Name ..... Index No. .....

School .....Candidate's signature .....

Date .....

232/1
PHYSICS
Paper 1

October/November 2015
Time 2 hours

KANDARA SUB-COUNTY SECONDARY SCHOOLS
FORM THREE JOINT EXAMINATION

Kenya Certificate of Secondary Education

PHYSICS

Paper - 232/1

October/November 2015

Time: 2 hours

INSTRUCTIONS TO CANDIDATES

- Write your name and index number in the spaces provided above.
- Sign and write the date of the examination in the spaces provided above.
- This paper consist of two sections A and B
- Answer ALL questions in section A and B in the spaces provided.
- All working must be clearly shown in the spaces provided in this booklet.
- Non-programmable, silent electronic calculators and KNEC mathematical tables may be used.

EXAMINER'S USE ONLY

SECTION	QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
A	1 - 12	25	
B	13	11	
	14	11	
	15	11	
	16	11	
	17	11	
TOTAL SCORE		80	

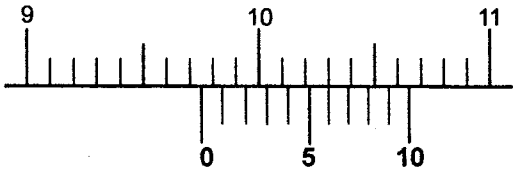
This paper consists of 8 printed pages
Candidates should check the question paper to ensure that all the printed pages are printed as indicated and no questions are missing.

SECTION A

Answer ALL the questions in the spaces provided.

1. Figure 1 below shows the reading of a vernier callipers used to measure the diameter of a cylindrical tin.

Fig 1



If the vernier callipers had a negative error of 0.02. Determine the actual diameter of the tin.(2 marks)

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2. A piece of ice was added into water at room temperature in a beaker. State and explain the effect of ice on the surface tension of the water. (2 marks)

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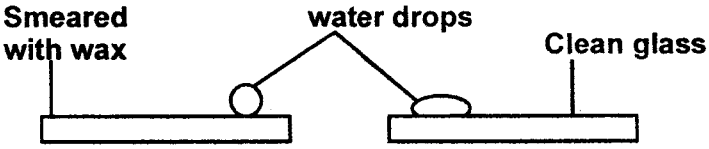
3. The figure 2 below shows water drops on two surfaces. In (a) the glass surface is smeared with wax while in (b) the glass surface is clean.

Fig 2



Explain the difference in the shapes of the drops. (2 marks)

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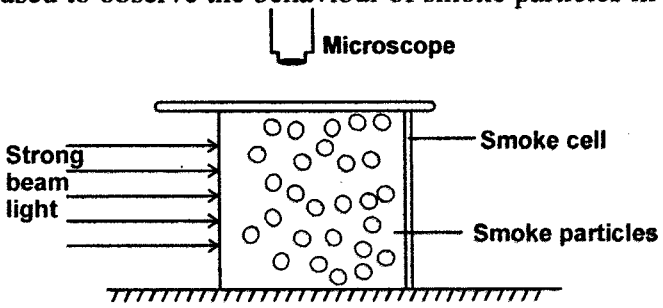
4. Figure 3 shows apparatus used to observe the behaviour of smoke particles in a smoke cell.

Fig 3



a) Explain what was observed. (1 mark)

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b) Explain what happens if the temperature was raised. (1 mark)

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5. A wooden block of mass 2kg is placed on a horizontal surface. A horizontal force 12N is exerted on it makes it to accelerate at $5ms^{-2}$. Find the frictional force acting between the surfaces. (2 marks)

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6. Figure 4 below shows two bulbs A and B containing air the bulbs are painted white and black respectively, the levels of water in the two tubes is equal initially. A heater is placed at a point midway between the bulbs.

