

232/1

Paper 1

PHYSICS – (Theory)

Dec. 2022 – 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 12 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	
	14	9	
B	15	10	
	16	12	
	17	13	
	18	11	
Total Score		80	

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SECTION A (25 marks)

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

1. (a) State what is meant by “Area”. (1 mark)

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- (b) State the SI unit of area. (1 mark)

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2. Explain why water in a glass tube forms a concave meniscus. (2 marks)

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3. **Figure 1** shows how water is drawn from a large tank into a low lying container using a rubber tube.

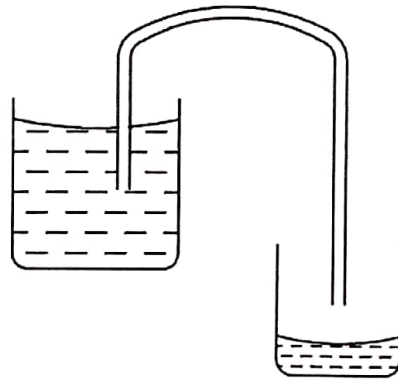


Figure 1

- Explain how the process takes place. (2 marks)

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4. State how a piece of paper can be used to demonstrate that matter is made of tiny particles. (1 mark)

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5. Figure 2 shows Six's maximum and minimum thermometer.

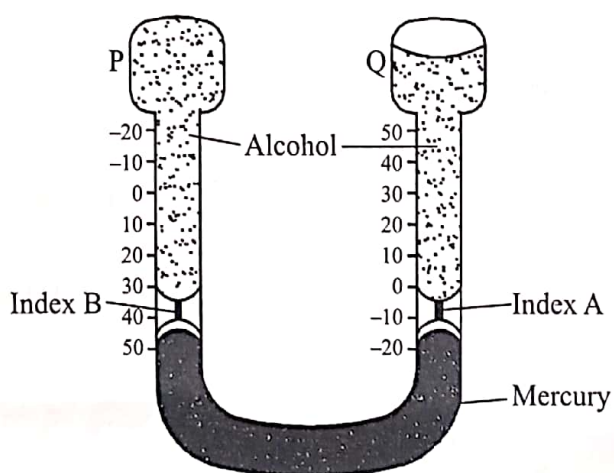


Figure 2

- Explain how increase in temperature causes index A to move upwards. (2 marks)

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6. State the difference between heat and temperature. (2 marks)

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7. State two factors that affect the stability of a cylindrical container. (2 marks)

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8. Figure 3 shows a set up in which a spring with a pointer is attached to a wooden strip that has a hanging hook. A graph paper is fixed along the strip to be used to calibrate the spring.

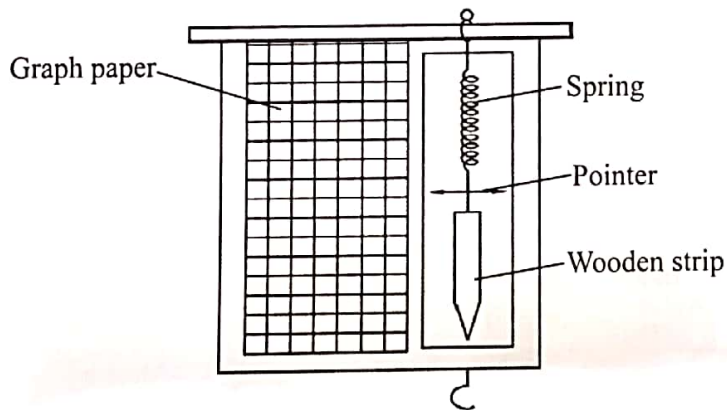


Figure 3

- A mass of 100 g is provided. Explain how the spring balance can be calibrated. (3 marks)

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9. Water enters a pipe at a velocity V_1 at a point where the cross-sectional area is A_1 . It leaves the pipe at a velocity V_2 at a point where the cross-sectional area is A_2 . Show that $A_1 V_1 = A_2 V_2$. (3 marks)

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10. Sketch the displacement – time graph for a body moving with decreasing velocity. (1 mark)

