

**KCSE 2022**

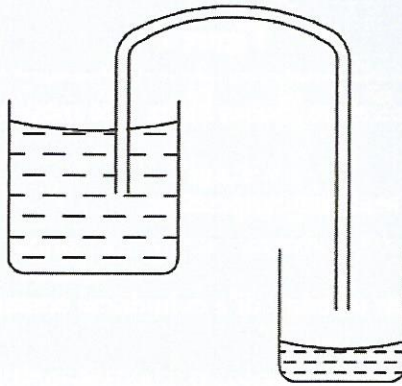
**4.4 PHYSICS (232)**

**4.4.1 Physics Paper 1 (232/1)**

**SECTION A (25 marks)**

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

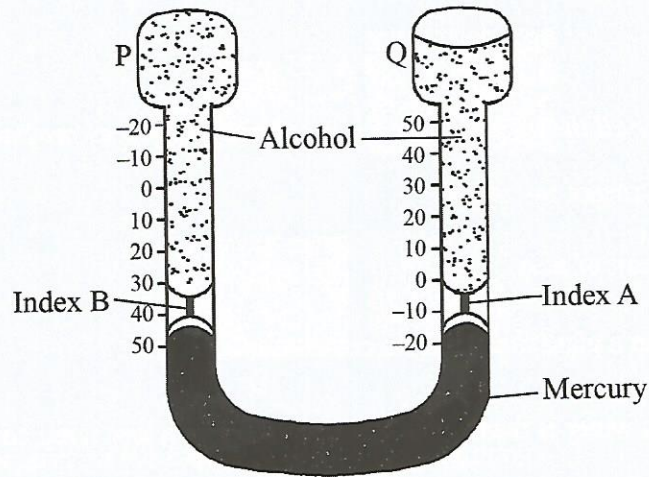
1. (a) State what is meant by “Area”. (1 mark)
- (b) State the SI unit of area. (1 mark)
2. Explain why water in a glass tube forms a concave meniscus. (2 marks)
3. **Figure 1** shows how water is drawn from a large tank into a low lying container using a rubber tube.



**Figure 1**

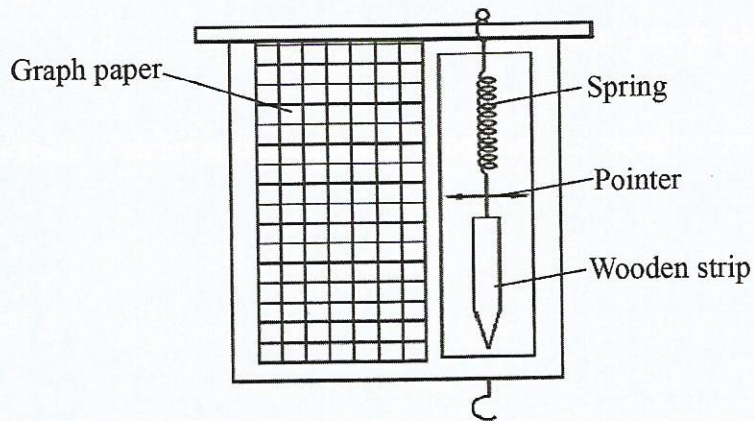
- Explain how the process takes place. (2 marks)
4. State how a piece of paper can be used to demonstrate that matter is made of tiny particles. (1 mark)

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)
6. State the difference between heat and temperature. (2 marks)
7. State **two** factors that affect the stability of a cylindrical container. (2 marks)
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)
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  $A_1V_1 = A_2V_2$ . (3 marks)



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.