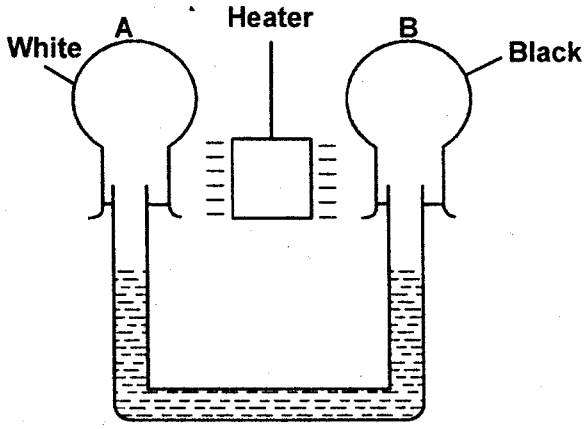

Fig 4

a) Indicate on the diagram the levels of the liquid after sometime. (1 mark)

b) Explain the observation in (a) above. (1 mark)

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7. Explain how the thin bore in a liquid-in-glass thermometer increases the sensitivity of the thermometer. (1 mark)

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8. A hydraulic jack has a master piston the area $20cm^2$ and ram piston of area $1000cm^2$. Calculate the mass of the car that would be lifted using an effort of 40N. (3 marks)

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9. State one factors that affect the stability of a body. (1 mark)

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10. Figure 5 below shows a liquid water manometer.

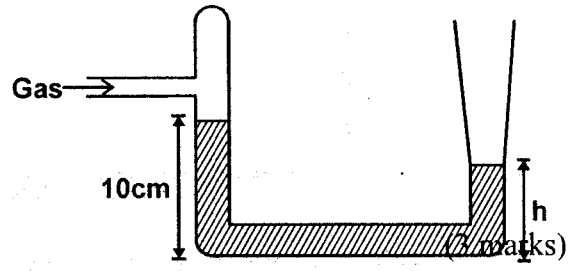

Fig 5

In the pressure of the gas is 9.8×10^4 p.a.
Determine the height h (Density of water = $1000kg/m^3$, and atmospheric pressure = 10^5 pa) (3 marks)

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11. Figure 6 shows a uniform bar of the length 1m away mass 70kg. Two other masses 65 kg and 10kg are hung 20cm and 100cm from end A respectively.

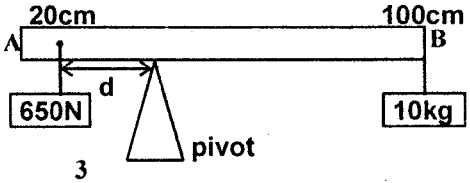

Fig 6

Determine distance d. (3 marks)

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12. A girl stands inside a lift on the second floor of a storey building. If the lift is ascending upwards at an acceleration of $3ms^2$ and she weights 60kg. Determine the reaction of the lift on the girl's feet. (2 marks)

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SECTION B (55 marks)
Answer ALL the questions in this section in the spaces provided.

13. a) Distinguish between speed and velocity. (2 marks)

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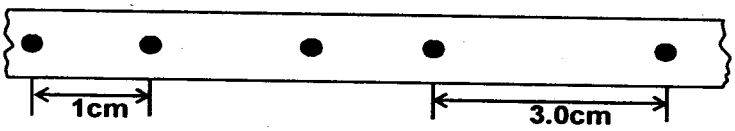
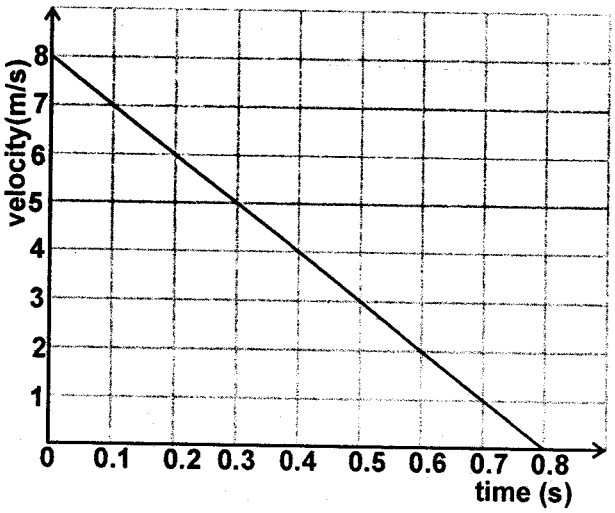
b) The tape in the figure 7 below was produced by a ticker-timer with a frequency of 50Hz. Determine the acceleration of the object which was pulling the tape. (3 marks)

Fig 7



c) Figure 8 below show the velocity time graph of a ball bouncing vertically upwards from the ground. The velocity upwards is taken positive.

