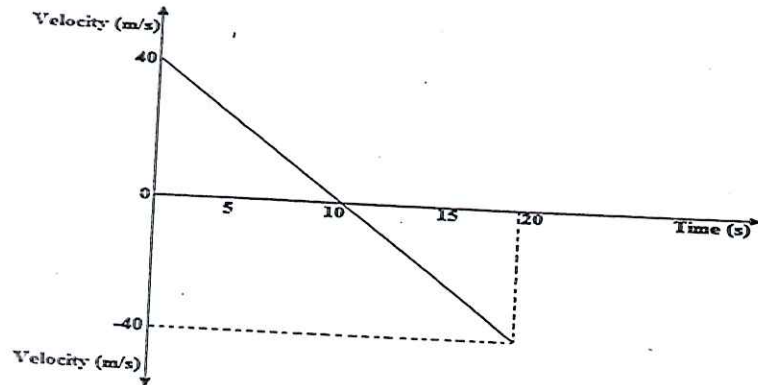


SECTION A (25 MARKS)
ANSWER ALL QUESTIONS IN THIS SECTION IN THE SPACES PROVIDED

1. A micrometer screw gauge which had an error of +0.02mm was used to measure the diameter of a spherical marble whose diameter was 3.67mm. Determine the actual reading of the gauge (2 marks)

$$\begin{aligned} \text{Actual reading} &= \text{reading} + \text{positive zero error} \\ &= 3.67 - 0.02 \\ &= 3.65 \text{ mm} \end{aligned}$$

2. The figure shows graph of velocity against time for a body in motion for 20 seconds. Study the graph and answer the questions that follow



Describe the motion of the object in the 20 seconds

(2 marks)

The body decelerates uniformly from 40m/s to 0m/s in the first 10 seconds then accelerate uniformly to 20m/s but in the opposite direction

3. When a steel ball is allowed to fall freely in a viscous fluid, it is observed to attain terminal velocity after some time. State the reason why the ball attains terminal velocity (1 mark)

The ball attains terminal velocity because the total upward force acting on the ball equals to the total downward force

4. A weightless non-uniform rod balanced by two forces of 5N and 4 N. The position of the centre of gravity of the rod is at 1.2cm mark. Given that the 5N force is acting at the 0 cm mark, determine the length of the rod (2 marks)

$$5 \times 1.2 = 4(x-1.2)$$

2

Name: Marking Scheme Index No.
 School: Candidate's Sign.
 Date:

232/1
 PHYSICS THEORY
 PAPER 1
 2022
 TIME: 2 HOURS

Kenya Certificate of Secondary Education (K.C.S.E.)
 TRIAL EXAMINATION

232/1
 Physics
 Paper 1

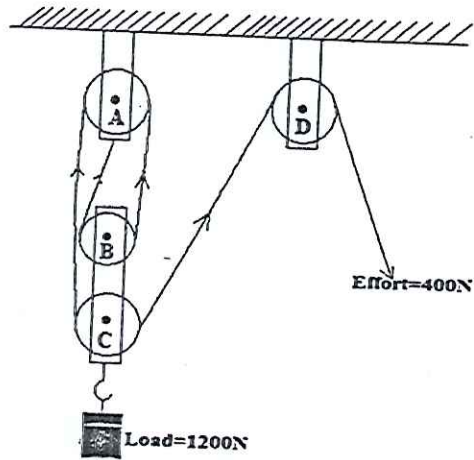
INSTRUCTIONS TO THE CANDIDATES:

- Write your name and index number in the spaces provided above.
- 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.

