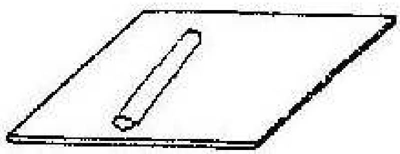
K.C.S.E 2005
PHYSICS PAPER 232/1
MARKING SCHEME

1. Volume of 55 drops =8ml accept cm^3
Or Volume of one drop =8/55
= 0.1454/0.1455/0.145/0.15cm^3

2.



3. Water in A expands reducing/lowers density
This reduces/lowers up-thrust on block causing tipping to side A
4. There is extra/ more/higher/ increased pressure in (b) due to the wooden block increasing distance d_2
5. Reduce/ minimize the transfer of heat by radiation OR Reduce the loss of heat OR gain of heat by radiation.

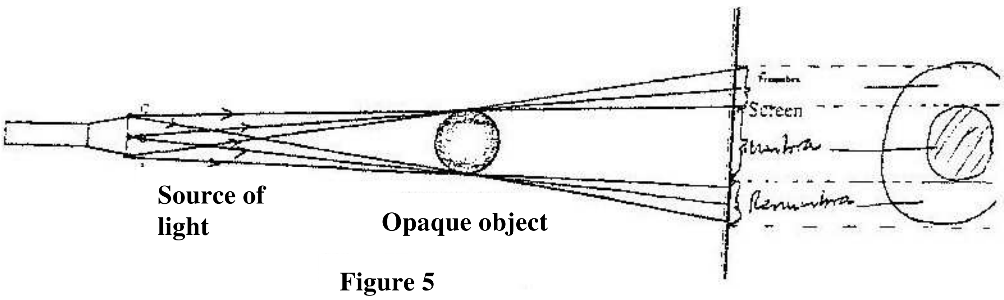


Figure 5

6. 2 sec of rays with arrows labeling of umbra (totally dark) and partly dark (Penumbra)
7. A or tube with air
Gas molecules move faster/quicker than water molecules OR Diffusion of gases is faster/more than in water/Grahams law the density of air is less than that of water

8.

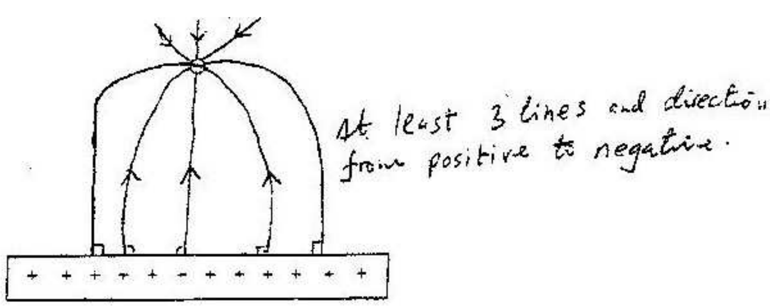


Figure 6

9. A-Positive
B-Negative

10. C- Ammonium jelly/chloride /paste/solution/NH_4Cl
D-Mixture of carbon and manganese (iv) oxide/MnO_2

11. In (a) cohesive forces between water molecules are greater than adhesive forces between water and wax while in (b) adhesive forces between water and glass molecules are greater than cohesive forces between water molecules.

12.

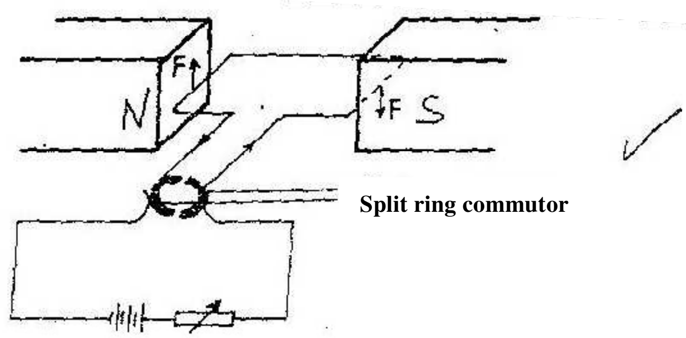


Figure 9

13. to make the rotation continuous by changing the direction in the coil every half cycle/turn also accept changing direction of the current every half cycle/turn/maintaining the direction of current in field.

14. $S=nt+{}^{1}/_{2}\ st^2$ where t is the time to reach the ground
$15= 0 + ½\ St^2$ since the initial velocity is zero and t= 3 = 1.732
Horizontal distance= Horizontal speed x t = 300x 3 o 519.62m

15. Efficiency = Ma/VR OR Ma/VRx 100%

$$0.75 = \frac{600/400}{V.R}$$

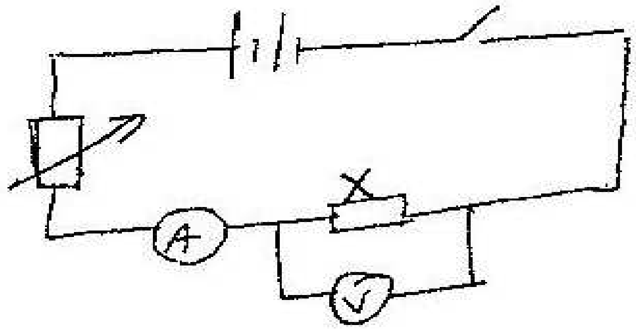
V.R = 2

ACT
M.A $^{600}/_{400}$= 1.5
$^{1.5}/_{V.R}$= 0.75
V.R=2

16. =4cm or 0.04m from the graph
V = fλ= 5 x 0.04
= 0.2ms-1 or 20cm/s

17 The pitch decreases as the siren falls
The higher the speed away from the observer, the lower the frequency heard and so the lower the pitch hard.

18. *Accept cells in parallel and other symbols of rheostats*



19 (i)

$= V^2/-R$

2500= 240 2/R

R=23.04 or (23.03)

(ii) P=IV

I P/V = 2500/240 =10.417A

V = V/I= $\frac{240/2500}{2500}$

= 23.04R (23.03)

(iii) P= IV and V=IR or I^2 R

R= $\frac{240 \times 240}{2500}$

R= 23.04R

20. The liquid is boiling

21.

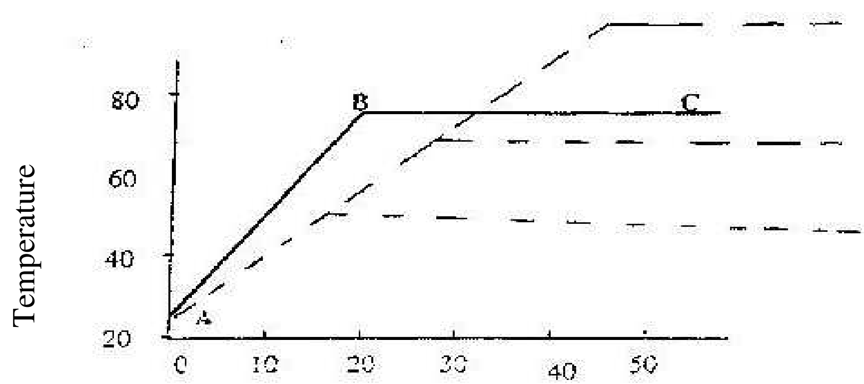


Figure 11 Time t(s)

22.

