Yesmark tuition services

232/1
FORM4 PHYSICS 2016
PAPER 1
(THEORY)
TIME: 2 HRS

INSTRUCTIONS

1. The paper consists of two sections, Section **A** and **B**.
2. Answer **ALL** the questions in section A and B in the spaces provided.
3. **ALL** working **MUST** be clearly shown.
4. Mathematical tables and electronic calculators **may be** used.
5. Take g = 10m/s^2 and density of water = 1000kg/m^3, L_V = 2.6 x 10^{6}Jkg^{-1}, L_f= 3.3 x 10^{5}J^{-1}kg

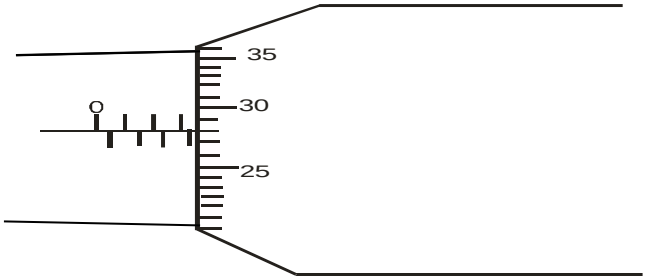
FOR EXAMINER'S USE:

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1-14	25	
15	12	
16	13	
17	10	
18	9	
19	11	
TOTAL	**80**	

This paper consists of 13 printed pages
Candidates should check to ensure that all pages are printed as indicated and no questions are missing

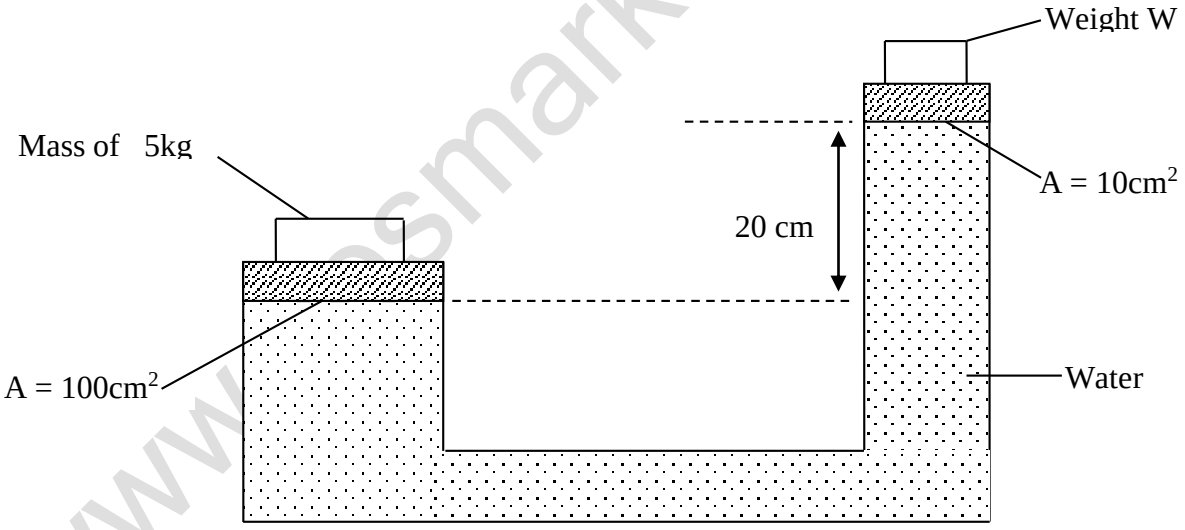
SECTION A (25 MARKS)

1.The micrometer screw gauge in figure below gives the reading of the diameter of a piece of a wire, Given that the length of the wire whose diameter was read by using figure above is 4cm, determine the volume of the wire. (3 Marks)

