# KAPSABET HIGH SCHOOL

232/1

(Kenya Certificate of Secondary Education)

Paper 1

INTERNAL MOCK EXAM

# PHYSICS

(THEORY)

## Dec. 2020– 2 Hours

**Name**..... **Index No.** .....

**Adm No**..... **Date:**.....

**Signature** ..... **Stream** :.....

**Instructions to candidates**

a) *Write your Name, Index, Admission number and stream in the spaces provided above.*
b) *Sign and write the examination date on 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 workings* ***must*** *be clearly shown.*
f) *Non-programmable silent electronic calculators may be used.*
g) *All your answers must be written in the spaces provided in the question paper.*
***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 must answer the questions in English.***

**For Examiners use only**

**Total Score**

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

**Section A:** (25 marks)

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

1. A stone of mass 18.0g was immersed into a liquid and then removed. Figure 1 shows initial liquid level, A, when the stone was fully immersed and the final level, B, after the stone has been removed.

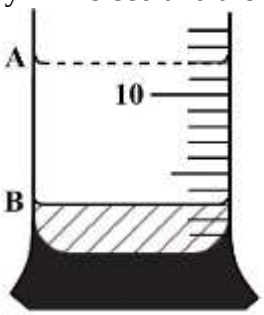


**Figure 1**

Determine the density of the stone. (3 marks)

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2. A rubber balloon filled with carbon (IV) oxide is released from a high-flying aeroplane. State and explain what happens to its volume as it falls. (2 marks)

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3. Two horizontal strings are attached to a block, resting on a frictionless surface, as shown in figure 2.

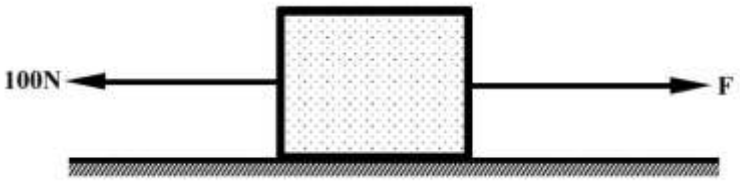


**Figure 2**

A force of 100N pulls on one string. The block does not move. Find the value of the force, F on the other string. (1 mark)

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4. Explain what is observed when the temperature of water, which has pollen grains suspended it, is raised. (2 marks)

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5. Figure 3 shows a bimetallic strip which can be calibrated to measure temperature. It is put at a place with a temperature of 0°C, a mark for that temperature is made on the scale. It is then moved to a place with a temperature of 100°C. A new mark is made on scale.

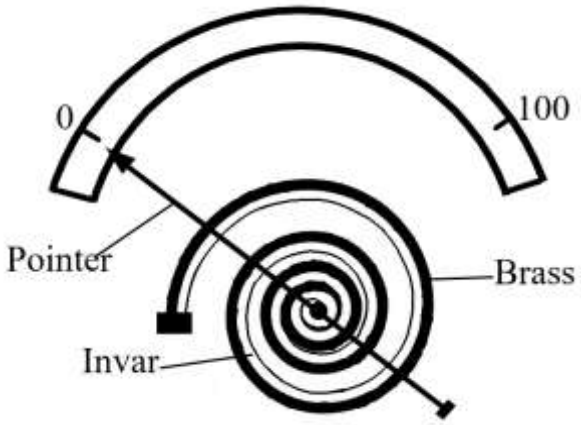


**Figure 3**

Explain how the pointer is made to move from the 0°C mark to the 100°C mark. (2 marks)

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6. A wood bench and its metal stand, feel neither warm nor cold when touched by your bare hands. Explain this observation. (2 marks)

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7. An oil drop of volume 6.0mm$^3$ forms a patch of diameter 35.0cm on a water surface. Estimate the size of a molecule of the oil. (2 marks)

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8. Figure 4 shows a plank of length 2m balanced by two weights of 10N and 40N hang at the ends.