11. Figure 4 shows a graph of force against time when a tennis ball is hit.

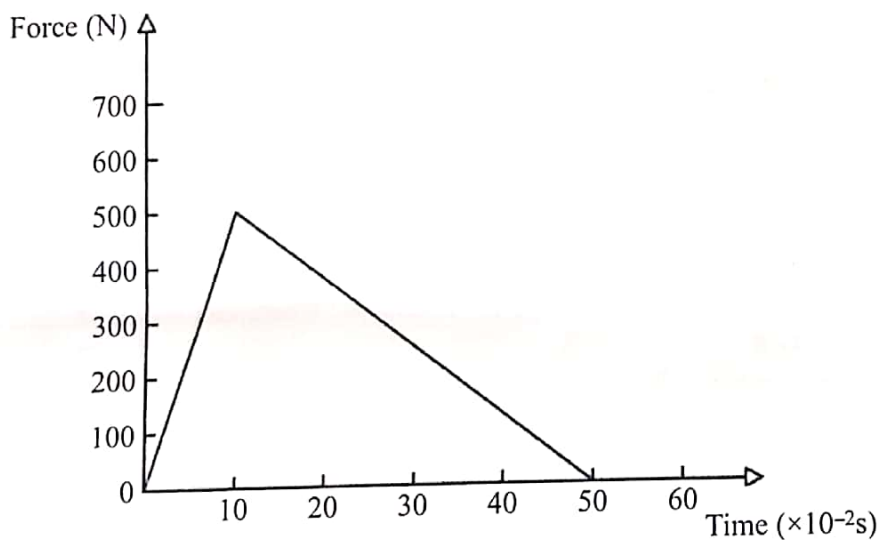


Figure 4

Determine the mass of the tennis ball whose velocity is 60 ms^{-1} . (Assume the ball is stationary before it is hit). (3 marks)

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12. State the energy transformations that take place as a pendulum bob swings. (1 mark)

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13. When determining the specific latent heat of fusion of ice by electrical method, other than mass, voltage and current, state **one** other measurement that should be taken. (1 mark)

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SECTION B (55 marks)

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

14. (a) State Boyle's law. (1 mark)

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(b) **Figure 5 (a)** shows a column of air of length 6 cm trapped by a mercury thread in a tube. **Figure 5 (b)** shows the same tube in a horizontal position.

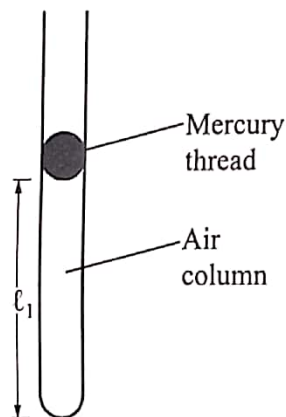


Figure 5 (a)

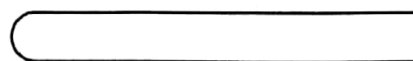


Figure 5 (b)

(i) Draw the mercury thread in **Figure 5 (b)**. (2 marks)

(ii) Explain why the thread appears as in 14(b)(i). (2 marks)

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(c) (i) State what is meant by "*absolute zero temperature*". (1 mark)

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(ii) A balloon contains hydrogen gas at a temperature of 2 °C and a pressure of 6 mmHg. Determine the pressure in the balloon when the temperature is raised to 80 °C. (3 marks)

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15. (a) State two ways in which the centripetal force acting on a body of mass M can be reduced. (2 marks)

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(b) A stone of mass 0.5 kg tied to a string is whirled in a vertical plane along a circular path of radius 2 m and that its frequency is 2 cycles per second.

($\pi = 3.142$)

(i) Determine the:

I. velocity of the stone (3 marks)

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II. tension in the string when the stone is at the top most part of the circular path (3 marks)

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(ii) State with a reason how the tension in the string changes as the stone gets to the bottom of the circular path. (2 marks)

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16. (a) **Figure 6** shows a cube of mass 2 kg and sides 5 cm fully immersed in a liquid of density 0.8 gcm^{-3} . The cube is balanced by a stone of mass M .

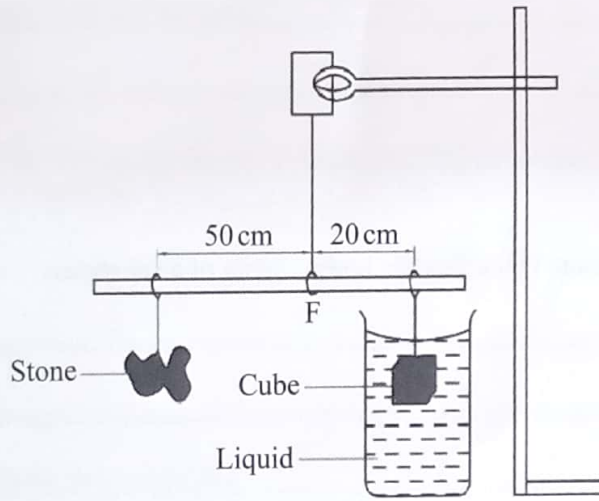


Figure 6

Given that the gravitational field strength, g , is 10 Nm^{-2} , determine the:

- (i) upthrust acting on the cube (3 marks)

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- (ii) apparent weight of the cube (3 marks)

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- (iii) weight of the stone (3 marks)

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- (b) A block of mass 500 g floats in water. Determine the volume of the block under the water. (*density of water is 1 g cm^{-3}*). (3 marks)

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17. (a) State **two** factors that affect the boiling point of a substance. (2 marks)

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- (b) A well lagged calorimeter contains a liquid of mass 200 g at a temperature of 10°C . An electric heater rated 80 W is used to heat the liquid. **Figure 7** shows a graph of temperature against time for the liquid.