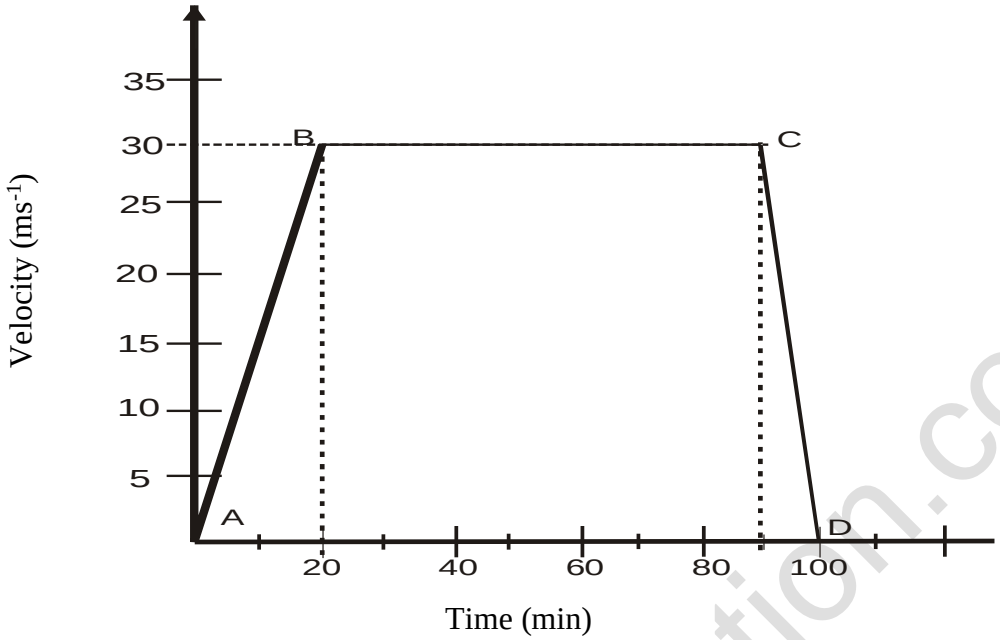


.

2. The figure below shows two masses placed on light pistons. The pistons are held stationary by water of m . Determine the weight w



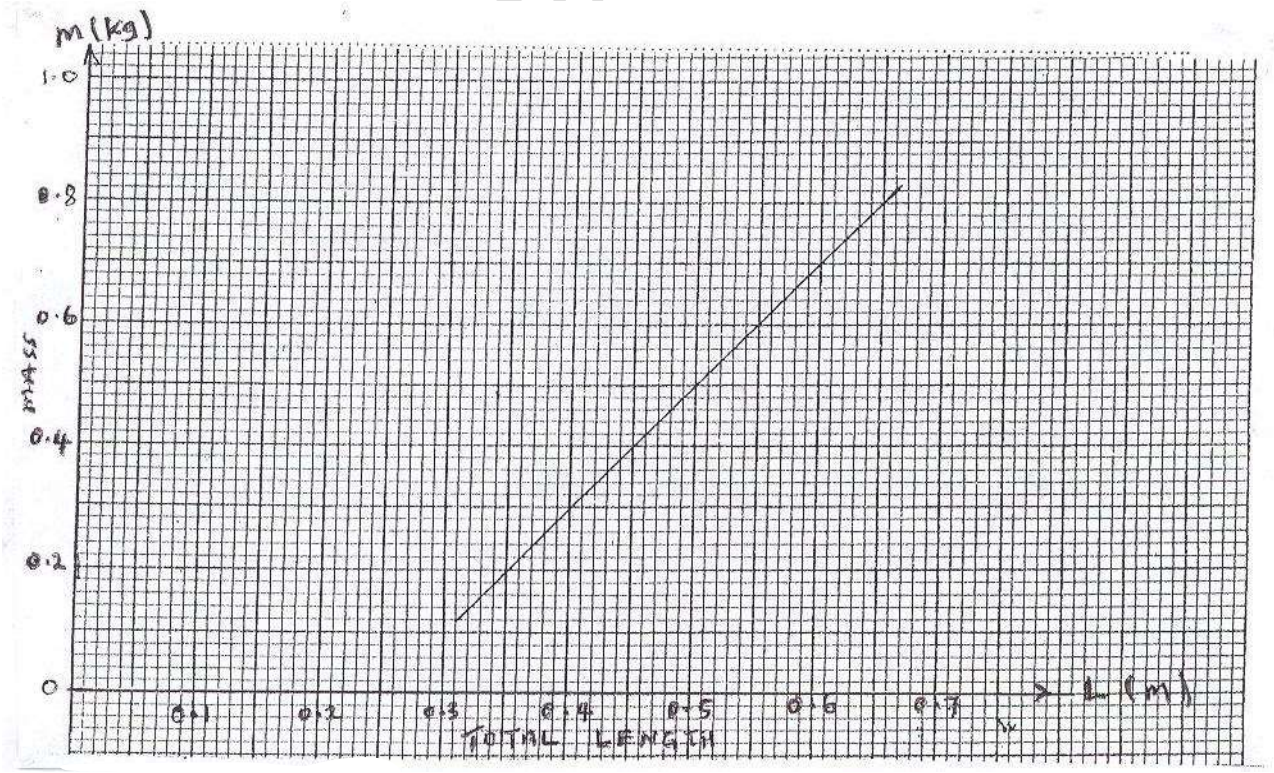
3) The following figure shows the velocity-time graph for the journey of a car in 100 minutes.



