

# **FIZIKA ANGOL NYELVEN PHYSICS**

## **KÖZÉPSZINTŰ ÍRÁSBELI VIZSGA STANDARD LEVEL WRITTEN EXAMINATION 2005. november 5., 8:00**

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 MINISZTERIUM MINISTRY OF EDUCATION**

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### Instructions to candidates

The time allowed for this examination paper is 120 minutes.

Read the instructions of the problems very carefully, and make sure that you do not run out of time.

You can 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 sheet 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

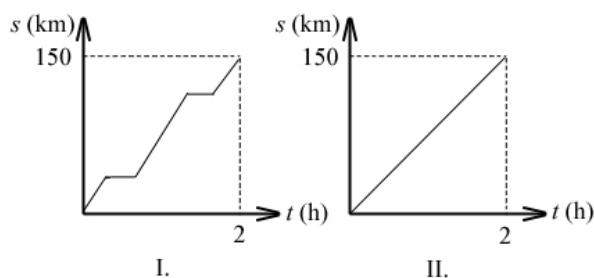
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## PART ONE

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

- 1. The graphs represent the motions of two vehicles. Which vehicle covered a greater distance in the time shown in the graphs?**



- A) Vehicle number I.  
 B) Vehicle number II.  
 C) They covered equal distances.

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2 points	
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- 2. How will our power change if we do three times as much work in three times as much time?**

- A) It will not change.  
 B) It will increase by a factor of three.  
 C) It will increase by a factor of nine.

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2 points	
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- 3. The specific heat of copper is three times that of lead. A copper tube and a lead tube of the same mass are heated to increase their temperatures by the same amount. What can be said about the heats required?**

- A) Three times as much heat is needed for the copper tube as for the lead tube.  
 B) Three times as much heat is needed for the lead tube as for the copper tube.  
 C) The same amount of heat is needed in each case.

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2 points	
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4. What percentage of radioactive  $^{14}\text{C}$  nuclei will decay in a time equal to twice the half life?

A) 75%  
B) 50%  
C) 25%

2 points	
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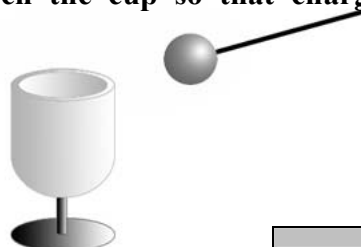
5. What is the condition for the accelerated motion of an object?

A) There must be no retarding force (e.g. friction) acting on the object.  
B) The direction of the velocity of the object must be the same as the direction of the net force acting on it.  
C) The net force acting on the object must NOT be 0.

2 points	
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6. In order to remove charge from an electrically charged metal cup mounted on an insulating base, the cup is touched with an uncharged metal sphere on an insulating handle. Where should the metal sphere touch the cup so that charge can be removed from the cup?

A) On the inside.  
B) On the outside.  
C) Anywhere. It does not make a difference.



2 points	
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7. Two objects are performing uniform circular motion at the same angular speed. Which of the statements below is correct for two such objects?

A) They always complete the same number of revolutions per second.  
B) They always have the same tangential speed.  
C) They always have the same centripetal acceleration.

2 points	
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**8. Which of the following statements are about wave phenomena. Which of them is FALSE?**

- A) Polarisation is a phenomenon that can be observed with transverse waves as well as longitudinal waves.
- B) Interference is a phenomenon that occurs when waves meet.
- C) The phenomenon of diffraction can be observed when waves encounter openings or obstacles comparable in size to their wavelengths.

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2 points	
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**9. Which of the following phenomena is explained by the corpuscular nature of light?**

- A) Diffraction.
- B) Polarisation.
- C) The photoelectric effect.

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2 points	
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**10. Which of the phenomena listed below can be interpreted in terms of the thermal agitation of molecules?**

- A) Air is rising above the radiator.
- B) After some time, the scent of perfume in an open bottle can be smelt at the far end of the room, too.
- C) In summer mornings the wind blows from the cool sea towards the warm land.

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2 points	
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**11. A film played in reverse appears funny because it shows events that would never occur in reality (e.g. the pieces of a broken glass would never unite to form a whole). Which important law is related to this experience of the direction of processes?**

- A) The first law of thermodynamics.
- B) The second law of thermodynamics.
- C) The law of energy conservation.

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2 points	
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**12. Why is it at dawn that dew forms?**

- A) Because that is when the water in the ground evaporates most.  
B) Because that is when plants evaporate most water.  
C) Because that is when air is cool enough for the vapour in it to condense.

2 points

**13. The resistance of the bulb of a car's parking light is  $37.5\ \Omega$ . The voltage of the car battery is 12 V. What current flows through the bulb when it is on?**

- A) 0.32 A.  
B) 3.125 A.  
C) 4.5 A.

2 points

**14. Two identical resistors are connected in series to a certain voltage. Then they are connected in parallel to the same voltage. In which case will the total power dissipated by the two resistors be larger?**

- A) When they are connected in series.  
B) When they are connected in parallel.  
C) The same power will be dissipated in each case.

