Name..... Index No...../.....

232/1
PHYSICS
Paper 1
(THEORY)
Oct./Nov. 2014
2 hours

Candidate's Signature.....

Date.....

THE KENYA NATIONAL EXAMINATIONS COUNCIL

Kenya Certificate of Secondary Education

PHYSICS

Paper 1

(THEORY)

2 hours

Instructions to candidates

(a) *Write your name and index number in the spaces provided above.*
(b) *Sign and write the date of examination in the spaces provided above.*
(c) *This paper consists of **two** sections; **A** and **B**.*
(d) *Answer **all** the questions in sections **A** and **B** in the spaces provided.*
(e) ***All** working **must** be clearly shown.*
(f) *Silent non programmable electronic calculators may be used.*
(g) ***This paper consists of 13 printed pages.***
(h) ***Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.***
(i) ***Candidates should answer the questions in English.***

For Examiner's Use Only

Section	Question	Maximum Score	Candidate's Score
A	1 - 14	25	
B	15	11	
	16	11	
	17	12	
	18	10	
	19	11	
Total Score		80	

SECTION A: (25 marks)

*Answer **ALL** the questions in this section in the spaces provided.*

1 A student measured the length of a wire four times using a metre rule and obtained the following readings: 18.6 cm; 18.5 cm; 18.6 cm and 18.5 cm. Determine the length the student should record. (2 marks)

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2 **Figure 1** shows a magnified scale of a micrometer screw gauge.

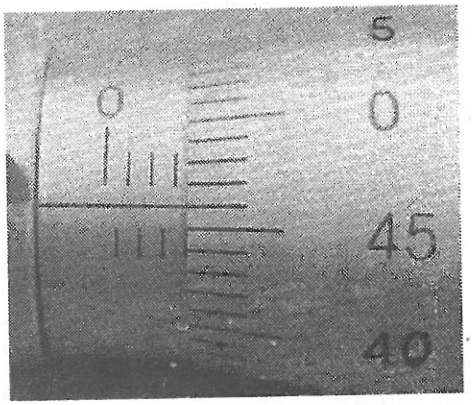

Figure 1

Record the reading indicated. (1 mark)

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3 State the reason why it is **not correct** to quote the weight of solid objects in kilograms. (1 mark)

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4 **Figure 2** shows a section of a curved surface **ABCD**. Point **A** is higher than point **B** while **BCD** is horizontal. Part **ABC** is smooth while **CD** is rough. **A** mass **m** is released from rest at **A** and moves towards **D**.

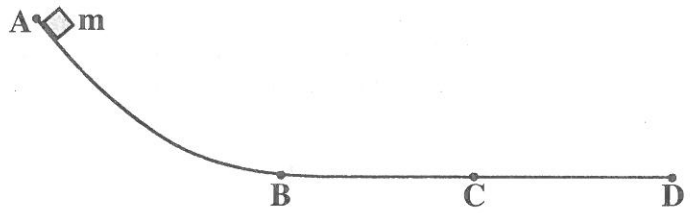

Figure 2

State the changes in the velocity of **m** between:

(a) **B** and **C**; (1 mark)

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(b) **C** and **D**. (1 mark)

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5 **Figure 3** shows two cylinders of different cross-sectional areas connected with a tube. The cylinders contain an incompressible fluid and are fitted with pistons of cross-sectional areas 4 cm^2 and 24 cm^2.

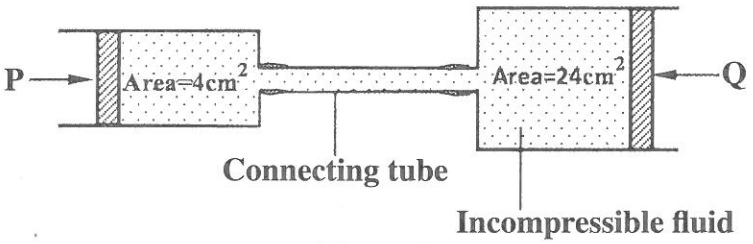

Figure 3

Opposing forces **P** and **Q** are applied to the pistons such that the pistons do not move. If the pressure on the smaller piston is 5 N cm^{-2}. Determine force **Q**. (2 marks)

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6 An oil drop of volume V m^3 introduced on the surface of water spreads to form a patch whose area is A m^2. Derive an expression for obtaining the diameter, d of a molecule of oil.

