

Specification of the Physics Entrance Examination for Admission to the Bachelor's Degree Programs of ToshTech Technical University for the 2026/2027 Academic Year

1. Purpose of the Entrance Examination

The Physics Entrance Examination is conducted for the purpose of objectively assessing applicants' level of preparation in physics, their understanding of fundamental physical laws, their ability to analyse physical phenomena and processes, apply physical knowledge when solving quantitative and practical problems, and the academic potential of applicants required for successful study in the bachelor's degree programs of ToshTech Technical University.

The results of the Entrance Examination are used to establish the ranking of applicants and to make decisions regarding recommendations for admission within the approved admission quota.

The Entrance Examination is an integral part of the competitive admissions process and is conducted in accordance with the Regulations on Admission to Bachelor's Degree Programs at ToshTech Technical University for the 2026/2027 academic year.

2. Provisions Determining the Content of the Examination

The content of the Physics Entrance Examination is determined by:

- the content of the State Educational Standards of the Republic of Uzbekistan and the physics curricula of secondary general education;
- the knowledge, skills, and competencies required for successful study in engineering and technology bachelor's degree programs at ToshTech Technical University.

The examination content covers the main sections of the secondary-school physics curriculum and is intended to assess physical literacy, understanding of physical laws and principles, physics problem-solving skills, the ability to construct and analyse physical models, interpret calculation results, and applicants' readiness for higher education programs in technical fields.

3. Approaches to Content Selection

Physics is one of the fundamental disciplines of engineering education. Successful study in technical degree programs requires both strong knowledge of fundamental physical laws and the ability to apply them when analysing physical phenomena and solving practical problems.

The examination content covers the main sections of the secondary-school physics curriculum and makes it possible to assess applicants' level of preparation in mechanics, molecular physics and thermodynamics, electrostatics and electrodynamics, oscillations and waves, optics, atomic physics, and quantum physics.

The examination consists of two parts.

The tasks in Part 1 are intended to assess the fundamental physics preparation of graduates of secondary general education institutions. They cover a broad range of physical concepts, laws, and models from the secondary-school curriculum and require short answers. This format makes it possible to assess

knowledge of fundamental physical principles, understanding of physical quantities and units of measurement, and the ability to perform standard calculations.

The tasks in Part 2 require extended responses and are intended to assess the ability to apply physical knowledge in new situations. Completion of such tasks requires constructing a physical model of the process under consideration, selecting the necessary laws and relationships, performing sequential calculations, and analysing the obtained result.

Extended-response solutions make it possible to assess the depth of understanding of physical processes, the ability to justify the chosen method of solution, correctly apply mathematical tools, and interpret the obtained results from a physical perspective.

The two-part structure of the examination ensures assessment of both applicants' fundamental preparation and their readiness to solve complex physics problems characteristic of engineering education.

4. Structure of the Entrance Examination

The Entrance Examination consists of two parts and includes 14 tasks that differ in content, difficulty, and format:

- Part 1 contains 10 short-answer tasks (Tasks 1–10);
- Part 2 contains 4 extended-response tasks (Tasks 11–14) requiring a complete written solution with justification of the steps taken.

The tasks in Part 1 are intended to assess the fundamental physics preparation of graduates of secondary general education institutions. A task is considered completed if the correct answer is recorded on the answer sheet.

The tasks in Part 2 are intended to assess the ability to apply acquired knowledge and require physics proficiency at an advanced level. Part 2 tasks are designed to provide more precise differentiation among applicants.

When completing the extended-response tasks in Part 2 of the examination, applicants must provide a complete, justified solution and a final answer for each problem on the answer sheet.

5. Distribution of Entrance Examination Tasks by Content Areas and Assessed Learning Outcomes

The examination provides an opportunity to assess the following subject-specific learning outcomes:

- understanding of fundamental physical laws;
- ability to apply physical laws to solve problems;
- ability to perform calculations and transformations of physical quantities;
- ability to analyse physical processes;
- ability to use graphs, tables, and diagrams;
- ability to construct physical models of real-world situations;
- ability to evaluate the validity and realism of obtained results.

