

Introduction to the Physics GRE

Society of Physics Students

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1 Test Format

The test consists of 100 multiple choice questions, each with five given answers, some with accompanying diagrams, figures, or tables. The test duration is 170 minutes, and no calculators are allowed. Since the exam is given in a written format, you need not answer the questions sequentially, as you were required to do for the computer-based GRE General Exam.

2 Content of the Physics GRE

According to the official Physics Test Practice Book published by ETS, the coverage of the Physics GRE is broken down as follows:

1. **Classical Mechanics [20%]** Newton's laws, kinematics, work and energy, oscillatory motion, rotational motion about a fixed axis, dynamics of systems of particles, central forces and celestial mechanics, three-dimensional particle dynamics, Lagrangian and Hamiltonian formalism, noninertial reference frames, elementary topics in fluid dynamics.
2. **Electromagnetism [18%]** Electrostatics, currents and DC circuits, magnetic fields in free space, Lorentz force, induction, Maxwell's equations and their applications, electromagnetic waves, AC circuits, magnetic and electric fields in matter.
3. **Optics and Wave Phenomena [9%]** Wave properties, superposition, interference, diffraction, geometrical optics, polarization, Doppler effect.
4. **Thermodynamics and Statistical Mechanics [10%]** Laws of thermodynamics, thermodynamic processes, equations of state, ideal gases,

kinetic theory, ensembles, statistical concepts and calculation of thermodynamic quantities, thermal expansion, and heat transfer.

5. **Quantum Mechanics [12%]** Fundamental concepts, solutions of the Schrödinger equation (including square wells, harmonic oscillators, and hydrogenic atoms), spin, angular momentum, wave function symmetry, elementary perturbation theory.
6. **Atomic Physics [10%]** Properties of electrons, Bohr model, energy and quantization, atomic structure, atomic spectra, selection rules, black-body radiation, x-rays, atoms in electric and magnetic fields.
7. **Special Relativity [6%]** Introductory concepts, time dilation, length contraction, simultaneity, energy and momentum, four-vectors and Lorentz transformations, velocity addition.
8. **Laboratory Methods [6%]** Data and error analysis, electronics, instrumentation, radiation detection, counting statistics, interaction of charged particles with matter, lasers and optical interferometers, dimensional analysis, fundamental applications of probability and statistics.
9. **Specialized Topics [9%]** Nuclear and Particle physics (e.g. nuclear properties, radioactive decay, fission and fusion, reactions, fundamental properties of elementary particles), Condensed Matter (e.g. crystal structure, x-ray diffraction, thermal properties, electron theory of metals, semiconductors, superconductors), Miscellaneous (e.g. astrophysics, mathematical methods, computer applications).

3 How the Test Is Scored

The test is scored on a scale of 990 points (rather than GRE General Exam 800 point scale). For different editions of the GRE, this score can result from different raw scores, so there is no exact scaling system for raw score vs. point score. However, all point scores *are* based on the **raw score**, which is calculated as the number of correct answers minus one-quarter the number of wrong answers. This means *you are penalized for answering questions incorrectly*, so if you are very uncertain about an answer, it is probably a good idea to leave it blank. There are no penalties for blank responses.