(2 marks)

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7 **Figure 4** shows a source of heat placed at equal distances from two identical flasks **X** and **Y** containing air. The surface of **X** is painted black while **Y** is clear.

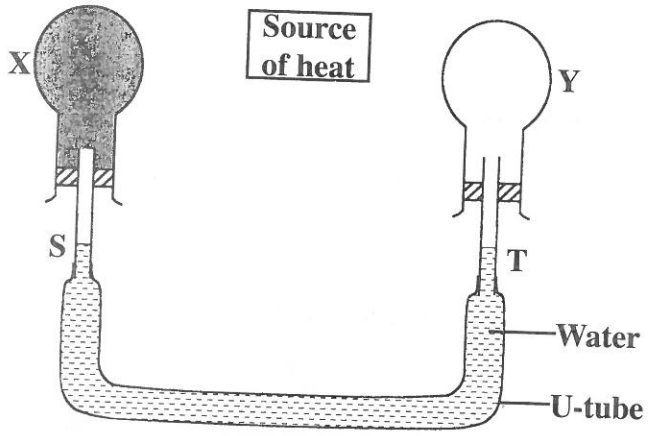

Figure 4

X and **Y** are linked by a U-tube filled with water whose levels **S** and **T** are initially the same. It is later observed that **S** falls while **T** rises. Explain this observation. (2 mark)

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8 **Figure 5** shows a uniform rod 4 m long and of mass 2 kg. It is pivoted 1 m from one end and balanced horizontally by a string attached near the other end.

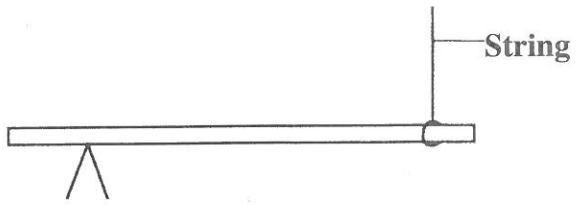

Figure 5

Determine the position where a mass of 5 kg should be placed on the rod so that the rod remains horizontal and the tension in the string is zero. (3 marks)

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9 **Figure 6** shows two identical rods **JK** and **LK** connected with a hinge at **K**.

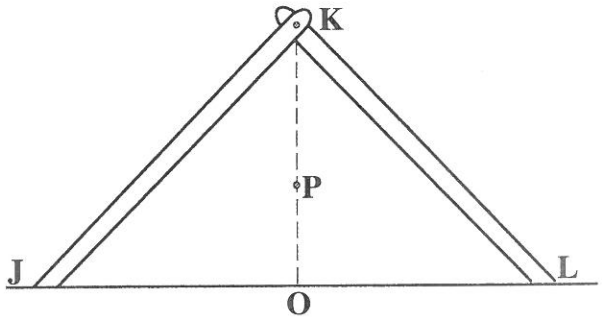

Figure 6

The position of the centre of gravity for the system is at **P**. The arrangement is now adjusted so that **J** and **L** move equal distances towards **O**. Sketch the new arrangement on the same diagram and mark the new position of the centre of gravity. (2 marks)

10 A light spiral spring extends by 4 mm when loaded with a weight W. The spring is connected in series with an identical spring. The combination is loaded with the weight W. Determine the extension of the combination. (2 marks)

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11 **Figure 7** shows an incompressible fluid flowing through a pipe, A_1 and A_2 are the cross-sectional areas of the pipes in the larger section and smaller section of the pipe respectively, while V_1 and V_2 are speeds of the fluid at the two sections of the pipe.

