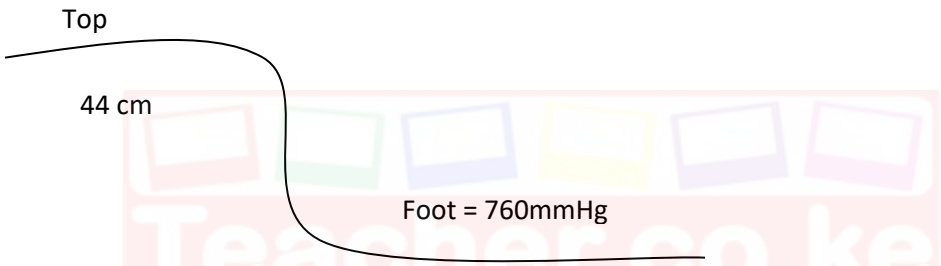
PHYSICS PAPER 1
FORM 3 – TERM 3 2025
END OF YEAR EXAM
TIME: 2 HOURS

SECTION A (25MARKS)
INSTRUCTIONS
Answer all the questions in the spaces provided.

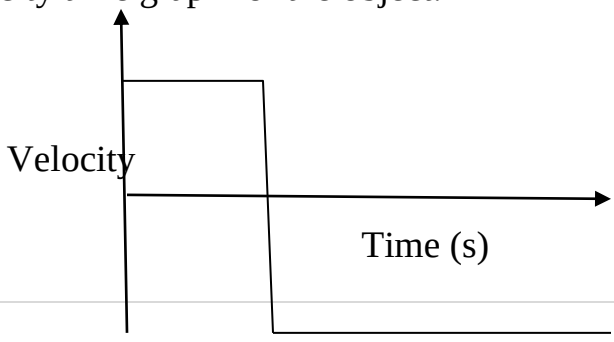
1. State the reading shown on the scale of a vernier calipers in the diagram below. (1mk)
   - ***2.78mm***
2. State the reason why electricity transmission cables are left sagging between the pylons. (1mk)
   - ***To allow for contraction and expansion of the cables.***

3. The reading on a mercury barometer at the foot of a hill. Density of air = 1.25kg/m^3, density of mercury = 1.36 x 10^{4}kg/m^3. (3mks)



   - ***Pressure due to air column= pressure difference in mercury height.***
   - ***Let difference in height be h***
   - $h_a\rho_a g = h_m\rho_m g$
   - ***440 x 1.25 x 10 = h x 13600 x 10***
   - ***h= 0.0404m***
     = 40.4 mm
     Reading at the top = 760 – 40.4
     = 719.6mmHg

4. The figure below shows the displacement time graph for the motion of an object. Sketch the velocity time graph for the object. (2mks)



5. State two factors that would raise the boiling point of water. (2mks)

i. Presence of impurities.

ii. ***Increase in pressure***

6. The level of water in a burette is $25cm^3$. 40 drops each of volume $0.05cm^3$ are added to the burette, what would be its new reading. (2mks)

V drops = 40 x 0.05

= $2cm^3$

New reading = 25.2 = $23cm^3$

7. Explain how the efficiency of a vacuum flask us affected if the double-walled glass surface is replaced with a double-walled metal surface. (2mks)

- ***It would be less efficient. The shiny surface reflect heat back to the liquid hence lost minimized.***
- ***The metal surface would conduct the heat away from the liquid hence making the liquid lose heat.***

8. A body moving at 50m/s decelerates uniformly at $2m/s^2$ until it comes to rest. What distance does it cover from the time it starts to decelerate to the time it comes to rest. (3mks)

