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Assessment Criteria For Physics Olympiads

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ABSTRACT
This thesis presents a scientific and methodological analysis of the criteria for assessing participants' knowledge and skills in physics subject Olympiads. The thesis serves as a methodological guide for teachers, aiding them in selecting effective assessment criteria during the process of preparing students for Olympiads.

KEYWORDS: Assessment criteria, written work, laboratory work, olympiad, physics, test.

INTRODUCTION
In recent years, special attention has been paid to the manifestation of students' independent thinking, creative approach, and deep knowledge in the educational process. From this point of view, physics olympiads play an important role in identifying gifted students and guiding them towards scientific activity. One of the pressing issues is the fairness and transparency of the assessment process at the Olympiads, the development of basic criteria for correctly determining the level of students' knowledge[1].
The first, second, and third stages of the Physics Olympiad are held in grades 9-11 of general education schools. In academic lyceums and vocational colleges, the first stage is held in the 1st-3rd years, the second and third - in the 2nd-3rd years.
The Olympiad in mathematics, physics, chemistry, and biology will be held in two rounds. Each participant must complete the following tasks:
Written assignments: For each subject, participants are given 5 written assignments of varying difficulty levels. These assignments are evaluated in the following order:
Task 1 and 2: 7 points each
Task 3 and 4: 10 points each
Task 5: 16 points Written assignments are evaluated with a total score of 50 points and 180 minutes are allocated for them.
Test assignments: Test assignments are divided into three types:
- the first 10 simple closed tests, each with a score of 0.9 points;
- the next 10 medium-level closed tests, each with a score of 1.5 points;
- the last 10 open tests, each with a score of 2.6 points. Thus, a total of 50 points can be accumulated on the tests. 90 minutes are allocated for completing the test tasks.
Participants in mathematics, physics, chemistry, and biology can score 100 points in both rounds.

Table 1
Written work evaluation criteria

T\r	Rating Criterion	Points

1	If the student fully reveals the physical meaning of phenomena and laws, correctly solves the problem using basic concepts and laws, the drawing is a condition for the problem, the drawings are drawn correctly, and the physical quantities and their units are correctly derived	10
2	If the student fully reveals the physical meaning of phenomena and laws, correctly solves the problem using basic concepts and laws, correctly derives the units of physical quantities, and if the drawing is a prerequisite for the problem, there are minor errors in drawing the drawing.	9
3	If the student reveals the physical meaning of phenomena and laws, correctly solves the problem using basic concepts and laws, if the drawing is a prerequisite for the problem and the drawing is correct, if there are errors in deriving and writing units of physical quantities.	8
4	If the student reveals the physical meaning of phenomena and laws, correctly solves the problem using basic concepts and laws, makes a drawing a condition for the problem, and makes mistakes in drawing the drawing and deriving and writing units of physical quantities	7
5	If the student reveals the physical meaning of phenomena and laws, correctly solves the problem using basic concepts and laws, if the drawing is a condition for the problem, and there are errors in drawing the drawing, writing physical quantities, and does not lead to the unification of physical quantities	6
6	If the student reveals the physical meaning of phenomena and laws, makes mistakes in solving the problem using basic concepts and laws, the drawing is a condition for the problem, the drawing is drawn incorrectly, makes mistakes in determining physical quantities, does not derive the unit of physical quantities at all	5
7	If the student reveals the physical meaning of phenomena and laws, if there are errors in deriving the problem formula using basic concepts and laws, if the drawing is a condition for the problem, if the drawing is drawn incorrectly, if there are errors in determining physical quantities, if there is no derivation of the unit of physical quantities at all	4
8	If the student reveals the physical meaning of phenomena and laws, makes mistakes in deriving and calculating the problem formula using basic concepts and laws, if the drawing is a condition for the problem and the drawing is not drawn at all, if there are errors in determining physical quantities and the unit of physical quantities is not derived at all	3

9	The student wrote a formula to solve the problem, didn't work on the problem, had a drawing as a condition for the problem, didn't draw the drawing at all, and didn't derive any units of physical quantities	2
10	The student wrote the physical quantities given in the problem statement, but didn't solve the problem at all	1

Laboratory work

One of the 3 variants prepared based on the physics program of laboratory classes is selected by drawing lots. 60 minutes are allocated for the laboratory work. It is rated at a maximum of 10 points[3].

Evaluation criteria are one of the most important components of the Olympiad process. They serve to assess the student's knowledge not only by the final result, but also by the level of analytical thinking in the process of solving the problem, the correct use of physical laws, the justification of the solution, and the interpretation of the result. Therefore, the correct development and effective application of assessment criteria in practice contributes to the objective and fair determination of students' knowledge.

Written works of participants of the IV (republican) stage of the main Olympiad evaluation criterion

In the first round of physics, participants will be allocated 180 minutes to complete 5 written assignments (10-point assignments). In accordance with international experience, taking into account the level of complexity and solution of the tasks, the assessment criteria are presented together with the answers. The total score is 50 points.

Physics test tasks

Test assignments in physics for the IV (republican) stage of the main Olympiad are prepared taking into account the age characteristics of students to assess their knowledge, skills, abilities, and competencies.

In the development of test tasks, along with the curriculum and textbooks, additional information corresponding to the psychophysiological characteristics of students, requiring creative thinking, is used.

The purpose of the assessment to determine the acquisition of cognitive skills by students during the testing process (BM):

–BM1: Cognitive skills of knowing and understanding

• knows concepts, terms, physical quantities and their units, regularities and formulas of connections related to physical phenomena;

• can consciously observe physical processes and phenomena, explain their essence.

–BM2: Application cognitive skills

• can write the interrelationships of physical quantities in the form of mathematical expressions and draw conclusions;

• can solve problems practical and problem-based based on physical laws and their relationship formulas.

–BM3: Analytical cognitive skills

• can solve and evaluate problems related to all branches of physics, requiring expanded and creative thinking;

can analyze basic concepts, terms, and patterns related to physics sections.

In the IV (republican) stage of the main Olympiad, the test variant in physics consists of 30 test tasks, of which 20 are strictly structured (closed) and 10 are structured (open). Test tasks are formed at simple, medium, and high difficulty levels. The number of test tasks at each difficulty level is 10. 90 minutes are allocated for completing the test tasks.

In the test variant formed in physics, closed test tasks with alternative answers and requiring adaptation, as well as open test tasks requiring a short answer, were used.

At the IV (republican) stage of the main Olympiad, test assignments in physics will be evaluated based on the "differentiated scoring system." For each correctly completed simple difficulty test task, 0.9 points are awarded, for a medium difficulty test task - 1.7 points, and for a high difficulty test task - 2.4 points. For each incorrectly completed test task, 0 points are awarded.

The answer to an open-ended test task that requires a short answer can be one or more words, phrases, symbols, formulas, or a single number. The total score is 50 points[4].

Conclusion

In conclusion, it can be said that the development of a system of specific criteria for assessing physics Olympiad participants serves an objective assessment of students' knowledge and skills. In the evaluation process, it is necessary to take into account not only the final answer, but also the logical consistency in solving the problem, the degree of application of physical laws, and a creative approach. These assessment criteria allow us to identify the strengths and weaknesses of students. Also, the transparency and fairness of assessment will improve the quality of education and encourage students to think independently.

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