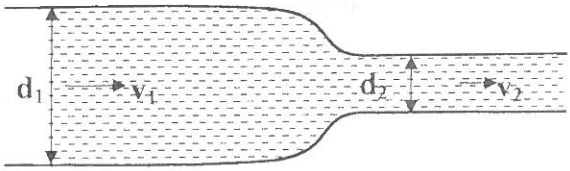

Figure 7

Derive an expression for the ratio of the speeds $\frac{V_2}{V_1}$ in terms of A_1 and A_2. (2 marks)

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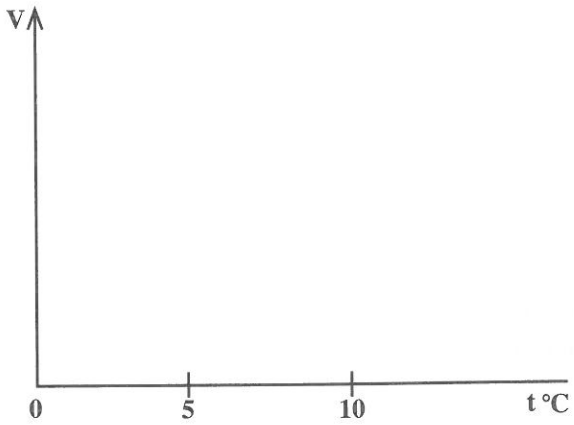
12 On the axis provided, sketch the graph which shows the relationship between volume and temperature of a fixed mass of water in the temperature range 0°C to 10°C. (1 mark)



13 **Figure 8** shows a graph of the variation of temperature with time for a pure substance heated at a constant rate.

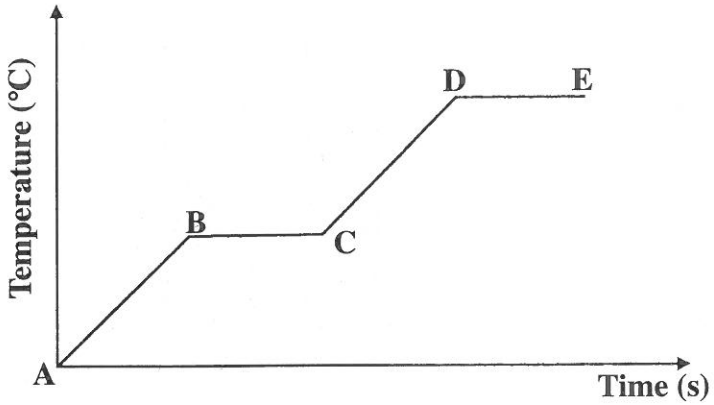


Figure 8

Assuming that heat transfer to the surroundings is negligible, state the changes observed on the substance in region:

(a) **BC**; (1 mark)

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(b) **DE**. (1 mark)

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14 In a smoke cell experiment to demonstrate Brownian motion, smoke particles are seen moving randomly. State the cause of the randomness. (1 mark)

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SECTION B: (55 marks)

*Answer **all** the questions in this section in the spaces provided.*

15 **Figure 9** shows a velocity-time graph for the motion of a body of mass 2 kg.

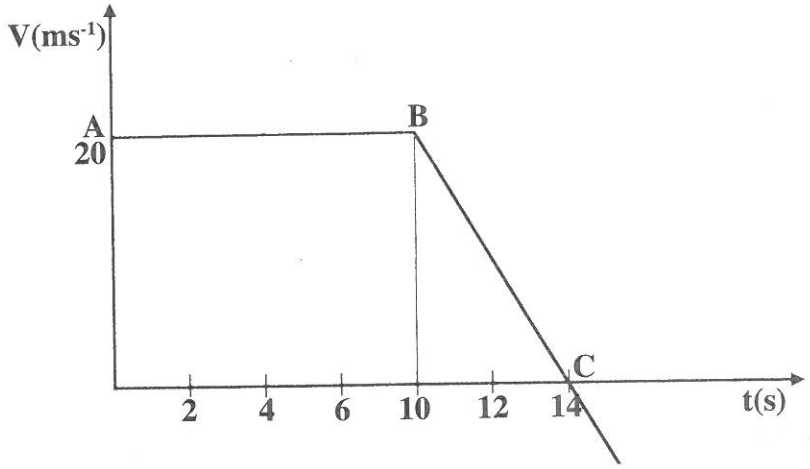

Figure 9

(a) Use the graph to determine the:

(i) displacement of the body after 8 seconds. (3 marks)

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(ii) acceleration after point **B**; (3 marks)

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(iii) force acting on the body in part (a) (ii). (3 marks)

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(b) Sketch a displacement-time graph for the motion from point **A** to **C**. (2 marks)

16 **Figure 10** shows a trolley of weight 20 N pulled by a force of 4 N from the bottom to the top of an inclined plane at a uniform speed.