Fig 8



Determine the maximum height the ball raises. (2 marks)

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d) A body initially moving at 50m/s decelerated uniformly at $2ms^{-2}$ until it comes to rest. Determine the distance it covers form the time it started to decelerate. (3 marks)

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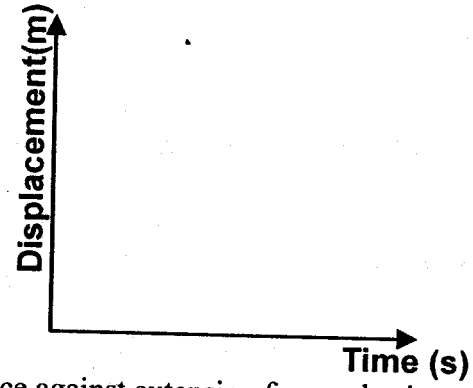
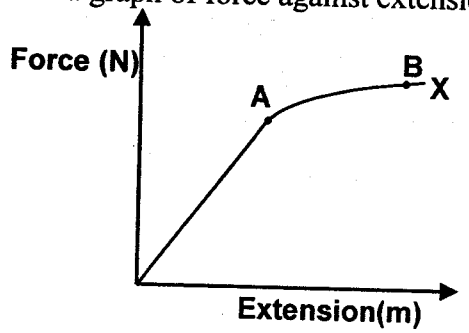
e) A stone is dropped from the top of a cliff. On the axes provided sketch a displacement-time graph for the motion of the stone. (1 mark)



14. a) Figure 9 below is a graph of force against extension for an elastic material, X.

Fig 9



i) Sketch on the same axes a graph that would be obtained with an elastic material Y whose spring constant is twice that of X. (1 mark)

ii) Give a reason why the spring is not appropriate for making a spring balance between A and B on the graph. (1 mark)

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b) A spring has a length of 22cm when not supporting a load. When a small rectangular metal block is hung on the spring, the length of the spring becomes 31.6cm. A mass of 72g is added to the metal block and the total length of the balance becomes 38 cm.

i) Determine the mass of the metal block. (3 marks)

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ii) If the metal block measures 10cm by 6cm by 4cm, calculate the maximum pressure it can exert when placed on a flat surface. (3 marks)

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c) A certain liquid of height 120cm exert the same pressure as the metal block in (ii) above. Calculate the density of the liquid. (3 marks)

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15. a) Distinguish between heat and temperature. (1 mark)

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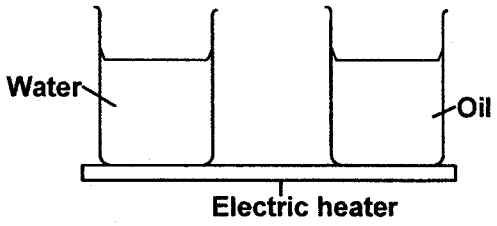
b) Figure 10 shows an electric heater used to heat a beaker of water and an identical beaker of oil for several minutes.

Fig 10



The temperature of the water and the temperature of the oil increases constantly. The rise in temperature of the oil is much greater than the that of the water. Explain. (2 marks)

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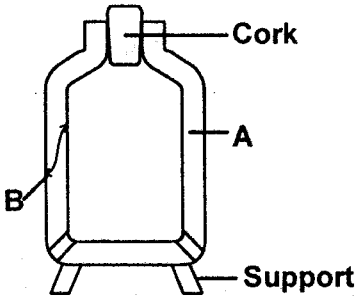
c) Figure 11 shows a vacuum flask. Use the information to answer the questions that follow.