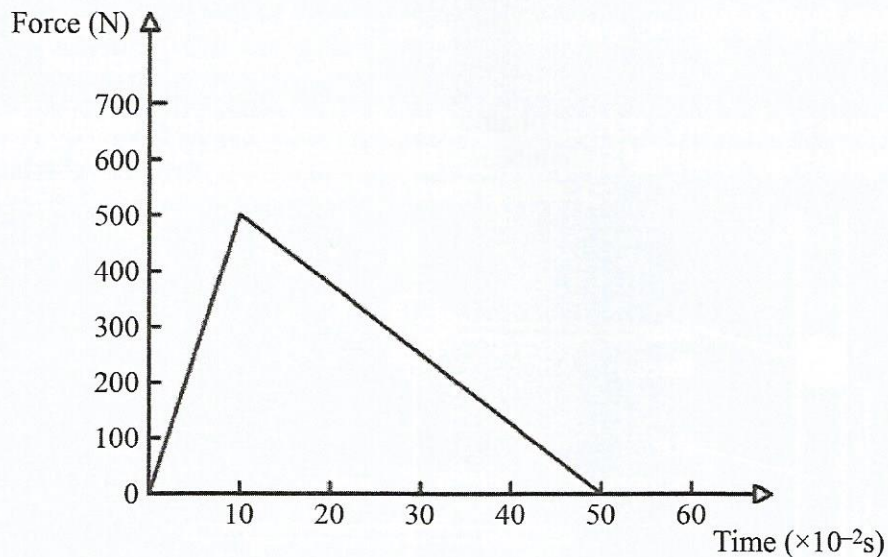


Figure 4

- Determine the mass of the tennis ball whose velocity is  $60 \text{ ms}^{-1}$ . (Assume the ball is stationary before it is hit). (3 marks)
12. State the energy transformations that take place as a pendulum bob swings. (1 mark)
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)

SECTION B (55 marks)

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

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

(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.

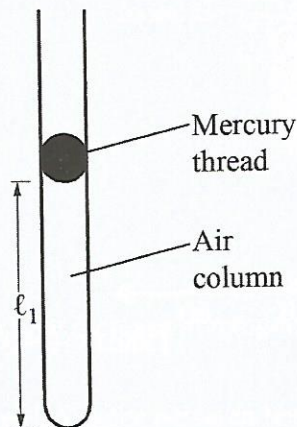


Figure 5 (a)

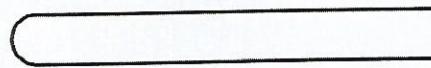


Figure 5 (b)

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

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

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

(ii) A balloon contains hydrogen gas at a temperature of  $2^{\circ}\text{C}$  and a pressure of 6 mmHg. Determine the pressure in the balloon when the temperature is raised to  $80^{\circ}\text{C}$ . (3 marks)

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

(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)



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

(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)

