	Federal State-Funded Educational Institution of Higher Professional Education ***Volga State University of Technology*** **Entry Examination Scheme** **Higher Education – Bachelor Degree Program** **Higher Education – Specialist Degree Program**

APRROVED BY
Rector of VOLGATECH
_____ I.V. Petukhov
"29" 10 2025

PHYSICS ENTRY EXAMINATION SCHEME

Reviewed at the meeting of the Subject Examination Panel for Physics and Applied Physics,
Minutes No. 1 of October 29, 2025

2025

	Position	***Full Name / Signature***	***Date***
Developed by	*Chairman of the Subject Examination Panel for Physics and Applied Physics*	*M.E. Gordeyev /*	29.10.25
Agreed with	*First Vice-Rector*	*A.A. Rozhentsov*	29.10.25
Valid until re-approval			

Re-approved			
		Full Name / Signature	***Date***
Approved by	*Meeting of the Subject Examination Panel for Physics and Applied Physics, Minutes No. 1 of _____,20__, Chairman of the Subject Examination Panel*		
Agreed with			
Re-approved			
		Full Name / Signature	***Date***
Approved by	*Meeting of the Subject Examination Panel for Physics and Applied Physics, Minutes No. 1 of _____,20__, Chairman of the Subject Examination Panel*		
Agreed with			
Re-approved			
		Full Name / Signature	***Date***
Approved by	*Meeting of the Subject Examination Panel for Physics and Applied Physics, Minutes No. 1 of _____,20__, Chairman of the Subject Examination Panel*		
Agreed with			
Valid until re-approval			

INTRODUCTION

The program is designed for Bachelor or Specialist Degree Program applicants who achieved secondary general education grade and who are eligible to undertake general education entry examinations conducted by the university independently, in accordance with the current Rules for Admission to the Federal State-Funded Educational Institution of Higher Education Volga State University of Technology.

The scheme contains a list of the main topics recommended for preparation for entry examinations in Physics. The list of substantive sections corresponds to the sections of the Federal State Educational Standard for Basic General Education (approved by Order of the Ministry of Education and Science of the Russian Federation No. 1897 of December 17, 2010).

The scheme includes a demo version of an examination paper (test), a marking scale for evaluating examination papers (tests).

The examination paper for applicants applying for rapid forms of accelerated learning contains 10 tasks is to be completed within 60 minutes. The level of complexity of all 10 tasks of the test paper ranges from the basic level of knowledge similar to the tasks of Part 1 of the Unified State Examination to the tasks of Part 2. All 10 tasks are of an open type, which require the detailed solution.

I. MAIN TOPICS IN PHYSICS TO PREPARE FOR ENTRY EXAMINATION

1. Mechanics.
2. Molecular physics and thermodynamics.
3. Electricity.
4. Magnetism.
5. Oscillations and waves.
6. Optics.
7. Atomic and nuclear physics

References:

1. Babayev, V.S. Physics: Full course for school-leavers and applicants. V.S. Babayev, A.V. Tarabanov. - M.: Eksmo, 2008. - 400 p.

2. Balva, O.P. Russian National Test. Physics: Universal Handbook. O.P. Balva, A.A. Fadeyev. - M.: Eksmo, 2010. - 352 p.

3. Russian National Test 2010, Examination tasks. M.Yu. Demidov, I. I. Nurminsky. - M.: Eksmo, 2010. - 304 p.

4. Kabardin, O.F. Physics: Handbook. O.F. Kabardin. - M.: AST: Astrel, 2008. - 573 p.

5. Kasatkina, I.L. Physics. Full preparation course: analysis of real examination tasks. M.: AST: Astrel, 2010. 366 p.

6. Kirik, L.A. Trainer. Universal edition for examination preparation. M.: ILEKSA, 2009. - 432 p.

7. Monastyrsky, L.M. Physics. Thematic tests (basic and advanced levels). L.M. Monastyrsky, A.S. Bogatin. Rostov-on-Don: Legion-M, 2009. - 304 p.

8. Moskalev, A.N. Getting ready for the Unified State Examination. Physics. A.N. Moskalev, G.A. Nikulova. M.: Drofa, 2009. - 318 p.

II. DEMONSTRATION VERSION OF THE EXAMINATION PAPER (TEST)

Volga State University of Technology
Test in Physics (in written form)
Run time 60 minutes

Form No. 00 Code _____

Tasks	1	2	3	4	5	6	7	8	9	10
Point										
Signature										
Direction: For each task, give a complete solution and the answer										

1) A body is thrown vertically upward with a speed of 20 m/s. After some time, it fell onto the ground surface. Determine the flight time of the body.

2) A boy weighing 50 kg is on a cart weighing 50 kg moving along a smooth horizontal road at a speed of 1 m/s. What will be the speed modulus of the cart provided the boy jumps off in the direction of the initial speed of the cart at a speed of 2 m/s relative to the road?

3) The average kinetic energy of the translational thermal motion of rarefied gas molecules increased by 2 times, and the concentration of its molecules decreased by 2 times. How does the pressure of the gas change?

4) How will the period of free electromagnetic oscillations in the circuit change if the air gap between the capacitor plates is filled with a dielectric with a permittivity ε?

5) An object is placed at a distance of 50 cm from a plane mirror. What will the distance be between it and his image if the object is brought closer to the mirror by 15 cm?

6) While carrying out photoelectric effect experiments, they took a metal plate with the work function of 3.5 eV and began to illuminate it with light with a frequency of $3 \cdot 10^{15}$ Hz. Then the intensity of the light incident on the plate was reduced by a factor of 2, leaving the frequency unchanged. How has the maximum kinetic energy of photoelectrons changed as a result of this?

7) A lorry moves along a straight street and passes by a stop at a speed of 10 m/s. In 5 s, a motorcyclist drives off from the stop after the lorry, moving with acceleration of 3 m/s^2. How long will it take for the motorcyclist to catch up with the lorry?

8) When carrying out the experiment to measure the specific heat capacity of the substance, a metal cylinder weighing 0.15 kg was taken out of boiling water and lowered into the water of 20°C. The mass of cold water is 0.1 kg. After obtaining thermal equilibrium, the temperature of the metal and water became equal to 30°C. What is the specific heat capacity of the substance which the cylinder is made of? Ignore the heat capacity of the calorimeter.

9) An electron flies into a uniform electric field at a speed of $0.5 \cdot 10^7$ m/s and moves in the direction of the lines of field force. What distance will the electron fly before a complete loss of speed provided the modulus of the field force is 600 V/m?

10) A lens with a focal length $F = 0.3\ m$ gives an image of an object on the screen magnified by 3 times. What is the distance from the lens to the image?

III. MARKING SCALE OF EXAMINATION PAPERS (TESTS)

Papers are evaluated on a 100-point scale.
Each task is scored from 0 to 10 points:

10 points - the task was completed correctly with all the necessary justifications;

8-9 points - the task as a whole was completed correctly, a typo or a minor inaccuracy being present;

6-7 points – when solving the task, an error was made that did not affect the answer;

4-5 points - when solving the task, an error was made that affected the answer, for example, the loss of part of the solution or the inclusion of extraneous solutions;

2-3 points - the method of solving the task is chosen correctly, there are elements of the correct solution;

1 point - there is only an idea for solving the task, not a single stage has been completed;

0 points - the applicant did not start the task, or gross errors were made.

Each paper is checked by the examination panel. Points for the task are set in a table and signed by the subject panel member having checked the tasks.
The final score for the paper is calculated by summing the scores for the tasks. The final score is set on the first page of the paper signed by the chairman of the subject panel.