

Physics I

011

23/11/2017

08.30AM – 11.30AM

**YEAR
2017**

ORDINARY LEVEL NATIONAL EXAMINATIONS, 2017

SUBJECT: PHYSICS I

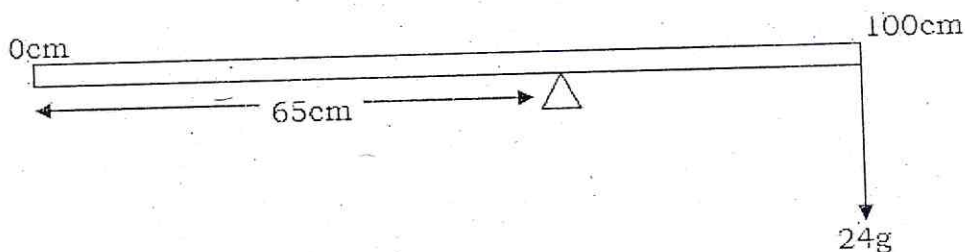
DURATION : 3 HOURS

INSTRUCTIONS:

- 1) Write your names and index number as they appear on your registration form and **DO NOT** write your names and index number on additional sheets of paper if provided.
- 2) Do not open this paper until you are told to do so.
- 3) This paper has **THREE** sections **A, B** and **C**.
SECTION A: This section is **compulsory**. (55 marks)
SECTION B: Attempt any **three** questions (30 marks)
SECTION C: Attempt **Only one** question. (15 marks)
- 4) Calculators and mathematical instruments may be used.
- 5) Use only a **blue** or **black pen** for writing and a pencil for drawing

SECTION A: Attempt all questions (55 marks)

- 1) a) The mass of fresh milk at 20°C is 103.5g and its volume is 100cm^3 . Calculate the density of fresh milk. (2 marks)
 b) Why is it useful to know the density of fresh milk. (1 mark)
- 2) a) What is the difference between distance and displacement of a moving body? (2 marks)
 b) A car starts from town A and travels 40km eastwards to town B and then travels 30km northwards from town B to town C. What is the displacement of the car from town A to town C? (2 marks)
- 3) a) Define the term "deceleration" of a moving body. (1 mark)
 b) A car slows down from 72km/h with a uniform deceleration of 2m/s^2 . How long will it take to reach 18km/h ? (3 marks)
- 4) A student with a mass of 40kg is running with a velocity of 2m/s .
 a) Calculate the kinetic energy of the student. (2 marks)
 b) What would be the kinetic energy of the student if the velocity was doubled? (2 marks)
- 5) a) Define the term "center of gravity of a body." (2 marks)
 b) A uniform meter rule is balanced by the mass of 24g at 100cm mark while the pivot is at 65cm mark. Calculate the mass of the meter rule. (2 marks)