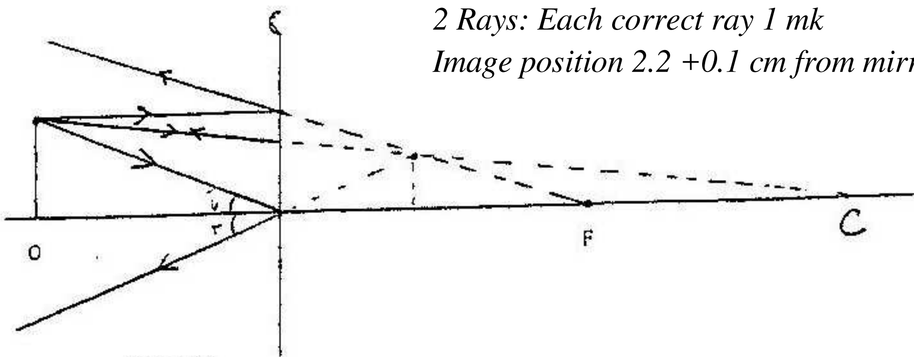


Figure 12

2 Rays: Each correct ray 1 mk
Image position 2.2 +0.1 cm from mirror.

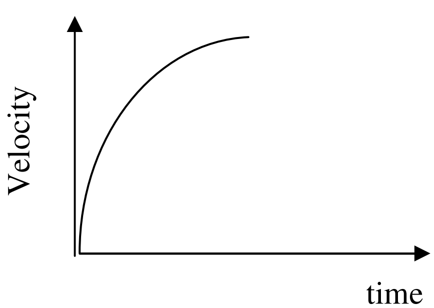
23. $C=47^0-10^0=37^0+7=37^0$

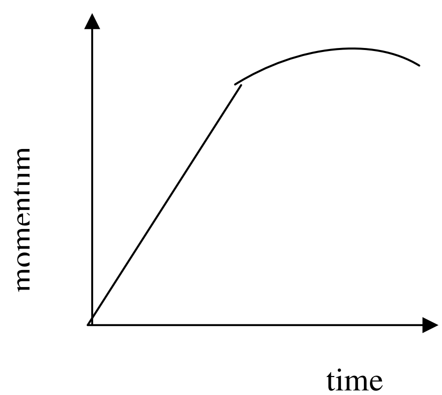
24. $n = \dfrac{i}{\text{Sin } C}$

$n = \dfrac{I}{\text{Sin } 37} = \dfrac{1}{0.6018}$

n =1.66/1.551/1.662 Allow TE from question 23 and allow all the mks.

25.

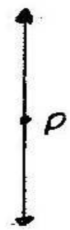




26. 1. At steady rate, the sum of pressure, the potential energy per unit volume and kinetic energy per Unit volume in fluid in a constant.
2. Provided a finish is non-viscous, incompressible and its flow steamline and increase in its velocity produces a corresponding decrease in pressure
3. When the speed of a fluid increases, the pressure in the fluid decreases and vice versa.

27. 273+ -281.3 = 8.3K (accept – 8.15 was use.)

28.

(i) 

(ii) 

29. (i) $F = MV^2/r$

$4800 = \frac{800 \times V^2}{20}$

V = 10.95m (allow 10.09 of a slide is used)

Alternatives.

(ii) $V_{max} = \sqrt{Mrg}$ but $Fr = M\mu g$

$M = \frac{Fr}{Mg} = \frac{4800}{800\times10}$

$= 0.6$

(iii) F = Ma

4800 – 800 x a, $a = 6m/s^2$

$A = v^2/r$

OR

$6 = V^2/20$

V = 10.95

(iv) F = MR, M = F/R = $\frac{4800}{800} = 0.6$

Tan ɵ = 0.6

$V^2 = rg \tan ɵ$

OR

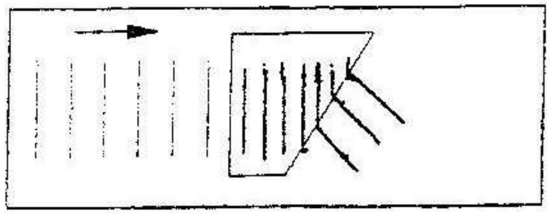
$V^2 = 20 \times 10 \times 0.6$

V = 10.95

30. Image changes from real to virtual
Image changes from inverted to upright
Image changes from behind lens to the same side as object.

31. In excited state the electron is in a higher (outer) energy level. As it falls back it releases energy and may fall in steps releasing different energies (radiations) (proton) packets energy.

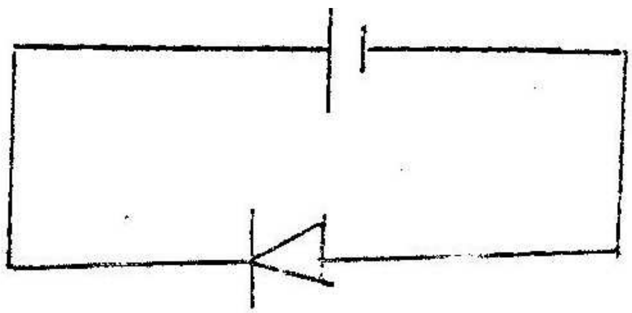
32.



33. To withstand the high temperature (immerse heat) prevent the target from melting due to high temperature or immense heat.

34. Methylated spirit evaporates faster/highly volatile than water taking latent heat away faster from the hand.

35.



36. m- Alpha (∝) particle/ radiation/decay

n- Beta (β)

x- Polonium (P_o)

37. When the switch is closed and nails attracted.

When the switch is opened, the nail on the iron end drops first.

38. Conductor allows charge to be distributed/movement/spread.

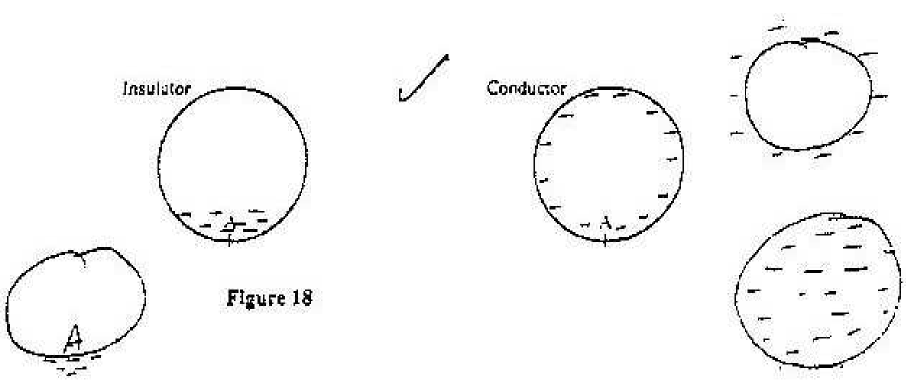
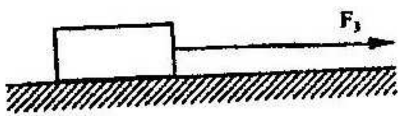


