

- Mechanics- vectors, gravitations- field and potential, conservation of energy, conservation of linear and angular momentum, electrostatics, magnetism, magnetic properties of materials, electromagnetic induction, maxwell's equations and electromagnetic wave propagation.
- Optics- interference, diffraction, polarizations, associated optical instruments.
- Nuclear physics- basics of atomic and nuclear physics, radiation detection and monitoring devices- radiation quantities and units, radiation detection, elementary particles.
- Quantum mechanics- wave particle duality, origin of quantum theory, formalism of quantum mechanics, schrodinger equation- the first law of quantum mechanics.
- Solid state physics- crystal structure, elementary, lattice dynamics, magnetic properties of metter, dielectric properties of materials, elementary band theory.
- Thermal physics and statistical- thermodynamic description of system, thermodynamics potentials, kinetic theory of gases, theory of radiation, statistical mechanics.
- Basic electronics- network theorems , power supplies, solid state deveces, amplifiers, oscillators, Boolean algebra, logic gates, basics of special theory of relativity, consequences of Lorentz transformations, dynamics of rigid body and idea of moment of inertia, fluids, elasticity.
- Waves, acoustics and oseeillations- simple hammonic oseeillations, damped harmonic oseeillations, forced harmonic oseeillations, applications, analysis of wave motions, ultrasonic, acoustics, application.
- Elements of modern physics.

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विषय- रसायन विज्ञान (स्नातक स्तर)

Unit- A

- Atomic Structure.
- Periodic Properties.
- Chemical Bonding- Ionic bonding, covalent bonding.
- s-Block elements.
- p-Block elements.
- Chemistry of noble gases.
- Metallurgical processes.
- Chemistry of Transition elements (first, second and third series).
- Oxidation and reduction.
- Coordination Chemistry.
- Chemistry of lanthanides and actinides.
- Acids and bases.
- Non aqueous solven's.
- Magnetic Properties of transition metal complexes.
- Electronic spectra of transition metal complexes.
- Organometallic chemistry.

Unit- B

- Structure and bonding.
- Mechanism of organic reactions.
- Stereochemistry of organic compounds.
- Alkanes and cycloalkanes.
- Alkenes, cycloalkenes, dienes and alkynes.
- Arenes and aromaticity.
- Alkyl and aryl halides.
- Alcohols.
- Phenols.
- Ethers and epoxides.
- Aldehydes and ketones.
- Carboxylic acids and their derivatives.
- Organic synthesis via enolates.
- Carbohydrates, nitrogen containing organic compounds.

- Amino acids, peptides, proteins and nucleic acids.
- Heterocyclic compounds.
- Organo-metallic compounds in organic synthesis.
- Spectroscopy of organic compounds, introduction.
- Electromagnetic spectrum; absorption spectroscopy.
- Infra red (IR) absorption spectroscopy.
- Nuclear magnetic resonance (NMR) spectroscopy.
- Vibrational spectrum.
- Rotational spectrum.

Unit- C

- Gaseous states
- Liquid state
- Solid state
- Colloidal state
- Chemical equilibrium
- Ionic equilibria
- Phase equilibrium
- Chemical kinetics and catalysis
- Thermodynamics I
- Thermodynamics II
- Thermodynamics III
- Electrochemistry I
- Electrochemistry II
- Surface chemistry
- Elementary quantum mechanics
- Photo chemistry
- Solutions and colligative properties

Unit- D

- Green chemistry
- Bioinorganic chemistry
- Fats, oils and detergents
- Polymers
- Synthetic dyes
- Chromatography
- Pharmaceutical compounds.

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Examination syllabus of Competitive Papers (Graduate level)

Zoology

Animal Diversity

Part 1 (Non chordata)

Salient Features and outline classification upto classes of Non-Chordates - phyla, Locomotory organelles and Locomotions in Protozoa, Morphology, life cycle and control measures of *Trypanosoma* and *Plasmodium*, Canal system in Sponges, Polymorphism in Coelentrates, Life cycle of *Taenia* and *Ascaris*, parasitic adaptations in Helminthes. Metamerism in Annelids and it's significance, Zoological importances and distribution of *Peripatus*, Torsion in Gastropods, water vascular system in Echinoderms.