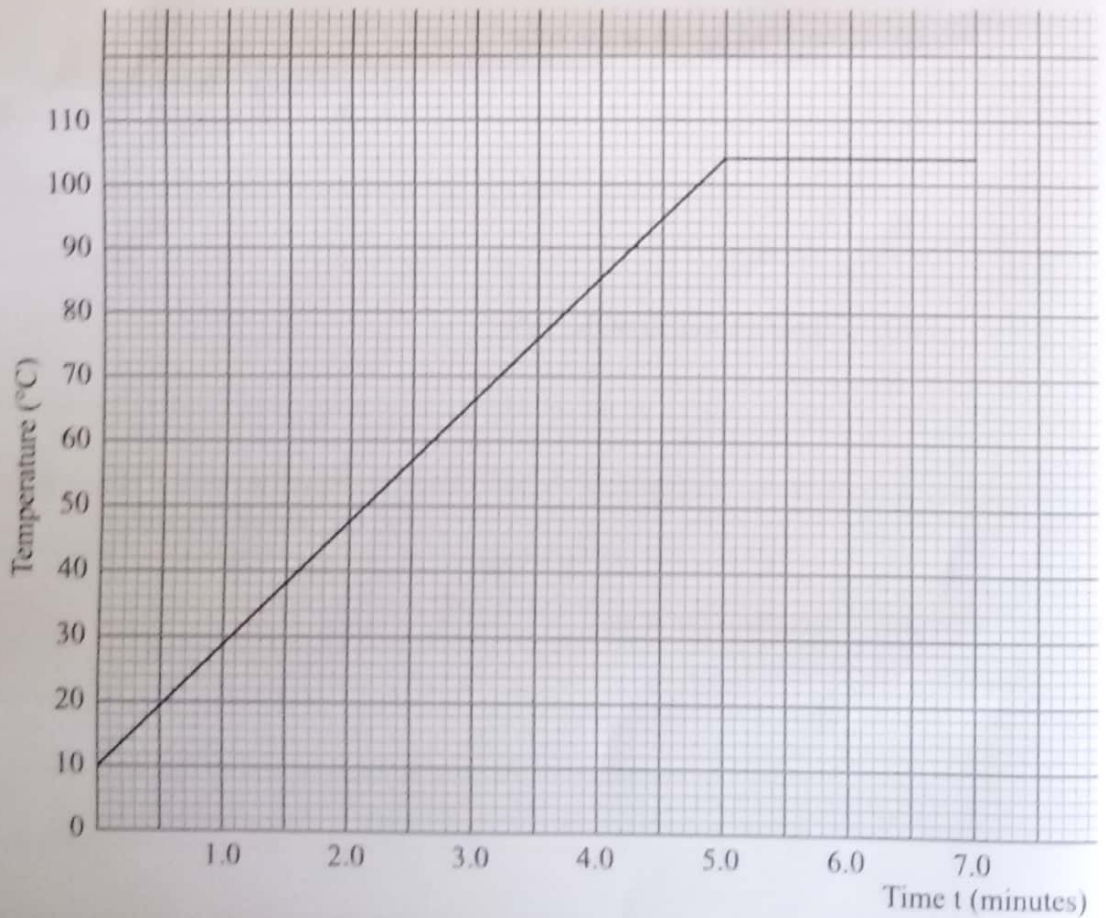


Figure 7

From the graph, determine the:

- (i) boiling point of the liquid (1 mark)

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- (ii) quantity of heat given out by the heater between time $t = 1$ minute and time $t = 4.5$ minutes (3 marks)

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(c) Based on (b)(ii), determine the:

- (i) temperature change between the time $t = 1$ minute and time $t = 4.5$ minutes (1 mark)

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- (ii) specific heat capacity of the liquid (3 marks)

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- (d) 2 g of vapour was collected from the liquid between times $t = 5.4$ minutes and $t = 6.3$ minutes. Determine the specific latent heat of vaporisation of the liquid. (3 marks)

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18. (a) A weighing balance placed on the floor of a lift is used to measure the weight of a body of mass 80 kg. Determine the reading on the balance when the lift moves upwards: (acceleration due to gravity g is 10ms^{-2})

(i) with uniform velocity (3 marks)

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(ii) with an acceleration of 3ms^{-2} (3 marks)

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(b) Explain why a person standing on a boat is likely to fall into the water when attempting to jump to the shore. (3 marks)

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(c) A box is moved 30m along a surface whose frictional force is 1000N with uniform velocity. Determine the work done against friction. (2 marks)

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