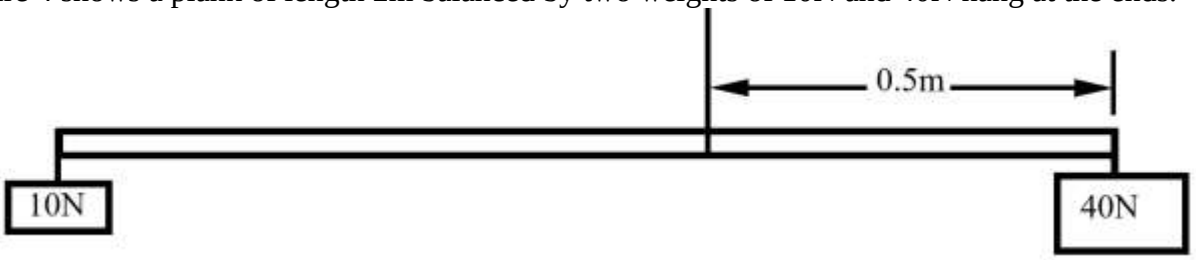


**Figure 4**

Determine the weight of the plank. (2 marks)

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9. Two identical empty bottles A and B are placed as shown in figure 5.

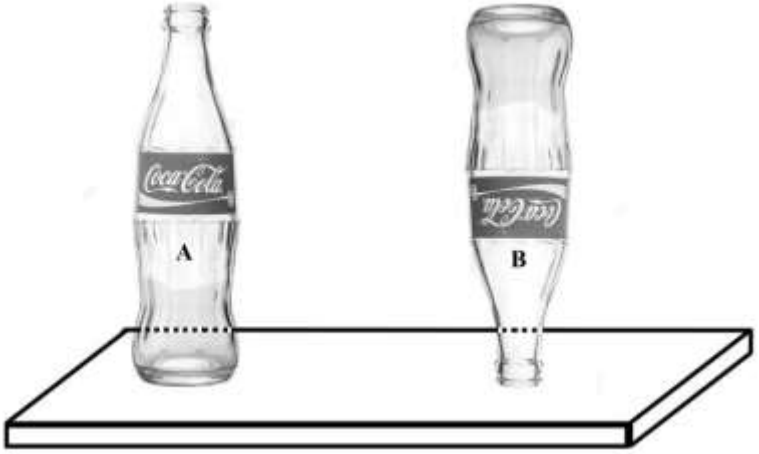


**Figure 5**

Explain why bottle B is less stable than bottle A. (2 marks)

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10. The flow of a fluid in a certain pipe changes from laminar to turbulent. Suggest **one** possible reason for this observation. (1 mark)

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11. Figure 6(a) shows a velocity-time graph for a body moving in a straight line.

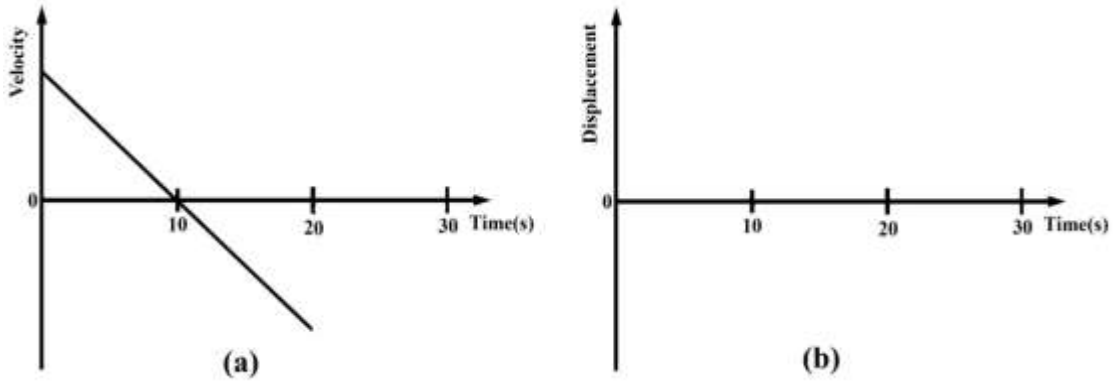


**Figure 6**

On the axes provided in figure 6(b), sketch a displacement-time graph for the motion. (1 mark)

12. Wrapping a bottle of milk with wet cloth is a better method of keeping the milk cold than placing the bottle in a bucket of cold water. Explain this observation. (2 marks)

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13. Figure 7(i ixed mass of gas at different t