FOR EXAMINERS' USE ONLY

SECTION	QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
Section A	1-14	25	
Section B	15	13	
	16	12	
	17	15	
	18	09	
	19	06	
	TOTAL		80

This paper consists of 15 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions is missing

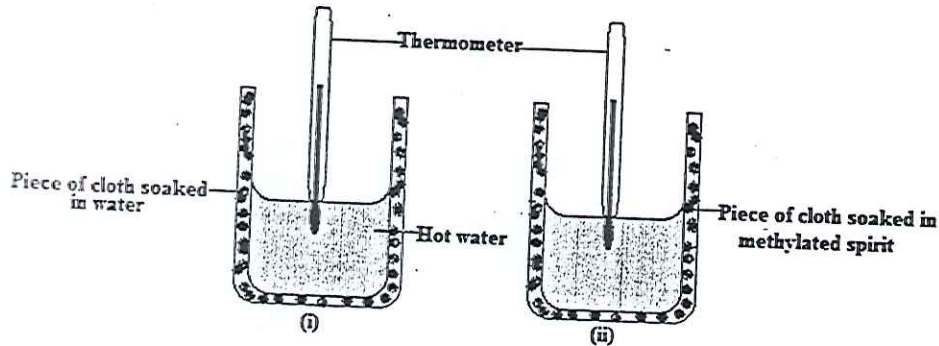


State the purpose of pulley D

(1 mark)

To change the direction of the effort

8. The figure shows hot water at same temperature placed in two identical beakers. One beaker is covered using a piece of cloth soaked in methylated spirit while the other is soaked in water. Study the diagram and answer the questions that follow



After some time, the thermometer in (ii) recorded a lower temperature. Explain this observation (2 marks)
Methylated spirit evaporates faster than water; hence it takes away heat from the hot water faster than water.

9. The figure shows a metal rod used to roll a rock. Study the diagram and answer the questions that follow

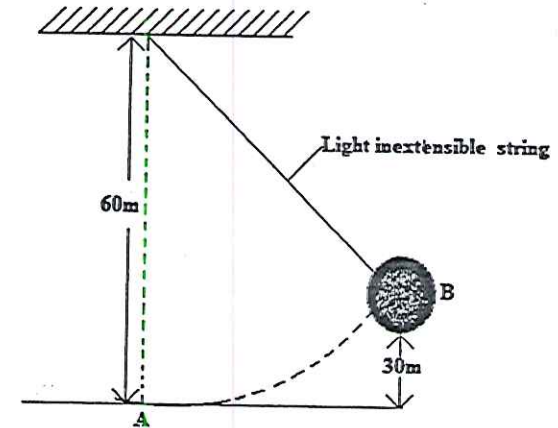
4

$$6 = 4x - 4.8$$

$$4x = 10.8$$

$$x = 2.4$$

5. The figure shows a bob of mass 100g is suspended using a string of 50cm from a support and swings through a vertical height of 30 cm as shown below:



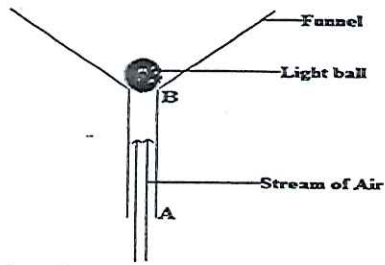
Give the reason why the amplitude of the pendulum reduces as it continues to oscillate between points A and B (1 mark)

Due to air resistance or friction in air thereby reducing the amplitude of the pendulum

6. A highly inflated balloon bursts when transferred to a hotter environment. Explain this observation using kinetic theory of gases (2 marks)
Rise in temperature increase the kinetic energy /velocity of gas particle. More collisions between gas particles and the walls of the balloon increases the rate of change of momentum hence increase in pressure causing the balloon to burst

7. The figure shows a pulley system that has two pulleys on the lower block and one pulley on the upper block. The system is used to lift a load of 1200N using an effort of 400N. Study the diagram and answer the questions that follow

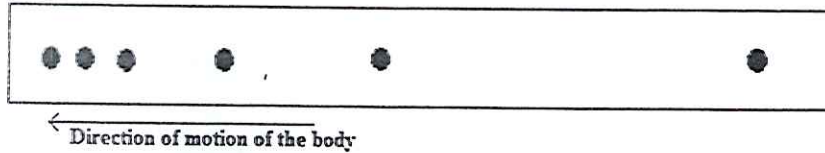
3



When air is blown from A through to side B it is observed that the ball remains at point B. Explain this observation (3 marks)

