

SECTION B

PART I

1. State the dimensions of
 - a. impulse (2nd marks)
 - b. acceleration (2nd marks)
- 2a. A body of mass 400g is placed on a horizontal table. Calculate the pulling force if the coefficient of friction between the body and the table is 0.2 ($g = 10 \text{ m/s}^2$) (5 marks)
3. The table below shows the pointer reading of a spring balance when different weights are hung on it. Determine the value of L. (5 marks)

Weight/N	0	5	10	30
Length of wire (mm)	500.0	500.5	501.0	L

4. A particle is projected horizontally at 10 m/s from the top of a tower 20 m high. Calculate the horizontal distance traveled by the particle when it hits the level ground ($g = 10 \text{ m/s}^2$) (5 marks)
5. A spiral spring with a metal extends by 10.50 cm in air. When the metal is fully submerged in water the spring extends by 6.8 cm . Calculate the relative density of the metal. (5 marks)
- 6a. List TWO factors that can affect the rate of diffusion
- b. State THREE examples to illustrate the effect of surface tension (3 marks)
7. A wire of length 2 m and radius 1.0 mm is stretched by 25.0 mm on application of a force of 10^3 N . Calculate the Young's modulus of the wire (5 marks)

PART II

Answer any THREE questions from this part

8a. Define

(i). Work

(2 marks)

(ii). Power

(2 marks)

- b. Show that the efficiency, E , the force ratio $M.A$ and the velocity ratio $V.R$ of a machine are related by the equation

$$E = \frac{M.A}{V.R} \times 100$$

$V.R$

(6marks)

- c. An inclined plane of angle is used to raise a load of 4500N through a height of 2m. If the plane is 75% efficient. Calculate

(i). velocity ratio of the plane (5marks)

(ii). work done on the load (5marks)

- d. Explain Charles's law using the kinetic theory of matter (5marks)

9a.(i). Define the term linear momentum (4marks)

(ii). State the law of conservation of linear momentum (4marks)

- (b). A force of 100N is used to kick a football of mass 0.8kg. Find the velocity with which the ball moves if it takes 0.8second to be kicked (6marks)

(c). State Newton's second law of motion (3marks)

- (d). The engine of a vehicle moves it forward with a force of 9,600N against a resistive force of 2200N. If the mass of the vehicle is 3400kg, calculate the acceleration produced (8marks)

10a. Define

(i). specific heat capacity (4marks)

(ii). Boiling point of a liquid (4marks)

- (b). A piece of copper block of mass 24g at 230°C degree c is placed in a copper calorimeter of mass 60g containing 54g of water at 31°C. Assuming that heat losses are negligible, calculate the final steady temperature of the mixture (specific heat capacity of water = 4200J/kgK; specific heat capacity of copper = 400J/kgK) (8marks)

(c). (i) Define ice point and steam point as used in thermometry. (4marks)

- (ii). The electrical resistance of the element in a platinum resistance thermometer at 100°C, 0°C and room temperature are 75Ω, 63Ω and 64.99Ω respectively. Determine the room temperature (5marks)

11(a). Explain

(I). Wave motion (4marks)

(ii). stationary wave (4marks)

b.(i). List four physical properties of a wave (4marks)

(ii). Define amplitude and use it to distinguish between the node and antinode of a stationary wave (3marks)

(c).(i) state Boyle's law (2marks)

- (ii). A uniform capillary tube closed at one end contained dry air trapped by a thread of mercury $8.5 \times 10^{-2} \text{ m}$ long. When the tube is held horizontally the length of the air column was $5.0 \times 10^{-2} \text{ m}$, when it was held vertically with the closed end downwards the length was $4.5 \times 10^{-2} \text{ m}$. Determine the value of the atmospheric pressure ($g = 10 \text{ m/s}^2$; density of mercury $= 1.36 \times 10^4 \text{ kg m}^{-3}$) (8marks)

12. (a) Define:

(i). Resultant

(2marks)

(ii). equilibrium

(2marks)

b. (i). State the principle of moment

(4marks)

(ii). State the conditions for equilibrium of rigid bodies under the action of parallel forces.

(4marks)

c. (i). Explain

(a). Free oscillation

(3marks)

(b). Damp oscillation

(3marks)

(ii). A uniform rod AB 120cm long weighs 120N and rests on two supports P and Q placed 10cm from each end of the rod respectively. A 20N weight hangs on the 30cm mark from P and a 90N weight hangs at the 40cm mark from B. calculate the reactions at the support.