Figure 18

K.C.S.E 2006

PHYSICS PAPER 232/1
MARKING SCHEME

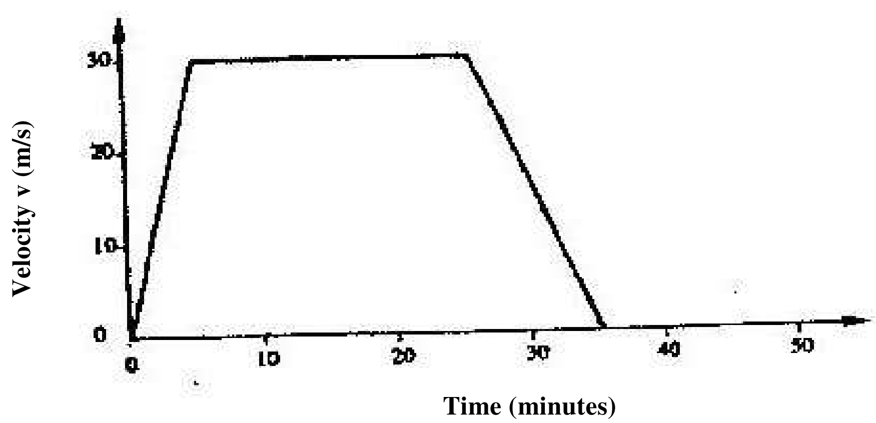
1. Volume = $68cm^3$
   Mass = 567g
   Density = $\frac{m}{V} = \frac{567}{68}$
   = $8.34\ gcm^{-3}$ (3 mks)

2. 

3. Pressure at a point in a fluid is transmitted equally to all points of the fluid and to the walls of the container. (1 mk)

4. On heating, the bimetallic strip bends; This causes the position of the centre of gravity of the section to the left to shift to the right causing imbalance and so tips to the right (2 mks)

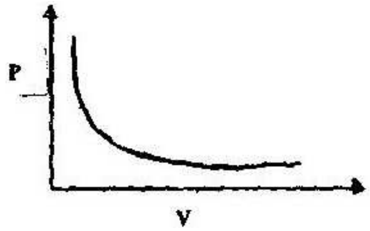
5. Lower spring extend by 15 cm;
   Upper springs extended by 10 cm;
   Total = 15 + 10 = 25 cm (3 mks)

6. 

7. Effect of weight of second pulley reduces efficiency of A. Load in B is larger and so effect of friction is less in B increasing efficiency. (1 mk)

8. In B some of the heat is used up in melting the ice, while in A all the heat goes to raise the temperature of the water to reach boiling point (2 mks)

9.



10. At F, radius of curve is smallest and so greatest centripetal force is required to keep luggage on carrier; ($F = \frac{mv^2}{R}$) (2 mks)

11. $A_1V_1 = A_2V_2$;
$\pi \times 6^2 \times V_1 = \pi \times 9^2 \times 2$;
$= 4.5\ ms^{-1}$ (3 mks)

12. As the temperature changes the volumes of the gases in the balloons change differently. The change in volume and hence the change in upthrust will differ. (2 mks)

13. $Ft = \Delta\ mv$;
$720 \times 0.1 = 0.6 \times v$;
$= 120ms^{-1}$ (3 mks)

14. (a) In solids the molecules are held in position by intermolecular forces that are very large. In liquids the molecules are able to roll over one another since the forces are smaller (1 mk)

(b) (i) Volume = $4/3\ \pi\ r^3$
$= 4/3\ \pi \times 0.025^3$
$= 6.54 \times 10^{-5}\ cm^3$ (2 mks)

(ii) Area = $\pi\ r^2$
$=\pi \times 10^2$
$= 314\ cm^2$ (2 mks)

(iii) A x diameter of molecule = volume;
$314 \times d = 6.54 \times 10^{-5}$
$d = 2.1 \times 10^{-7}$ cm (3 mks)

(c) (i) The oil is assumed to have spread to thickness of one molecule (1 mk)

(ii) Sources of errors:

- Getting the right oil
- Measuring drop diameter

- Measuring diameter of patch
- Getting drop of a right size (any 2 x 1 = 2 mks)

15. (a)

- Make diameter of springs different
- Make number of turns per unit length different
- Make lengths of springs different (any 2 x 1 = 2 mks)

(b) (i) 2.2 N ; 2.2 ± 0.1

(c) (ii) Spring constant = gradient

= 2.1

4.1×10^{-2}

= $5/Nm^{-1}$

For each spring k= 102 Nm^{-1} (1 mk)

(iii) Work = Area under graph

$= \frac{0.75 + 1.65}{2} \times 1.7 \times 10^{-2}$

= 2.04×10^{-2} J (3 mks)

16. (a) A gas that obeys the gas laws perfectly (1 mk)

(b) (i) By changing pressure very slowly or by allowing gas to go to original temperature after each change (1 mk)

(ii) k is slope of graph

$K = \frac{(2.9 - 0) \times 10^5}{(3.5 - 0) \times 10^6}$

K = 0.083 NM

(iii) Work done on the gas (4 mks)

(iv) Use dry gas (1 mk)

Make very small changes in pressure (any 1 x 1 = mks)

(c) Since pressure is constant

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$T_1 = 273 + 37 = 310k$

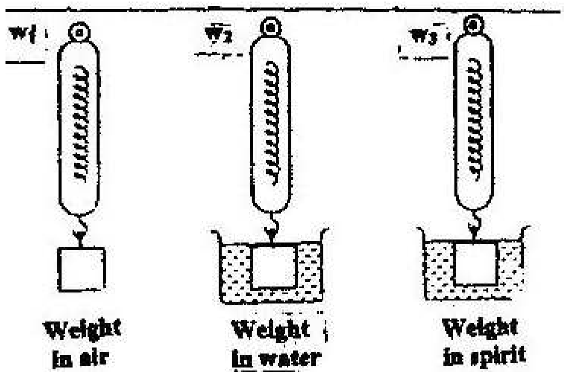
$T_2 = 273 + 67 = 340k$

$\frac{4000}{310} = \frac{V_2}{340}$

$V_2 = 4387$ litres (4 mks)

17. (a) A body fully or partially immersed in a fluid experiences an upthrust equal to the weight of the fluid displaced (1 mk)

(b) (i)



(ii) 100g: $U_w = 0.12N$ $U_s = 0.09N$
150g: $U_w = 0.18N$ $U_s = 0.14N$
200g: $U_W = 0.24N$ $U_s=0.18N$ (2 mks)

(ii) Relative density = $\frac{\text{upthrust in spirit}}{\text{Upthrust in water}}$

$$= \text{average} \left(\frac{0.09}{0.12}, \frac{0.14}{0.18}, \frac{0.18}{0.24} \right)$$

= 0.76 (3 mks)

(c) Weight of air displaced = ρVg
1.25 x 1.2 x 10N
=15N;
= upthrust
Weight of helium = ρVg
0.18 x 1.2 x 10N
= 2.18N;
Weight of fabric = 3N
Forces downwards = 2.16 + 3 = 5.16N;
Tension = 15 – 5.16
= 9.84 N (4 mks)

18. (a) Specific latent heat of fusion of a substance is the quantity of heat required to melt completely one kilogram of the substance (at its normal melting point) to liquid without change of temperature. (1 mk)

(b) (i) $Q = ml$

$= 0.02 \times 334000J$

$= 6680J$ (2 mks)