- ***U= 50m/s a= -2m/s^2, v=0***

  $V^2 = U^2 + 2as$

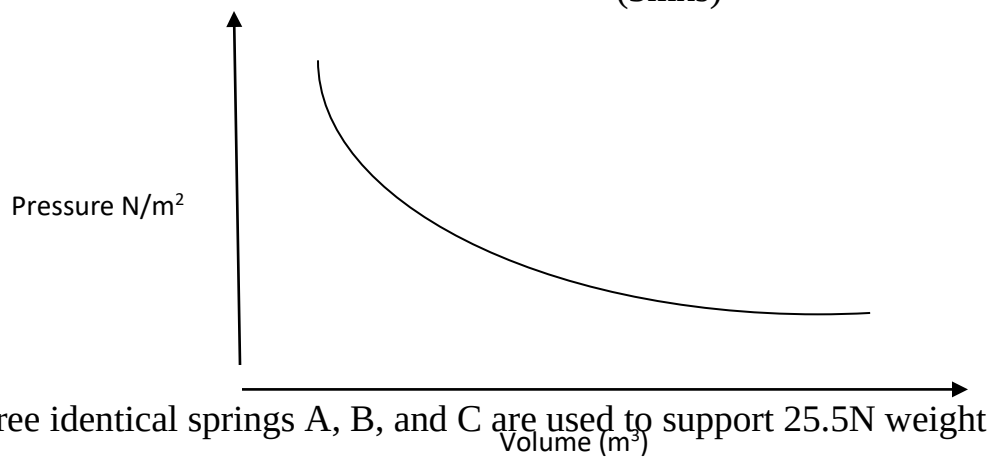
  $O^2 = 50^2 + 2x - 2 \times 5$

  $O = 2500 - 45$

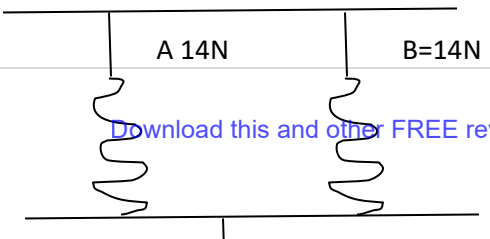
  $45 = 2500$

  S=625m

9. Sketch a graph of pressure versus volume for an ideal gas at constant temperature. (3mks)



10. Three identical springs A, B, and C are used to support 25.5N weight as shown below.



The weight of the horizontal bar is 2.5N, determine the extension on each spring given that 6N causes an extension of 2cm. (2mks)

Extension for C $= \frac{25.5 \times 2}{6} = 8.5cm$

Extension of A = extension of B $= \frac{14 \times 6}{6} = 4.667cm$

11. State the property of Freon that makes it useful as a refrigerant liquid. (1mk)

- ***It is volatile***

12. The diagram below shows a spinning ball as it moves through air in the direction shown.

Draw the streamlines of air around the ball and show the direction in which it spins such that an upward force is created. (2mks)

13. State the law of conservation of energy. (1mk)

- ***Energy can neither be created nor destroyed but can be transformed from one form to another.***

SECTION B (55 MARKS)

14. State one renewable source of energy. (1mk)

- ***Wind, water, solar, geothermal, biomass***

b. An electric crane lifts a load of 2000kg through a vertical distance of 3m in 6 seconds. Determine:

i. The work done. (2mks)

W.d = F x d = Mgh.

2000 x 10 x 3

60,000J

ii. The power developed by the crane. (2mks)

$$p = \frac{w.d}{t}$$

$$= \frac{60000}{6}$$

$$= 10000W$$

$$= 10KW$$

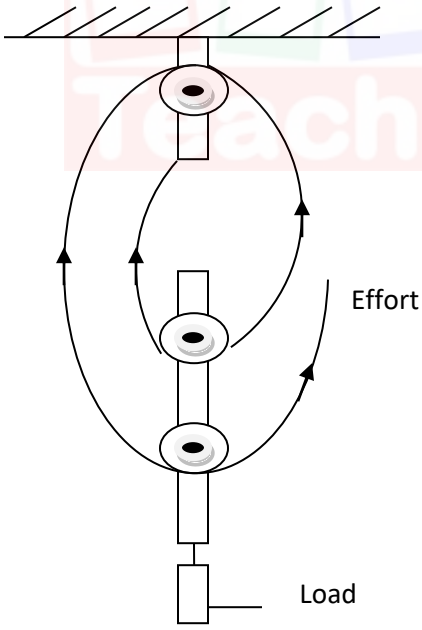
iii. The efficiency of the crane if operated by an electric meter rated 12.5kw. (2mks)