i) Determine the acceleration of the car between A and B and between C and D. (2 marks)

ii) Determine the distance covered by the car during the journey. (1 marks)

4). The result of an experiment to investigate how the total length of a spring varies with load on the end of the spring is as shown in the graph below. *(Assume Hooke's Law is obeyed)*

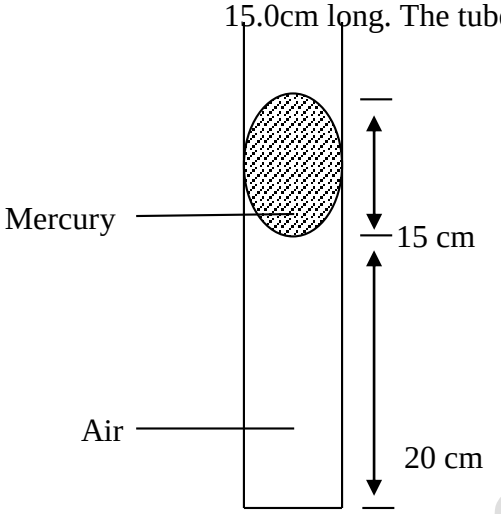


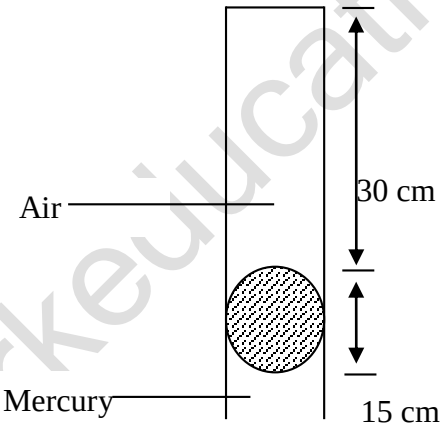
Calculate the energy increase stored by the spring when the load is increased from 4N to 8N.
(2Marks)

5) State the two constant forces that act on a body falling through a fluid. 1mark

6). A fixed mass of gas is enclosed in a vessel. Explain in terms of molecular theory how the pressure measured at the wall of the vessel is produce by the gas molecules. (2 Marks

7. A uniform narrow-bored tube closed at one end contains dry air which is sealed by a thread of mercury is 15.0cm long. The tube is held in the following two positions as shown in the diagram below

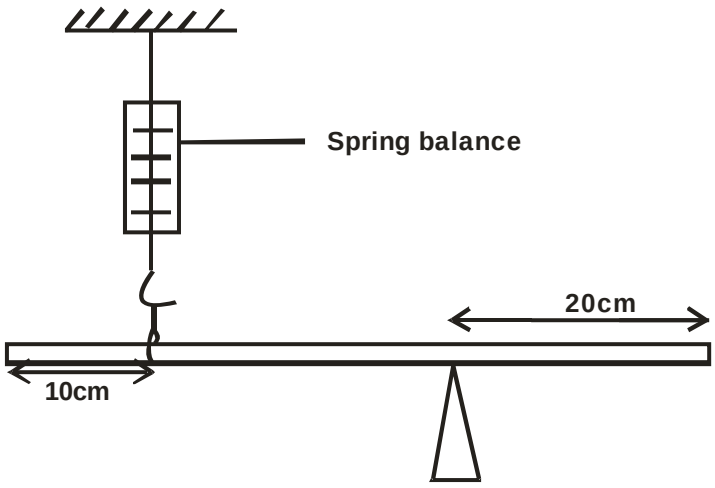




(i) Calculate the atmospheric pressure (3 Marks)

8 Explain the cause of random motion of smoke particles as observed in Brownian motion experiment using a smoke cell. (1Marks)

9.Figure shows a uniform bar of length 1.0 m pivoted near one end. The bar is kept in equilibrium by a spring balance as shown:



Given that the reading of the spring balance is 0.6 N, determine the reaction force at the pivot.