When air is blown from the narrow section, the pressure becomes lower than the atmospheric pressure acting from the wider section since air flows at a higher velocity in the narrow section than in the wider section. Greater atmospheric pressure therefore pushes the ball to remain at point B

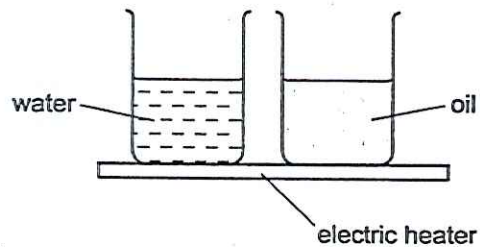
12. The figure shows an extract from a ticker timer (not to scale) obtained from an experiment using a timer of frequency 50Hz



State whether the body is decelerating or not the acceleration of the body whose motion is represented in the tape. (1 mark)

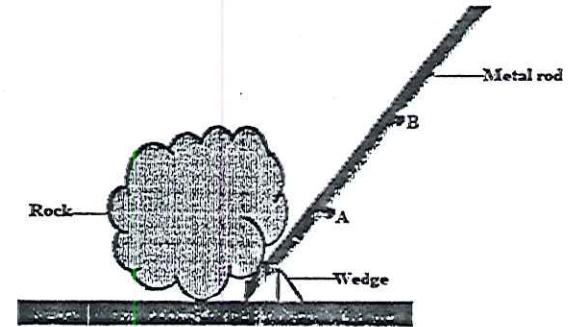
The body is accelerating

13. The diagram shows an electric heater being used to heat a beaker of water and an identical beaker containing oil. Both are heated for one minute.



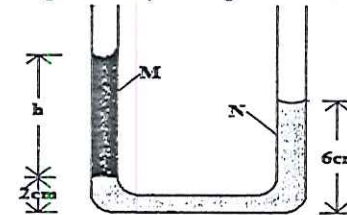
The specific heat capacity of water is higher than that of oil. State with a reason the liquid that will have a higher temperature after one minute (2 marks)

6



State with a reason at which point A or B on the metal rod where it is easier to roll the rock (2 marks)
Point B since the perpendicular distance from the pivot is longer hence greater moment of force will be acting on the rock.

10. The figure shows two immiscible liquids M and N placed in a u-tube manometer. Liquid M has a density of 0.8g/cm^3 while that of N is 1.2g/cm^3 . Study the diagram and answer the questions that follow



Determine the height h

(2 marks)

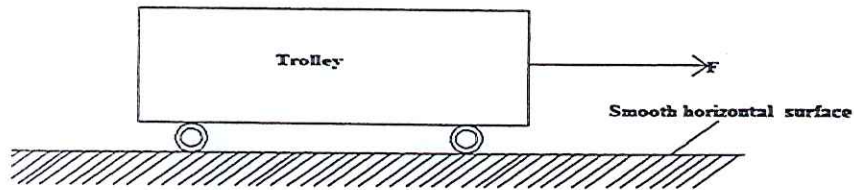
$$\frac{4}{100} \times 800 \times 10 = h \times 1200 \times 10$$

$$h = \frac{0.04 \times 800 \times 10}{1200 \times 10}$$

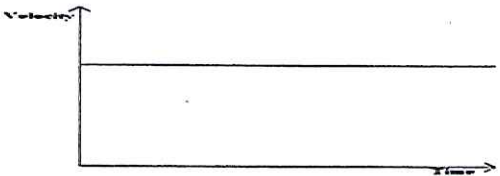
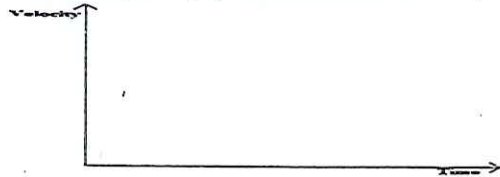
$$h = 2.667\text{cm}$$

