

232/1

— **PHYSICS** —  
(THEORY)

**Paper 1**

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**Apr. 2021 – 2 hours**

Name ..... Index Number .....

Candidate's Signature ..... Date .....

**Instructions to Candidates**

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in 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** working **must** be clearly shown in the spaces provided in this booklet.
- (f) Non-programmable silent electronic calculators may be used.
- (g) **This paper consists of 16 printed pages.**
- (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 should answer the questions in English.**

**For Examiner's Use Only**

Section	Questions	Maximum Score	Candidate's Score
A	1–13	25	
B	14	09	
	15	10	
	16	13	
	17	12	
	18	11	
Total Score		80	

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## SECTION A (25 marks)

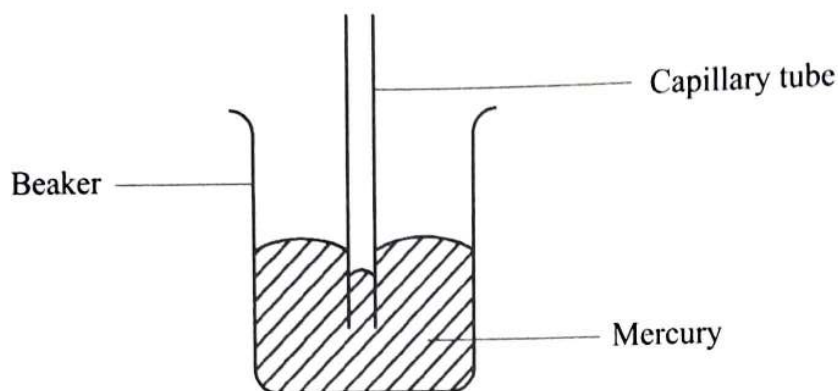
Answer **all** the questions in this section in the spaces provided.

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1. The diameter of a wire was measured as 2.43 mm. Name the instrument that was used to measure this diameter. (1 mark)

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2. **Figure 1** shows a capillary tube dipped in mercury in a beaker.



**Figure 1**

State with a reason the observation that would be made on the level of mercury in the capillary tube if the temperature of mercury is increased. (2 marks)

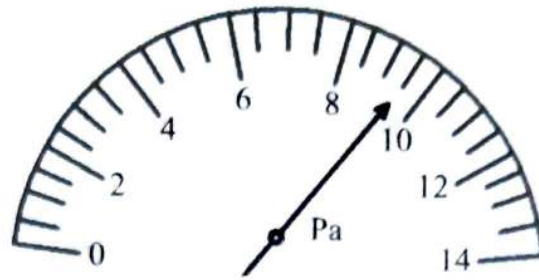
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3. State the kinetic theory of gases. (1 mark)

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4. **Figure 2** shows the scale of a measuring instrument.

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**Figure 2**

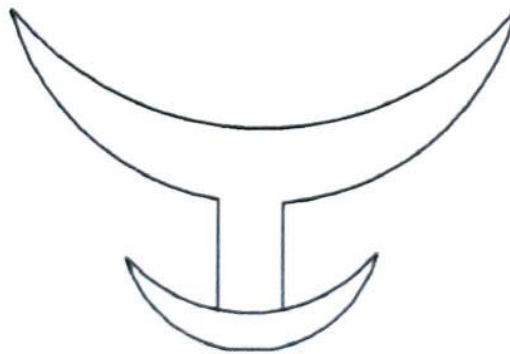
- (a) Determine the reading indicated. (1 mark)

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- (b) State the physical quantity measured by this instrument. (1 mark)

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5. **Figure 3** shows a traditional stool resting on a level surface.



**Figure 3**

- (a) Identify its state of equilibrium. (1 mark)

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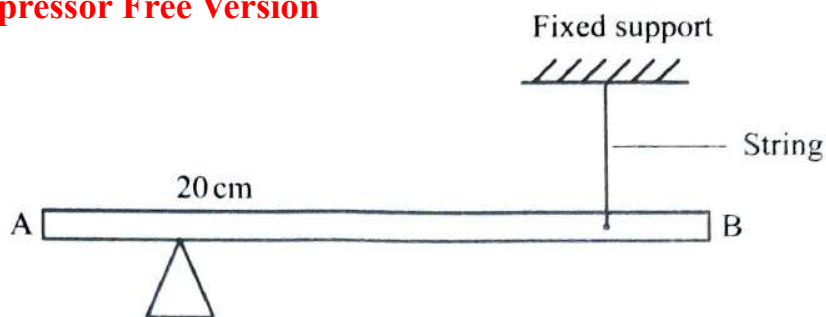
- (b) State the reason for the answer in (a). (1 mark)

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6. **Figure 4** shows a uniform rod AB of length 1 m and weight 8 N pivoted at 20 cm from one end. It is balanced by supporting it with a string attached to a fixed support.