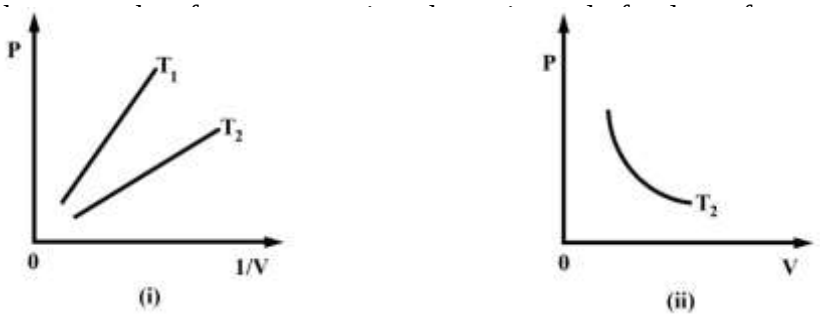


**Figure 7**

Sketch, in figure 7(ii) the pressure-volume graph for temperature $T_1$. (1 mark)

14. Figure 8 shows load-extension graphs, **A** and **B**, for two springs, of the same length made of the same material.

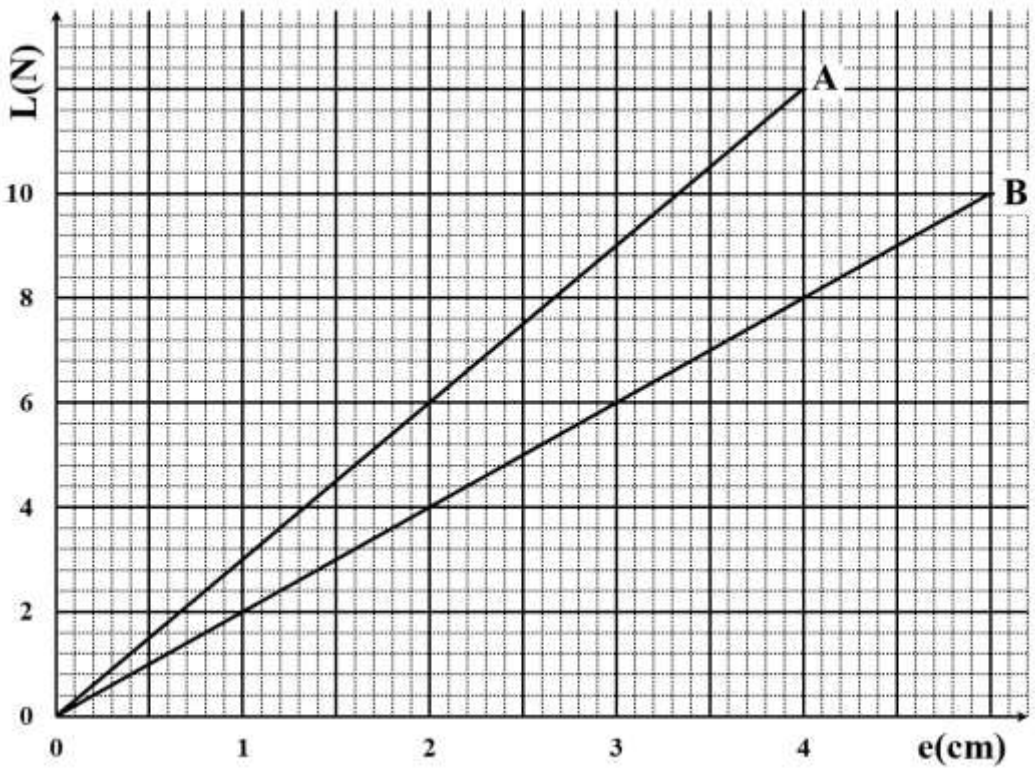


**Figure 8**

Explain, in terms of the physical features of the springs, the differences in the graphs.
(2 marks)

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**Section B:** (55 marks)

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

15. a) A small steel sphere falls through a liquid in a tall container. Figure 9 is the speed-time graph of the fall up to the point where the sphere reaches the bottom.