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

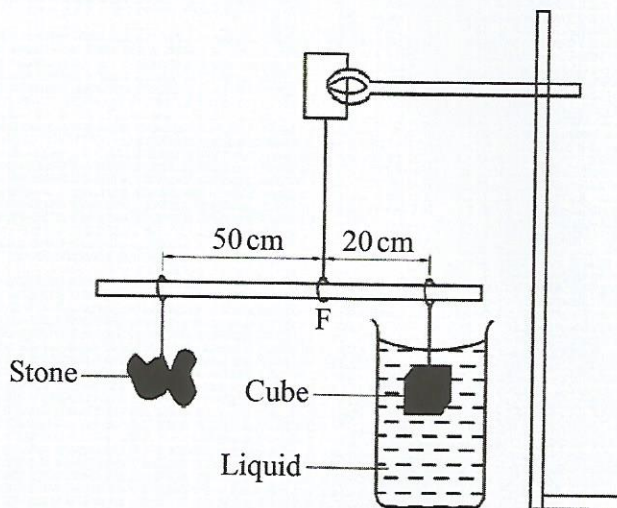


Figure 6

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

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

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

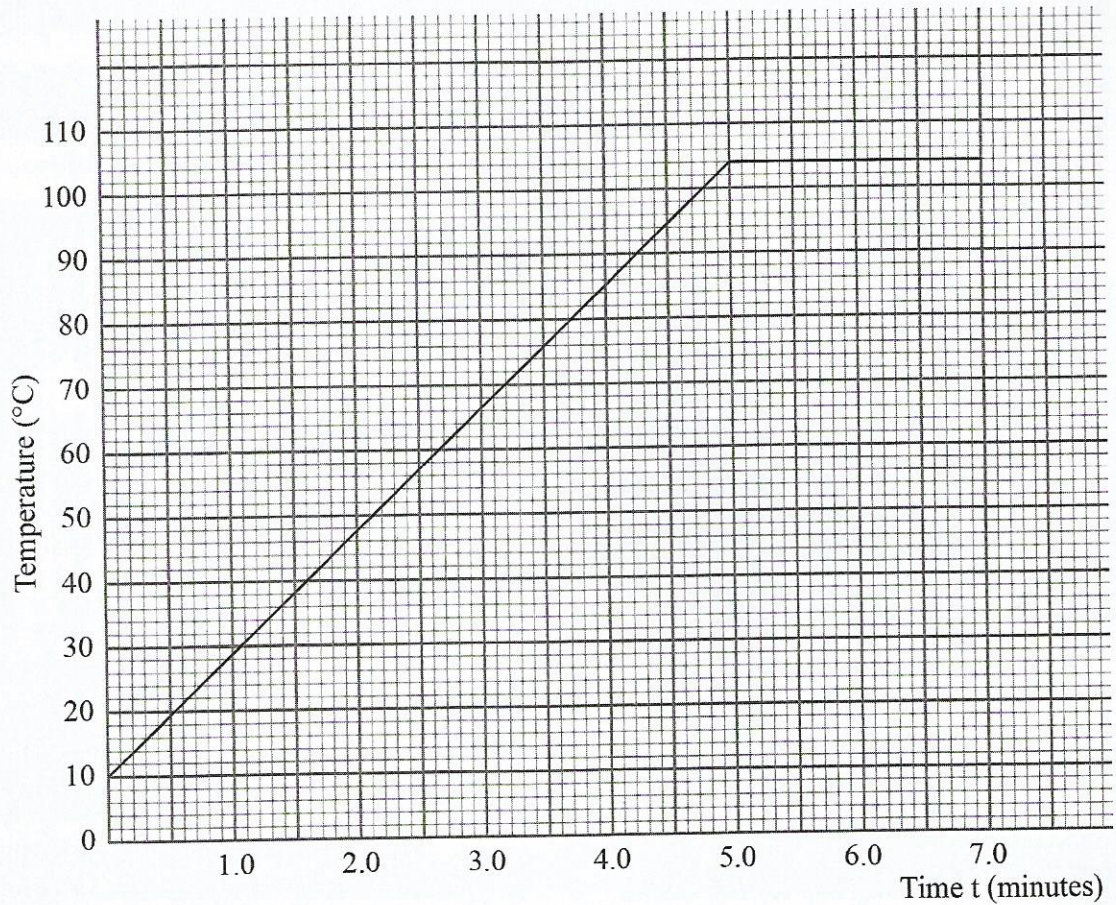
(iii) weight of the stone (3 marks)

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

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



- (b) A well lagged calorimeter contains a liquid of mass 200 g at a temperature of  $10^{\circ}\text{C}$ . 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)
- (ii) quantity of heat given out by the heater between time  $t = 1$  minute and time  $t = 4.5$  minutes (3 marks)
- (c) Based on (b)(ii), determine the:
- (i) temperature change between the time  $t = 1$  minute and time  $t = 4.5$  minutes (1 mark)
- (ii) specific heat capacity of the liquid (3 marks)



- (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)
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  $10 \text{ ms}^{-2}$* )
- (i) with uniform velocity (3 marks)
- (ii) with an acceleration of  $3 \text{ ms}^{-2}$  (3 marks)
- (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)
- (c) A box is moved 30 m along a surface whose frictional force is 1000 N with uniform velocity. Determine the work done against friction. (2 marks)