(3Marks)

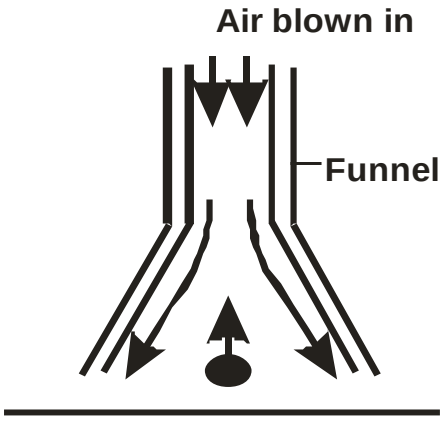
10.State the reason why it is colder during the night when the sky is clear than when it is cloudy.

(1Mark)

12 in terms of intermolecular distances explain anomalous expansion of water. 1mark

13 A resultant force F acts on a body of mass M causing an acceleration of A_1 on the body. When the same force acts on a body of mass 2m, it causes an acceleration of A_2. Express A_2 in terms of (2Marks)

14 Figure shows a pith ball being lifted into a funnel end of a blower.



Explain this observation (1Marks)

SECTION B (55 MARKS)

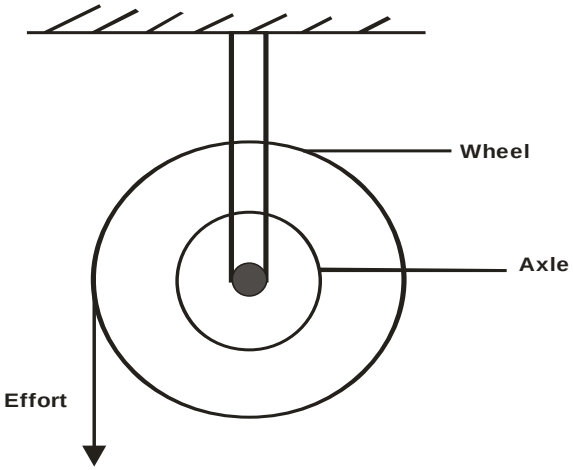
15. An object is fired vertically upward from the ground level with a velocity of $50ms^{-1}$ and reaches a maximum height, h. It falls back to the ground and bounces to a height of 4m.

a) Sketch a velocity time graph to represent the motion of the object from the time it is fired till it bounces to the height of 4m. (2Marks)

b)

b.) Calculate the maximum height reached h. (2Marks)

c.)The figure below represents a wheel and axle used as a machine, whose efficiency is 80% to raise 400N of building materials. The wheel and axle has diameters of 75cm and 15cm respectively.



i) Mark on the diagram the correct position and direction of the load to be lifted. (1Mark)

ii) Name the principle on which this machine works. (1Mark)

iii) Calculate the effort needed to raise the load. (3Marks)

iv) The machine is operated manually and raises the load to a height of 5m in 20 seconds. Calculate the power developed by the operator. (3Marks)

16. a) State what is meant by the term specific latent heat of vaporization. (1 mark)

b) In an experiment to determine the specific latent heat of vaporization of water, steam at 100^0C was passed into water contained in a well lagged copper calorimeter. The following measurements were made.

Mass of calorimeter =50g

Initial mass of water =70g

Final mass of calorimeter + water + condensed steam = 123g

Initial temperature of water + calorimeter = 5^0 C

Final temperature of mixture = 30^0C

(specific heat capacity of water=4200JKg^{-1}K^{-1} and specific heat capacity of copper=390 JKg^{-1}K^{-1}.}

Determine:

i) Heat gained by calorimeter alone (2 marks)

ii) Heat gained by water only. (2 marks)

iii) Given that L is the specific latent heat of evaporation of steam

I. Write an expression for the heat given out by steam. (1 mark)

II. Determine the value of L (3 marks)

c)

d) Steam at 100^oc was passed for some time into ice at 0^oc. At the end, temperature of the water obtained was 52^o_C and its mass 2g. Calculate;

ii) Mass of the ice used. (3Marks)

17a) Define a radian (1mk)

b) Three masses are placed in a rotating table at distances 6cm, 9cm and 12cm respectively from the canter of rotation. When the frequency of rotation is varied it is noted that each mass slides off at a

different frequency of rotation of the table. Table 1 shows the frequency at which each mass slides off.

