Name: …… Index No. ……

School: ……. Candidate's Sign. …….....

Date: …….....

232/1
PHYSICS THEORY
PAPER 1

MARCH/APRIL 2020
TIME: 2 HOURS

ARISE AND SHINE TRIAL 1 EXAM

MARCH/APRIL - 2020

INSTRUCTIONS TO THE CANDIDATES:

- Write your **name and index number** in the spaces provided above.
- This paper consists of TWO sections; **A** and **B.**
- Answer ***ALL*** the questions both in section **A** and **B** in the spaces provided below each question.
- **ALL** workings ***MUST*** be clearly shown; marks may be awarded for correct steps even if the answers are wrong.
- Mathematical tables and silent electronic calculators may be used.
- Candidate Must check the question paper to ensure that all the pages are printed as indicated and that no questions are missing.
- Take: Acceleration due to gravity=10m/s^2 Density of water = 1g/cm^3 and Pull of gravity =10kg/N.
- This paper consists of 10 printed pages.

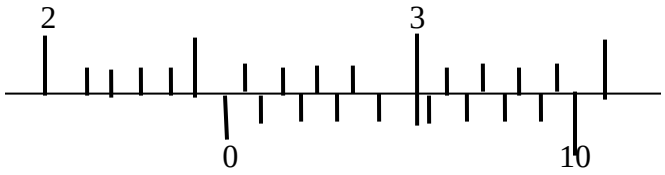
For Examiners' Use Only

SECTION	QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
Section A	1-10	25	
Section B	11	11	
	12	12	
	13	13	
	14	8	
	15	14	
	TOTAL	80	

SECTION A (25 MARKS)

Answer all questions in this section in the spaces provided

1. The Vernier calipers in the figure below has a zero error of -0.05cm. It was used to measure the diameter of an object and the reading was as shown.



(a). Determine the actual diameter of the object. (2 marks)

_____

(b). In an experiment to determine the density of Liquid **G**, a student obtained the following data:

- Mass of an empty density bottle = 35.0g
- Mass of the density bottle + water = 60.0g
- Mass of the density bottle + Liquid G = 53.5g

Determine the density of Liquid G. (density of water is 1g cm^{-3}) (3 marks)

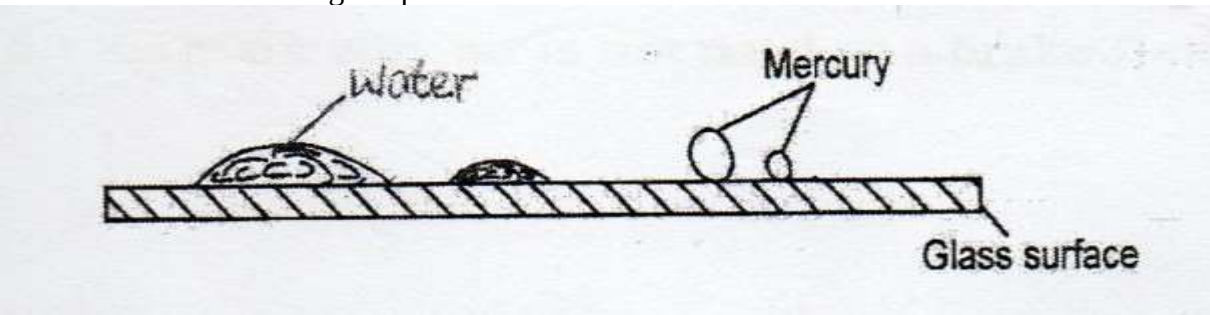
_____

_____

_____

_____

2. The figure below shows the shapes formed when drops of water and mercury are placed on the surface of a clean glass plate.