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**Figure 4**

- The tension in the string is 4 N. Determine the position of the string from end A. (3 marks)

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7. Define cohesive forces. (1 mark)

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8. Two similar containers A and B are filled with equal masses of water at the same temperature. Container A is made of copper while container B is made of glass. Heat is then supplied to the containers at the same rate. State with a reason, the container in which water boils first. (2 marks)

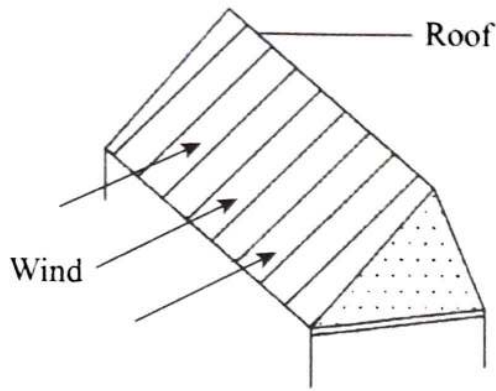
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9. **Figure 5** shows a roof of a house over which wind is blowing.  
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**Figure 5**

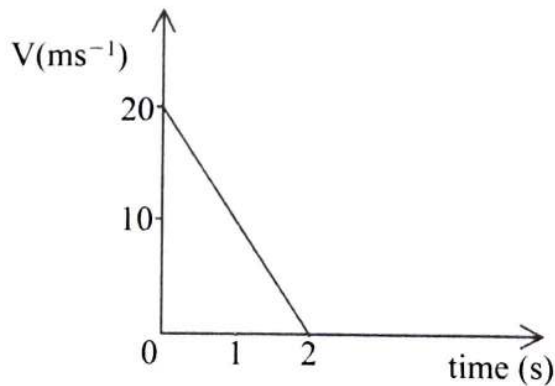
It was observed that, when the speed of the wind increased, the roof was blown off. Explain this observation. (2 marks)

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10. **Figure 6** shows the velocity–time graph of the motion of a stone thrown vertically upwards.



**Figure 6**

From the graph, determine the maximum height reached by the stone. (3 marks)

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11. It is observed that when methylated spirit is poured on the palm, the palm feels colder as it dries up. Explain this observation. (2 marks)

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12. Figure 7 shows a box placed on a weighing balance. The balance is placed on the floor of a lift.

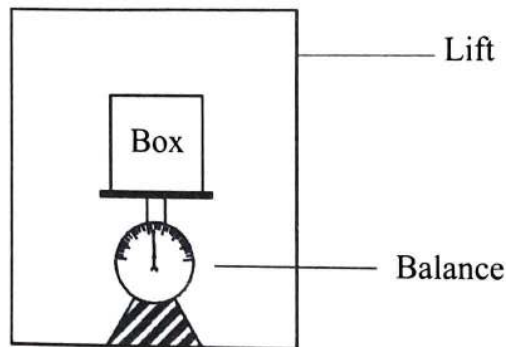


Figure 7

State what would be observed on the reading of the balance when the:

- (i) lift is accelerating downwards (1 mark)

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- (ii) lift moves downwards with a uniform velocity (1 mark)

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- (iii) lift is accelerating upwards (1 mark)

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13. An object placed on the surface of water in a beaker starts to sink immediately. It is observed that it stops sinking when half of its volume is below the water surface. State the reason for this observation. (1 mark)

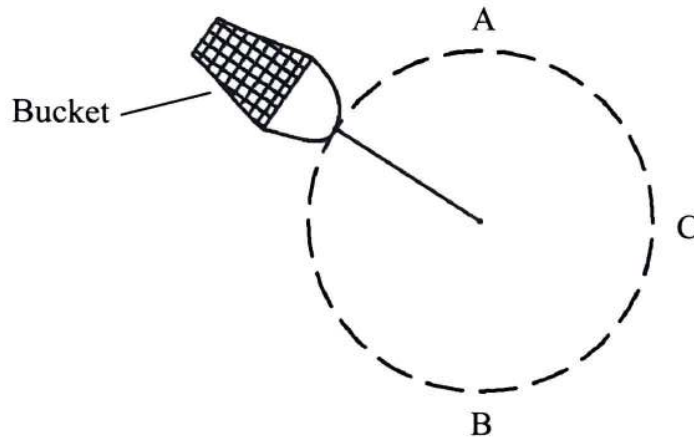
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### SECTION B (55 marks)

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

14. (a) **Figure 8** shows a bucket filled with water and tied to one end of a string which is used to whirl it in a vertical circular path with a uniform speed  $v$ .