11. The figure shows a light ball placed on a funnel at point marked B

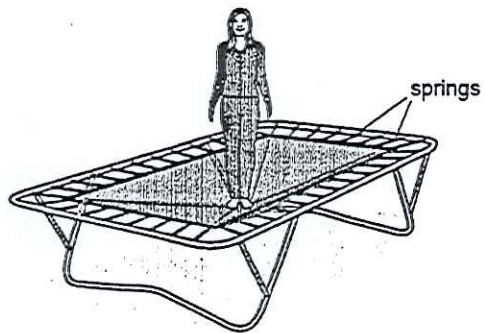
5



On the axis provided, sketch the velocity-time graph for the motion of the trolley (2 marks)



b) An athlete of mass 64 kg is bouncing up and down on a trampoline. At one moment, the athlete is stationary on the stretched surface of the trampoline as shown in the figure below.



State the form of energy stored due to the stretching of the surface of the trampoline. (1 mark)
Elastic potential energy

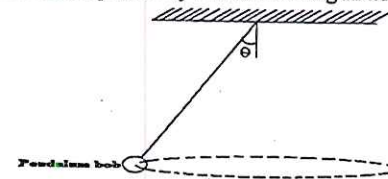
Oil will have a higher temperature.

Lower specific heat capacity of oil means with the same heat energy as that of water the temperature change will be greater

Or

Temperature change is inversely proportional to the specific heat capacity of a substance.

14. The figure shows a pendulum bob suspended by a thread moving in a horizontal circle



Name the forces acting on the pendulum as it moves (2 marks)

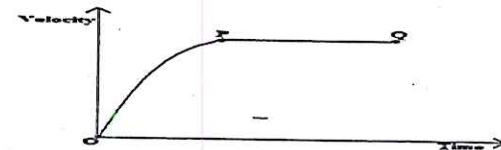
- Tension force
- Weight of the bob

SECTION B (55 MARKS)

ANSWER ALL QUESTIONS IN THIS SECTION IN THE SPACES PROVIDED

15.

a) The figure shows the graph of velocity against time for a ball bearing released at the surface of viscous liquid



Explain the motion of the ball bearing for parts

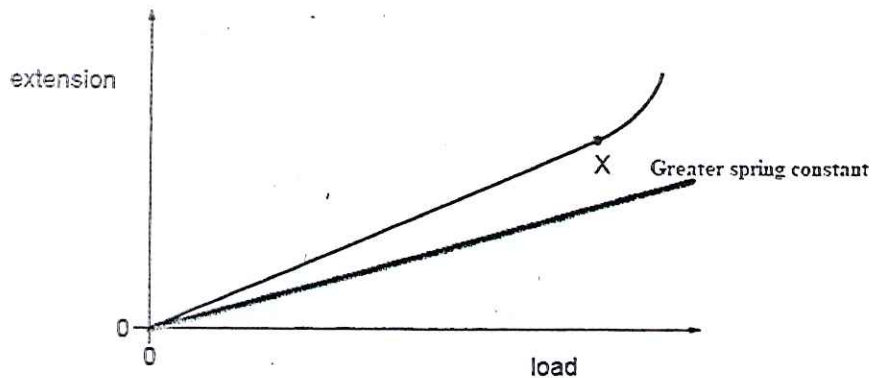
i. OP (2 marks)

The ball bearing is accelerating uniformly into the fluid. The total downward force is greater than up thrust acting on the ball

ii. PQ (2 marks)

The ball attains constant velocity/terminal velocity. The net force acting on the body equals to zero/ the total upward force acting on the ball equals to the total downward force

iii. The figure shows a trolley on a smooth surface being pulled by a constant force F



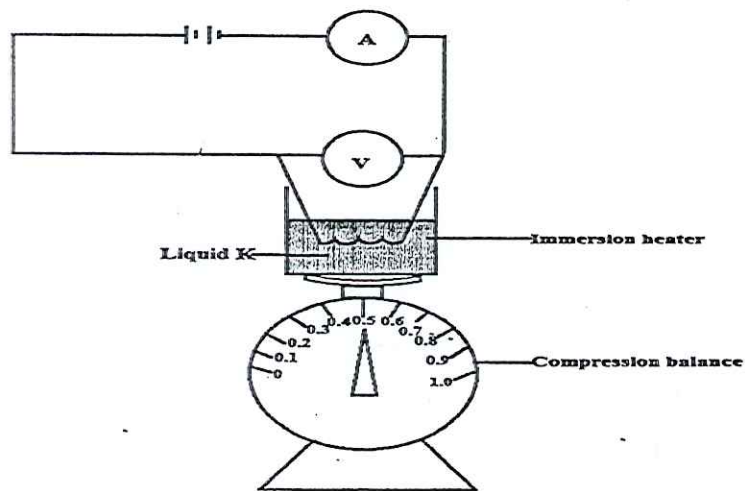
16.

