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| **Physics** |
| **Sr. No.** | **Core Areas** | **Percentage** |
| 1. | Classical Mechanics | 10% |
| 2. | Quantum Mechanics | 8% |
| 3. | Waves & Oscillation | 5% |
| 4. | Thermodynamics & Statistical Mechanics | 6 % |
| 5. | Electromagnetic Theory | 15 % |
| 6. | Electronics | 10% |
| 7. | Mathematical Methods of Physics | 5% |
| 8. | Nuclear & Astrophysics | 8% |
| 9. | Computational Physics | 5% |
| 10. | Solid State Physics | 8% |
| 11. | Digital Electronics | 5% |
| 12. | Atomic & Molecular Physics | 5% |
| 13. | Medical Physics | 5% |
| 14. | Semiconductor Physics | 5% |
|  | **Total** | **100%** |

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| **Physics (Detailed)** |
| **Sr. No.** | **Core Areas** | **Percentage** |
| **1.** | **CLASSICAL MECHANICS:**Vector Analysis, Kinematics, Newton's laws, work, energy and power, Gravitation, Equilibrium, Momentum, rotational motion about a fixed axis, dynamics of systems of particles, three-dimensional particle dynamics, Lagrangian and Hamiltonian formalism, non inertial reference frames. | **10%** |
| **2.** | **QUANTUM MECHANICS:**Fundamental concepts, Blackbody radiation, Pauli exclusion principle, solutions of the Schrödinger equation (including square wells, harmonic oscillators, hydrogen atom and hydrogenic atoms), spin, angular momentum, wave function symmetry, elementary perturbation theory, Stark Effect. | **8%** |
| **3.** | **WAVES & OSCILLATION:**Simple Harmonic Oscillations, Forced Oscillation and Damped oscillation, Longitudinal and transverse waves, The wave equation, The principle of superposition for waves, Standing waves, Sound. | **5%** |
| **4.** | **THERMODYNAMICS & STATISTICAL MECHANICS:****4.1 Thermodynamics:**First law of Thermo-dynamics and its applications to adiabatic, isothermal, cyclic and free expansion, Reversible and irreversible processes, Second Law of thermodynamics, Carnot theorem, Carnot engines, Heat engine, calculation of efficiency of heat engines, Thermodynamic temperature scale, Entropy, Entropy in reversible process, Entropy in irreversible process. Entropy & second law, Entropy & probability, Thermodynamic functions: Thermodynamic functions (Internal energy, Enthalpy, Gibb’s functions. **4.2 Statistical Mechanics:**Statistical distribution and mean values, Mean free path and microscopic calculations of mean free path, Distribution of molecular speeds, Distribution of energies, Maxwell distribution, Maxwell-Boltzmann energy distribution, Internal energy of an ideal gas. Brownian motion, qualitative description, Diffusion, Conduction and viscosity, partition function. | **6 %** |
| **5.** | **ELECTROMAGNETIC THEORY:**Fundamental Concepts, Gauss’s law and its applications, Biot and Savart Law and its applications, Faraday’s law of electromagnetic induction, Ampere’s circuital law. Poission’s and Laplace equation, Maxwell's equations in differential and integral forms, Poynting vector and energy conservation, Laws of reflection and refraction, Fresnel's formula, Total internal reflection, Refraction in conducting media, Reflection from a conducting surface. Monochromatic waves and plane waves, Waves guides. | **15 %** |
| **6.** | **ELECTRONICS:**Diode and transistor, Diode model, Models for Circuits, Junction Transistor as Amplifier, The Field Effect Transistor Circuit, Power Amplifiers, Frequency response of Amplifiers, Oscillators and Multivibrators. | **10%** |
| **7.** | **MATHEMATICAL METHODS OF PHYSICS:**Complex Variables, Differential Equations, Special Functions in physics, Green’s Function, Fourier and Laplace Transforms and Linear Vector Spaces and Matrices.  | **5%** |
| **8.** | **NUCLEAR & ASTROPHYSICS:****8.1 Nuclear Physics:** Nuclear Properties, Radioactivity, Alpha, Beta and Gamma Decay, Nuclear binding energy, nuclear fission, nuclear fusion and nuclear reactions. **8.2 Astrophysics:**  The solar system, physics of stars, properties of matter and radiation, ionization in stellar atmosphere, Interstellar gases and Galaxies. | **8%** |
| **9.** | **COMPUTATIONAL PHYSICS:**Computing Systems, Communication and connectivity, Programming and Languages. Program specification, Program design, Program code, Program test, Improving Efficiency and productivity, Five generation of programming Languages, Programming techniques in practical application to Physics problems, Data analysis and software packages. | **5%** |
| **10.** | **SOLID STATE PHYSICS:**Simple crystal structure, Principles of X-ray diffraction with the concept of reciprocal lattice, Interatomic forces and type of bonding. Lattice vibrations, thermal, acoustic and optical properties, Free electron theory of metals, Introductory band theory of solids, Simple Fermi surfaces, Dielectrics, Dia, Para and Ferro-magnetism. | **8%** |
| **11.** | **DIGITAL ELECTRONICS:**Overview of number system, Digital Codes, Combinational Digital Circuits and Systems, Decoder/Encoder and multiplexers, parity generator/encoder circuits, Sequential Logic, Memory and programming Logic, Fundamentals of microprocessor. | **5%** |
| **12.** | **ATOMIC & MOLECULAR PHYSICS:**Review of Bohr’s theory, Sommerfeld model, Frank Hertz Experiment, Stern Gerlach Experiment, quantum numbers, Radiative transitions, selection rules, normal Zeeman Effect, Many body systems, Spin orbit coupling (LS coupling), X-ray spectra, Molecular spectra, Ionic and covalent bonding, diatomic molecular-rotational, vibrational and electronic spectra, Einstein co-efficient and stimulated emission, Basic laser principle, pumping schemes, characteristic of laser beam, resonators. | **5%** |
| **13.** | **MEDICAL PHYSICS:**Diagnostic X-rays, Production of X-rays, CT, Diagnostic Ultrasound, Doppler effect, Radionuclide imaging, position emission tomography (PET), Magnetic resonance imaging (MRI), Absorbed Dose,Units for Absorbed Dose, Calorimeters, ionization chambers, chemical Dosimetry, Thermoluminescene Dosimetry (TLD), photographic Dosimetry, Cardinal principles of radiation protection minimize time, maximizes distance, maximize shielding. Time, distance and shielding, maximum permissible dose. Allowable limit on intake (ALI). | **5%** |
| **14.** | **SEMICONDUCTOR PHYSICS:**Properties of Semiconductors, Energy bands, Carrier concentration at thermal equilibrium, Carrier transport phenomena, Optical, Thermal and high-field properties of semiconductors, Basic device technology, Crystal growth and Epitaxi, Integrated Devices. | **5%** |
|  | **Total** | **100%** |