Part 2 (chordata)

General characters and outline classification of Chordates upto classes, salient features of body organization and systematic position of *Balanoglossus* and *Amphioxus*, External features of *Petromyzon*, scales and fins of fishes, parental care in fishes, parental care in Amphibians, Neoteny, General characters of *Gymnophiona*, poisonous and non-poisonous snakes, venom and anti-venum, biting mechanism in snakes, Flightless birds and their distribution, flight adaptations in birds, distribution and affinities of prototheria, adaptive radiations with particular reference to aquatic mammals.

Examination Syllabus of Competitive Papers(Graduate Level)

Embryology, Animal behaviour, Applied Zoology, Toxicology.

Part :1- Embryology, Animal Behaviour

Gametogenesis, Mechanism of Fertilization, Types of eggs, cleavage patterns, blastulation and gastrulation (frog and chick), foetal membranes (chick), retrogressive metamorphosis in Ascidians, Types of regeneration, embryonic induction(origin structure and significance of primary organizer).

Patterns of behaviour – Stereotyped, innate behaviour (taxis and reflexes), fixed action patterns, sign or key stimulus or releasers and innate releasing mechanism, migration in birds with particular reference to the mechanism of navigation, introduction to socio-biology (Social structure of primates).

Part : 2- Applied Zoology, Toxicology

Elementary Knowledge of aquaculture, sericulture, apiculture, Lac-culture, pearl culture.

Introduction and brief history of Toxicology, general principles of Toxicology, brief history of environmental toxicology,(kind and source of toxic agents - animal toxins, plant toxins, pesticides, metals, food additives), dose responses, relationships, frequency and cumulative responses, determination TL_m values, LC_{50} , margin of safety, Threshold limits.

Examination Syllabus of Competitive Papers(Graduate Level)

Ecology, Environmental biology , Microbiology, and Biostatistics

Part: 1 – Ecology and Environmental Biology

Definition of ecology and its relationship.

The environment: A biotic, biotic factors, edaphic factors.

Concept of Ecosystem, Energy flow in ecosystem, Trophic Level.

Productivity: Primary and Secondary, Food chain, Grazing and detritus, food web.

Biosphere:- Hydrosphere, Lithosphere and Atmosphere.

Biogeochemical cycles, Carbon and Nitrogen Cycles.

Population: Definition, Biotic Potential, Density, Natality, Mortality, Growth curves.

Concept of Biodiversity, Conservation and management of Biodiversity. Concept of protected areas, Ex-situ and In-situ conservation, India's wild life habitats distributions, conservation status and efforts.

Principles of Zoo-geographical relams of the world characteristics fauna of oriental region, barriers and means of dispersal, pollution and biomagnifications.

Part : 2- Microbiology and Biostatistics

Media preparation, Sterilization, General structure and multiplication of viruses, general characters of bacteriophages.

Biostatistics as a tool in research, data collection, random and non- random sampling, data tabulation, data presentation(graph, histogram and scattered diagrams), calculation of mean, mode and median, standard error.

Examination Syllabus of Competitive Papers(Graduate Level)

Taxonomy, Evolution, Biotechnology and Bioinformatics

Part :1(Taxonomy and Evolution)

Taxonomy and systematics, rules of nomenclature, binomial and trinomial, ICZN, components of classification, Linnaeus hierarchy, species concept, species as category, a brief concept and evidences of evolution , Lamarkism, Darwinism and modern synthetic theory, evolution of man , geological time scale, types of fossils,

Part 2: Biotechnology and Bioinformatics

Definition and scope of biotechnology ,biotechnological innovations in the areas of medical, agriculture, industrial and forensic sciences, brief knowledge of PCR and its significance, elementary knowledge of computer: input and output devices, elementary ideas of software and hardware, use of computer in biological sciences

Examination Syllabus of Competitive Papers(Graduate Level)

Biological Chemistry and Physiology

Part 1: Biological Chemistry

Introduction to biological molecules, proteins, amino acids, carbohydrates, lipids, vitamins and enzymes-their structure, metabolism of carbohydrates

Part 2: Physiology

Food constituents, intracellular and extra cellular digestion, digestion and absorption of carbohydrates, fats and proteins, types of respiration, respiratory pigments, gaseous transports and control of respiration, excretion of nitrogenous wastes, urine formation in mammals, composition of blood and function of blood corpuscles, haemopoiesis and blood coagulation, blood groups, types of heart, physiology of heart beat, types of neurons, resting and action potential of nerves, synapse and chemical transmission of nerve impulse, muscle contraction and its mechanism, general characteristics of endocrine system, mechanism of hormone action, brief knowledge of structure and hormonal function of the glands-thyroids, pituitary, pancreas, adrenal, testis, ovary and parathyroid.