**Figure 8**

- (i) State **two** forces acting on the bucket at any instant. (2 marks)

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- (ii) Explain why the tension is lowest at point A. (2 marks)

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- (iii) The speed of the bucket is gradually reduced. Explain what is likely to be observed when the bucket is at point A. (2 marks)

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- (b) A stone of mass 40 g is whirled at the end of a string in a horizontal circular path at speed of  $12 \text{ ms}^{-1}$ . (The string and the stone are in the same horizontal plane). If the string is 1 m long, determine the tension in the string. (3 marks)

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15. (a) Figure 9 shows a setup used by a student to investigate how a siphon works.

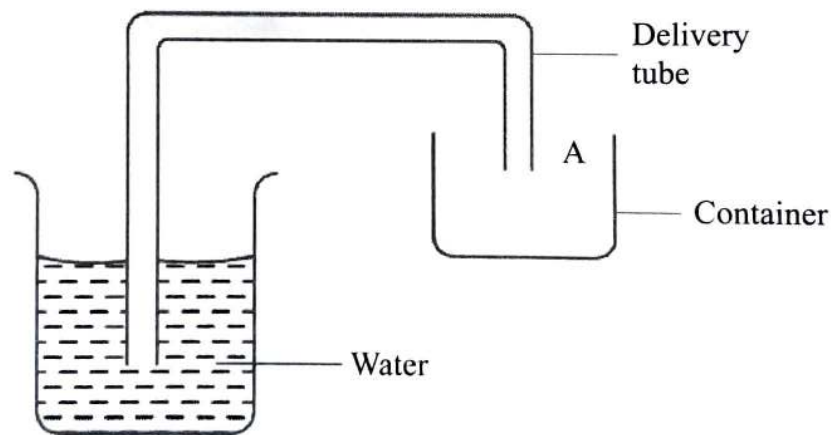


Figure 9

- (i) State what would be observed when the student sucks the tube at point A and releases it. (2 marks)

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(ii) Explain the observation in a(i). (2 marks)

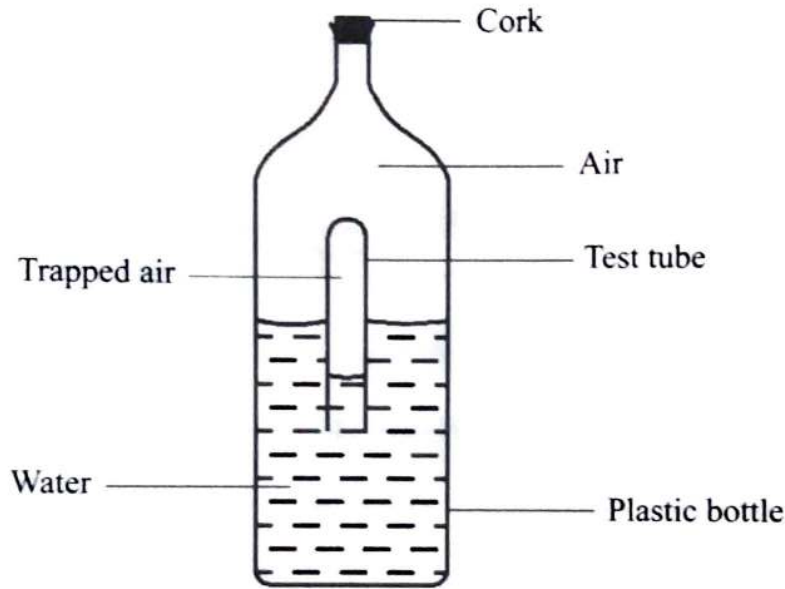
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(b) **Figure 10** shows a test-tube inverted and floating inside a plastic bottle containing some water. The bottle is then sealed.