Explain the difference in the shapes (2 marks)

_____

_____

3. State the possible reason why if water is used as a barometric liquid, the glass tube to hold the column of the liquid is longer (1 mark)

_____

_____

4. A beaker is filled completely with water. A spoon full of common salt is added slowly. The salt dissolves and the water does not overflow. State the reason why water does not overflow. (1 mark)

_____

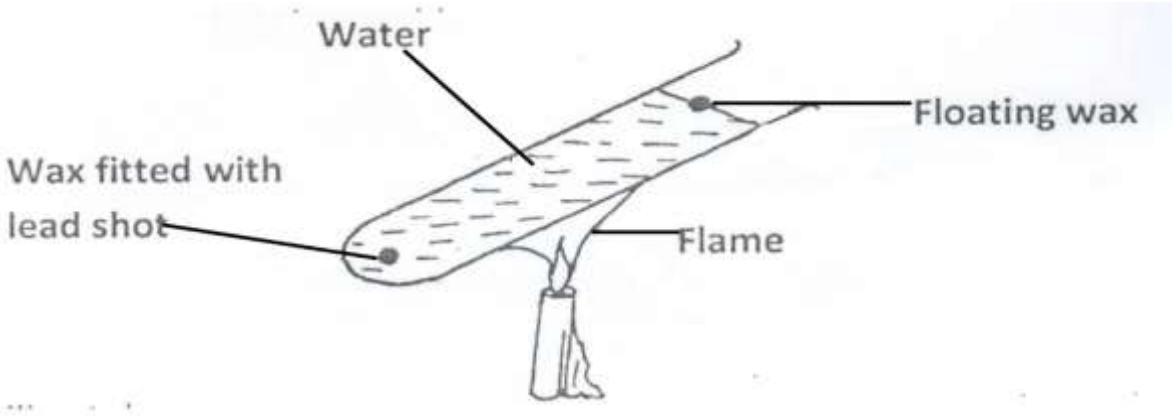
_____

5. Explain one advantage of mercury over alcohol as a thermometric liquid. (2 marks)

_____

_____

6. A form one student set up the apparatus as shown below.



The boiling tube was heated in the middle as shown.

(i). Which wax melted first? (1 mark)

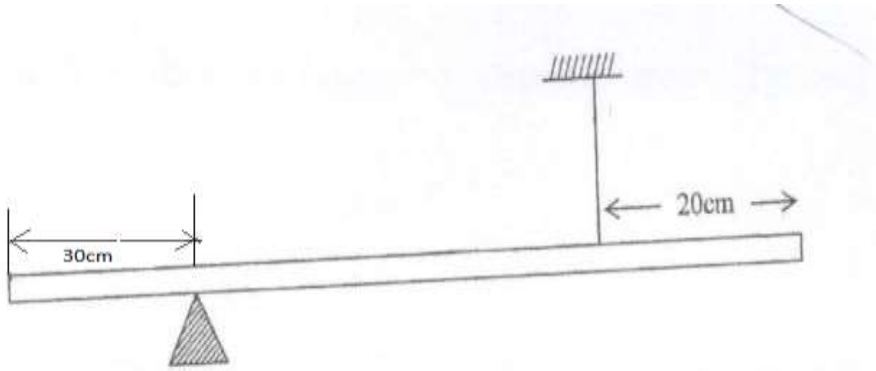
_____

(ii). Explain your answer in (i) above. (2 marks)

_____

_____

7. The figure below shows a uniform bar of length 1.4m pivoted near one end. The bar is kept in equilibrium by a string as shown.



Given that the weight of the bar is 1.5N, determine the tension in the string. (3 marks)