a) State the meaning of the term specific heat capacity

(1 mark)

This refers to the amount of heat that is required to raise the temperature of a unit mass of a substance by one kelvin

b) The figure shows a set-up that was used to determine the specific latent heat of vaporization of water. Study it and answer the questions that follow



10

c) The stretched surface of the trampoline begins to contract. The athlete is pushed vertically upwards and she accelerates. At time t , when her upwards velocity is 6.0 m/s , she loses contact with the surface. Determine

i. Her kinetic energy at time t .

(2 marks)

$$K.E = \frac{1}{2}mv^2$$

$$K.E = \frac{64 \times 6^2}{2}$$

$$= 1152 \text{ J}$$

ii. The height at which the kinetic energy will be zero

(2 marks)

$$K.E = mgh$$

$$1152 = 64 \times 10 \times h$$

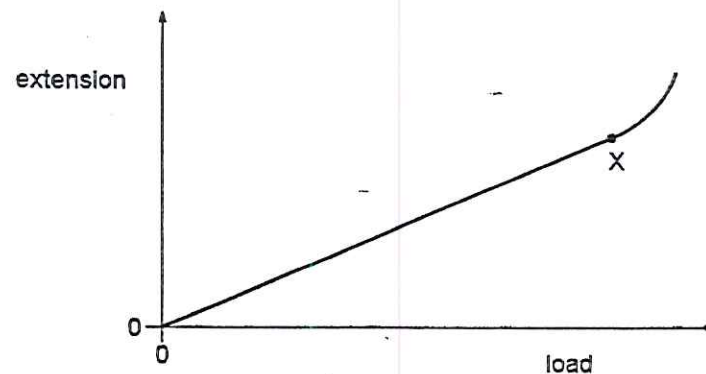
$$h = 1.8 \text{ m}$$

iii. In practice, she travels upwards through a slightly smaller distance than the distance calculated in (ii). Suggest why this is so.

(1 mark)

This is due to the effect of air resistance

d) The trampoline springs are tested. An extension-load graph is plotted for one spring as shown in the is the graph.



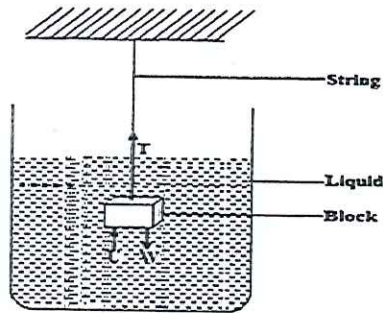
i. On the same axes sketch a graph of another spring whose spring constant is higher than the trampoline springs

(1 mark)

9

17. a) State the law of flotation. (1 mark)
 Floating body displaces its own weight of the fluid on which it floats.

- b) The figure shows a rectangular metal block of density 10800kgm^{-3} and dimensions $80\text{cm} \times 30\text{cm} \times 30\text{cm}$ suspended inside a liquid of density 800kgm^{-3} by a string attached to a point above the liquid. The three forces acting on the block are; the tension, T , on the string, the weight, W of the block and the up thrust, U , due to the liquid.



