SECTION A (25 Marks)

1. The number of molecules in 18cm3 of a liquid is 6x1023. Assuming that the diameter of the molecules is equivalent to the side of a cube having the same volume as the molecule. Determine the diameter of the molecule. (3mks)

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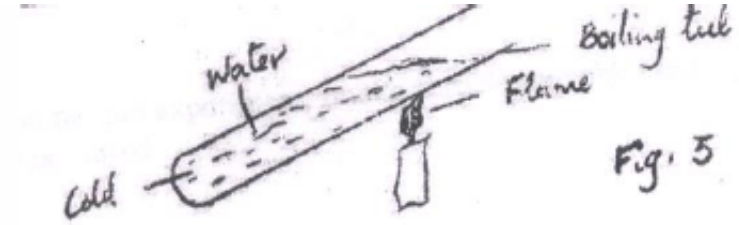
2. a) In the set up shown in figure 2, water near the top of the boiling tube boils while at the bottom remains cold.



Give a reason for the observation (1mk)

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b) An electric kettle with shiny outer surface is more efficient than one with a dull outer surface, give a reason for this? (1mk)

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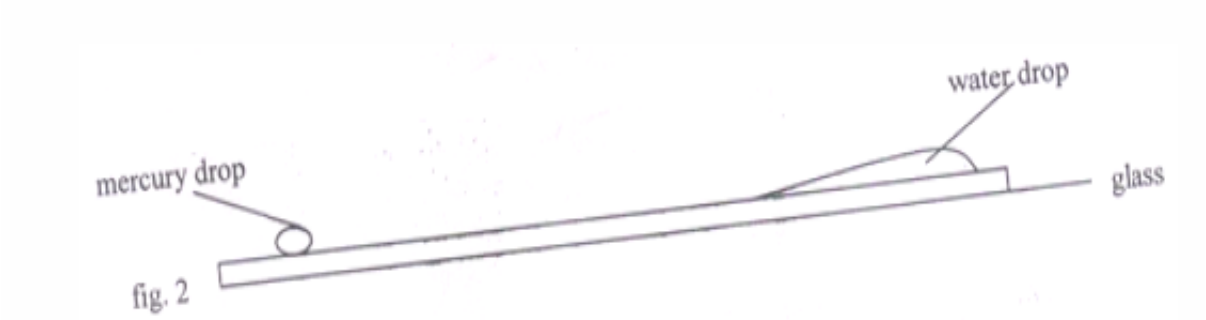
3. The figure 2 below shows drops of mercury and water on a glass surface,



Explain the difference in the shapes of drops. (2mks)

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5. State why diffusion is faster in gases than in liquids? (1mk)

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6. In the Brownian motion experiment, smoke particles are observed to move randomly. Explain how this motion is caused. (2mks)

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7. State how the pressure in a moving fluid varies with the speed of the fluid. (1mk)
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8. A pipe of diameter 12mm is connected to another of diameter 18mm. If water flows in the wider at the speed of 2m/s, determine his speed of water in the narrower pipe?
(3mks)
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9. State two ways in which the stability of a body can be increased. (2mks)
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10. The diagram in figure below shows two glass tube of different diameters dipped in water, give a reason for the difference in the heights? (2mks)

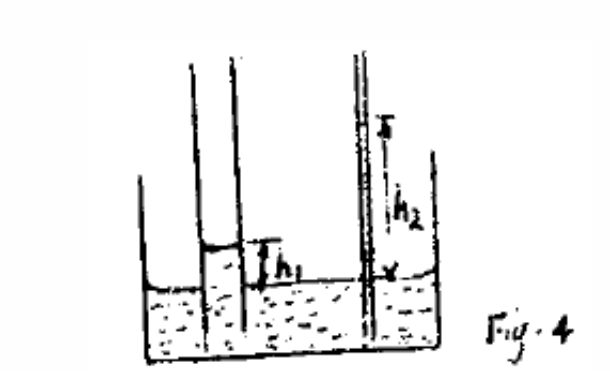

Fig. 4

SECTION B (55 Marks)

13. a) A crane lifts a load of 200kg through a vertical distance of 0.3m in 6 seconds.
Determine:
i) Work done (2mks)
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ii) Power development by the crane. (2mks)
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iii) Efficiency of the crane given that it is operated by an electric motor rated 12.5kW. (2mks)
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b) A child of mass 20kg sits on a swing of length 4m and swings through a vertical

height 0.9m as shown in figure 7.