_____

_____

_____

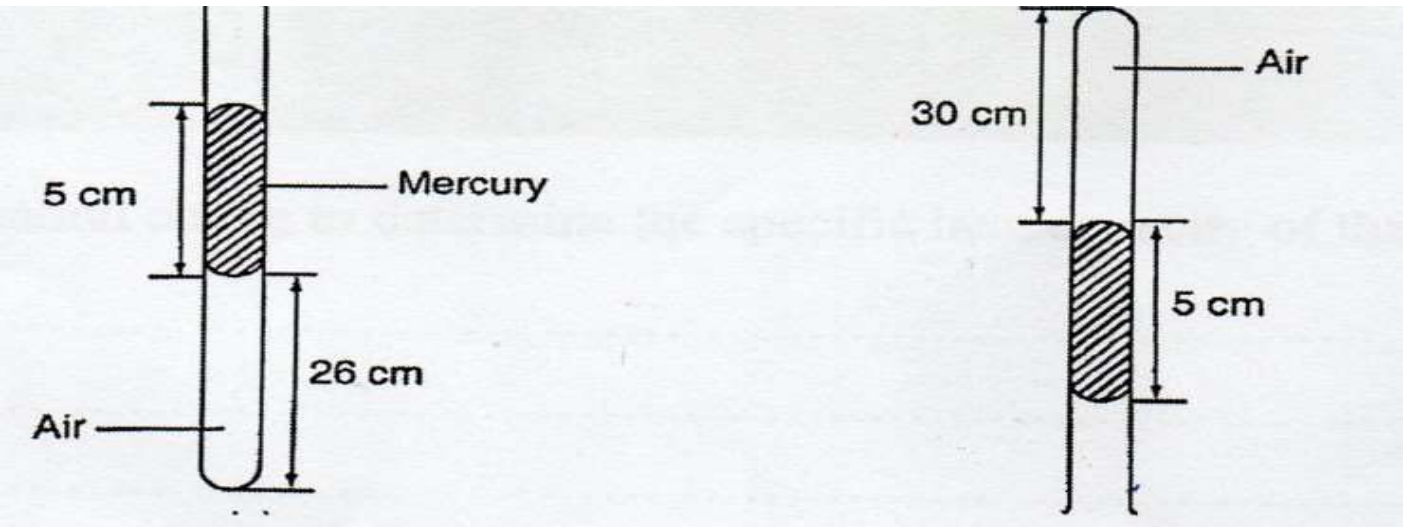
8. You are provided with two identical springs each of spring constant **k.** Sketch a diagram showing the arrangement of springs that produces an effective spring constant of **2k**. (1 mark)

9. (a). State two factors that must be kept constant for a gas to obey Boyle's law. (2 marks)

_____

_____

(b).The volume of air 26cm long is trapped by a mercury thread 5cm long as shown below. When the tube is inverted, the air column becomes 30cm long. What is the value of atmospheric pressure in cmHg. (3 marks)



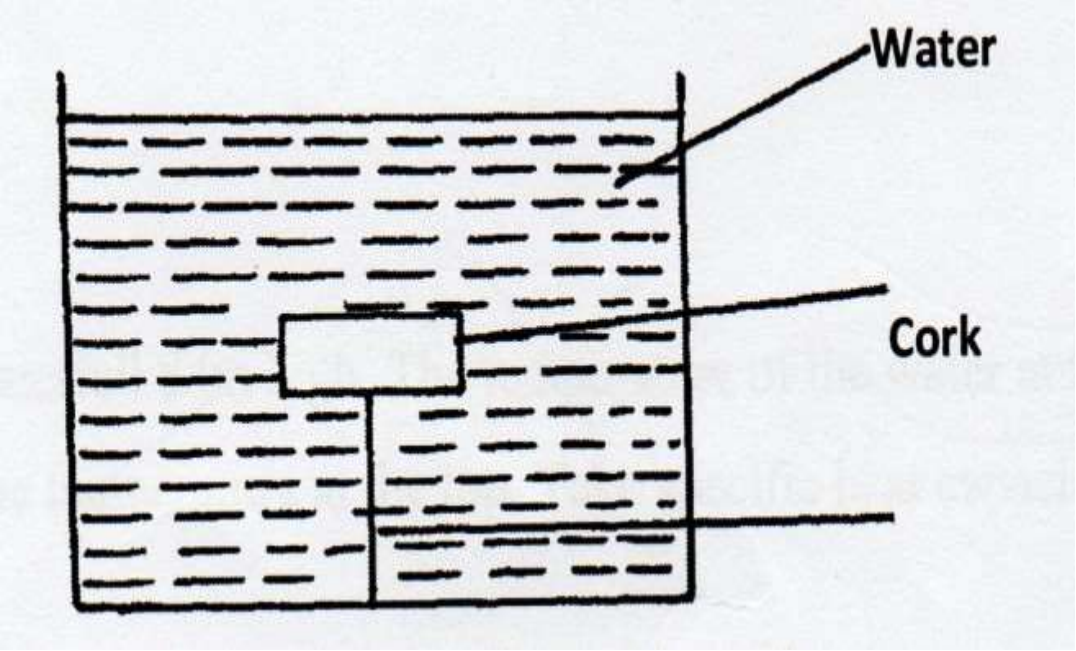
10. Water is known to boil at 100^{o}C. A student heated some water and noticed that it boiled at 101^{o}C. State two possible reasons for this observation. (2 marks)

