Azonosító jel: | | | | | | | | | | |

ÉRETTSÉGI VIZSGA • 2005. május 17.

FIZIKA
ANGOL NYELVEN
PHYSICS

KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA
STANDARD LEVEL
WRITTEN EXAMINATION

Az írásbeli vizsga időtartama: 120 perc
Time allowed for the examination: 120 minutes

Pótlapok száma / Number of extra sheets	
Tisztázati / Final version	
Piszkozati / Draft	

OKTATÁSI MINISZTÉRIUM
MINISTRY OF EDUCATION

Instructions to candidates

The time allowed for this question paper is 120 minutes.
Read the instructions of the problems very carefully, and make sure that you do not run out of time.
You may solve the problems in any order.
Materials allowed: calculator, data tables.
If there is not enough space provided for the solution of a problem ask for an extra sheet. On the sheets attached, please indicate the number of the problem.

Indicate here which of the problems 3/A and 3/B you have chosen (that is, which one you want to be assessed):

3/ ☐

PART ONE

Exactly one of the answers to each of the questions below is correct. Write the appropriate letter in the white square on the right. (If necessary, check your answer by calculation.)

1. A pedalo is floating at rest on a lake. A child jumps off the pedalo head first into the water. Which statement is true about the horizontal momenta acquired by the pedalo, the water set to motion by the pedalo and the child at the time instant of jumping off?

A) The sum of the momentum of the pedalo and that of the water set to motion will be the same as the momentum of the child.
B) The sum of the momentum of the pedalo and that of the water set to motion will be equal in magnitude as the momentum of the child, but its direction will be opposite.
C) The sum of the momentum of the pedalo and that of the water set to motion will be smaller in magnitude as the momentum of the child and its direction will be opposite.

2 points

2. Two objects of masses 1 kg and 0.5 kg are placed next to each other on a thick layer of loose snow. Is it possible that the 0.5-kg object compresses the snow more?

A) No, because the more massive object exerts a larger force.
B) Yes, if the object of smaller mass exerts a larger pressure.
C) No, because the object of larger mass always exerts a larger pressure.

2 points

3. An object is thrown vertically upwards. In comparison with the initial speed, at what speed will the object return to the initial position? (Ignore air resistance.)

A) At the same speed.
B) Its speed will be smaller.
C) Its speed will be greater.

2 points

4. The gravitational potential energy of a child sitting on a sledge on the top of a hill is 2500 J (with respect to the bottom of the hill). While the child is sliding down the hill, 500 J of work is needed to overcome friction and drag forces. What will be the kinetic energy of the child at the bottom of the hill?

A) 2000 J
B) 2500 J
C) 3000 J

2 points

5. **A man is carrying rice and fruits to the marketplace in baskets hanging from the ends of a horizontal rod placed on his shoulder. One basket contains 30 kg of rice and the other contains 20 kg of fruits. Where should he support the rod with his shoulder so that he does not need to exert a force with his hand to keep it balanced?**

A) Closer to the fruit basket.
B) Closer to the rice basket.
C) Exactly in the middle.

2 points

6. **A gas is enclosed in a cylinder with a frictionless piston. How will the volume of the gas change if its temperature in kelvins is doubled?**

A) It will be half as large.
B) It will stay the same.
C) It will be twice as large.

2 points

7. **How can one warm up a pot of soup faster on the kitchen cooker? With or without a lid?**

A) There is no significant difference.
B) Without a lid.
C) With a lid.

2 points

8. **We want to increase the internal energy of a given quantity of gas. In which case is more heat needed for the same rise in internal energy: if the heating takes place at constant volume or if it is done at constant pressure?**

A) At constant pressure.
B) At constant volume.
C) There is no difference.

2 points

9. **A half ring made of cast iron is heated. Which diagram shows correctly its shape after heating?**

A) An arc smaller than a semicircle: 

B) A semicircle: 

C) An arc greater than a semicircle: 

2 points	

10. **The nucleus of the helium atom consists of two protons and two neutrons. Which system has greater mass: two free protons and two free neutrons together or the He nucleus?**

A) The He nucleus.
B) The two masses are equal.
C) The two protons and two neutrons.

2 points	

11. **What will happen to the deflection of the pointer of a positively charged electroscope if a negatively charged object is brought near its plate?**

A) It will deflect even more.
B) Its deflection will be smaller.
C) It will not move.

2 points	

12. **How large is the resultant of two different resistances connected in parallel?**

A) Smaller than each of the individual resistances.
B) It is between the values of the two resistances.
C) Larger than each of the individual resistances.

2 points	

13. **In which case may a charged particle entering a uniform magnetic field move uniformly in a circle?**

A) If the initial velocity of the particle is perpendicular to the field lines.
B) If the initial velocity of the particle is parallel to the field lines.
C) Never, since the electric charge does not interact with the magnetic field.

2 points

14. **What happens if a direct current is flowing in the primary coil of a transformer?**

A) Direct voltage appears on the secondary coil.
B) No voltage appears on the secondary coil.
C) There is always an alternating voltage induced in the secondary coil.

