

Tamil Nadu Public Service Commission
Syllabus
Physics, Chemistry, Biology, Computer Science and Forensic Science
(PG Degree Standard)

Code: 575

Unit I: Fundamentals of Physics (20 Questions)

Impulse - Impact - Laws of Impact - Loss of Kinetic theory - Motion of two interacting bodies - Reduced mass - Rigid body dynamics. **Relativity:** Postulates of Special theory of relativity - Mass Energy Equivalence. **Space Physics:** Escape Velocity - Orbital Velocity - Geo Stationary Orbits and Satellite Communication - Remote Sensing.

Basic ideas of Interference, Diffraction and Polarisation - Principle of LASER and its applications - Coupling Schemes - Zeeman effect - Paschen Back effect - Rotation, Vibration and Rotation - Vibration Spectra - Frank Condon principle - Laws of thermodynamics - Entropy - Thermodynamic potentials - Maxwell's equations and its applications, Gibb's phase rule - Phase transition - Vanderwaal's equation of State.

Crystal Classes and Systems - 2D, 3D Lattices - Lattice heat capacity - X-rays - X-ray diffraction - Superconductivity - Super Conductors, Different types of magnetic materials - Binding energy - Propagation of electromagnetic waves in non conducting and conducting medium - Reflection and refraction at a plane interface between dielectrics - Radiation from a localised source. - Fourier transform infrared, Raman, NMR and ESR spectroscopy- Principle, technique and applications

Unit II: Electronics (20 Questions)

Ampere's circuital law and its application - theory of Ballistic Galvanometer - Potentiometer - measurement of current, voltage and resistance. Semiconductor diode and transistor - Optoelectronic devices - Photo diode, Photo transistor, LDR, LED, LCD, Special Semi conductor devices - JFET, MOSFET, UJT - Operational amplifier - Characteristics and applications - 555 timer. Logic gates - Half and Full adder and subtractors - Karnaugh map - NAND - NOR networks - flip flops - counters and shift registers - Active Filters - Analog to digital and digital to analog converter.

Modulation and demodulation techniques - Principle of radio communication - AM and FM transmission - RADAR Principle - Television transmission and reception - Propagation of Light in an Optical fibre. ECG and EEG techniques - Basic ideas of CT and MRI Scan.

Unit III: General Chemistry (20 Questions)

Reaction Kinetics: Rate laws - rate constant - order and molecularity of reactions - I, II, III, and zero order reactions - concept of Arrhenius theory - Collision theory and Transition state theory - catalysis.

Acids and Bases: Bronsted and Lewis acids and bases - pH and pKa acid - base concept in non - aqueous media - HSAB concept - Buffer Solutions. Redox Reactions: Oxidation numbers, Redox potential, Electro chemical series - application of EMF measurements -Redox indicators.

Structure and Bonding: Electronic configuration of atoms, periodic properties of elements, Ionic radii, ionization potential electron affinity, electro negativity, concept of Hybridization, molecular orbitals and electronic configuration of homo nuclear and hetero nuclear diatomic molecules, shapes of polyatomic molecules. Types of chemical bond (weak and strong) inter molecular forces, structure of simple and covalent bonds- covalent character in ionic bond and partial ionic character - lattice energy.

Organic Reaction Mechanism: SN1, SN2 mechanisms - addition substitution, elimination and

rearrangements - free radical mechanism - aromatic substitution - and stability of reactive intermediate (Carbocations, Carbanion's free radicals, nitrates and benzyne) - Polar effects - Hammett's equation and its modification.

Stereochemistry: Optical and geometric isomerism E, Z and R, S notation's
IUPAC Nomenclature of simple organic and inorganic compounds.

Unit IV: Chemical and Instrumental Analysis (20 Questions)

Titrimetric Analysis: Classification of reaction in titrimetric analysis - Standard Solutions - Normality, Molarity and Molality - concentration units - Primary and Secondary standard - neutralization indicators - self indicators and external indicators- acid base titrations - precipitation titrations - redox titrations.

Qualitative Analysis: Semi micro qualitative analysis of cations like Se, Te, W, Mo, Ce, Th, Zr, V, Ca, Ba, Ni, and Mg.

Basic Principles, Instrumentation and applications of Ultraviolet-visible (UV-vis.) spectroscopy; Beer-Lambert's law, solution preparation and small molecules analysis and Flow Injection analyzer -Nuclear Magnetic spectroscopy (NMR), small molecule analysis. Flame spectroscopy, Atomic Absorption Spectroscopy (AAS), Inductively Coupled Plasma -Mass Spectrometry (ICP-MS), Inductively Coupled Plasma Emission spectroscopy, Fluorimetry - Chemiluminescence's Detector system, X-ray fluorescence spectroscopy (XFS),

Chromatographic Techniques: Basic Principles of chromatography, Instrumentation and application of chromatography - Paper, thin layer chromatography (TLC), High-performance Liquid chromatography (HPLC) and Gas chromatography (GC), Gas-Chromatography with Mass Spectrometer (GC-MS), Liquid Chromatography with Mass spectrometry (LC-MS).