SECTION B: 55 MARKS

Answer all the questions in this section.

11. (a). State the law of floatation. (1 mark)

(b). Figure 8 shows a piece of cork held with a light thread attached to the cotton of a beaker. The beaker if filled with water.



(i). Indicate and label on the diagram the forces acting on the cork. (3 marks)

(ii). Write an expression showing the relationship between the forces. (1 mark)

(c). A solid displaces $8.5cm^3$ of liquid when floating on a Liquid X. The density of the solid if $0.8g/cm^3$.

Determine

(i). Up thrust on the solid when floating. (3 marks)

(ii). Density of the liquid X. (2 marks)

(d). State one feature of a hydrometer that makes it sensitive in its function. (1 mark)

12 (a). Define latent heat of fusion of a substance. (1 mark)

(b). An electric heater rated 6000W is used to heat 1kg of ice initially at -10^{o}c until all the mass turns to steam. Given that

Latent heat of fusion of ice =334,000J kg^{-1}

Specific heat capacity of ice = 2,100Jkg^{-1}K^{-1}

Specific heat capacity of water = 4,200Jkg^{-1}K^{-1}

Latent heat of vaporization = 2,260 000 Jkg^{-1}

Calculate

(i). the amount of energy required to raise the temperature of ice from -10^{o}C to 0^{o}C (2 marks)

(ii). the amount of energy required to completely melt the ice at 0^{o}C. (2 marks)

(iii). the amount of energy required to raise the temperature of the melted ice from 0^{o}C to 100^{o}C (2 marks)

(iv). the amount of energy required to vaporize the water. (2 marks)

(v). the minimum time required for the ice to be heated until all its mass turns to steam. (3 marks)

13. (a). State Newton's first law of motion (1 mark)

(b). A wooden block resting on a horizontal bench is given an initial velocity u, so that it slides on the bench surface for a distanced before coming to a stop. The values of **d** were measure and recorded for various values of initial velocity u. Figure 10 shows the graph of u^2 against d.