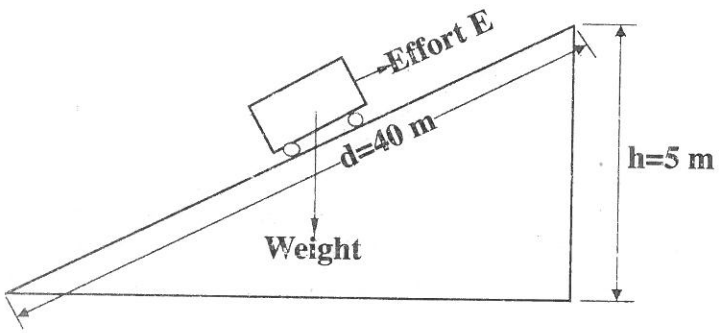

Figure 10

(a) (i) State the value of the force acting downwards along the inclined plane. (1 mark)

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(ii) Explain how the value in part (a) (i) is obtained. (2 marks)

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(b) For the system, determine the:

(i) mechanical advantage; (3 marks)

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(ii) velocity ratio; (3 marks)

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(iii) efficiency. (2 marks)

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17 (a) A long horizontal capillary tube of uniform bore sealed at one end contains dry air trapped by a drop of mercury. The length of the air column is 142 mm at 17°C. Determine the length of the air column at 25°C. (3 marks)

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(b) The pressure of the air inside a car tyre increases if the car stands out in the sun for some time on a hot day. Explain the pressure increase in terms of the kinetic theory of gases. (3 marks)

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(c) In an experiment to determine the specific latent heat of vapourization of water, steam of mass 10 g at 100°C is passed into 100 g of water initially at 20°C in a container of negligible heat capacity. The temperature of the water rises to 70°C.
(Take the specific heat capacity of water as 4.2×10^3 *J kg^{-1} K^{-1} and the boiling point of water as 100°C)*

(i) Determine the specific latent heat of vapourization of water. (4 marks)

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(ii) State **two** sources of error in this experiment. (2 mark)

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18 (a) When a bus goes round a bend on a flat road, it experiences a centripetal force. State what provides the centripetal force. (1 mark)

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(b) State the purpose of banking roads at bends. (1 mark)

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(c) A student whirls a stone of mass 0.2 kg tied to a string of length 0.4 m in a vertical plane at a constant speed of 2 revolutions per second.
(Take acceleration due to gravity g as 10 ms^{-2})

(i) State **two** forces acting on the stone when it is at the highest point. (2 marks)

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(ii) Determine the:

I angular velocity of the stone; (3 marks)

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II tension in the string when the stone is at the highest point; (3 marks)

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19 **Figure 11** shows a test–tube whose cross-sectional area is 2 cm^2 partially filled with lead shot floating vertically in water.

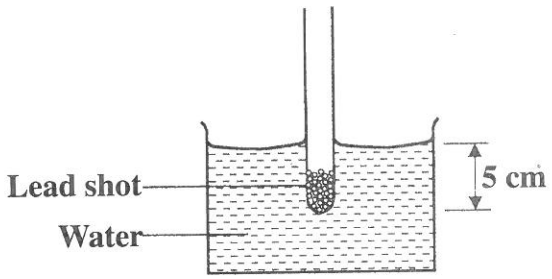

Figure 11

(Take gravitational acceleration as 10 ms^{-2} and density of water ρ_w as 1 g cm^{-3})

(a) (i) Determine the:

I volume of the water displaced; (2 marks)

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II weight of water displaced. (3 marks)

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(ii) State the combined weight of the test–tube and the lead shot. (1 mark)

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(iii) Determine the length of the test–tube that would be submerged in a liquid of density 0.8 g cm^{-3}. (4 marks)

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(b) The set up in **figure 11** can be used as a hydrometer to measure densities of liquids. State how such a hydrometer would be improved to measure small differences in densities of liquids. (1 mark)

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