

CSIR UGC NET Physical Sciences

Mathematical Physics Fundamentals

- **Dimensional analysis and scientific measurement techniques.**

This topic plays an important role in Physical Sciences preparation and helps candidates build conceptual understanding, analytical ability, and problem-solving skills required for examinations and research studies.

- **Vector algebra, vector calculus, and coordinate systems.**

This topic plays an important role in Physical Sciences preparation and helps candidates build conceptual understanding, analytical ability, and problem-solving skills required for examinations and research studies.

- **Matrices, determinants, eigenvalues, and eigenvectors.**

This topic plays an important role in Physical Sciences preparation and helps candidates build conceptual understanding, analytical ability, and problem-solving skills required for examinations and research studies.

- **Linear differential equations and mathematical modelling.**

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- **Special functions including Bessel, Hermite, and Legendre forms.**

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- **Fourier series, Fourier transforms, and Laplace transforms.**

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- **Complex variables, analytic functions, and residue methods.**

This topic plays an important role in Physical Sciences preparation and helps candidates build conceptual understanding, analytical ability, and problem-solving skills required for examinations and research studies.

- **Probability distributions and random variable concepts.**

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- **Statistical methods used in physical sciences.**

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- **Applications of mathematical tools in modern physics research.**

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Classical Mechanics and Electromagnetic Theory

- **Newtonian mechanics and laws of motion.**

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- **Central force motion and orbital dynamics.**

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- **Rigid body rotation and moment of inertia concepts.**

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- **Lagrangian and Hamiltonian formulations.**

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- **Relativity, Lorentz transformations, and energy relations.**

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- **Electrostatics and Gauss law applications.**

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- **Magnetostatics and electromagnetic induction.**

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- **Maxwell equations and electromagnetic wave propagation.**

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- **Reflection, refraction, interference, and diffraction.**

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- **Motion of charged particles in electromagnetic fields.**

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Quantum Physics, Thermodynamics and Electronics

- **Wave-particle duality and quantum behaviour.**

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- **Schrödinger equations and quantum states.**

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- **Angular momentum, spin, and atomic structure.**

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- **Perturbation theory and quantum transitions.**

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- **Laws of thermodynamics and energy transformations.**

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- **Statistical mechanics and ensemble theory.**

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- **Bose-Einstein and Fermi-Dirac statistics.**

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- **Semiconductor devices and transistor applications.**

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- **Operational amplifiers and digital electronics.**

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- **Experimental measurements, accuracy, and error analysis.**

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Advanced Physical Sciences and Modern Applications

- **Green functions and computational physics techniques.**

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- **Partial differential equations and numerical solutions.**

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- **Plasma physics and waveguide concepts.**

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- **Atomic and molecular spectroscopy fundamentals.**

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- **Laser physics and optical systems.**

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- **Condensed matter physics and crystal structures.**

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- **Superconductivity and advanced material properties.**

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- **Nuclear models, radioactive decay, and reactions.**

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- **Particle physics, symmetry principles, and quark models.**

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- **Research-oriented applications in modern physical sciences.**

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