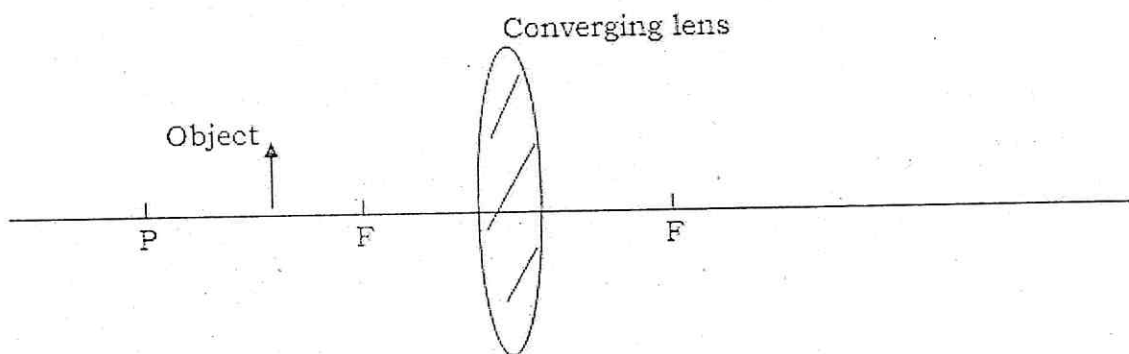
- 6) Two strings at right angle to each other support an object O of weight W . If the forces in the strings are 12N and 5N ; calculate the weight W of the object. (4 marks)
- 7) a) State "Archimedes's Principle." (2 marks)
 b) What is meant by the term "upthrust?" (2 marks)
- 8) a) What is meant by the term "viscosity?" (2 marks)
 b) What effect does soap have on the surface tension of water? (2 marks)
- 9) a) What is meant by the term "temperature" of a substance? (2 marks)
 b) State two applications of temperature. (2 marks)
- 10) Read each statement below and write "TRUE" if it is correct or "FALSE" if it is wrong.
 a) Luminous objects radiate light. (1 mark)
 b) Shadows and eclipses are due to the rectilinear propagation of light. (1 mark)
 c) Beams of light are parallel and divergent only. (1 mark)
 d) The image formed in a pin-hole camera is erect (upright). (1 mark)
- 11) a) State Ohm's law. (2 marks)
 b) Explain why:
 (i) The ammeter measuring current is placed in series in a circuit. (1 mark)
 (ii) The voltmeter measuring potential difference is placed in parallel with the circuit. (1 mark)

12) Read each statement below and write "TRUE" if it is correct and "FALSE" if it is wrong.

- a) Like electric charges repel and unlike charges attract. (1 mark)
 - b) An example of a conductor of electricity is a human body. (1 mark)
 - c) Insulators of electricity allow charges to flow through them. (1 mark)
 - d) A pointed charged conductor has a low density charge at the point. (1 mark)
- 13) a) Use the domain theory of magnetism to explain the magnetic behaviour of iron. (2 marks)
- b) State the difference between the magnetic properties of iron and steel. (2 marks)
- 14) List the energy changes which occur in each of these cases below:
- a) A match stick is struck. (1 mark)
 - b) An electric lamp bulb is switched on. (1 mark)
 - c) Dry cells in a torch when the torch is switched on. (1 mark)
 - d) A telephone ear piece when two people are talking on telephones. (1 mark)

SECTION B: Attempt three questions only (30 marks)

- 15) a) State "heat effects" (2 marks)
- b) Explain why the cooling unit (freezer) inside a refrigerator is placed near the top but an electric immersion heater in water tank should be near the bottom of vessel being used to heat the water. (4 marks)
- c) A clinical thermometer needs to be an accurate maximum thermometer. Briefly explain how two basic requirements are achieved. (4 marks)
- 16) a) Draw a converging lens and show how it refracts an incident parallel beam of light. (2 marks)
- b) Define the term "focal length" of a lens. (1 mark)
- c) What does the power of a lens depend on? (1 mark)
- d) Copy the diagram below and use rays to show how the image of the object is formed in a converging lens. State the properties of this image. (5 marks)



- e) State one application of a converging lens. (1 mark)
- 17) a) State any two effects of electric current. (2 marks)
- b) What is a **Coulomb**? (1 mark)
- c) A steady current of 4A flows for 5 seconds. Find the total charge passing any point in the circuit. (1 mark)
- d) What effect does increase in temperature have on the resistance of the filament of a torch bulb? (1 mark)

c) A student is given a 12V lamp and decides to measure the resistance of the lamp filament using the voltmeter-ammeter method. The student decides to apply various voltages to the lamp and to measure the current in each case.