(ii) $Q = mc\theta$

$= 0.02 \times 4200\ (T-0)$

$= 84\ TJ$ (2 mks)

(iii) Heat lost by warm water

$= mc\theta$

$= 0.2 \times 4200\ (60- T)$

Heat lost by calorimeter $= mc\theta$

$0.08 \times 900\ (600 – T)$ (2 mks)

(iv) Heat gained = Heat lost

$6680 + 84T = 0.2 \times 4200\ (60 –T) + 0.08 \times 900\ (60-T)$

$6680 + 84T = 50400 – 84OT + 4320 – 72T$

$996T = 48040$

$T = 48.2^0C$ (4 mks)

K.C.S.E 2007

PHYSICS PAPER 232/1

MARKING SCHEME

1.	0.562 – 0.012 = 0.550cm 5.62 – 0.12 = 0.55 cm 5.5 mm	Or 5.62 – 0.12 5.5	1 mk
2.	Density p= m/r D = m/v = $\frac{1.75g}{(0.550)^3cm}$ formula substitution = 10.5g/cm^3 answer 10500kg/m^3	- accept g/mm^3 - allow transfer of error	3 mks
3.	$V_2 V_4 V_1 V_3$ (correct order)		1 mk
4.	Sucking air reduces pressure inside the tube; so that atmosphere pressure forces the liquid up the tube		1 mk
5.	Look for symbols $P_A gh_A = Pagh_B$ formula or correct $P_A g \times 24 = 1200\ g \times 16$ substitute substitution $P_a = 800\ kgm^{-3}$ answer answer		3 mks
6.	Radiation		1 mk
7.	X_2 is made greater than X_1 / X_1 is made shon X_2 X_2 is made larger than X_1 Since B receives radiation at a higher rate, it must be moved Further from sources for rates to be equal: since A receives radiation at a lower rate than B. $F_1 d_1 = f_2 d_2$		2 mks
8.	Taking moments and equating clockwise movements = anticlock movements 0.6 N x 7cm = mg N x 30cm; W = mg = 1.4 N:		3 mks
9.	Distance = area under curve between 0 and 3. 0 second; = 120 x 3 x 0.2 = 72M: Trapezium Rule (3 trapeziua) Mid – ordinateral = 70.5		
10.	Acceleration = slope of graph at t = 4.0 s Or a= $\frac{\Delta V}{\Delta t}$ or trapezium rule (6 trapezia) = 72m = $\frac{16 \times 3}{17 \times 0.2}$ = 14.11 m/S^2 (12 – 14.5) m/s^2 or trapezium (1) or 1 triangle = 76.5m		2 mks
11.	Pressure, impurities::		2 mks
12.	Kelvin (K) in words (one triangle used follow)		2 mks

13.	The pressure of a fixed mass of a gas is directly proportional to its absolute (Kelvin) temperature provided the volume is kept constant P & T volume constant	1 mk
14.	Since the quantity of water A is smaller, heat produces grater change of temperature in A; This causes greater expansion causing the cork of temperature in A; this cause greater expansion causing the cork to sink further. Per unit volume/ greater decrease in density/ lower density in A	
	SECTION B	
15 (a)	**Smoke particles** Show the behavior or movement of air molecule Smoke particles are larger than air molecules/ visible and light enough to move when bombarded by air molecules **Lens** Focuses the light from the lamp on the smoke particle; causing them to be observable **Microscope** Enlarge the smoke particle So that they are visible/ magnifies smoke particles	2 mks) 2 mks) 2 mks)
(b)	Smoke particle move randomly / zigzag / haphazardly Air molecules bombard the smoke particles/ knock, hit Air molecules are in random motion	3 mks
(c)	The speed of motion of smoke particles will be observed to be higher smocking particles move faster, speed increases, increased random motion	1 mk
16(a) (b) (i) ii iii	A body at rest or motion at uniform velocity tends to stay in that state unless acted on by an unbalanced force/ compelled by some external force to act otherwise. $S = \underline{\Delta u}$ Nd or $\frac{98.75 - 0}{16 - 0}$ (m/s)^2 $= 6.17ms^{-2}$ 20k = s = 6.09 depend on (i) $K = \frac{6.09}{20}$ = 0. 304 Increase in roughness increases k and vice versa Uniform speed in a straight line – uniform velocity	1 mk 3 mks 2 mks 1 mk
(c)	Applying equation $V^2 - u^2 = 2as$ $V^2 - 0 = 2 \times 1.2 \times 400$ Momentum p = mv	4 mks

	$= 800 \times \sqrt{2 \times 1.2 \times 400}$ = 24787.07 = 24790	
17.(a)	Quantity of heat required to change completely into vapour 1 kg of a substance as its normal boiling point without change of temperature; Quantity of heat required to change a unit mass of a substance from liquid to vapour without change in temp	1 mk
(b) (i)	So that it vaporizes readily/ easily	1 mk
(ii)	In the freezing compartment the pressure in the volatile liquid lowered suddenly by increasing the diameter of the tube causing vaporization in the cooling finns, the pressure is increased by the compression pump and heat lost to the outside causing condensation. Acquires heat of the surrounding causing the liquid to vaporize	
(iii)	When the volatile liquid evaporates, it takes away heat of vaporization to form the freezing compartment, reducing the temperature of the latter. This heat is carried away and disputed at the cooling finns where the vapour is compressed to condensation giving up heat of vaporization	
(iv)	Reduces rate of heat transfer to or from outside (insulates) Reduces / minimizes, rate Minimizes conduction/ convertion of heat transfer	1 mk
(c) (i)	Heat lost = $ml_v + mc\,\Delta\theta$ = formula Heat lost by steam = 0.003 x 2.26 x 106 = substitution Heat lost by steam water = 0.003 x 4200 (100-T) Total = 6780 + 126 (100 – T) = 8040 – 12.6T	3 mks
(ii)	Heat gained by water = MC θ = 0.4 x 4200 (T- 10) Or = 1680 T - 16800	1 mk
(iii)	Heat lost = heat gained OR correct substitute 1680 (T – 10) = 6780 12.6 (100-T); Allow transfer of error 1680T – 16800 = 6780 + 1260 – 12.6T 1692 .6 T = 24840 T = 14.7^0C 14.68	1 mk 15 mks
18.(a)	Rate of change of velocity towards the centre Acceleration directed towards the centre of the motion Acceleration towards the centre of orbit/ nature of surface	2 mks
(b) (i)	Roughness / smoothness of surface. Radius of path/ angular velocity/ speed (Any two)	2 mks

(ii)	II) $_A$> $(l)_B$ $(l)_C$ (correct order)	1 mk
(c)	$F = m(l)^2 r$ $F = MV^2$ V=rw For thread to cut r w = <u>3.049</u> F= 5.6 N $5.6 = 0.2 \times v^2$ 0.15 (l) = 13.7 radius $V^2 = 4.2$ = 13.66 13.66 v = 2.0494	4 mks
19 (a)	A floating body displaces its own weight of the fluid on which it floats	
(b)(i)	To enable the hydrometer float upright / vertically	1 mk
(ii)	Making the stem thinner/ narrower (reject bulb)	1 mk
(iii)	Float hydrometer on water and on liquid of known density in turn and mks levels; divide proportionally and extend on either side/ equal parts	2 mks
(c)i)	Tension; upthrust; weight	3 mks
(ii)	As water is added, upthrust and tension increase; reaching maximum when cork is covered and staying constant then after weight remains unchanged as water is added	3 mks 11mks