Examination Syllabus of Competitive Papers(Graduate Level)

Cell Biology and Genetics

Part 1: Cell biology

Prokaryote and Eukaryote cell, models and functions of plasma membrane, structures and functions of cell organelles-mitochondria, Lysosomes, ribosomes, chloroplasts, centrioles, golgi complex, Endoplasmic reticulum, nucleus and nucleolus, basic features of cell cycle- mitosis and meiosis, polytene, and lamp brush chromosomes, nucleic acids (DNA and RNA), nucleosides and nucleotides, genetic and non-genetic RNA, expression of gene-Protein synthesis

Part 2: Genetics

Mendelian laws, symbols and terminology, linkage- kinds and chromosomal theory, coupling and repulsion hypothesis, crossing over –somatic and germinal, sex determination-chromosome mechanism, genic balance theory, sex linked gene(colour blindness and haemophilia in man), sex linkage in *Drosophila*, cytoplasmic inheritance-kappa particles in *Paramecium*, inheritance of plastids, eugenics, mutations-chromosomal and gene mutation and their interpretation.

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BOTANY (GRADUATE LEVEL)

UNIT I- MICROBIOLOGY, FUNGI, LICHENS AND ELEMENTARY PLANT PATHOLOGY

1. Viruses – Structure, transmission, multiplication, bacteriophages and economic importance.
2. Bacteria – Structure, reproduction and economic importance.
3. Salient features of fungi, Broad classification of Fungi (Alexopoulos) upto class level, nutrition of Fungi, Reproduction in Fungi - asexual reproduction, sexual reproduction, heterothallism, heterokaryosis and parasexual cycle, Economic importance of fungi, Life history of *Mucor*, *Penicillium*, *Puccinia*, *Agaricus*, *Alternaria*.
4. Lichens – Characteristics, general structure, symbiotic relationship, reproduction and economic importance.
5. Pathology of fungal plant diseases- A brief idea about disease symptoms, establishment of diseases, categories of plant diseases on the basis of their occurrence.
6. Control of plant diseases - brief idea about exclusion, eradication, protection by fungicides and by developing resistance.

UNIT II- ALGAE, BRYOPHYTA & PTERIDOPHYTA

1. Algae - Introduction and salient features, Classification of algae upto class level, range of vegetative structure, cell structure of prokaryotic and eukaryotic Algae, Reproduction, types of life cycles (haplontic, diplontic, diplohaplontic, haplobiontic and diplobiontic) and alternation of generations in algae, ecology of algae, Life cycle of *Nostoc*, *Chlamydomonas*, *Oedogonium*, *Vaucheria*, *Ectocarpus*, *Polysiphonia*, Diatoms, Economic importance of algae.
2. Bryophyta - Salient features of Bryophytes, Habitats, distribution and economic importance of Bryophyta, Classification of Bryophytes, A brief account of alternation of generations, Life history of *Marchantia*, *Anthoceros* and *Funaria*.
3. Pteridophyta - Salient features of Pteridophytes, habitat, distribution, classification, and economic importance of pteridophytes, alternation of generations in pteridophytes, Telome theory, steler system, apogamy, agamospory, apospory, heterospory and seed habit, life history of *Rhynia*, *Selaginella*, *Equisetum*, *Pteris*.

UNIT III- GYMNOSPERMS & TAXONOMY OF ANGIOSPERMS

1. General characteristics, classification (upto family level) of Gymnosperms, Ecological and economic importance of Gymnosperms, morphology, anatomy and reproduction of *Cycas* and *Pinus*. Types of fossils and their types, process of fossilization, living fossils.
2. A general account of the origin and evolution of angiosperms. Basic principles and broad outline of the classification proposed by Bentham & Hooker and Hutchinson.
3. International code of Botanical nomenclature, Botanical gardens and herbaria, Botanical survey of India.
4. Distinguishing features of the families - Ranunculaceae, Caryophyllaceae, Malvaceae, Rutaceae, Fabaceae, Rosaceae, Cucurbitaceae, Apiaceae, Rubiaceae, Solanaceae, Acanthaceae, Lamiaceae, Apocynaceae, Euphorbiaceae, Polygonaceae, Orchidaceae, Liliaceae, Poaceae.

