

Physics I

010

16 Nov.2012 8.30am 11. 30am

REPUBLIC OF RWANDA



RWANDA EDUCATION BOARD (REB)

ORDINARY LEVEL NATIONAL EXAMINATIONS 2012

SUBJECT : PHYSICS I

DURATION : 3 HOURS

INSTRUCTIONS:

This paper consists of **three** sections **A, B** and **C**.

Attempt **all** questions in section **A**. **(55 marks)**

Answer **any three** questions in section **B**. **(30 marks)**

Answer **only one** question in section **C**. **(15 marks)**

You may use a calculator and a mathematical instrument.

Use only a blue bic pen and a pencil for drawing only.

No other ink is allowed.

SECTION A: ATTEMPT ALL QUESTIONS (55 MARKS)

1. State three characteristics of magnetic field lines. **(3marks)**
2. Find the magnitude of force which produces a moment of 200Nm about a fulcrum at a distance of 5.0 m from the line of action of the force. **(3marks)**
3. Why is a stool made with outwards slanting legs? **(3marks)**
4. Why is a convex mirror used as a side mirror on motor cars? **(3marks)**
5. A man lifts a weight of 300N through a vertical height of 5m in 10 seconds. Determine the man's power. **(3marks)**
6. Explain, using the kinetic theory, why the pressure of air inside a car tyre increases on a hot day. **(4marks)**
7. (a) Why is the density of rain water less than that of ocean water? **(2marks)**
(b) Calculate the density of a substance whose mass is 180g and volume 200cm³. **(2marks)**
8. (a) What is meant by the term force? **(2marks)**
(b) A force of 80N acts on a body and produces an acceleration of 2m/s². What is the mass of the body? **(2marks)**
9. (a) What happens to water when it is heated
(i) from 0°C to 4°C ? **(1mark)**
(ii) from 4°C to 100°C? **(1mark)**
(b) At what temperature does water have maximum density? Explain your answer. **(2marks)**
10. A battery of e.m.f 1.5V and internal resistance, r , is connected in series with a 4Ω resistor. The current in the circuit is 0.3A. Sketch a diagram to show this connection and calculate the internal resistance, r , of the battery. **(4marks)**
11. (a) State the principle of floatation. **(1mark)**
(b) Why does a balloon full of hydrogen gas rise when released? **(3marks)**
12. The table below shows speeds of a car accelerating on a straight road.

Time/s	0	1	2	3	4
Speed/ms ⁻¹	0	6	12	18	24

- (a) What is the acceleration of the car? **(1mark)**
(b) Is the acceleration non-uniform? **(1mark)**
(c) What distance does the car travel in 5 seconds? **(2marks)**

13. (a) Why is water used to cool engines and radiators of vehicles? **(2marks)**
 (b) How much heat is needed to raise the temperature by 20°C of 4kg of a substance of specific heat capacity $300\text{J/kg}^{\circ}\text{C}$? **(2marks)**
14. (a) What is the coulomb ? **(2marks)**
 (b) The current through a conductor is 6A . What is the charge which passes in 2 seconds? **(2marks)**
15. With aid of a diagram explain why it is possible to drink fanta from a fanta bottle using a drinking straw? **(4marks)**

SECTION B: ATTEMPT ANY THREE QUESTIONS. (30marks)

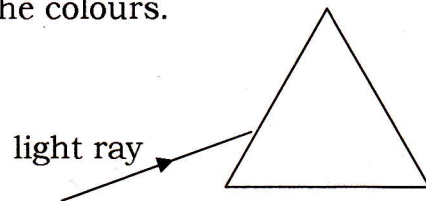
16. (a) What is meant by specific latent heat of vaporization? **(2marks)**
 (b) State two factors which affect the boiling point of water. **(2marks)**
 (c) Calculate the heat required to convert 0.9kg of water at 100°C to steam. Specific latent heat of vaporization of water = $2.26 \times 10^6 \text{ J/Kg}$. **(3marks)**
 (d) What is the difference between boiling and evaporation? **(3marks)**
17. (a) Differentiate a concave lens from a convex lens. **(3marks)**
 (b) What is meant by principal axis of a lens? **(2marks)**
 (c) An object is placed between the principal focus of a convex screen. Sketch a diagram to show the image formed and state characteristics of this image. **(5marks)**
18. (a) Which property of transmission of pressure in liquids is used in hydraulic press and hydraulic car brakes ? **(1mark)**
 (b) What is the other unit of pressure that is the same as 1N/m^2 ? **(1mark)**
 (c) Name the instrument that is used to measure the pressure of the atmosphere and which does not contain a liquid? **(1mark)**
 (d) A hydraulic press has a large circular piston of radius 80 cm and a circular plunger of radius 10cm. A force of 200N is exerted by the plunger.
 (i) Find the force exerted on the piston. **(6marks)**
 (ii) State one reason why the weight of the load just raised by the piston is less than the force obtained. **(1mark)**
19. (a) What is the use of a fuse in an electric circuit ? **3marks)**
 (b) Draw a diagram showing an electric circuit consisting of one battery of voltage 1.5 V, two parallel lamps and an ammeter to read the total current flow in the circuit. Calculate the current if the resistance of each lamp is 3Ω . **(7marks)**

20. (a) What is meant by dispersion of light? **(2marks)**

(b) Explain how a rainbow is formed. **(3marks)**

(c) The diagram below is a glass prism. A beam of white light strikes the face of a prism as shown. Copy the diagram below and show how the white light is splits into its component colours.

Label the colours. **(5 marks)**



SECTION C: ATTEMPT ONLY ONE QUESTION. (15marks)

21. A student carried out an experiment to determine the electrical resistance, R , of six lengths, L , of a wire. R is measured in Ohms and L is measured in metres. Below are the results obtained.

L/M	5.0	6.0	7.0	8.0	9.0	10.0
R/Ω	2.0	2.4	2.8	3.2	3.8	4.0

(a) Plot the graph of R against L (plot R **along y-axis** and L **along x-axis**). **(9marks)**

(b) Determine the slope (gradient) of the graph. Show on the graph how you determine the slope. **(4marks)**

(c) Use the results from (b) above to calculate resistivity of the wire, P , given that $R = \frac{\rho L}{A}$ and cross section area of the wire $L = 0.50\text{mm}^2$. **(2marks)**

22. A student heated 5.0kg of water in a copper calorimeter. The student recorded the time and corresponding temperature. The table below shows the results obtained.

Time/Minutes	4	5	6	7	8	9
Temperature/$^{\circ}\text{C}$	36	40	45	49	54	57

(a) Plot a graph of temperature (**along y-axis**) against time (**along x-axis**). **(9marks)**

(b) From the graph, determine room temperature. **(1mark)**

(c) Use the graph to determine the rate of temperature change. **(5marks)**