Fig 11



i) State the function of the part labelled A. (1 mark)

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ii) What feature of part B makes it suitable in minimizing heat losses through radiation?(1 mark)

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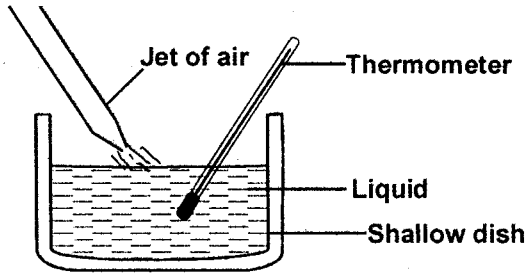
d) Figure 12 below shows a shallow dish containing a volatile liquid. The bulb of a thermometer is held in the liquid. A jet of air is blown over the surface of the liquid, so that the liquid evaporates rapidly.

Fig 12



State and explain what happens to the reading shown on the thermometer. (2 marks)

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e) A copper calorimeter of mass 60g is filled with 100g of water at 25°C. Steam at normal temperature and pressure is passed through the water until a temperature of 45°C is attained. The final mass of the calorimeter and the contents was found to be 163.5g. Calculate the specific latent heat of vaporization, Lv, of water.

(Take specific heat capacity of water = 4200J/kgk and copper =378 J/kgk) (4 marks)

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16. a) Define the term velocity ratio of a machine. (1 mark)

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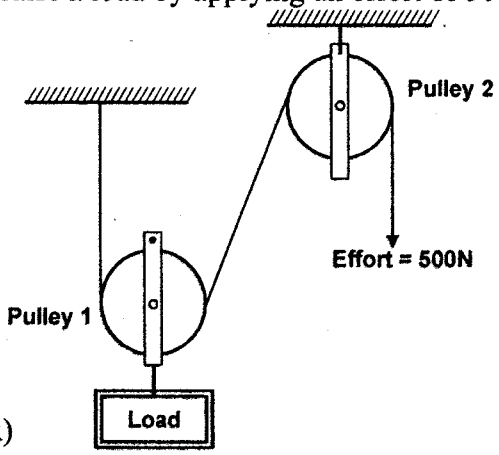
b) Figure 13 shows a pulley system used to raise a load by applying an effort of 500N.

Fig 13



State the :

i) Velocity ratio of the system (1 mark)

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ii) Purpose of pulley 2. (1 mark)

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iii) Given that the machine has an efficiency of 80%, determine the maximum load that can be raised. (3 marks)

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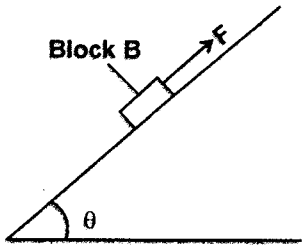
c) Figure 14 shows an incline system whose velocity ratio is 2.4. The mass of block B is 40kg and the friction of 6N act on the surface. Block B is pulled along the surface at a constant velocity with a force F.

Figure 14



i) Determine the value of θ. (2 marks)

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ii) Calculate the value of force F. (3 marks)

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17.a) State Charle's law for an ideal gas. (1 mark)

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b) A balloon the volume 0.5m³ containing hydrogen at a pressure of 2×10^5pa is released form the ground when the temperature is 17°C. Determine the volume when it reaches a height where the pressure inside the balloon is 1.5×10^5 pa and the temperature is 6°C. (3 marks)