UNIT IV- ANATOMY, EMBRYOLOGY AND MORPHOGENESIS

1. Meristems-Primary and secondary meristems, characteristics and functions, permanent tissues.
 2. A brief account of root, shoot and leaf anatomy, Root-stem transition.
 3. Secondary growth, secondary xylem, secondary phloem-structure-function, growth rings, sapwood, heartwood, periderm and anomalous secondary growth in Dicot, Monocot stem and roots.
 4. Structure of anther, microsporogenesis and development of male gametophyte.
 5. Structure of ovule, megasporogenesis and development of female gametophyte.
 6. Pollination, fertilization and life history of typical angiosperm, Endosperm and development of embryo, polyembryony, apomixis.
 7. General concept of morphogenesis, seed germination and dormancy, elementary plant movements.
 8. Plant growth regulators - Auxins, Gibberellins, Cytokinins and Abscissic acid.
 9. Physiology of flowering - photoperiodism and vernalization.
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UNIT V- ECOLOGY AND BIOSTATISTICS

1. Definition and scope of ecology.
2. Population- characters, growth curves, ecotypes and ecads.
3. Community- characteristics, life-forms and biological spectrum, ecological succession.
4. Ecosystems – Types, abiotic and biotic components, energy flow, food chain, food web and ecological pyramids.
5. Biogeochemical cycles- brief discussion of concept by giving examples of carbon, nitrogen and phosphorus cycles.
6. Biogeographical regions of India. Vegetation types of India.
7. Environmental pollution-air, water, soil, noise and radio-active pollution.
8. Definition, scope and importance of statistics, representation of statistical data.
9. Measures of central tendency - mean, median and mode.
10. Measures of dispersion- range, standard deviation, standard error.
11. Coefficient of correlation.
12. Chi-square (X^2) test.

UNIT VI- CYTOLOGY, GENETICS, MOLECULAR BIOLOGY & BIOTECHNOLOGY

1. Cell structure and division: cytoplasmic organelles, nucleus, chromosomes.
2. Cell division - mitosis, meiosis, comparison of mitosis and meiosis.
3. Laws of inheritance: Mendel's experiments, principles of segregation, independent assortment, incomplete dominance, sex linked inheritance, sex determination.
4. Linkage and crossing over: complete and incomplete linkage, linkage group and crossing over, Mutations.
5. DNA structure and replication. RNA structure and types.
6. Genetic code and protein synthesis, Classical and modern concept of genes.
7. Introduction to Biotechnology (role in modern life), and Recombinant DNA technology- tools and techniques, cloning vectors, plasmids.
8. Basic concept of plant tissue culture techniques, collection and storage of germplasm (cryopreservation).
9. Industrial biotechnology - Fermentation and alcohol production.
10. Agriculture Biotechnology- Biofertilizers and biopesticides.

11. Nutritional Biotechnology - Mycotoxins and health hazards, control of mycotoxin production, single cell protein.
12. Elementary idea of Gene Bank, Nif and Nod Genes, c-DNA, Totipotency, Antibiotics, Mycoprotein.

UNIT VII- PHYSIOLOGY AND BIOCHEMISTRY

1. Diffusion, osmosis, plasmolysis and Inhibition. Absorption of Water, active and passive absorption.
2. Transpiration- Factors affecting the rate of transpiration, significance of transpiration, mechanism of stomatal opening and closing.
3. Mineral Nutrition. Macro and Micronutrients. mineral deficiency symptoms. absorption of minerals.
4. Translocation of solutes and factors affecting translocation, mechanism of phloem transport.
5. Respiration, glycolysis, Krebs's cycle, electron transport system, redox potential, pentose phosphate pathway, ATP- biological energy currency, aerobic and anaerobic respiration., Oxidative phosphorylation, factors affecting the rate of respiration, Krebs cycle.
6. Photosynthesis - Historical background, concepts of two photosystems, Z-scheme, structure of chloroplast, pigments, photophosphorylation, Calvin cycle, factors affecting the rate of photosynthesis, CAM Plants.
7. Enzymes - Properties, classification, mechanism of enzyme action and factors affecting enzyme activities.
8. Carbohydrates – classification, properties, structure and biological role.
9. Amino acids and Proteins- classification and structure
10. Structure and function of lipids, fatty acids biosynthesis, storage and mobilization of fatty acids, β - oxidation.