Table 1. General Blueprint Showing the Distribution of Examination Tasks Across the Content Areas of the Physics Curriculum

| Task No. | Physics Content Area | Knowledge and Skills Assessed | Maximal raw score | Percentage of the Total Score (%) |
|---------------------------------------|--------------------------------------|--|-------------------|-----------------------------------|
| Part 1 | | | | |
| 1 | Mechanics | Kinematics: uniform and uniformly accelerated motion, average speed, relativity of motion, graphs of coordinate, velocity, and acceleration versus time. Relationships between kinematic quantities. | 1 | |
| 2 | Mechanics | Dynamics: Newton's laws, forces in mechanics (gravitational force, elastic force, frictional force). Work, power, mechanical energy. Law of conservation of energy. Momentum of a body. Law of conservation of momentum. | 1 | |
| 3 | Molecular Physics and Thermodynamics | Fundamental principles of the molecular-kinetic theory. Structure of matter. Amount of substance. Molar mass. Particle concentration. Ideal gas and its properties. | 1 | |
| 4 | Molecular Physics and Thermodynamics | Thermodynamic processes. Internal energy. Heat transfer. Quantity of heat. First law of thermodynamics. Heat engines and thermal efficiency. | 1 | |
| 5 | Electrostatics and Electrodynamics | Electric charge. Coulomb's law. Electric field. Electric field strength and electric potential. Work done by an electric field. | 1 | |
| 6 | Electrostatics and Electrodynamics | Electric current. Current strength. Voltage. Resistance. Ohm's law. Series and parallel connection of conductors. Work and power of electric current. | 1 | |
| 7 | Oscillations and Waves | Mechanical and electromagnetic oscillations. Amplitude, period, frequency, and phase of oscillations. Simple pendulum and spring oscillator. Oscillatory circuit. Mechanical and electromagnetic waves. Wavelength, period, frequency, and wave propagation speed. | 1 | |
| 8 | Optics | Geometrical optics: rectilinear propagation of light, laws of reflection and refraction, total internal reflection. Wave properties of light: interference, diffraction, and dispersion. Light as an electromagnetic wave. | 1 | |
| 9 | Atomic Physics | Structure of the atom. Bohr atomic model. Line spectra. Spectral analysis. | 1 | |
| 10 | Quantum Physics | Photoelectric effect. Photons. Quantum nature of light. Radioactivity. Structure of the atomic nucleus. Nuclear reactions. | 1 | |
| Total Points for Part 1 Tasks: | | | 10 | 50% |

| Part 2 | | | | |
|---------------------------------------|--------------------------------------|---|---------------|------------|
| 11 | Mechanics | Newton's laws. Work, power, and mechanical energy. Law of conservation of energy. Momentum of a body. Law of conservation of momentum. Motion of connected bodies. | 2 or 3 points | |
| 12 | Molecular Physics and Thermodynamics | Fundamental principles of the molecular-kinetic theory. Equation of state of an ideal gas. Gas processes. Internal energy. Quantity of heat. First law of thermodynamics. | 2 or 3 points | |
| 13 | Electrostatics and Electrodynamics | Electric charge. Coulomb's law. Electric field. Electric field strength. Electric potential. Voltage. Ohm's law for a section of a circuit. Series and parallel connection of conductors. Work and power of electric current. | 2 or 3 points | |
| 14 | Oscillations, Waves, and Optics | Mechanical and electromagnetic oscillations. Simple pendulum and spring oscillator. Oscillatory circuit. Mechanical and electromagnetic waves. Geometrical and wave optics. | 2 or 3 points | |
| Total Points for Part 2 Tasks: | | | 10 | 50% |

6. Distribution of Tasks by Difficulty Level

Part 1 contains 7 basic-level tasks and 3 intermediate-level tasks.

Part 2 contains 2 intermediate-level tasks and 2 advanced-level tasks; all tasks in Part 2 require integrated application of physics knowledge.

Table 2. Distribution of Tasks by Difficulty Level

| Difficulty level | Number of tasks | Maximal raw score | Percentage of the Total Score (%) |
|------------------|-----------------|-------------------|-----------------------------------|
| Basic | 7 | 7 | 35 |
| Intermediate | 5 | 7 | 35 |
| Advanced | 2 | 6 | 30 |
| Overall | 14 | 20 | 100 |

7. Examination Duration

The examination duration is 90 minutes.

8. Scoring System for Individual Tasks and the Entrance Examination as a Whole

The Physics Entrance Examination is marked by expert assessors using a developed system of scoring criteria.

Each of Tasks 1–10 is worth 1 point. A task is considered correct if the answer is correct and is presented in the format specified in the task instructions (where a response format is specified).

Partial credit may be awarded for solutions to Tasks 11–14 in accordance with the established scoring criteria. Two tasks in Part 2 are worth a maximum of 2 points each, and two tasks are worth a maximum of 3 points each.

The maximum raw score for the examination is 20 points.

Based on performance across all examination tasks, raw scores are calculated and then converted into examination scores expressed as percentages. The maximum raw score (20 points) is taken to be 100%.

9. Additional Materials and Equipment

During the Physics Entrance Examination, applicants are provided with the following materials:

- an examination booklet containing the tasks;
- answer sheets;
- scratch paper (if necessary, at the discretion of the Partner Organization).

Applicants may use only those materials and equipment permitted by the Admission Regulations and the instructions for administering the Entrance Examination.

The use of communication devices, electronic devices, calculators, reference materials, printed publications, and any other unauthorised items is prohibited.