$$= \frac{\text{power output}}{\text{Power input}} \times 100$$

$$= \frac{10 \times 100}{12.5}$$

$$= 80\%$$

c. A pulley system has two pulleys on the lower block and one pulley on the upper block. Sketch the system showing the direction of the robe, the load and the effort. (3mks)



15. Define the term friction. (1mk)

- ***Friction is the force that opposes relative motion between two surface in contact with one another.***

b. A spherical steel ball is released from rest just above the surface of a column of oil which is in a long wide tube.

i. State three forces affecting the movement of the ball as it falls in the oil. (3mks)

- ***Upthrust pushing it up***
- ***Viscous drag, opposing motion hence pushes upwards***
- ***Weight of the ball acting downwards.***

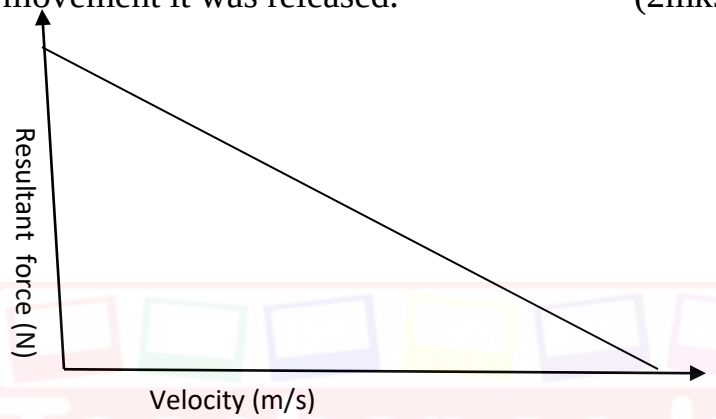
ii. Explain which of the forces in b (i) above varies as the ball falls. (1mk)

- ***Viscous drag varies since weight and upthrust are constant***

iii. What is the net force acting on the ball that is moving at terminal velocity? (1mk)

- ***The net force is zero***

iv. Sketch a graph to show the variation of resultant force on the ball with velocity from the movement it was released. (2mks)



c. State the principle of movements. (1mk)

- ***For a system in equilibrium the sum of clockwise moments about a point equals sum of anticlockwise moments about same point***

i. The diagram below shows a uniform metre rule in equilibrium under the forces shown.

ii. Determine the weight of the metre rule. (3mks)

- ***Sum of clockwise moments = sum of anticlockwise moments***
  (10 x w) + 60 x 2 = 40 x 4
  10W + 120 = 160
  10W = 40
  W = 4N

16. A 4kg mass is receiving heat at a rate of 100KJ per minute and its temperature at various times recorded as follows.

Temp (°C)	230	250	270	270	270	270	310	350	390	390	390
Time t (min)	0	1	2	6	9	13	18	23	28	29	30

a. Plot a graph of temperature against time. (5mks)

b. Use you graph to determine:

i. Specific heat capacity of the substance in solid state. (3mks)

Q=MCΘ

2 x 100000 = 4 x C x (270 – 230)

$$\frac{200000}{160} = \frac{4 \times 40C}{160}$$

C = 1250J/KgK

ii. Specific heat capacity in its liquid state. (3mks)

Q=MCΘ

15 x 100000 = 4 x C (390 – 270)

1500000 = 4 x 120 C

C = 3125 J/KgK

iii. Its melting point (1mk)

270^{O}C

iv. Its boiling point (1mk)