Radius, r (cm)	12	9	6
Sliding off frequency rev/s	0.68	0.78	1.0

i) State two factors that determine the frequency at which each mass slides off. (2 marks)

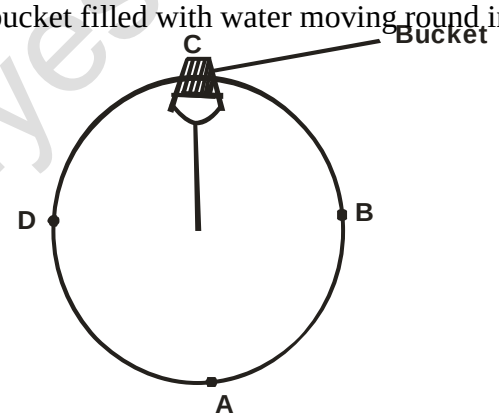
ii) Oil is now poured on the table before placing the masses. Explain the effect of this on the frequency at which the mass slides off. (2 marks)

c) A marked point on a rim of a wheel has a linear velocity of 11.2m/s. if the rim has a radius of 0.8. Calculate;

i)The angular velocity of the point (2 marks)

ii)The centripetal acceleration (2 marks)

Figure below shows a bucket filled with water moving round in a vertical circular path of radius 1m



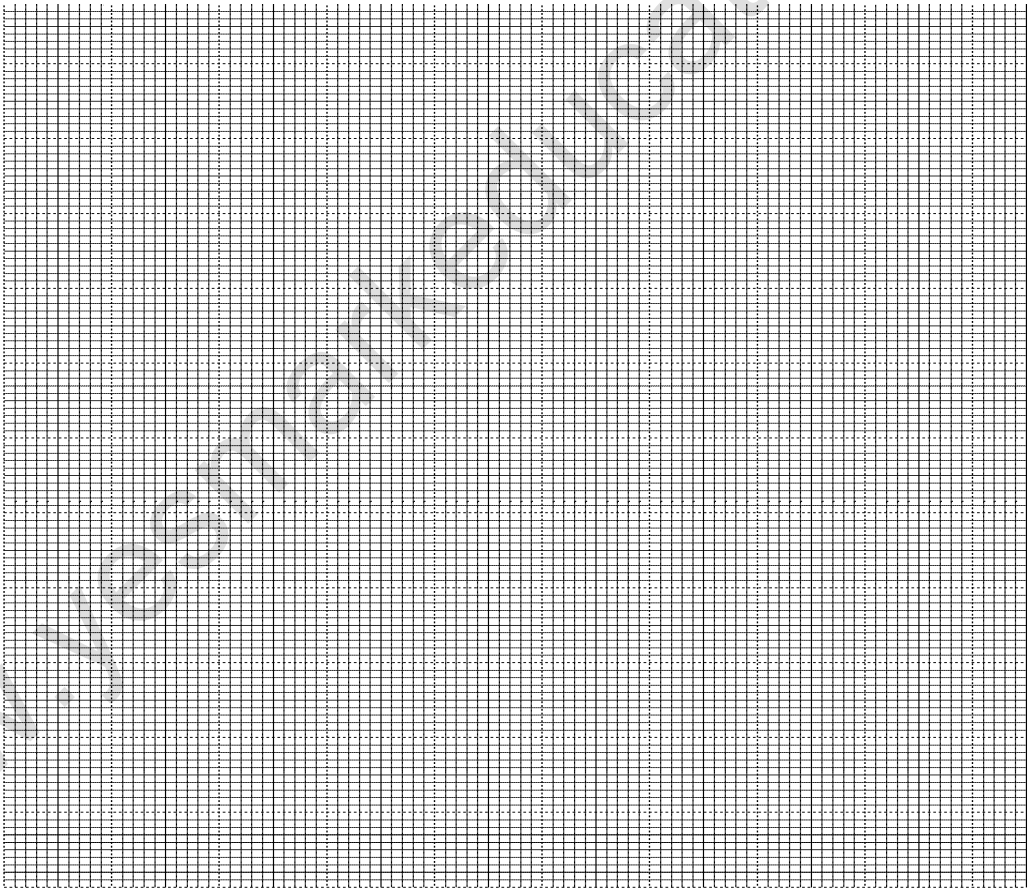
If the mass of water is 5kg and the speed of the bucket is 20m/s Show by calculation that this net force is greater at point A than at point C. (3Mks)

18) The table below shows the volume V of a certain mass of a gas at different temperatures, T, obtained in an experiment to verify Charles law.