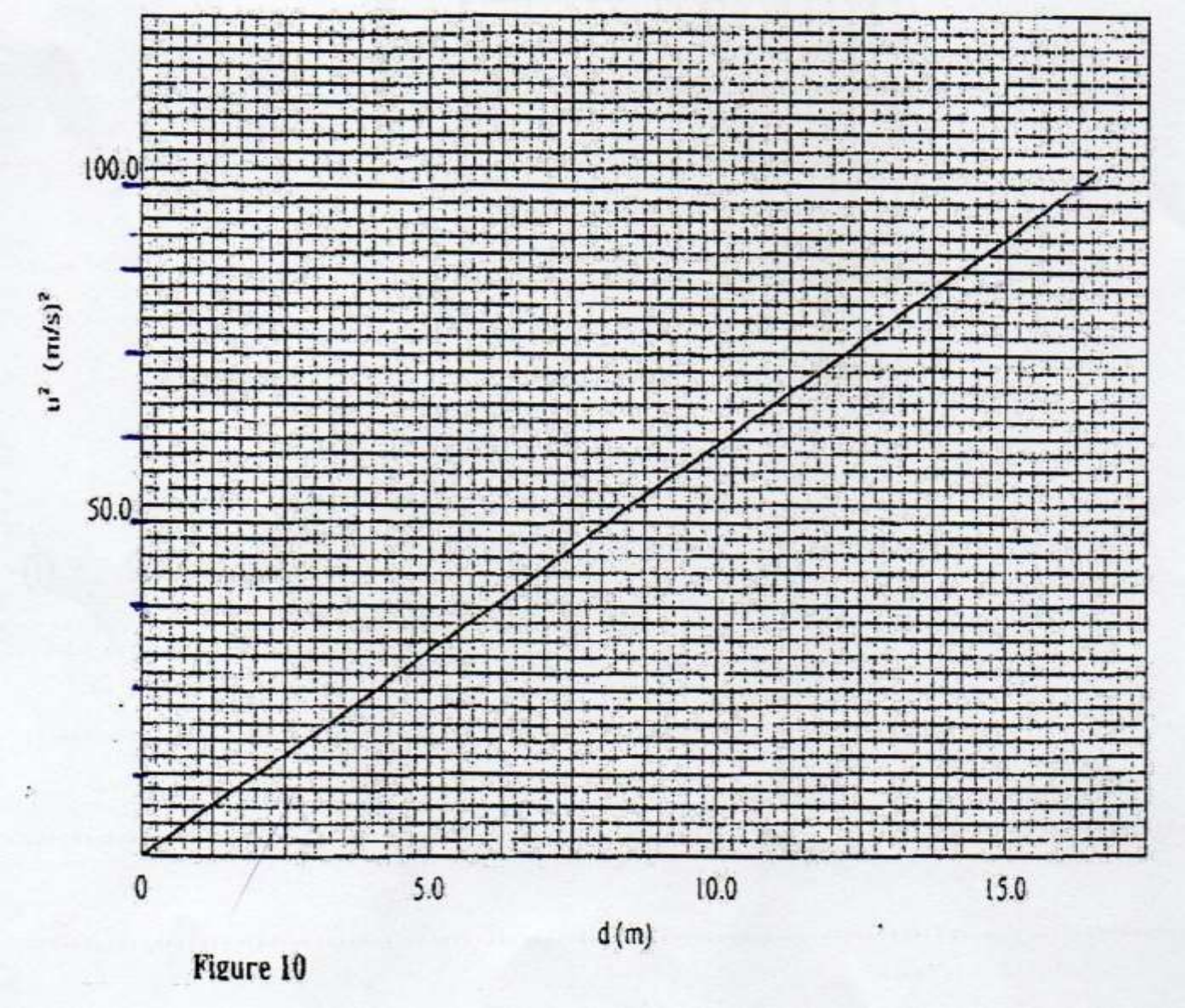


Figure 10

(i). Determine the slope, S of the graph. (3 marks)

(ii). Given that $u^2 = 20kd$, where k is a constant for the bench surface, determine the value of k from the graph. (2 marks)

_____

_____

_____

_____

(iii) State how the value of k would be affected by a change in the roughness of the bench surface.

(1mark)

_____

_____

(c). A ball of mass 200g is projected vertically upwards with an initial velocity u. Figure 11 shows the velocity-time graph for part of its motion.