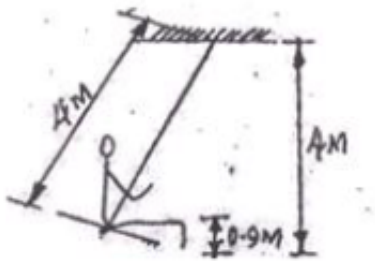

Fig. 2

Determine:
i) Speed of the child when passing through the lowest point. (2mks)
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ii) Force exerted on the child by the seat of swing when passing through the lowest point. (3mks)
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14. a) State Archimedes principle (1mk)
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b) In an experiment to determine the relative density of methylated spirit applying Archimedes Principle, the following were provided, a spring balance, some masses a piece of thread, water in a beaker and methylated spirit in a beaker. The table below shows the results obtained.

Mass (g)	100	150	200
Weight in air (N)	1.00	1.50	2.00
Weight in water (N)	0.88	1.32	1.76
Weight in spirit (N)	0.91	1.36	1.82

i) Draw labeled sketch diagrams to show how the readings in the table were obtained. (1mk)
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ii) For each mass, determine the upthrust in water and the upthrust in the spirit. (2mks)
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iii) Determine the average relative density of the spirit. (3mks)
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c) A weather balloon of volume 1.2m3 is tied to a rigid support while being filled with helium gas. The mass of the fabric making the balloon is 0.30kg. Determine the maximum tension on the string tying the balloon to the rigid support. (4mks)
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15. a) Define the term angular velocity. (1mk)

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b) A body moving with uniform angular velocity is found to have covered an angular distance of 170 radians in t seconds. Thirteen seconds later it is found to have covered a total angular distance of 300 radians. Determine t. (2mks)
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c) Fig. 8 shows a body of mass m attached to the centre of a rotating table with a string whose tension can be measured.(The device for measuring the tension is not shown in the figure.)

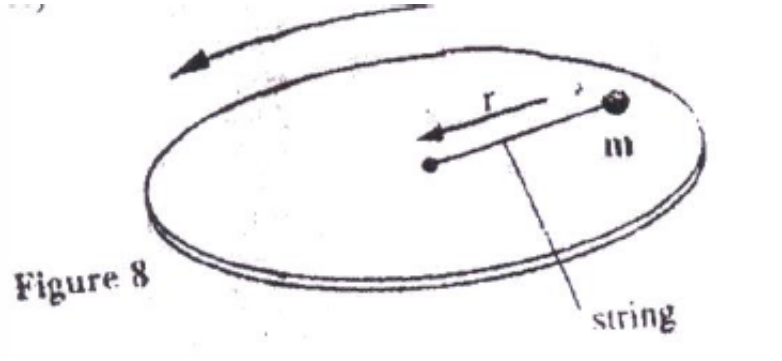

Figure 8

The tension, T on the string was measured for various values of angular velocity, w. The distance r of the body from the centre was maintained at 30cm. Table below shows the results obtained.

W^{-2}	4.0	9.0	16.0	25.0	36.0
Angular velocity w ($radi^{-1}$)	2.0	3.0	4.0	5.0	6.0
Tension T(N)	0.04	0.34	0.76	1.30	1.96

i) Plot the graph of T(y-axis against w2) (5mks)

ii) From the graph, determine the mass, m of the body given that T=mw2-C
Where C is a constant (3mks)
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iii) Determine the constant C and suggest what it represents in the set up. (2mks)
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