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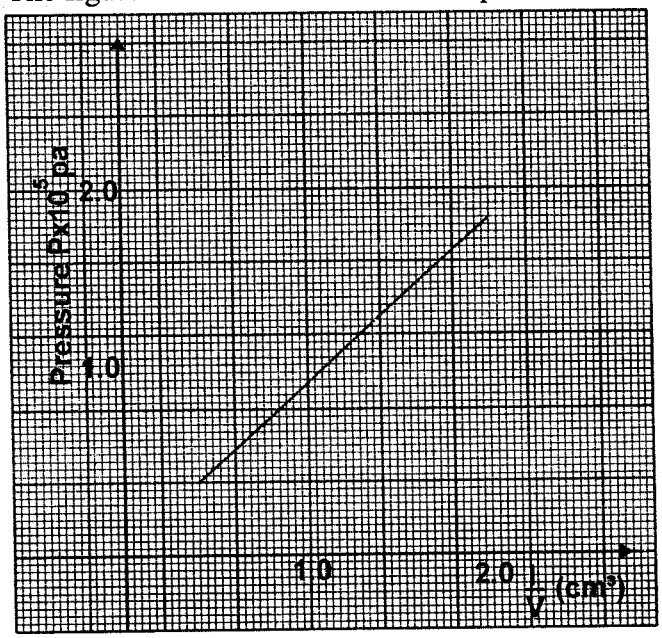
c) An air bubble is released at the bottom of a tall jar containing a liquid. The height of the liquid column is 80cm. The volume of the bubble increases from 0.5m³ at the bottom of the liquid to 1.15cm³ at the top. The figure 15 shows the variation of pressure P on the bubble with $^1/_V$ as it rises in the liquid.



i) State the reason why the volume increases as the bubble rises in the liquid column. (1 mark)

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ii) From the graph determines the pressure on the bubble:

I. At the bottom of the liquid. (1 mark)

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II. At the top of the liquid column (1 mark)

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III. Hence determine the density of the liquid in kg/m³ (3 marks)

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IV. What is the value of the atmospheric pressure of the surrounding? (1 mark)

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KANDARA SUB-COUNTY SECONDARY SCHOOLS FORM THREE JOINT EXAMINATION

Kenya Certificate of Secondary Education

PHYSICS

Paper - 232/1

October / November - **2015**

MARKING SCHEME

SECTION A (25 marks)

1. Main scale reading = 97cm
Vernier scale reading 6×0.01 = 0.06
9.76 cm ✓1
Zero error -0.02cm
9.74cm ✓1

2. Ice reduces the temperature ✓1 of water, hence the surface tension increases ✓1

3. In (a) the cohesive forces are greater than the adhesive forces, hence water forms spherical balls. ✓1
In (b) the adhesive forces are greater than cohesive force hence water spreads on the glass surface. ✓1

4. a) Smoke particles moves in random motion. This is due to collisions between the invisible air particles and smoke particles. ✓1

b) When the temperature is raised the particles moves faster. ✓1

5. F = ma
$F = 2 \times 5 = 10$ N ✓1

Frictional force = 12 N - 10N
= 2 N ✓1

6. a) Level of tube B lower while level of tube A higher. ✓1

b) Black body absorb heat. Better than white bodies.
Hence on bulb B expands more than air on bulb A. ✓1

7. When the temperature increases the length of the column increases.
For a thin bore, a small increase in temperature will cause a significant increase in temperature. ✓1

8. $F_1 = 40\ N$

$A_1 = 20\ cm^2$

$A_2 = 1000\ cm^2$

$\frac{F_1}{F_2} = \frac{A_1}{A_2}$

$F_2 = \frac{F_1 A_2}{A_1}$ ✓1

$F_2 = \frac{40 \times 1000 \times 10^{-4}}{20 \times 10^{-4}}$ ✓1

$F_2 = 2000\ N$ ✓1

9. Base area
Position of the centre of gravity ✓1 (any one).

10. Pg + heg = Pa

$98000 + h \times 1000 \times 10 = 100000$

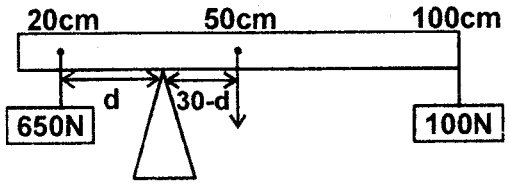
$10000\ h = 100000 - 98000$

$h = \dfrac{2000}{10000}$

$h = 0.2m$

$h = 20cm$

11.