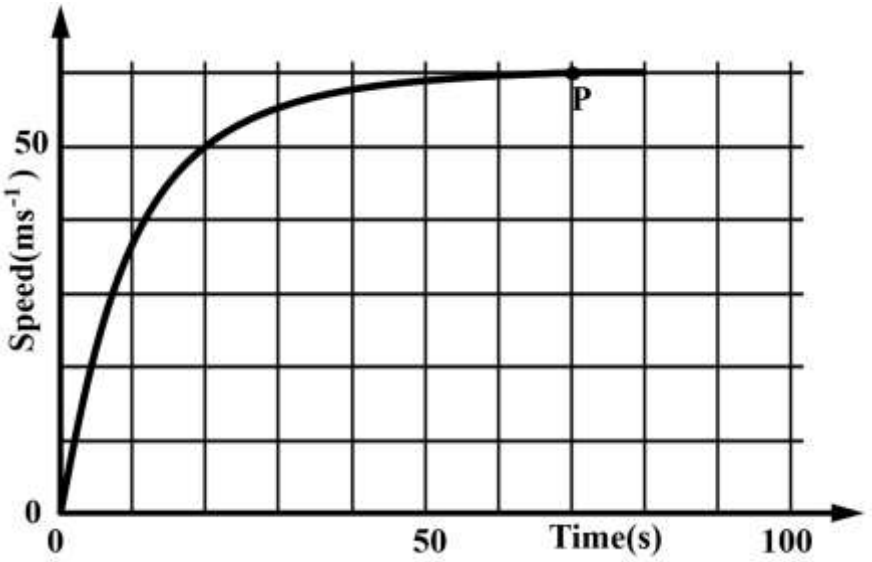


**Figure 9**

(i) Explain the motion of the sphere. (2 marks)

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(ii) (I) Determine the speed of the sphere at point P. (1 mark)

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(II) Explain why this speed is called terminal velocity. (1 mark)

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(iii) Estimate the total distance moved by the sphere. (3 marks)

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b) Figure 10 shows, a diagram of the sphere at point P.


**Figure 10**

The upthrust, U and two other forces act on the sphere.

(i) Name the forces labelled A and B. (2 marks)

A …… B……..

(ii) Write an expression relating the three forces. (1 mark)

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16. a) A wheel fitted on axle is free to rotate on a horizontal axis as shown in figure 11. The radius of the wheel is 40cm and that of the axle is 8cm. The system has an efficiency of 90%.

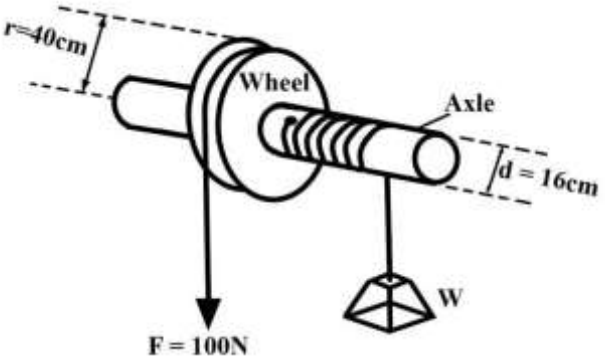


**Figure 11**

(i) Starting from the definition of velocity ratio, show that the velocity ratio of the system is given by V.R = $\frac{R}{r}$. (2 marks)

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(ii) Determine the:

I. Velocity ratio of the system. (2 marks)

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II. Load W. (2 marks)

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b) A bullet of mass 100g moving horizontally at a velocity of $250ms^{-1}$ hits a wooden block of mass 19.9kg, suspended freely from a light inextensible string. The bullet becomes embedded in the block and the block rises through a vertical distance h, as shown in figure 12

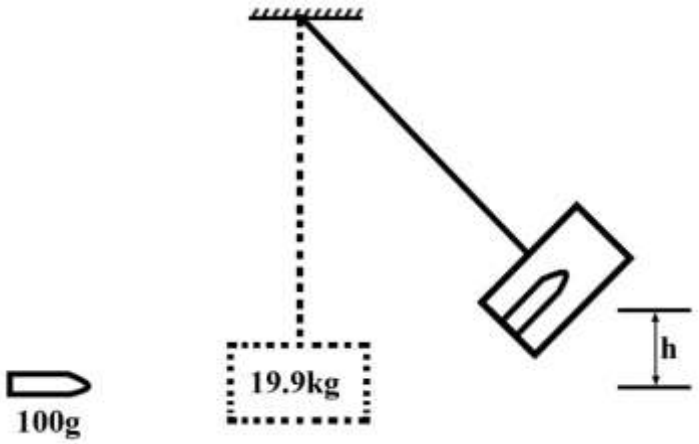


**Figure 12**

Determine the:

(i) velocity of the block containing the embedded bullet immediately after collision. (2 marks)

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(ii) total kinetic energy lost during the collision. (2 marks)

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(iii) value of h. (2 marks)

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17. a) In figure 13, the mass of $m_2$ is twice that of $m_1$. The two masses are initially equidistant from the centre, O, of the turntable.

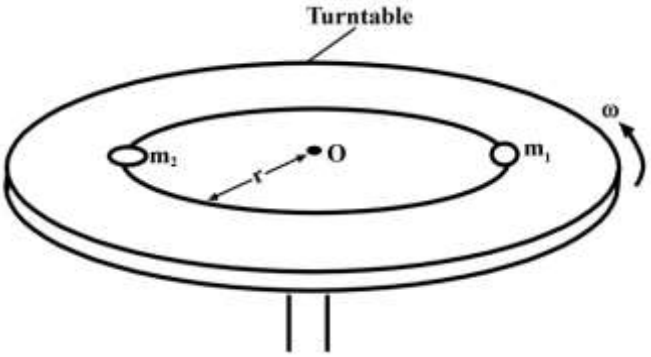


**Figure 13**

The angular velocity, ω of the turntable gradually increased from zero until the masses slide off the turntable.

(i) State with a reason which of the masses is likely to slide off the turntable first. (2 marks)

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(ii) Name the force which provides the centripetal force on the masses. (1 mark)

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b) A body of mass 300g tied to string moves in a horizontal path of radius 20cm. If it takes 0.5s to describe an arc length of 12cm:

(i) Identify the forces acting on the body. (2 marks)

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(ii) Determine the angular velocity of the body. (3 marks)

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(iii) Determine the centripetal force. (2 marks)

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18. a) (i) State **one** similarity and **one** difference between boiling and evaporation. (2 marks)

**Similarity**……

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……**Difference**

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(ii) Figure 14 shows two identical beakers P and Q. Beaker P contains water at $0^oC$ while Q contains water and ice cubes at $0^oC$.

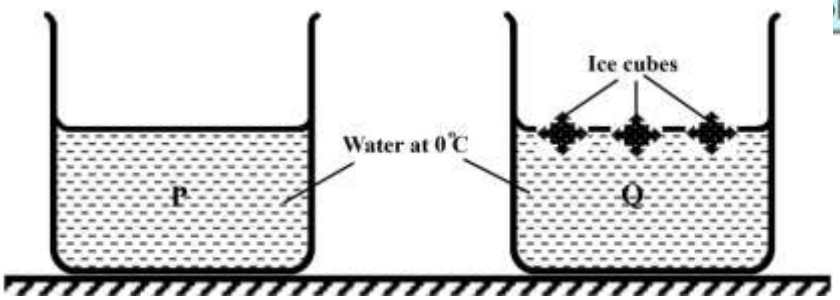


**Figure 14**

Identical metal blocks are removed from the same hot furnace and dropped into each of the beakers. Identify which of the two beakers experiences more evaporation. Give a reason for your answer. (2 marks)

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b) 0.5 kg of ice at -20°C in a copper calorimeter of heat capacity $300JK^{-1}$ is converted into steam at 100°C. Determine the amount of heat required for this process. (Take specific capacity of ice = $2100Jkg^{-1}K^{-1}$, specific heat capacity of water = $4200Jkg^{-1}K^{-1}$, Latent heat of fusion of ice = $3.36x10^{5}Jkg^{-1}$, latent heat vaporization of steam = $2.26x10^{6}Jkg^{-1}$) (3 marks)

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c) Figure 15 shows two containers X and Y of capacity $0.5m^3$ and $9.5m^3$ respectively. The two containers are connected a capillary tube of negligible volume. The tap is closed and container X is filled with a gas at pressure of $4.0x10^{5}Pa$ and a temperature of 27°C.