K.C.S.E 2008

PHYSICS PAPER 232/1

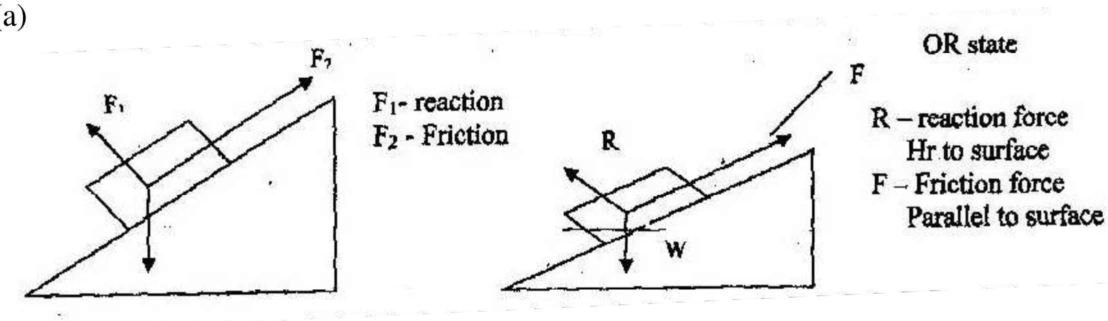
MARKING SCHEME

1. Water $V = \frac{Mw}{I}$ or $MW = \frac{ML}{P}$ $RD = \frac{ML}{ML} = P$

2. For liquid $V = \frac{ML}{P}$ $P = \frac{ML}{MW}$ $P = \frac{ML}{MW}$

   $P = \frac{ML}{MW}$

3. (a)



   b) R – Increases OR R – Approaches W
   F – Reduces F – Reduces

4. - Atmospheric pressure is higher than normal/ standard or boiling was below
   - Pressure of impurities

5. When flask is cooled it contracts/ its volume reduces but due to poor conductivity of the glass/ materials of the flask water falls as it contraction is greater than that of glass.
   (3 mks are independent unless there is contradiction)

6. Heat conductivity/ rates of conduction/ thermal conductivity (NB: If heat conduction no mk)

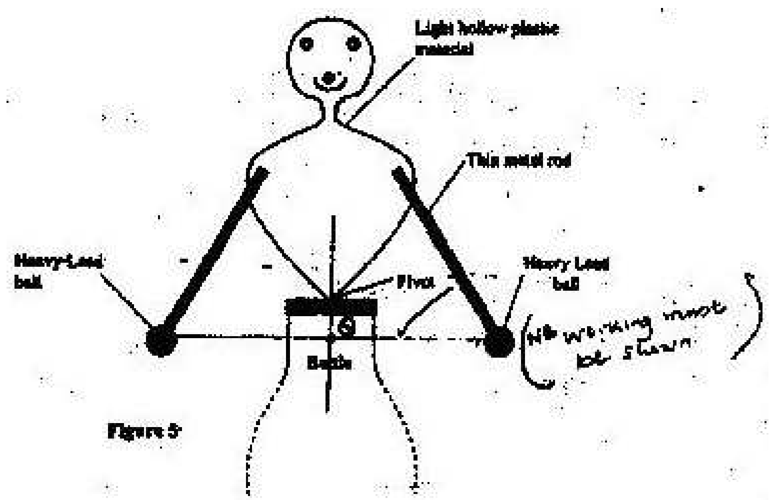
7. X sectional area/diameter/thickness/radius

8. $P_1 = pgh$
   $= 1200 \times 10 \times 15 \times 10^{-2}$
   $= 1800$ pa
   Total pressure
   $= 8.58 \times 10^4$ pa
   (85800pa)

   or $Pr = PA + heg$
   $= 8 \times 10^{-4} + 15 \times 1200 \times 10^{-2} \times 10$
   $= 8.58 \times 10^4$ pa

9. - Intermolecular distances are longer/ bigger/ in gas than in liquids
- Forces of attraction in liquids are stronger/ higher/ greater/ bigger/ than in gases

10. (In the diagram)



11. Stable equilibrium
When it is tilted slightly Q rises/ c.o.g is raised when released it turns to its original position

12. This reduces air pressure inside the tube, pressure from outside is greater than inside/ hence pressure difference between inside and outside causes it to collapse.

13. Diameter coils different/ wires have different thickness/ No. of turns per unit length different/ length of spring different.
(x- Larger diameter than Y
Or in one coils are closer than in the other

14. Heated water has lower density, hence lower up thrust

15. (a) Rate of change of momentum of a body is proportional to the applied force and takes in the direction of force.

(b) (i) $S= ut + ½ at^2$
$49 = 0 + ½ x a x 7^2$
$a = 2M/S^2$

(ii) V = u + at or $v^2 = u^2 + 2 as$
= 0 + 2 x 7 = 14m/s $v^2 = 02 + 2 + 2 x 2 x 49$
V2 = 14m/s

(c) (i) $S = ut + \frac{1}{2} gt^2$ either $V^2 = u^2 + 2gs$

$1.2 = 0 + \frac{1}{2} \times 10 \times t^2$ $v = u + gt$

$V^2 = 0^2 + 2 \times 10 \times 1.2$

$T = \sqrt{\frac{1.2}{5}} =$ $v = \sqrt{24} = 4.899$

$4.899 = 0 + 10t$

$= 0.49s$ $T = 0.4899s$

(ii) $s = ut$

$u = \frac{8}{t} = \frac{2.5}{0.49} = 5.10215.103m/s$

16. Heat energy required to raise the temperature of a body by 1 degree Celsius/ centigrade of Kelvin

Measurements or

Initial mass of water and calorimeter M_1

Final mass of water & calorimeter, M_2

Time taken to evaporate (M1 – M2), t

Heat given out by heater = heat of evaporation= ML

Pt = (m1 – m2)1

$L = \frac{pt}{M1 - M2}$

(c) (i) = CDT

= 40 x (34 – 25) = 40 x 9 = 360J

(ii) MWCWDT

$100 \times 10^{-2} \times 4.2 \times 10^3 (34-25) = 3780J$

(iii) MmCMDT or sum of (i) and (ii)

$= 150 \times 10^3 \times cm\ 6$ 360 + 3780

= 9.9 cmJ = 4140J

(iv) $150 \times 10^{-3} \times cm \times 66 = 4140$ heat lost = heat gained by water + heat gained by

$cm = \frac{4140}{150 \times 10^{-3} \times 60}$ 9.9 cm = 360 + 3780

$cm = \frac{4140}{0.15 \times 60}$

418J/Kgk 418J/Kgk

17. (a) Lowest temperature theoretically possible or temperature at which/ volume of a gas/ pressure of gas/K.E (velocity) of a gas is assumed to be zero