$650d = (30-d)700 + (80-d)100$ ✓1

$650d = 21000 - 700d + 8000 - 100d$

$650d + 700d + 100d = 21000 + 8000$

$1450d = 2900$ ✓1

$d = \dfrac{29000}{1450}$

$d = 20cm$ ✓1

12. Reaction = m (g + a)
= 60 (10 + 3) ✓1
= 60 × 13
= 780 N ✓1

SECTION B (55 marks)

13. a) Speed is the rate of change ✓1 of distance with time while velocity is rate of change of displacement with time.

b) $T = \dfrac{1}{50} = 0.025$

Initial velocity, u $= \dfrac{0.01m}{0.02s}$

$= 0.5m/s$

Final velocity, v, $= \dfrac{0.03\ m}{0.02\ s}$

$= 1.5m/s$

$a = \dfrac{v-0}{t} = \dfrac{1.5-0.5}{0.02 \times 3}$

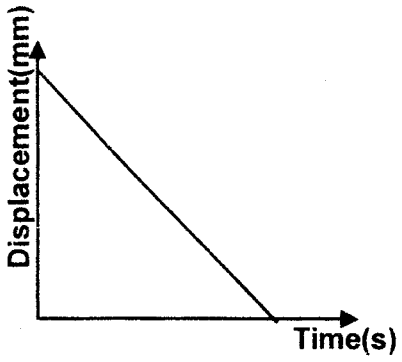
$= 16.67\ m/s^2$

c) Area under the graph give the height.

h = ½ × 0.8 × 8 ✓1

h = 3.2m ✓1

d)



$$a = \frac{v-u}{t}$$

$$t = \frac{v-u}{a}$$

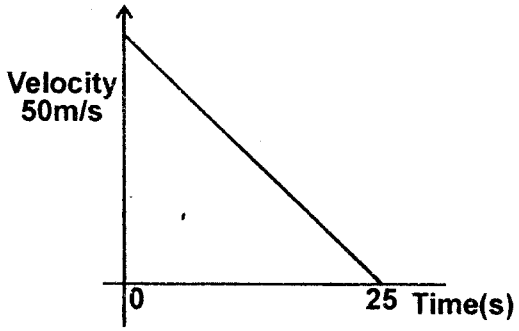
$$t = \frac{0-50}{-2}$$

$t = 25$ sec *onds* ✓1

Distance = ½ × 25 × 50 ✓1

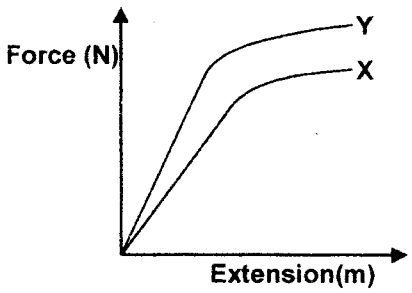
= 625 m ✓1

e)



✓1 *Straight line*

14.



✓1 *graph for Y*

ii) Extension is not directly to the force applied. ✓1

b) i) F = Ke

Mass of the metal block = x

$$k = \frac{f}{e}$$

$$k = \frac{x}{0.096}$$

$$k = \frac{0.72 + x}{0.16}$$

$$\frac{x}{0.096} = \frac{0.72 + x}{0.16}$$ ✓1

$0.16x = 0.096\ (0.72 + x)$
$0.16x = 0.06912 + 0.096\ x$
$0.16x - 0.096x = 0.06912$

$$x = \frac{0.06912}{0.0614}$$

$x = 1.08\ N$ ✓1

Mass of the metal block = 0.108kg ✓1

ii) $$P_{max} = \frac{Force}{A_{(minimum)}}$$

$$P_{max} = \frac{1.08N}{24 \times 10^{-4} m}$$ ✓1 ✓1

$= 450 N/m^2$ ✓1

c) P = hpg
$450 = 120 \times p \times 10$ ✓1

$p = \frac{450}{120 \times 10}$ ✓1

$p = 0.375 kg/m^3$ ✓1

15. a) Heat is a form of energy which can be transferred from one body to the other due to temperature difference. Temperature is the measure of degree of hotness or coldness of a body. ✓1