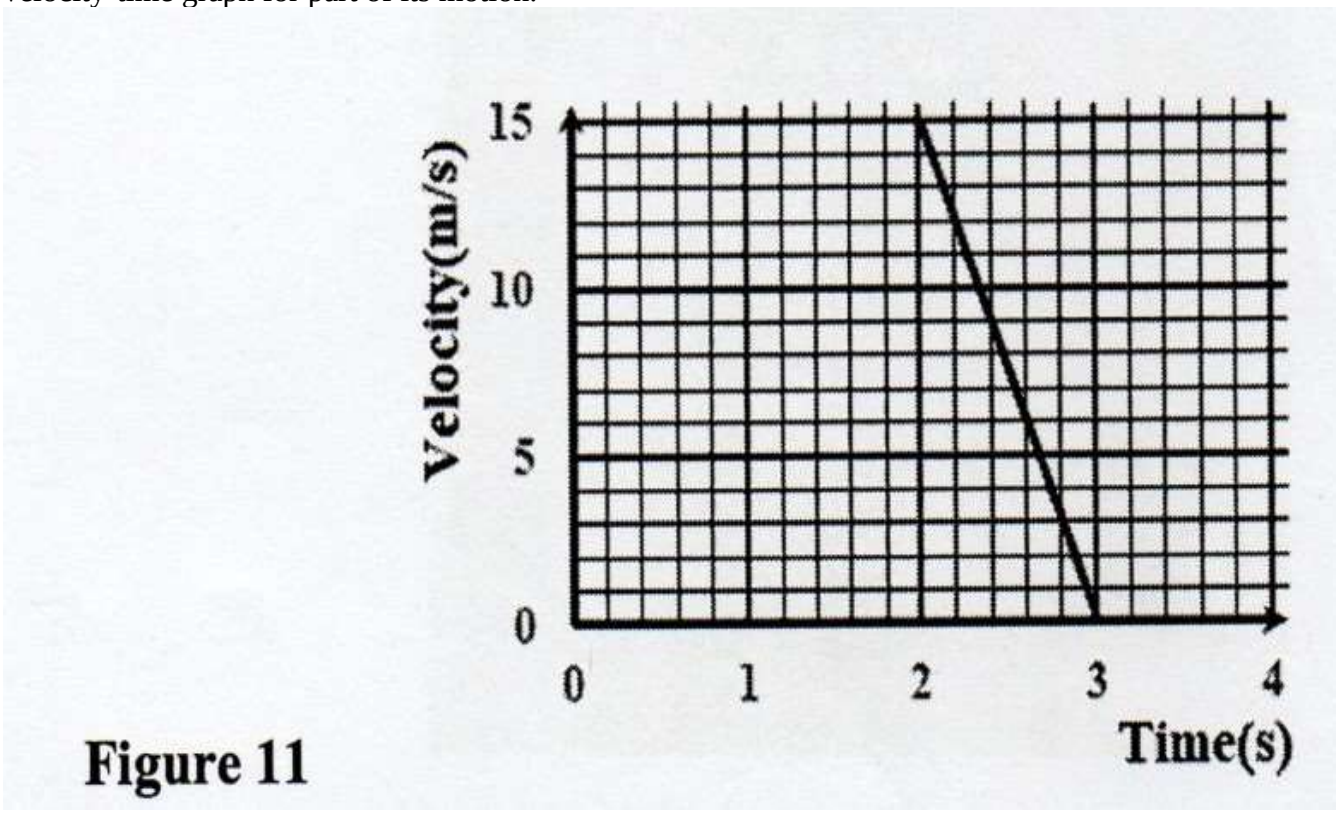


Figure 11

Determine:

(II). Deceleration of the ball. (2 marks)