390^{O}C

v. Specific latent heat of fusion. (2mks)

Q=mLf

$$\frac{11 \times 100000}{4} = \frac{4\,Lf}{4}$$

Lf= 2.75 x 10^{5}J/Kg

17. In an experiment to demonstrate Brownian motion, smoke was put in a smoke cell and observed under a microscope.

i. State and explain the observation made. (2mks)

- ***Smoke particles move constantly and randomly. This is due to collusion with invisible air molecules also moving constantly and randomly.***

ii. Give a reason for using small particles like smoke particles in the experiment. (1mk)

- ***Large particles may not move on collision with air particles.***

iii. What observation would be made if the temperature of the smoke cell is raised? (1mk)

- ***The random and constant motion increases / fasten as increase in temperature increases kinetic energy.***

b. An oil drop of average diameter 0.7mm spreads out into a circular patch of diameter 75cm on the surface of water in a trough.

i. Calculate the thickness of the molecule. (3mks)

$V\ drop = v\ patch$

$^4/_3\ \pi r^3 = \pi r_2 h$

$^4/_3 \times \pi \times {}^{0.7}/_2 \times {}^{0.7}/_2 = \pi \times ({}^{750}/_2)^2 \times h$

$h = 4.065 \times 10^{-7mm}$

$= 4.065 \times 10^{-10m}$

ii. State any two sources of error in b (i) above. (2mks)

- ***Measurement of the diameter of the drop***
- ***Diameter of the patch***

18. At 30°C , the pressure of a gas is 100cmHg. At what temperature would the pressure of the gas fall by 20cm of mercury. Give the temperature in °C. (3mks)

- ${}^{P1}/_{T1} = {}^{P2}/_{T2}$ $\quad P_2 = 80$
- $P_1 = 100cmHg$ $\quad T_2 = ?$

  $T_1 = 30 + 273 = 303$

$$\frac{100}{303} = \frac{80}{T_2}$$

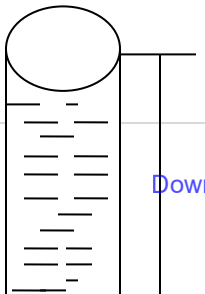
$$T_2 = \frac{303 \times 80}{100}$$

$= 242.4\ K$

$= 242.4 - 273$

$= -30.6^oC$

b. A hole of area $4.0cm^2$ at the bottom of a tank 5m deep is closed with a cork. Determine the force on the cork when the tank is filled with water. ($g=10m/s^2$, density of water = $1000kg/m^3$). (4mks)



$P = F/A$

$H\rho g = F/A$

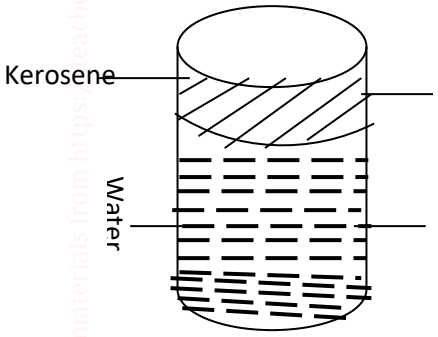
$5m$

$4 \times 10^{-4} \times 5 \times 1000 \times 10 = \frac{F}{4 \times 10^{-4}} \times 4k10^{-4}$

$F = 20N$

$A = 4cm^2$

c. A measuring cylinder of height 25cm is filled to a height at 15cm with water and the rest is occupied by kerosene. Determine the pressure acting on its base. (Density of water = $1g/cm^3$, density of kerosene = $0.8g/cm^3$ atmospheric pressure = 103,000 Pa) (3mks)



$P = P_{kerosene} + P_{water} + P_{atmospheric}$

$= h_k\rho_k g + h_w\rho_w g + p_a$

$= (^{15}/_{100} \times 1000 \times 10) + (^{10}/_{100} \times 800 \times 10) + 103000$

$= 105,300\ Pa.$