(b) Mass/ mass of a gas
Pressure / pressure of a gas/ pressure of surrounding

(c) (i) 4×10^{-5} m^3 /40×10^{-6}m^3 / 40cm^3

(ii) -275^{0}C – 280^{0}C

(i) a real gas
Liquefies/ solidifies

(d) $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$ but $V_1 = V_2$ If $\frac{P}{T_1} = \frac{P_2}{T_2}$ is used max mks 3

$P_2 = \frac{P_1 T_2}{T_1} = 9.5 \times 104 \times \frac{283}{298}$ P2 = $\frac{P_1 T_2}{T_1}$

= 9.02×10^4pa = $9.5 \times 10^4 \times \frac{283}{298}$

= (90200pa) (90200 pa)
(90.2×10^3 pa) (90.2×10^3pa)

18. (a) VR = $\frac{\text{Effort distance}}{\text{Load distance}}$

(b) (i) Pressure in liquid is transmitted equally through out the liquid
NB; if term fluid is used term in compressive must be staled
Work done at RAM = work done on the plunger

(ii) P x A x d = P x a x d or vol of oil at plunger = at RAM

A x D = a x d a x d = A x D

$\frac{d}{D} = \frac{A}{a}$ $\frac{d}{D} = \frac{A}{a}$

VR = $\frac{A}{a}$ VR = $\frac{A}{a}$

(c) (i) MA = $\frac{\text{load}}{\text{Effort}}$

$\frac{4.5 \times 10^3}{135}$

$= 33.3\ (33\ ^1/_3)$

(ii) Efficiency = $\frac{MA}{VR} \times 100\%$ OR efficiency = $\frac{MA}{VR} = 33.3$

$= \frac{33.3}{45} \times 100\%$

= 74%

= 0.74

(iii) % work wasted = 100% - 74%

= 26%

19. (a) When an object is in equilibrium sum of anticlockwise moments about any point is equal to the sum of clockwise moments about that point

(b) (i) V= 100 x 3 x 0.6 = 180cm^3

M = VP

180 x 2.7 = 486 g

W = Mg

$\frac{486}{1000} \times 10$

= 4.86 N

OR W = Mg

= Pvg

$= \frac{2.7 \times 3 \times 0.6 \times 100 \times 10}{100}$

= 4.86N

(ii) Taking moments about F pivot; 20F = 15 x 4.86

$F = \frac{15 \times 4.86}{20} = 3.645$

Or

F = taking moments about W, 15R = 35F – (i)

F + W = F = R – 4.86 – (ii) substitute

F = R – 4. 86 ---- 1

F = 3.645N

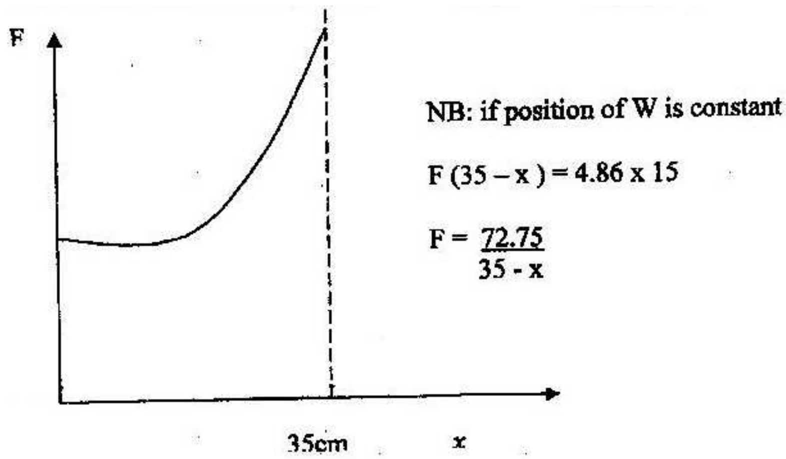
OR

Taking moments about F = 20R = 4.86 x 35

R = 8.51 and F = R – W

F= 8.51- 4.86 = 3.645N

(iii)



(iv) As x increase/ anticlockwise moments reduces/ moments to the left reduces/ distance between F and pivot reduces F has to increase to maintain equilibrium

K.C.S.E 2009

PHYSICS PAPER 232/1

MARKING SCHEME

1. Volume run out= 46.6 cm^3
   Density = $^m/_v$ = 54.5 / 46.6 = 1.16953
   = 1.17g/ cm^3

2. $T^2 = 4\,\Pi\,^{2L}/g$
   $= 1.7^2 = \frac{4\,\Pi^2 \times 0.705}{g}$
   g= 9.63m/s^2

3. Needle floats due to the surface tension force
   Detergents reduces surface tension, so the needle sinks

4. When equal forces applied, pressure on B is greater than on A due to smaller area./ pressure differences is transmitted through to liquid causing rise upward. Force on A is greater than hence upward tension.

5. Molecules inside warm water move faster than in cold water. For Kinetic energy in warm water is higher than in cold water/ move with greater speed/ molecules vibrate faster in warm water.

6. Prevents/ holds, traps breaks mercury thread/ stops return of mercury to bulb when thermometer is removed from a particular body of the surrounding

7. Dull surface radiate faster than bright surface
   P- Looses more of the heat supplied by burner than Q OR
   Q shinny surface is a poorer radiator/ emitter of heat thus retains more heat absorbed Or
   P- Dull surface is a better radiator/ emitter i.e. retains less of the heat absorbed. (there must be a comparison between P & Q

8. Heat travels from container to test tube by radiation so the dull surface P, gives more heat to the test tube.

9. Center of gravity located at the intersection of diagonals

10. Parallel
F= 2 ke
40= 2 x ke
$E_1 = {}^{40}/_{2k} = {}^{20}/_{k}$

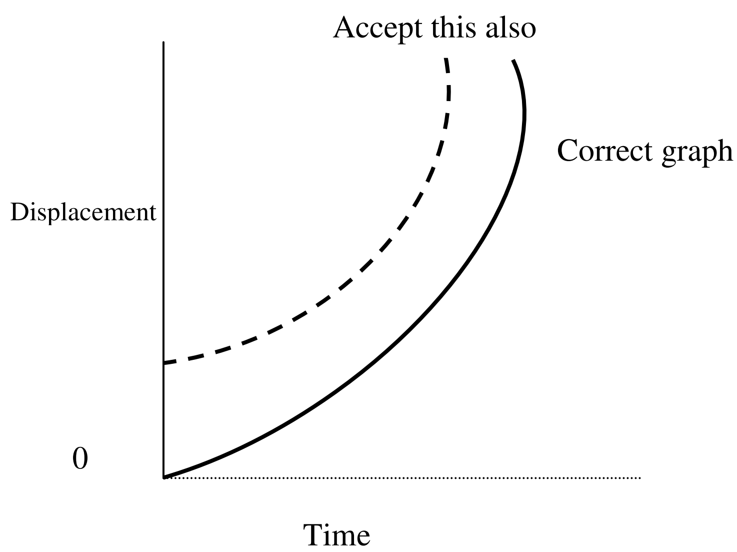
Single = f= ke_2
20 = ke_2
E_2 = 20/k

$E_T = e_1 + e_2$
20 = 20 /k + 20/k
20 k = 40
K= ${}^{40}/_{20}$ = 2N/cm

OR Extension of each spring = 10
K = 20N/ 10 cm
- 2N/ cm

11. Air between balloon is faster that than outside so there is pressure reduction between.

12.