- (i) Draw a circuit diagram and show clearly, where the voltmeter and ammeter are placed in the circuit. (2 marks)
- (ii) Two of the student's results are:

| Voltmeter reading/ V | Ammeter reading/A |
|----------------------|-------------------|
| 2.0 | 1.0 |
| 12 | 2.0 |

Calculate the resistance of the lamp filament in each case. (2 marks)

(iii) Explain why the resistance of the lamp filament is different in the two cases. (1 mark)

- 18) a) Explain why two steel needles hanging from the N pole of a magnet are not parallel. (2 marks)
- b) A bar magnet is heated. State the effect of its (the bar magnet) magnetic properties. How does the domain theory of magnetism explain this effect? (2 marks)
- c) What is a place where there is no magnetic field called? (1 mark)
- d) The north pole N of a compass needle points to geographical north. Since like poles repel each other, how do you explain this fact? (3 marks)
- 19) a) What is the difference between force and pressure? (3 marks)
- b) State the principle of transmission of pressure in fluids. (2 marks)
- c) With the aid of two labelled diagrams describe and explain the action of a "crushing can experiment." (5 marks)

SECTION C: Attempt only one question in this section (15 marks)

20) In an experiment to determine the acceleration due to gravity g of a falling ball-bearing; the following results were obtained:

| Time, t/s | t^2/s^2 | Distance, h/m |
|-------------|-----------|-----------------|
| 1 | | 5 |
| 2 | | 20 |
| 3 | 9 | 45 |
| 4 | | 80 |
| 5 | | 125 |

- a) Copy the above table and complete the missing values of t^2 . (2 marks)
- b) Plot the graph of distance h against time t^2 . (9 marks)
- c) Find the slope, S of the graph showing clearly how you get your answer. (3 marks)
- d) State the acceleration of gravity g . (1 mark)

- 21) In an experiment to determine the specific heat capacity of a substance **c**, the following results were obtained:

| Temperature, $t/^{\circ}\text{C}$ | Quantity of heat, Q/J |
|-----------------------------------|--------------------------------|
| 5 | 200 |
| 10 | 400 |
| 15 | 600 |
| 20 | 800 |
| 25 | 1000 |
| 30 | 1200 |

- a) Plot the graph of quantity of heat **Q** against temperature, **t**. (9 marks)
- b) From the graph, find the gradients **S** of the graph showing clearly how you get your answer. (3 marks)
- c) Use the formula **S = mc** to determine the specific heat of substance **c**. take mass **m**, of the substance to be 20g. (3 marks)

END

PHYSICS I ANSWER GUIDE

ORDINARY LEVEL NATIONAL EXAMINATIONS, 2017

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|--|--|
| <p>1. a) The density of fresh milk at $20^{\circ}\text{C} = \frac{103.5\text{g}}{100\text{cm}^3}$ = $1.035\text{g}/\text{cm}^3$</p> <p>b) Density of milk shows that it is pure milk. Density of milk ranges from $1027 - 1033\text{kg}/\text{m}^3$</p> | <p>2. a) Displacement is distance moved in a specific direction while Distance is length travelled in any direction.</p> <p>b) Displacement of the car from Town A to C = $\sqrt{(30^2 + 40^2)} \text{ km} = 50\text{km}$</p> |
| <p>5. a) Deceleration is the rate of decrease of velocity with time</p> <p>b) $u = 72\text{km}/\text{h} = 20\text{m}/\text{s}$, $v = 18\text{km}/\text{h} = 5\text{m}/\text{s}$ and $a = -2\text{m}/\text{s}^2$.</p> <p>From the formula; $v = u + at$, $5\text{m}/\text{s} = 20\text{m}/\text{s} + (-2\text{m}/\text{s}^2)t$</p> $t = \frac{5-20}{-2} \text{ s} = 7.5\text{s}$ <p>The car will take 7.5s to reach a velocity of 18km/h</p> | <p>4. a) Kinetic energy of the student = $\frac{1}{2}mv^2$ = $\frac{1}{2} \times 40 \times 2^2 \text{ J}$ = 80 J</p> <p>b) The kinetic energy of the student would increase four times i.e. = $\frac{1}{2} \times 40 \times (2 \times 2)^2 \text{ J} = 320 \text{ J}$</p> <p>5. a) Center of gravity of a body is the point through which its total weight acts.</p> <p>b) Let the mass of the meter rule be m, then $m \times (65 - 50) = 24 \times (100 - 65)$ so $m = \frac{24 \times 35}{15}$; $g = 56\text{g}$</p> |