**Figure 10**

It is observed that when the sides of the bottle are squeezed, the test-tube sinks.

Explain this observation. (3 marks)

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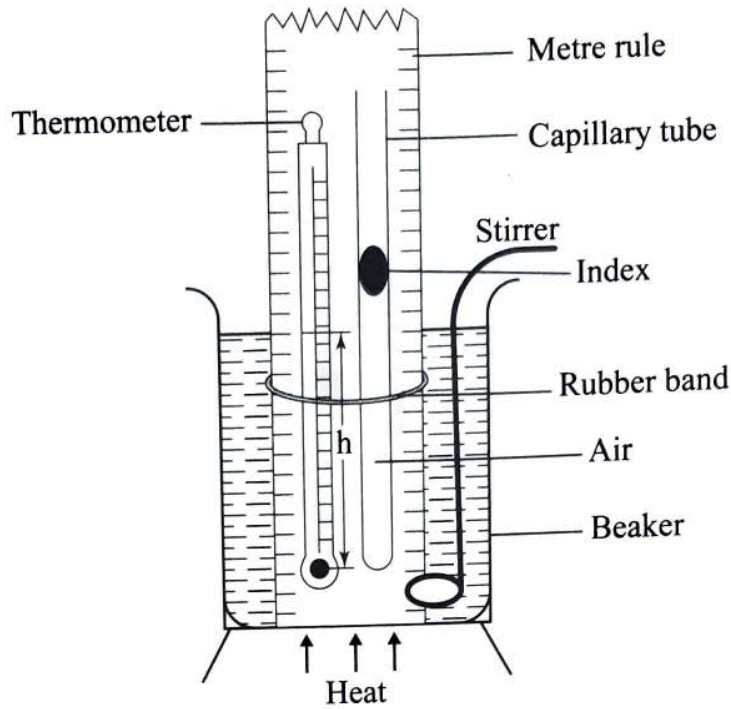
(c) A metallic box weighs 188 N and measures 10 cm by 30 cm by 8 cm. Determine the maximum pressure it can exert when lying on one of its surfaces. (3 marks)

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16. (a) **Figure 11** shows a setup that can be used to verify Charles' Law.  
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**Figure 11**

- (i) Explain how the:
- I. temperature of air in the tube is measured; (2 marks)  
 .....  
 .....  
 .....
  - II. volume of air in the tube is measured. (2 marks)  
 .....  
 .....  
 .....
- (ii) State how the pressure is kept constant during the experiment. (1 mark)  
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(iii) State how the measurements in (i) can be used to verify Charles' law. (3 marks)

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(iv) State **one** precaution that must be taken to ensure that the temperature of air is accurately measured. (1 mark)

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(b) A fixed mass of gas initially at 20°C is heated at constant pressure until its volume doubles. Determine its final temperature. (4 marks)

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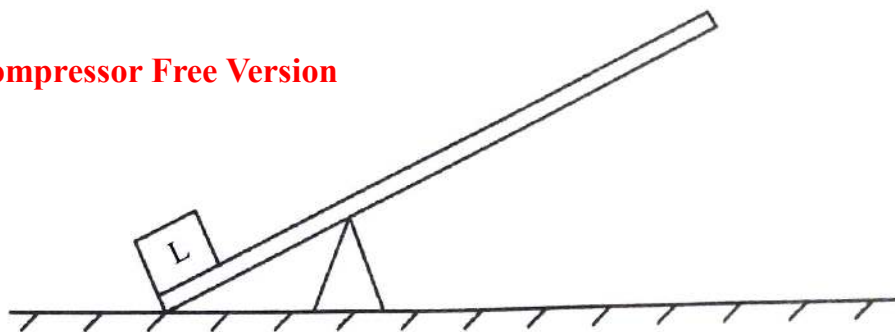
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17. (a) **Figure 12** shows a simple machine.

