

Physics I

011

23/11/ 2017 08.30 AM - 11.30 AM



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 question 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)**

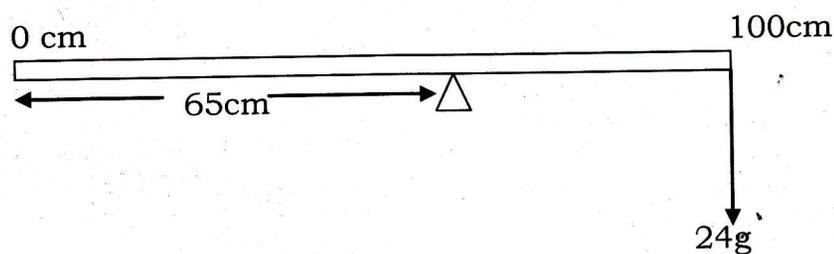
SECTION B : Attempt any **three** questions. **(30 marks)**

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 (55marks)

- 1) a) The mass of fresh milk at 20°C is 103.5g and its volume is 100cm³. Calculate the density of the fresh milk. **(2marks)**
b) Why is it useful to know the density of fresh milk? **(1mark)**
- 2) a) What is the difference between distance and displacement of a moving body? **(2marks)**
b) A car starts from town A and travels 40 km eastwards to town B and then travels 30 km northwards from town B to town C. What is the displacement of the car from town A to town C? **(2marks)**
- 3) a) Define the term "deceleration" of a moving body. **(1mark)**
b) A car slows down from 72km/h with a uniform deceleration of 2m/s². How long will it take to reach 18km/h? **(3marks)**
- 4) A student with a mass of 40kg is running with a velocity of 2m/s.
a) Calculate the kinetic energy of the student. **(2marks)**
b) What would be the kinetic energy of the student if the velocity was doubled? **(2marks)**
- 5) a) Define the term "centre of gravity of a body". **(2marks)**
b) A uniform metre rule is balanced by the mass of 24g at 100cm mark while the pivot is at 65cm mark. Calculate the mass of the metre rule. **(2marks)**



- 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. **(4marks)**

$KE = mv^2$
 $PE = mgh$

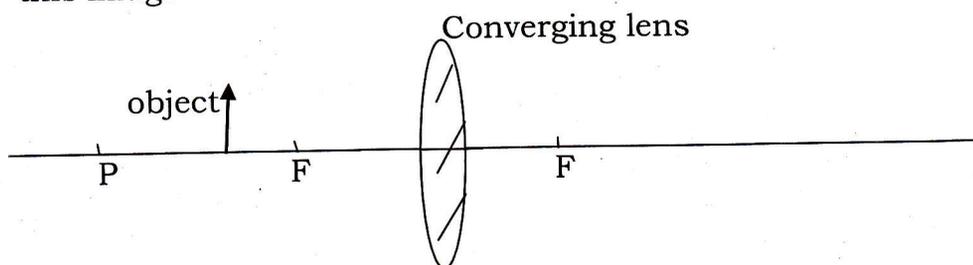
*W**

- 7) a) State "Archimedes's Principle". **(2marks)**
b) What is meant by the term "upthrust"? **(2marks)**
- 8) a) What is meant by the term "viscosity"? **(2marks)**
b) What effect does soap have on the surface tension of water? **(2marks)**
- 9) a) What is meant by the term "temperature" of a substance? **(2marks)**
b) State two applications of temperature. **(2marks)**
- 10) Read each statement below and write "TRUE" if it is correct or "FALSE" if it is wrong.
- a) Luminous objects radiate light. **(1mark)**
b) Shadows and eclipses are due to the rectilinear propagation of light. **(1mark)**
c) Beams of light are parallel and divergent only. **(1mark)**
d) The image formed in a pin-hole camera is erect (upright). **(1mark)**
- 11) a) State Ohm's law. $V = I \times R$ **(2marks)**
b) Explain why:
(i) The ammeter measuring current is placed in series in a circuit. **(1mark)**
(ii) The voltmeter measuring potential difference is placed in parallel with the circuit. **(1mark)**
- 12) Read each statement below and write "TRUE" if it is correct and "FALSE" if it is wrong.
- a) Like electrical charges repel and unlike charges attract. **(1mark)**
b) An example of a conductor of electricity is a human body. **(1mark)**
c) Insulators of electricity allow charges to flow through them. **(1mark)**
d) A pointed charged conductor has a low density charge at the point. **(1mark)**

- 13) a) Use the domain theory of magnetism to explain the magnetic behaviour of iron. **(2marks)**
- b) State the difference between the magnetic properties of iron and steel. **(2marks)**
- 14) List the energy changes which occur in each of the cases below:
- a) A match stick is struck. **(1mark)**
- b) An electric lamp bulb is switched on. **(1mark)**
- c) Dry cells in a torch when the torch is switched on. **(1mark)**
- d) A telephone ear piece when two people are talking on telephones. **(1mark)**

SECTION B : Attempt three questions only (30marks)

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



*Cool
coldest*



- e) State one application of a converging lens. (1mark)
- 17) a) State any two effects of electric current. (2marks)
- b) What is the **Coulomb**? $F = \frac{1}{4\pi\epsilon_0} \times \frac{q_1 \times q_2}{d^2}$ (1mark)
- c) A steady current of 4A flows for 5seconds. Find the total charge passing any point in the circuit. (1mark)
- d) What effect does increase in temperature have on the resistance of the filament of a torch bulb? (1mark)
- e) 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. (2marks)
- (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. (2marks)
- (iii) Explain why the resistance of the lamp filament is different in the two cases . (1mark)
- 18) a) Explain why two steel needles hanging from the N pole of a magnet are not parallel. (2marks)
- b) A bar magnet is heated. State the effect on its (the bar magnet) magnetic properties. How does the domain theory of magnetism explain this effect? (4marks)
- c) What is a place where there is no magnetic field called? (1mark)
- 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? (3marks)

- 19) a) What is the difference between force and pressure? **(3marks)**
- b) State the principle of transmission of pressure in fluids. **(2marks)**
- c) With the aid of two labelled diagrams describe and explain the action of a “crushing can experiment”. **(5marks)**

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

- 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	t²/s²	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 **t²**. **(2marks)**
- b) Plot the graph of distance **h** against time **t²**. **(9marks)**
- c) Find the slope, **S** of the graph showing clearly how you get your answer. **(3marks)**
- d) State the acceleration of gravity **g**. **(1mark)**

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

Temperature , t/°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**. **(9marks)**
- b) From the graph, find the gradient **S** of the graph showing clearly how you get your answer. **(3marks)**
- c) Use the formula **S = m c** to determine the specific heat of substance **c**. Take mass **m** , of the substance to be 20g. **(3marks)**