V (cm^3)	7.0	7.6	8.2	8.6	8.8
T (^oC)	15	40	65	80	90

Draw a setup of apparatus that could be used to verify the law. 2mks

i) Plot a graph of volume (y-axis) against temperature. (5Marks)



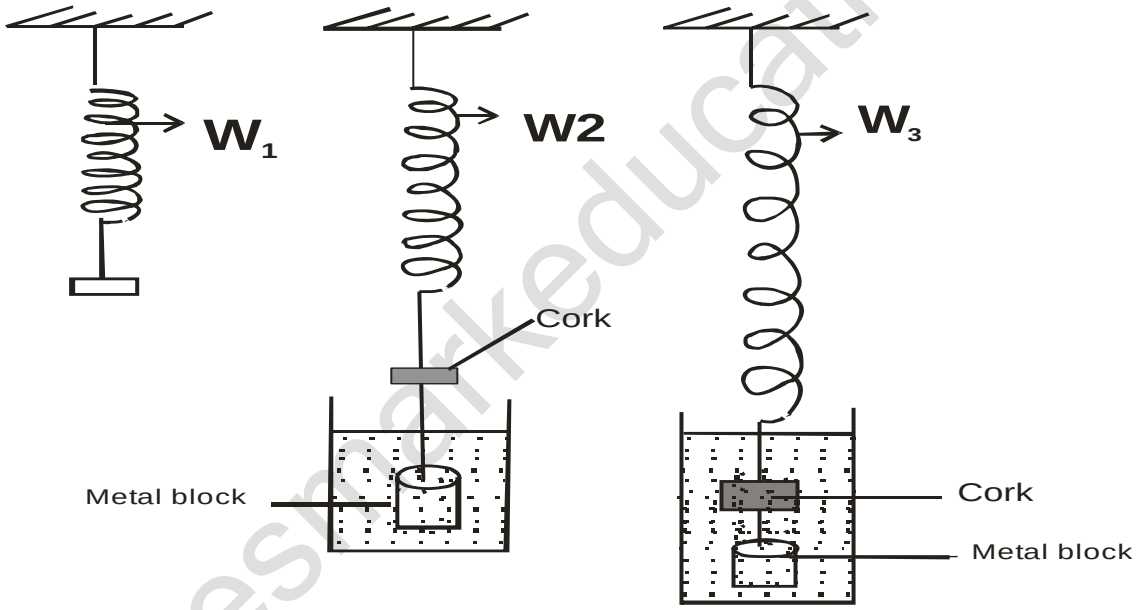
ii) From the graph determine the volume of the gas at 0^oc. (1Mark)

iii) Use the graph to determine the rate of expansion of the gas. (2Marks)

iv) Given that V=KT+C, write down the values of K and C. (2Marks)

19) State Archimedes' principle. (1Mark)

b) A student was provided with water in a beaker, a spring balance, a metal block, a cork and a string. Using the arrangements shown in figure below she recorded the following results



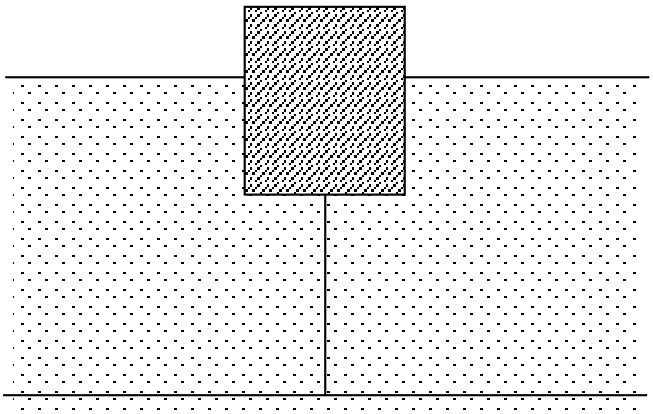
Weight of cork in air = W_1

Weight of cork in air and metal in water = W_2

Weight of both cork and metal in water = W_3

i) Derive an expression for the relative density of the cork. (3Marks)

(a) A wooden block of mass 50g floats with 20% of its volume above the water surface and kept in place by string as shown below. The tension in the string is 0.06N.



Calculate:-

(i) The up thrust experienced by the object. (1 Mark)

(ii) The volume of the water displaced. (2 Marks)

(iii) The density of the object. (3 Marks)

(iv) What would happen if the string was cut and what volume of water would the block finally displace? (2 Marks)

c) The rubber used to make a balloon weighs 0.1kg.The balloon is inflated to a volume of $0.5m^3$with hydrogen whose density is $9.0 \times 10^{-2} Kg/m^3$.What is the maximum load the balloon can lift.

(Density of air=$1.3Kg/m^3$)