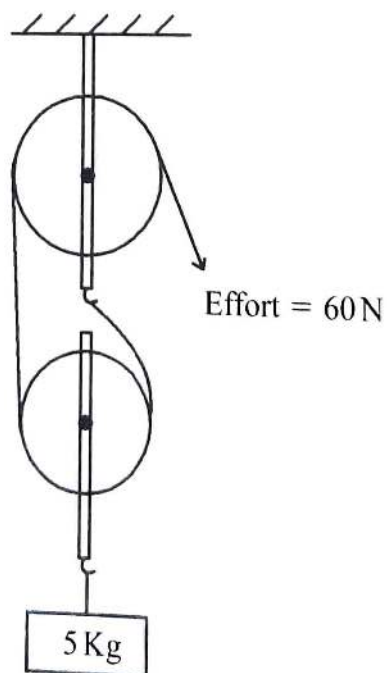
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**Figure 12**

On the same figure, mark and label the following parts:

- (i) Effort arm (1 mark)
- (ii) Load arm (1 mark)
- (b) **Figure 13** shows a pulley system used to raise a mass of 5 kg through a height of 2 m when a force of 60 N is applied. (Acceleration due to gravity  $g$  is  $10 \text{ ms}^{-2}$ )



**Figure 13**

Determine the:

(i) distance moved by the effort;

(1 mark)

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(ii) work done on the load;

(3 marks)

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(iii) potential energy gained by the load ( $g = 10 \text{ Nkg}^{-1}$ ).

(1 mark)

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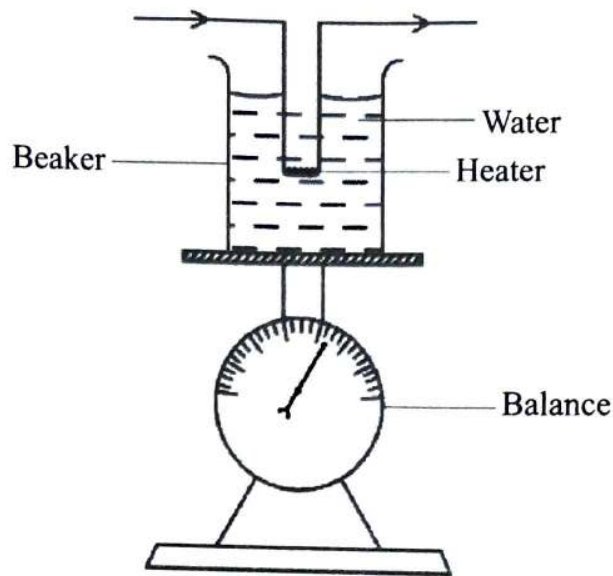
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- (c) **Figure 14** shows a setup that can be used to determine the specific latent heat of vaporisation of water. A beaker containing some water was placed on a weighing balance and an immersion heater rated 500 W immersed in the water.



**Figure 14**

The water was then heated until it boiled. When the water started boiling, the initial reading on the balance was noted and the stop watch started immediately. The final reading on the balance was then noted after a time  $t$  seconds.

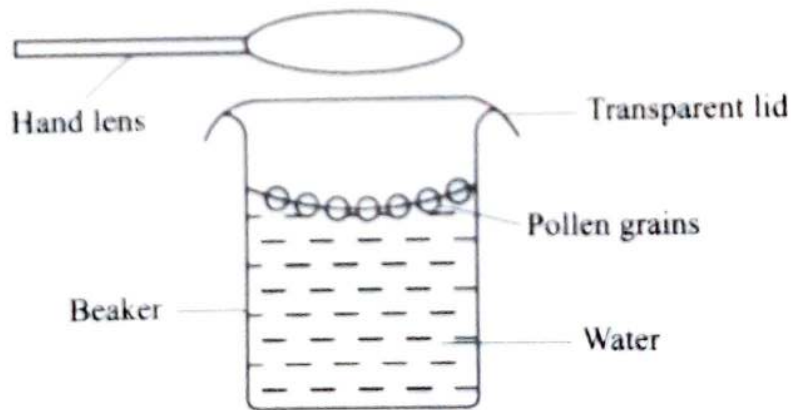
- (i) State how the mass of steam can be measured using this setup. (1 mark)
- .....
- .....
- (ii) Write down an expression for the heat supplied by the heater. (1 mark)
- .....
- .....
- (iii) Determine the specific latent heat of vaporisation of water. (3 marks)
- .....
- .....
- .....

18. (a) State the meaning of the term *matter*. (1 mark)

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- (b) It is observed that when a liquid is heated its volume increases. Explain this observation using the kinetic theory of matter. (3 marks)

- (c) **Figure 15** shows a setup used to study Brownian motion in liquids.



**Figure 15**

- (i) State the function of the hand lens. (1 mark)
- (ii) State what is observed on the pollen grains. (1 mark)
- (iii) Explain the observation made in (ii). (2 marks)

(iv) State and explain what would be observed on the pollen grains if the water is  
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