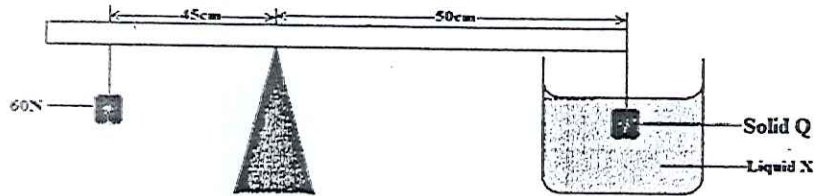
- i. Write the expression relating to T , W and U when the block is in equilibrium inside the liquid. (1 mark)

$$T + U = W$$

or

$$W = T + U$$

- c) The figure shows a system at equilibrium. Study the diagram and answer the questions that follow:



Determine the

- i. The apparent weight of solid Q immersed in liquid X (3 marks)

$$F_1 d_1 = F_2 d_2$$

For a system at equilibrium

$$60\text{N} \times 0.45 = 0.5 \times F_2$$

12

- i. State and explain the effect on the reading of the compression balance when the liquid K was heated for some time (2 marks)

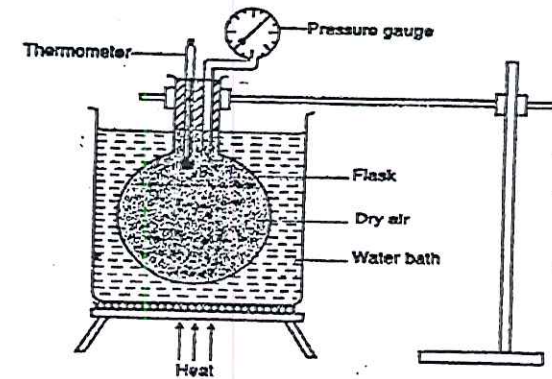
The reading of the balance decreases. This is because the liquid will change to steam or evaporate and therefore reducing the mass on the balance

- ii. Apart from the mass of liquid K state two measurements that need to be taken to determine the specific latent heat of vaporization of the liquid (2 marks)

Time taken
 Voltmeter reading
 Ammeter reading

- iii. State two sources of errors in the experiment (2 marks)
 - Taking reading from the cippa instruments.
 - Some heat energy was lost to the atmosphere

- c) The diagram below shows a set-up used to investigate a particular gas law. Study the diagram and answer the questions that follow



- i. State with a reason which gas law is being experimented by the set-up (2 marks)

Pressure law since it can measure pressure and temperature

- ii. Name the two factors that are held constant in the experiment (2 marks)

Mass of the gas
 Volume of the gas

- iii. Give the reason why heating is done through a water bath (1 mark)

To ensure uniform distribution of heat

11

Determine

- i. The volume of the metal block (3 marks)

$$\begin{aligned} \text{Upthrust in water} &= 2.0 - 1.6\text{N} = 0.4\text{N} \\ \text{Weight of water displaced} &= \text{Upthrust} \\ v\rho g &= 0.4\text{N} \\ v \times 1000 \times 10 &= 0.4\text{N} \\ v &= 40\text{cm}^{-3} \end{aligned}$$

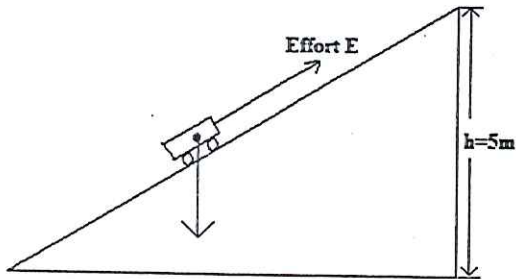
- ii. The density of the metal block (2 marks)

$$\begin{aligned} \text{Density of metal block} &= \frac{\text{Mass of block}}{\text{Volume of metal block}} \\ \text{Mass of the block} &= \frac{2\text{N}}{10} \times 1000 = 200\text{g} \\ &= \frac{200\text{g}}{40\text{cm}^{-3}} \\ &= 5\text{gcm}^{-3} \end{aligned}$$

- iii. The water level before the metal block was immersed in the water (1 mark)

$$\begin{aligned} \text{Water level before} &= 150\text{cm}^3 - 40\text{cm}^3 \\ &= 110\text{cm}^3 \end{aligned}$$

18. The figure shows a trolley of weight 20N pulled by a force of 4N from the bottom to the top of an inclined plane at uniform speed