13. The lowest temperature possible/ Temp at which ideal gas has zero volume (Zero pressure) or molecules have zero / minimum energy OR
Temperature at which a gas has min internal energy/ zero volume

14. V= r x 21 OR T = 1/33 = 0.030303

= 0.08 x 21 V 33m/s T = 2V / w =

= 16.6m/s w = 2v/0.0303 = 207.525

V= rw

0.08 x 207. 5292

= 16.5876m/s

SECTION B (55 MKS)

15. (a) - Pressure

- Dissolved impurities

(b)

(i) BPt = 78^0C

(ii) (I) Δt = 4.5 min

Q = pt = 50 x 4.5 x 60J

= 13500J

(II) Q = 70 - 16 = 54^0C *(accept 54 alone or from correct working)*

(III) Q = MC Δθ

$C = \frac{13500J}{0.1kg \times 54k}$

= 2500J/ kj

(iii) Δ t = (7.3 – 6.8) min = 30s

Q = pt = ml = 30x 50J

$L = \frac{30 \times 50}{0.18} = 83.33 \times 10^5$ J/kg

16. (a) Efficiency = $\frac{\text{work output}}{\text{Work input}}$ x 100% (equivalent)

OR Ratio of work output to work input expressed as a percentage

(b) (i) work effort = F x S

= 420 N x 5.2 N

2184J

(ii) Distance raised = 5.2 sin 25 = 2.2 m (2.1976)

Work done = 900N x 2.2 m

= 1980J

(iii) Efficiency = $\frac{\text{work output}}{\text{Work input}}$ x 100% = $\frac{1980}{2184}$ x 100

= 90.7%

17. (a) A floating body displaces its own weight of the fluid on which it floats

(b) (l) w = T + U

(ii) Vol = 0.3 x 0.2 x $0.2m^3$

Weight = mg = 0.3 x 0.2 x 0.2 x 10500 kg/m^3 x 10

= 1260N

(iii) Vol of liquid = vol of block

Weight of liquid displaced = Vpg

0.3 x 0.2 x 0.2 x 1200 x 10N

= 144N

(iv) T = w - u

1260 – 144N

1116N

(c) Weight of solid = weight of kerosene displaced

= 800 x 10 x 10^{-6} x 10 = 0.08 N

Mass = 0.008 kg

Vol = 50 cm^3 Density $^m/_v$ = $^{0.008}/_{50 \text{ x } 106 \text{ m}^3}$

18. (a) The pressure of a fixed mass of an ideal gas is directly proportional to the Absolute temperature if the volume is kept constant.

(b)

(i) Volume increases as bubble rises because the pressure due to liquid column is lowered; therefore the pressure inside bubbles exceeds that of outside thus expansion.

(ii) (I) Corresponding pressure = 1.88 x 10^5 Pa

(II) I/v = 1/1.15 = 0.87 cm^{-3}

(iii) Δ P = (1.88 – 0.8) x 10^5 pa = 1.08 x 105 Pa

ΔP = ℓgh = ℓ x 0.80 x 10

P = $\frac{1.08 \text{ x } 10^5 \text{ kg/m}^3}{0.80 \text{ x } 10}$

= 13500 kg/m^3

(iv) Pressure at top = atmospheric

0.8×10^5 pa

c. ${}^{p1v1}/_{T1} = {}^{p2v2}/_{T2}$ $= \frac{2.7 \times 10^5 \times 3800}{298} = \frac{2.5 \times 10^5 \times v_2}{288}$

$25^0C = 298$ k $= 3966\ cm^3$

$15^0c = 288k$

19. (a) Rate of change of angular displacement with time

Acc. Without (rate)

(b)

(i) Mass, friction, radius (any two)

(ii) Oil will reduce friction since frictions provide centripetal force; the frequency for sliding off is lowered.

(c) $v^2 = u^2 + 2\ as$

$= 0 + 2\ (0.28)h$

$V = \sqrt{0.56 \times 1.26}$

$= rw$

$= 0.84 = 0.14 \times w = \frac{0.84}{0.14} = 6$ rad s

K.C.S.E 2010

PHYSICS PAPER 232/1
MARKING SCHEMES

SECTION A (25 MARKS)

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

1. Figure 1 shows a vernier callipers being used to measure the internal diameter of a tube

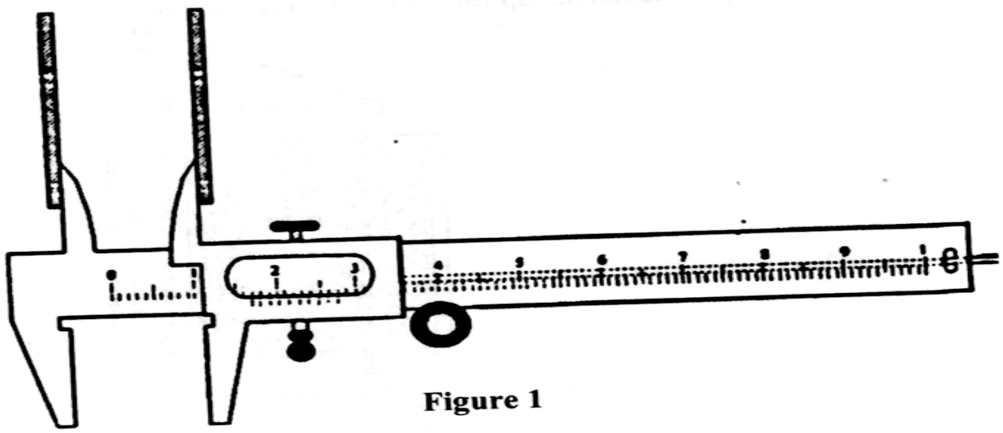


Figure 1

Record the diameter of the tube. (1 mk)

1.62cm / 1.62

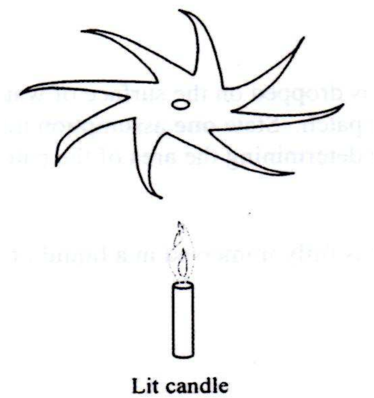
2. A stopwatch started 0.50s after the start button was pressed. The time recorded using the stopwatch for a ball bearing falling through a liquid was 2.53s. Determine the time of fall. (1 mk)

- 2.53 + 0.5 = (working must be shown)

3. Some water in a tin can was boiled for some time. The tin was then sealed and cooled. After sometime it collapsed. Explain the observation. (2 mks)

- Air (molecules) expelled by heating
- Pressure inside is less that atmospheric pressure

4. A paper windmill in a horizontal axis was paled above a candle as shown in figure 2.



When the candle was lit the paper windmill begun to rotate. Explain this observation (2 mks)
- Flame heats air which/becomes less dense (expands) /and move upwards expand
- This will push the blade upwards/creates convection currents hence rotate.

5. When liquid is heated in a glass flask, its level at first falls, then rises. Explain this observation.(2 mks)
   - Flask which is in intact with heat expands first
   - Liquid expands more than glass.