UNIT VIII- ECONOMIC BOTANY AND PLANT BREEDING

1. Cereals and millets- wheat, rice and maize.
2. Food plants- potato, sugarcane; Fruits - mango, apple, banana, citrus and litchi.
3. Fibres - cotton, hemp and coir.
4. Vegetables: root vegetables. stem vegetables. leaf and fruit vegetables.
5. Timbers: Teak, shisham, sal, chir and deodar.

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6. Medicinal Plants: *Aconitum*, *Atropa*, *Cinchona*, *Rauwolfia* and *Ephedra*.
7. Oils: Linseed oil, mustard oil and groundnut oil.
8. Plant breeding: aims and objectives, basic techniques of Plant breeding.
9. Crop improvement methods - Selection, Plant introduction and acclimatization, hybridization and mutational breeding.

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UK SSSC
SYLLABUS OF FORENSIC SCIENCE
(DEGREE LEVEL)

UNIT-I

General Forensic Science- Basic concepts, History, Principles and different branches of forensic science. Contribution of different forensic Scientific disciplines in criminal justice system. Structure and functions of State and Central forensic science laboratories.

UNIT-II

Crime Scene Investigation and Physical Evidence- Definition, types, Protection, Searching, Documentation, collection, preservation, packaging transportation of exhibits to forensic science laboratories and chain of custody.

Physical Evidence:- Definition, types, Class and individual characteristics of Evidences. Glass, Paint, Soil, Foot Prints, tyre Marks, Skid Marks, Tool Marks

UNIT-III

Finger Prints:-Types, Patterns, Ridge Characteristics, Classification of Finger prints. Development of latent finger prints by various methods.

Questioned Documents:- Preliminary Examination, Handling, Preservation, types of documents Examinations Hand Writing Characteristics, Basic tool for documents Examination

Introduction of fire-arms, Ammunition and Explosive and their forensic Examination.

UNIT-IV

Biological Evidences:-Nature, types and scopes, Human body fluids (Blood, Semen, Saliva, Sweat, Urine, Vaginal fluid etc), Forensic entomology and its scope in time since death estimations. Hair as a physical evidence, wildlife and microbial forensic science.

UNIT-V

Forensic Anthropology, Osteology and Odontology- Scope and objectives, biological profiling of unknown skeletal and dental remains, bite-marks and their acceptability by courts of law. Role of forensic anthropologists in mass disasters; thanatological changes in the cadavers and forensic taphonomy.

Molecular Forensic Science:- DNA profiling as a gold standard of establishing identities; its universality and applicability as an infallible evidence; current challenges and future possibilities. Genetic markers of human blood.

UNIT-VI

Forensic Toxicology- Aims and Scope Classification of poisons and narcotics Drugs, Types of poisonings; Toxicological Exhibits in fatal and survival cases. Extraction, Isolation and forensic Analysis of Poisons and Drugs by different methods.

UNIT-VII

Instrumentation

Microscope- Principle and types (Compound, comparison, polarising, SEM and TEM, Stereomicroscope, fluorescence) and their forensic Applications.

Chromatography- TLC, GLC, HPLC

Spectroscopy- UV-VIS, IR, FTIR, AAS, NMR

Electrophoresis- Agarose and SDS-PAGE

UNIT-VIII

Criminology and Criminal Law

Meaning and scope of criminology. Different sociological theories of criminal behaviours. Difference between crime and Tort. Juvenile delinquency/ female Delinquency and recent amendments in criminal Law. Probation and Parole.

Element of Crime- actus reus and mens rea. Criminal liability and General Exceptions under Indian Penal Code 1860. Role of Criminal Justice System: Police, Prosecuting Agencies, Judges, Advocates, Prison Authorities, Rehabilitation Agencies. Cognizable / Non-Cognizable, Bailable/Non-bailable, Compoundable/Non-Compoundable Offences, Summon and Warrant cases under Criminal Procedure Code 1973. Presumption under Indian Evidence Act 1872. Relevancy of Confession and Dying Declaration. Relevancy and admissibility of Evidence Expert Evidence under section 45 of Indian Evidence Act 1872.

UNIT-IX

Recent Advancements in Forensic Analogical Techniques

- Lie- Detector/Polygraph
- Norco- Analysis
- BEOS
- Speaker Voice Identification

UNIT-X

Quality Management and Statistical Tools in Forensic Science:- Quality Assurance, and its Management, Document control, Equipment, Measurement Traceability, Sampling Plan, calibrations results, reporting the results. Lab safety. Descriptive, Co-relation and Regression, ANOVA, Discriminant functional Analysis, Non Parametric tests.