b) Oil have low heat capacity while water have higher heat capacity ✓1
The temperature of oil is greater because the quantity of heat required to raise the temperature of oil by 1k is less compared to that of water ✓1

c) A - vacuum

i) Minimises the heat loss in the vacuum flask by conduction and convection ✓1

ii) Silvered surfaces / shiny surfaces . ✓1

d) Reading decreases ✓1
When the air is blow, it increases the rate of evaporation.
Evaporation causes cooling, hence the reading decreases. ✓1

e) mc = 60g = 0.06kg
mw = 100g = 0.1kg
Initial temperature of water = 25°C
Final temperature of water = 45°
Mass of condenses steam = 0.0035kg

Heat given out by steam = heat gained by water and calorimeter

$M_S L_V + m_C c_w \theta s = m_w c_w \theta_w + m_c c_c \theta_c$

$0.0035L_v + 0.0035 \times 4200 \times 55$ ✓1 $= 0.1 \times 4200 \times 20 + 0.06 \times 378 \times 20$ ✓1

$0.0035Lv + 808.5 = 8400 + 453.6$ ✓1

$$Lv = \frac{8853 - 8085}{0.0035}$$

$Lv = 2{,}298{,}600J$ ✓1

$Lv = 2.299 \times 10^6 J$

16. a) Velocity ratio of a machine is the ratio of distance moved by the effort to distance moved by the load. ✓1

b) i) Velocity Ratio = 2 ✓1

ii) Change direction of the effort applied ✓1

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

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

$80 = \frac{\frac{L}{500}}{2} \times 100$ ✓1

$160 = \frac{L}{500} \times 100$

$L = \frac{160 \times 500}{100}$ ✓1

$L = 800\ N$ ✓1

c) i) Velocity ratio $= \frac{1}{Sin\theta}$

$2.4 = \frac{1}{Sin\theta}$ ✓1

$Sin\theta = \frac{1}{2.4}$

$Sin\theta = 0.4167$

$\theta = 24.62°$ ✓1

ii) $F = mg \text{ Sin } \theta + \text{Frictional force}$

$F = 40 \text{ Sin } 24.62° + 6$ ✓1

$F = 16.66 + 6$ ✓1

$F = 22.66 \text{ N}$ ✓1

17. a) Charles law states that the volume of a fixed mass of a gas is directly proportional to the absolute temperature provided the pressure is kept constant. ✓1

b) $V_1 = 0.5m^3$

$P_1 = 2 \times 10^5$ Pa

$T_1 = 290K$

$P_2 = 1.5 \times 10^5$

$T_2 = 279K$

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

$$\frac{2\times10^5 \times 0.5}{290} = \frac{1.5\times10^5 \times V_2}{279} \checkmark 1$$

$$V_2 = \frac{2\times10^5 \times 10.5 \times 279}{1.5\times10^5 \times 290}$$

$$V_2 = \frac{279}{435} \checkmark 1 = 0.6441$$

$$V_2 = 0.6441m^3 \checkmark 1$$

c) i) Pressure increases with depth
As the bubble rises the pressure decreases, hence the volume increases. ✓1

ii) I. $P = 1.088 \times 10^5$ pa. ✓1

II. $P = 0.4 \times 10^5$Pa ✓1

III. $P = (1.88 - 0.4) \times 10^5$

$= 1.48 \times 10^5$

$P = h\rho g$

$1.48 \times 10^5 = 0.8 \times e \times 10$ ✓1

$\rho = \frac{1.48 \times 10^5}{0.8 \times 10}$ ✓1

$\rho = 0.185 \times 10^5$

$\rho = 1.85 \times 10^4$ kg/m³ ✓1

Density of the liquid = 1.85×10^4 kg/m³

IV. Atmospheric pressure
= pressure at the top
= 0.4×10^5 pa. ✓1