

**Linear Algebra:** vector space with examples, subspace, linear dependence and independence, Basis and dimension of a vector space, Quotient space, Sum and direct sum of spaces. Linear transformation, Kernel and image, of a-linear transformation, Rank and nullity of linear transformations. Rank nullity theorem. Composite of linear transformations and its rank & nullity. Singular and non singular linear transformation, Transpose, of a linear transformations, Matrix of a linear transformation. **Vector differentiation:** Gradient, divergence, curl, first order vector identities. Directional derivatives (with application point of view).

**Vector integration:** Line integral; surface integral, volume integral, Green's theorem, Gauss-divergence theorem, stokes's theorem, (From application point of view).

**Riemann integration:** Integration of discontinuous functions, Lower and upper integrals of a bounded functions, Integration of a step function and signum function.

**Statics:** Equilibrium of a body under the action Of-three forces, coplanar forces, Equilibrium of a body Under the Action of a system of coplanar forces, Centre of gravity catenary Friction.

**Dynamics:** Motion of a projectile in vertical plane under gravity, Work power and energy Direct impact of smooth bodies, Radial and transverse Velocity and acceleration. Tangential and normal acceleration.

**Trigonometry:** Trigonometric equations, Properties of triangles Inverse circular functions, Height and distance, Complex numbers, D-moivres theorem & its application, nth roots of unity.