2 points

15. **In the photoelectric effect electrons are emitted from a zinc plate illuminated by ultraviolet light. What will happen if the intensity of the light is increased?**

A) Both the number of the electrons and their speed will increase.
B) Only the speed of the electrons emitted will increase.
C) Only the number of the electrons emitted will increase.

2 points

16. **A nucleus of $^{213}_{84}$Po undergoes α-decay. What isotope is obtained?**

A) $^{209}_{82}$Pb.
B) $^{213}_{83}$Bi.
C) $^{209}_{83}$Bi.

2 points

17. **Would it be possible to construct a slide projector that uses a convex mirror instead of a converging lens?**

A) No, because convex mirrors do not form real images.
B) No, because the image appearing on the screen would be diminished.
C) Yes, but the slide would have to be placed too far away from the mirror.

2 points

18. **What is the gravitational acceleration on the surface of a planet that has the same radius as the Earth but its mass is twice as large?**

A) The double of the *g* on the Earth.
B) Half the *g* on the Earth.
C) One quarter of the *g* on the Earth.

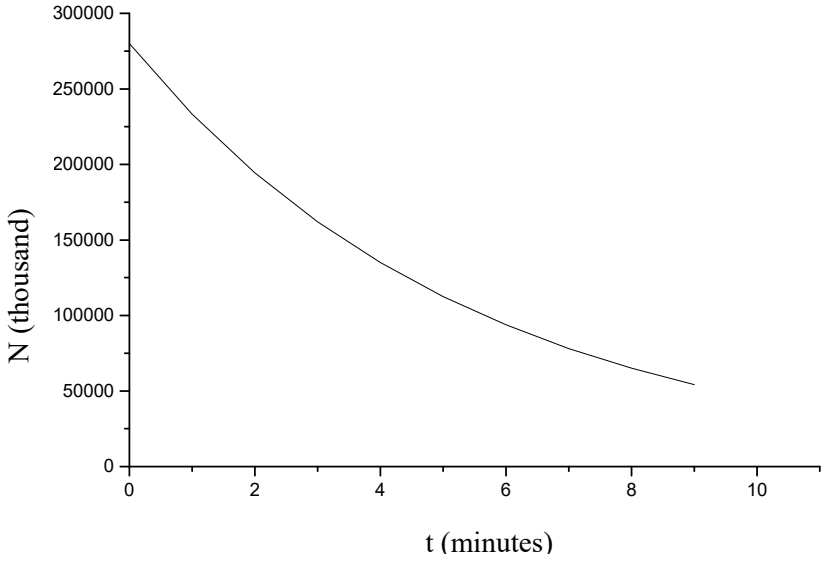
2 points

19. **If the Earth had another moon with an orbit of larger radius than the Moon's orbit, what would be its orbital period in comparison to the Moon's?**

A) Shorter.
B) The same.
C) Longer.

2 points

20. **The diagram below is the decay curve of a radioactive substance. Read the half life of the substance from the graph.**



A) 3 minutes.
B) 4 minutes.
C) 5 minutes.

2 points

PART TWO

Solve the following problems. Justify your answers by means of explanations, diagrams or calculations, depending on the nature of the problem. Make sure that the meaning of all notations used is clear.

1. A spring is suspended at one end, and an object of mass 2 kg is hung on the other end. As a result, the spring stretches by 10 cm. ($g = 10 \frac{m}{s^2}$)

a) Find the spring constant of the spring.

b) What work is needed to stretch the spring further by 5 cm?

a)	b)	Total
6 points	8 points	14 points

2. **In a cylinder of cross-section 1 dm^2, closed at one end, a tight-fitting piston encloses an air column of length 7 dm. We press the piston inwards until the force we are exerting on the piston reaches 400 N. During the compression, the temperature of the gas does not change. The external air pressure is 10^5 Pa.**

a) What pressure will we exert on the gas?

b) What will be the pressure of the gas then?

c) What will be the volume of the gas?

a)	b)	c)	Total
5 points	7 points	6 points	18 points

Solve only one of the problems 3/A and 3/B. Indicate your selection on the inside of the front cover!

3/A Astronomers in the 19th century studying the light of stars were surprised to observe that their spectra contained lines of characteristic arrangements. The first explanation of this phenomenon was provided by Bohr's model of the atom.

By referring to Bohr's model, explain how line spectra are formed.

18 points	

3/B **a) Electric cables are usually insulated, for example they are surrounded by plastic sheaths. What is the function of the insulation? What makes plastic a good material for that purpose? List two other insulating substances.**

b) What is the difference between insulation and shielding? Give an example of shielding.

a)	b)	Total
10 points	8 points	18 points

To be filled in by the teacher

	score attained	maximum score
I. Multiple Choice Questions		40
II. Extended Response Problems		50
TOTAL		**90**
Grade (percentage)		

teacher

	score attained elért pontszám	score input for program (programba beírt pontszám)
I. Multiple Choice Questions (Feleletválasztós kérdéssor)		
II. Extended Response Problems (Összetett feladatok)		

teacher (javító tanár)

registrar (jegyző)