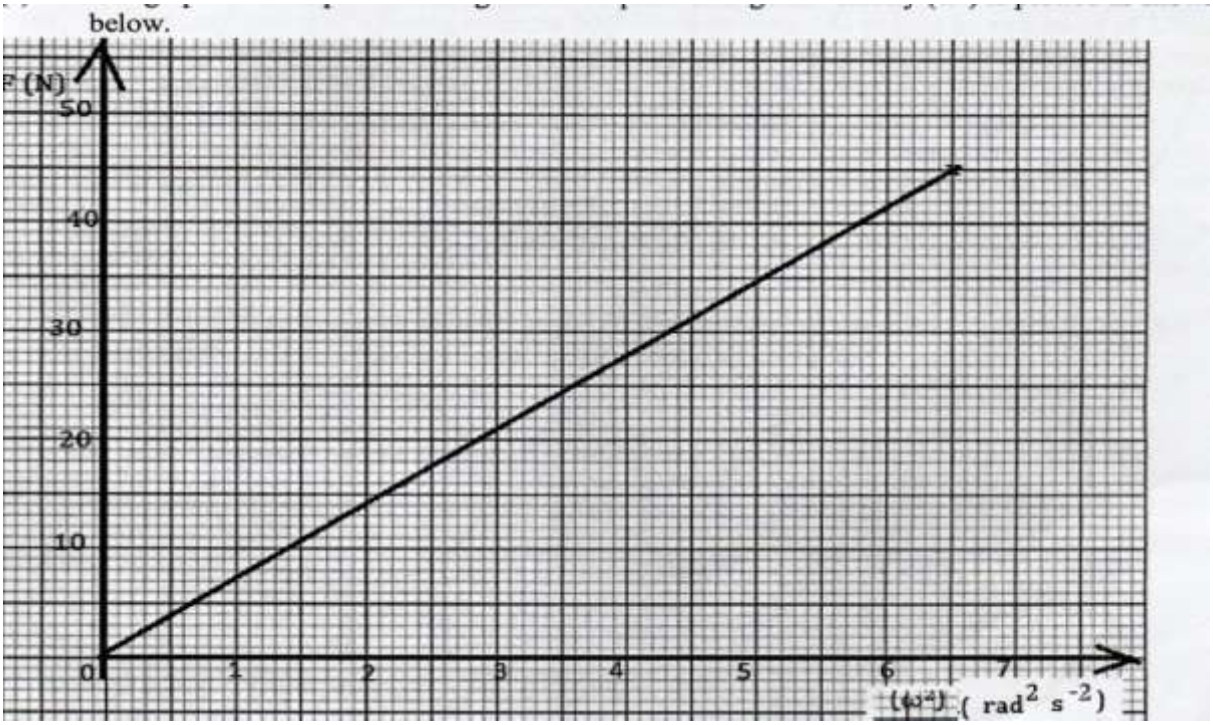
(II). Maximum height of the ball (3 marks)

(ii). Explain why the value of deceleration obtained in (i)(I) is less than the expected value of acceleration due to gravity,g. (1 mark)

14. (a). Define angular velocity (1 mark)

(b). State the reason why a body in uniform circular motion is said to be accelerating. (1 mark)

(c). The graph of centripetal force against the square of angular velocity (ω^2) is plotted as shown



(i). From the graph determine the slope. (2 marks)

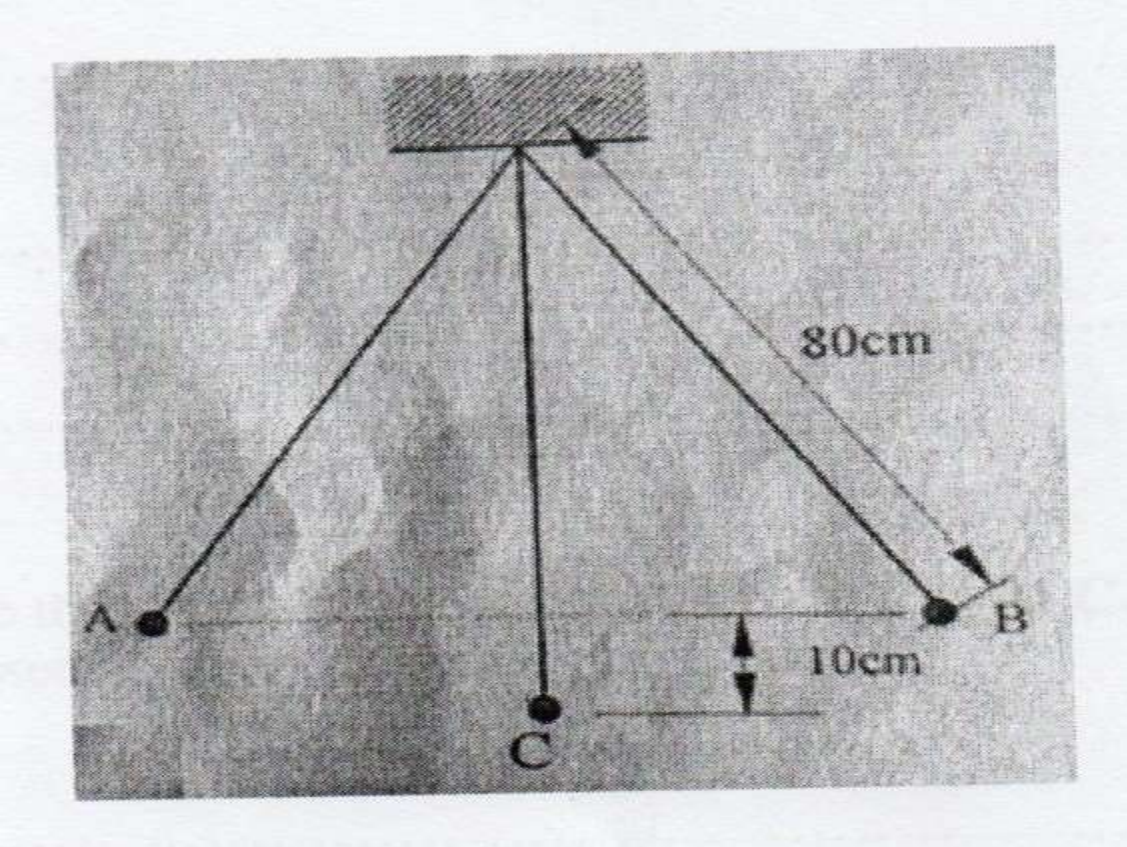
(ii). Given that $F = mrw^2$; determine m when r = 1.23m (2 marks)