2 points

**15. How many neutrons are there in a nucleus of the  $^{236}_{92}\text{U}$  isotope?**

- A) 144  
B) 236  
C) 328

2 points

**16. Which radiation is electrically neutral?**

- A)  $\alpha$  radiation.  
B)  $\beta$  radiation.  
C)  $\gamma$  radiation.

2 points

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**17. Which description of the operation of a transformer is correct?**

- A) The secondary voltage is greater than the primary voltage by the same factor as the ohmic resistance of the secondary coil is greater than that of the primary coil.
- B) The changing magnetic field of the alternating current flowing in the primary coil, induces voltage in the secondary coil.
- C) The iron core of the transformer provides the electrical connection between the primary and secondary coils.

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2 points	
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**18. Optical fibres are important parts of the endoscope used in medical diagnostics. On what principle does an optical fibre operate?**

- A) The walls of the fibre are coated with a reflecting material.
- B) The fibre has a coating that absorbs light.
- C) Light undergoes total internal reflection on the walls of the fibre.

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2 points	
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**19. The value of the gravitational acceleration of an object on the Earth is independent of the mass of the object. Is that true on other astronomical bodies, too?**

- A) Yes.
- B) No.
- C) Only on bodies of similar mass and size as the Earth.

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2 points	
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**20. Modern technology makes it possible to make astronomical observations with a telescope in orbit around the Earth. What is the advantage of that?**

- A) The telescope is much closer to the stars, thus they can be seen better.
- B) The atmosphere of the Earth does not disturb the observation.
- C) The telescope can be directed more accurately at the target of observation.

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2 points	
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## 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. The work function of an electron emitted from silver as a result of illumination is 0.69 aJ.**

- a) What is the minimum possible frequency of light that can eject an electron from the surface of silver? (The value of Planck's constant is  $6.63 \cdot 10^{-34}$  Js.)
- b) What kind of light may that be: infrared, visible or ultraviolet light?

a)	b)	Total
10 points	3 points	13 points



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**2. An electric immersion heater working at its operating voltage (voltage: 230 V, current: 2 A) is used for heating 4 litres of water for 12 minutes. (The specific heat of water is 4200 J/kg K.)**

- a) How much does the heating cost, given that the price of 1 kWh of electrical energy is 32.20 Ft?
- b) What will be the final temperature of the water, given that the heating is 90% efficient and the initial temperature of water is 20 °C?

a)	b)	Total
9 points	10 points	19 points

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

**3/A** In the physics lab, students were given the task of finding the spring constant  $D$  of a spring. Therefore they measured the force  $F$  required to stretch the spring of unknown spring constant by  $\Delta x$ . The data obtained are tabulated below.

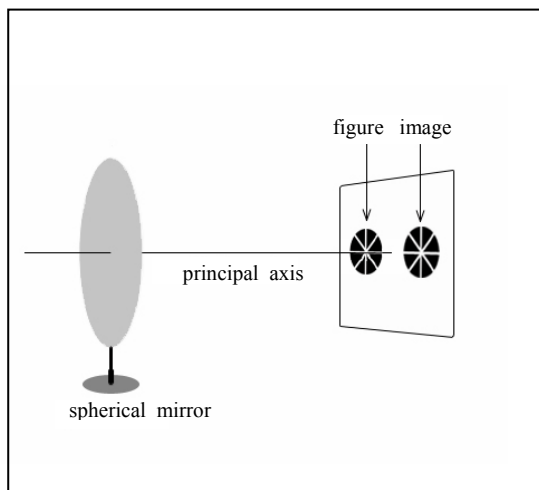
$\Delta x$ (m)	0.01	0.02	0.03	0.04	0.05	0.06	0.07
$F$ (N)	0.12	0.256	0.38	0.51	0.63	0.76	0.89

- Show that the data obtained are in accordance with the known relationship between the force and the deformation of the spring.
- Use the data to determine the value of the spring constant.
- Determine the work that has to be done to increase the extension of the spring from 3 cm to 7 cm.

a)	b)	c)	Total
9 points	3 points	6 points	18 points

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**3/B** A figure was drawn on a white sheet of paper, and the well-illuminated sheet was placed in front of a spherical mirror with a focal length of 20 cm. The sheet was then moved along the principal axis until – next to the figure drawn – a sharp image of the figure appeared on it.



- What kind of spherical mirror was used, concave or convex?
- Does the diagram show correctly the image that formed? That is, is the image really of the same size as the original figure?
- What is the distance of the screen from the mirror in this position?

a)	b)	c)	Total
8 points	6 points	4 points	18 points

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**To be filled in by the teacher**

	score attained	maximum score
I. Multiple Choice Questions		40
II. Extended Response Problems		50
<b>TOTAL</b>		<b>90</b>

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teacher

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

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teacher  
(javító tanár)

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registrar  
(jegyző)