Unit V: Zoology (20 Questions)

Salient features of Invertebrata and Vertebrata - Structural Organization of animal cell - Types of Muscle - Blood and its composition - grouping - Blood cells - Structure of sperm and Egg. Human genetics - Pedigree analysis - Karyotyping - Chromosome structure and functions - Beneficial and harmful insects - Exploiting insects olfaction in forensic studies - Ants, blowflies and beetles in forensic investigation. Anthropology scope - Basic concepts, types - Applied and developmental Anthropology - Forensic anthropology and criminal investigations. DNA finger printing technology in forensic investigations. Chemistry of Biomolecules - Types of carbohydrates, proteins and lipids. Metabolism of Bio molecules - Nucleic acids - Types, Structure and functions of DNA & RNA, Enzymes - Properties - Marker enzymes - Classes and function of Hormones - Pheromones. Theories of Origin of life.

Unit VI: Botany (20 Questions)

Plant Diversity: Salient features and economic importance of Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.

Cell Biology: Cell Organelles and its functions. Cell cycle, Cell division, Tissue system and secondary growth

Plant pathology: Bacterial, fungal and viral diseases of plants.

Embryology: Microsporogenesis, Megasporogenesis, Polyembryony, Double fertilization.

Genetics: Mendelism, Linkage, crossing-over, chromosome mapping.

Plant adaptations: Hydrophytes, Xerophytes, Mesophytes, Epiphytes, Halophytes and Mangrove vegetation. Biodiversity conservation methods.

DNA profiling: Genetic code, Mutation and DNA polymorphism, Recombinant DNA technology.

Isolation of DNA: Agarose Gel Electrophoresis, PCR, DNA Sequencing, RAPD, RFLP, DNA Finger printing, STR Typing.

Isolation of Proteins: SDS-PAGE, RIA, ELISA, FISH. Ames test, Comet Assay.

Microbiology: Microscope and its types. Histology and Staining techniques. Microbial culture and preservation techniques. Host-parasite interaction, Microbial diseases, Bioterrorism and Biohazards.

Unit VII: Computer Fundamentals and Applications (20 Questions)

Computer Peripherals - Operating System Fundamentals - File Systems & Management - Processors - Memory Devices - Network Fundamentals - Word Processing - Spread Sheets - Power Point Presentation - Database Fundamentals - Web Fundamentals - Browsers - Hypertext Markup Language (HTML) - Java Script - Web pages - Internet - Cloud Services - AI Fundamentals and its Applications - Cyber Security - Authentication - Firewalls - E-Commerce Applications - Data Protection - Messaging Tools - Mail Services - Internet of Things (IoT).

Unit VIII: Fundamentals of Forensic Science and Crime Scene Investigation (20 Questions)

Forensic science - Definition - Organisation and functions of Forensic laboratory - Foot and tire Impressions: Walking pattern - Finger prints: principles, patterns, classification - Identification of tool marks - Firearms, bullet and cartridge case identification, Pellets and Wads - Fire and Arson - Explosives; classification - Combustion, detonation and explosion - Military and Industrial Explosives - Physical evidence, classification and significance - Crime scene examinations - Documentation - recognition, collection, preservation of transportation for laboratory examinations - Fundamentals of Crime Scene Photography.

Unit IX: Advanced Forensic Techniques in Documents, Toxicological and Bio-Evidence (20 Questions)

Questioned documents: Identification of Hand writing, Typed and Forged signatures - Broken glass: glass fractions, direction of force - Forensic examination of soil and paints, polygraph and voice identification - Toxicology: classification, mode of action of poison - Narcotic drugs, alcoholic beverages - Examination of biological fluids: blood, seminal, vaginal and saliva stains - Examination of fibres, hair, bones, nail, teeth, tissues and skull.

Unit X: Criminology, Penology and Victimology (20 Questions)

Concept of Crime - Nature and its Scope - Typology and Patterns of Crime - Schools of Criminology - Causation of Crime- Theories of Crime: Psychological, Sociological and Tentative- Crime and Economic Conditions - Media , Race and Crime- Organised Crimes - White Collar Crimes - Cyber Crimes - Sexual Offenders - Green and Environmental Criminology - Alcoholism , Drug Addiction and Crime - Crimes of the powerful - Methods and Counting Crime - Crime Statistics - Punishment: Theories, Forms of Punishment and Judicial Sentencing - Capital Punishment - Criminal Law Courts - Prisons - Parole - Juvenile Delinquency - Crime Prevention - Victimology: Branches of Victimology - Restorative Justice - Risk and Protective factors - Formal and Informal responses to victimisation - Victims: Victimisation Cycle - Stages, Effects and Theories of Victimisation.

Dated: 23.05.2025