(iii). Determine the angular velocity attained when a force of 16N is applied. (2 marks)

15. (a). The figure below show a simple pendulum of length 80cm, the pendulum bob whose mass is 50g

oscillates between points A and B through its rest position **C. A** and **B** are both 10cm higher than **C**.

(2 marks)



(i). Indicate with an arrow on the path **ACB**, the direction of the greatest velocity of the bob as it moves from **A** to **B**. (1 mark)

_____

(ii). State the form of energy possessed by the bob at point **A**. (1 mark)

_____

_____

(iii). Determine he tension in the string as the bob passes point **C**. (3 mark)

(take acceleration due to gravity g=10ms^{-2}

(b). A matatu whose mass is 2500kg is lifted using a screw jack of 10mm pitch. If the handle is 30cm from the screw. Find the force applied (neglect friction and take π=3.142) (1 marks)

(c). A person of mass 75kg runs up a flight of stairs and develops a power of 300W. Calculate the velocity of the man. (3 marks)

(d). The figure below shows an inclined plane and a load of mass 15kg pulled by an effort of 100N

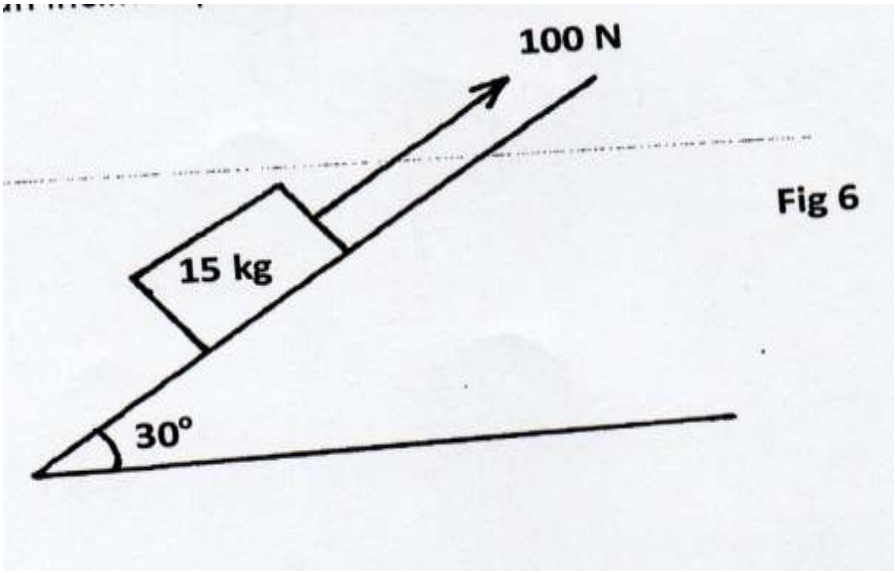


Fig 6

Find the efficiency of the machine. (3 marks)