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

- b) Explain how the value in the question above is obtained (2 marks)

Since the trolley is moving at uniform speed the effort equal to frictional force + $mg \sin \theta$

- c) For the system, determine the (2 marks)

- i. Mechanical advantage

$$M.A = \frac{L}{E}$$

14

- ii. Volume of the solid given that the density of the liquid is 0.8g/cm^3 and the weight in air of solid Q is 60N (2 marks)

$$F_2 = \text{Apparent weight} = 54\text{N}$$

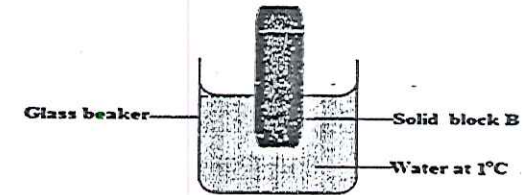
$$\text{Upthrust} = 60\text{N} - 54\text{N} = 6\text{N}$$

$$6\text{N} = v\rho g$$

$$6\text{N} = v \times 800 \times 10$$

$$v = 7.5 \times 10^{-4}\text{m}^3$$

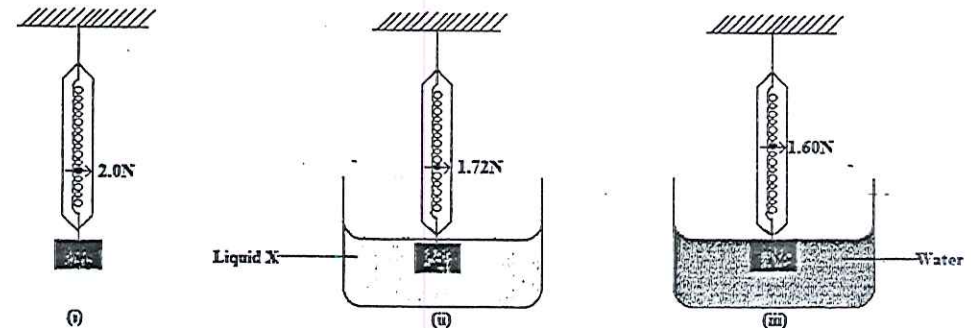
- iii. The figure shows a solid block B floating on water at 1°C .



When water is heated to 4°C , it is observed that the portion of the block that floats increases. Explain this observation (2 marks)

When water is heated from 2°C to 4°C water contracts and therefore the density of water increases the block rises further to displace less volume of water. Up thrust remains constant because the weight of the block remains

- d) The figure shows the same metal block weighed in air, liquid X and water. The reading of the level of water becomes 150cm^3 when the metal is fully immersed. Study the diagram and answer the questions that follow



13

$$= \frac{20N}{4N}$$

$$= 5$$

ii. Velocity ratio

$$V.R = \frac{\text{Effort distance}}{\text{Load distance}}$$

$$= \frac{40}{8}$$

$$= 5$$

(2 marks)

iii. Efficiency

$$\text{Efficiency} = \frac{M.A}{V.R} \times 100$$

$$= \frac{5}{8} \times 100$$

$$= 62.5\%$$

(2 marks)

19.

a) When a bus goes round a bend on a flat road, it experiences a centripetal force. State what provides the centripetal force
Frictional force between the tyres and the surface of the road (1 mark)

b) A student whirls a stone of mass 0.2kg tied to a string of length of 0.4m in a vertical plane at constant speed of 2 revolutions per second (take acceleration due to gravity as 10ms^{-2})
 i. Apart from tension name the other force acting on the stone when it is at the highest point (1 mark)

The weight of the body

- ii. Determine
 I. Angular velocity of the stone

$$\omega = 2\pi f$$

$$= 2 \times 3.14 \times 2$$

$$= 12.568 \text{ Rad s}^{-1}$$

(2 marks)

II. Tension in the string when the stone is at the highest point

$$\text{Tension at the highest point} = m r \omega^2 - m g$$

$$= 0.2 \times 12.568 \text{ Rad s}^{-1} \times 0.4 - 0.2 \times 10$$

$$= 10.636N$$

(2 marks)

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