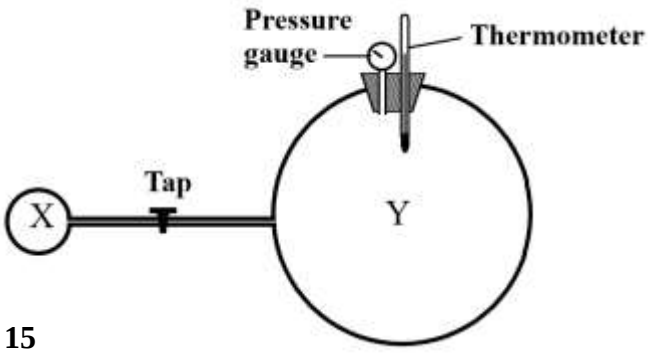


**Figure 15**

When the tap is opened, the temperature of gas falls to 17°C.

(i) Give a reason for the drop in the temperature. (1 mark)

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(ii) Assuming that the containers don't contract, determine the new pressure of the gas (3 marks)

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19. a) A solid cube of length 10cm is released on the surface of a liquid having the same density as the cube. (see figure 16)

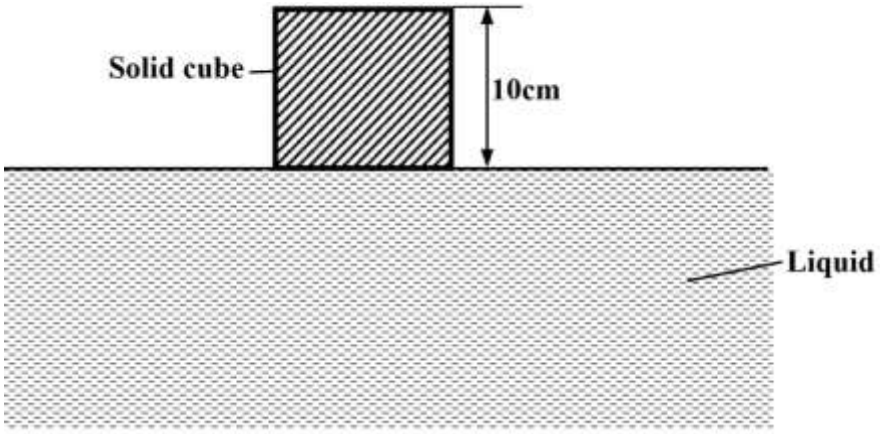
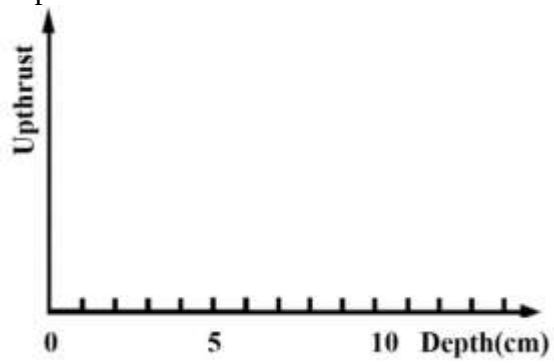



**Figure 16**

On the axes provided below, sketch a graph showing how the upthrust of the solid cube varies with the depth. (2 marks)




b) An object sinks in water but just floats in liquid, L. Explain this observation in terms of weight and upthrust. (2 marks)

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c) A buoy of mass 10kg is held under water by a rope attached to the bottom of a lake. The tension in the rope is 50N.
Determine the:

(i) volume of the buoy (3 marks)

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(ii) density of the buoy. (2 marks)

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c) A test tube containing some water and some air is inverted so that it floats inside a glass jar full of water. A tight diaphragm fixed at the mouth of the jar. See figure 17.

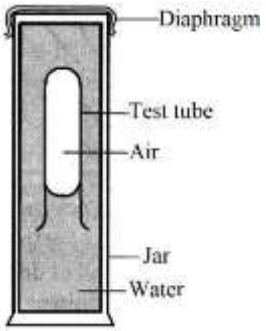


**Figure 17**

If the diaphragm is pressed downwards, the test tube moves to the bottom of the jar. Explain this observation. (3 marks)

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