6. Figure 3 shows a uniform metre rule pivoted at the 30cm mk. It is balanced by a weight of 20 suspended at the 5cm mk.

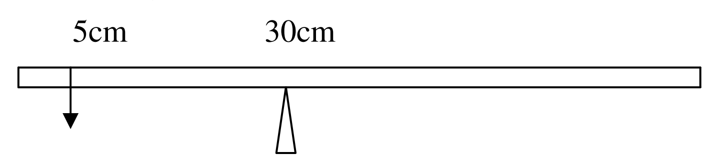


Figure 3

Determine the weight of the metre rule

Clockwise moments = anticlockwise moments } either
OR $W_1d_1 = w_2d_2$ / $f_1d_1 = F_2d_2$

$W \times 0.2 = 2 \times 0.25$

$W = 2.5N$

7. Figure 4 shows a horizontal tube with two vertical tubes x and y. Water flows through the horizontal tube from right to left. The water travel in tube x is higher than water level in tube y.

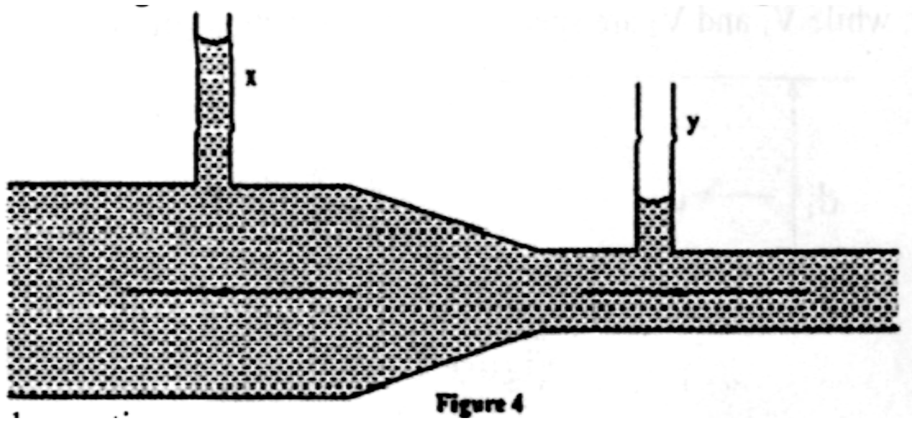


Figure 4

Explain this observation

- Water flows faster in Y than X hence pressure is lower at Y than X

(i.e 1st mk - compare velocity)

2nd - compare pressure

8. A cart of mass 30kg is pushed along a horizontal path by a horizontal force of 8N and moves with constant velocity. The force is then increased to 14N. Determine
   a) The resistance to the motion of the cart. (1 mk)
      - 8N
   b) The acceleration of the cart. (2 mks)
      14 - 8 = 30n or F = ma
      $a = {}^{6}/_{30} = 0.2m/s^2$

9. When a drop of aloeic acid of known volume is dropped on the surface of water in a large trough, it spreads out to form a large circular patch. State one assumption made when the size of the molecule of aloeic acid is estimated by determining the area of the patch. (1 mk)

   - Patch is one molecule thick or monolayer

10. The weight of a solid air is 50N. When it is fully immersed in a liquid of density $800Kg\ m^3$ its weight is 4.04N.
    Determine:
    i) The upthrust in the liquid (1mk)
       u - 5.0 - 4.0 (working must be shown)
       u = 0.96N

    b) The volume of the solid. (2 mks)
       Weight of liquid displaced = 0.96N
       Mass of liquid displaced = 0.096kg

$V = {}^{M}/_{P} = {}^{0.096}/_{800} = 1.2 \times 10^{-1} m^3$

$1.2 \times 10^2 cm^3$

$120 cm^3$

11. When a bicycle pump was sealed at the nozzle and the handle slowly pushed towards the nozzle, the pressure of the air inside increased.
    Explain this observation. (1 mk)
    - Volume decreases so more collisions per second.

12. Figure 5 shows a mass of 200g connected by a string through a hollow tube to a mass of 0.5kg. Teh 0.5kg mass is kept stationary in the air by whirling the 200g mass round in a horizontal circle of radius 1.0 metre.

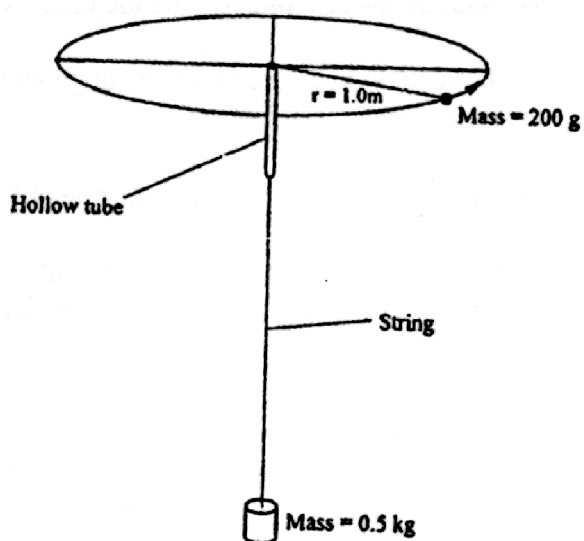


Figure 5

Determine the angular velocity of the 200g mass. (3 mks)

$F = mw^2r = mg$ **Or** $F = {}^{mv2}/_{v}$ but $V = wr$

$0.2 \times 1 \times w^2 = 0.5 \times 10$ $w2 = {}^{f}/_{mr} = {}^{0.5 \times 10}/_{0.2 \times 1}$

$w^2 = {}^{5}/_{0.2}$ $w = 5$ rad/s

$w = \sqrt{2.5} = 5$ rad/s

13. State the SI unit of a spring constant (NB in words) (1 mk)
    - Newton per mete

14. Figure 6 shows an athlete lifting weights while standing with the feet apart.

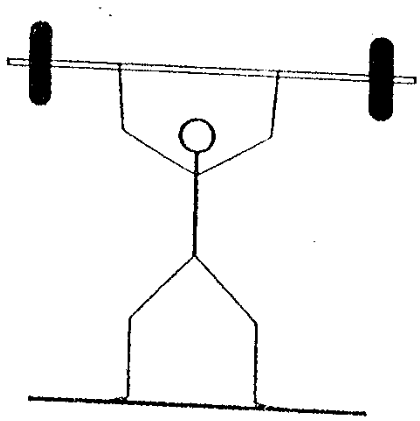


Figure 6

Explain why standing with the feet apart improves an athlete's stability. (1 mk)

- Increases the base area or lowers the centre of gravity

SECTION B(Mks)

Answer all the questions in their section in the spaces provided

15. a) A cyclist initially at rest moved down a hill without pedalling. He applied brakes and eventually stopped. State the energy changes as the cyclist moved down the hill. (1 mk)

Potential energy - Kinetic energy - heat + sound (sound not a must)

a) Figure 7 shows a mass of 30kg being pulled from point P to point Q with a force of 200N parallel to an inclined place. The distance between P and Q is 22.5m. In being moved from P to Q the mass is raised through a vertical height of 7.5m.

b)

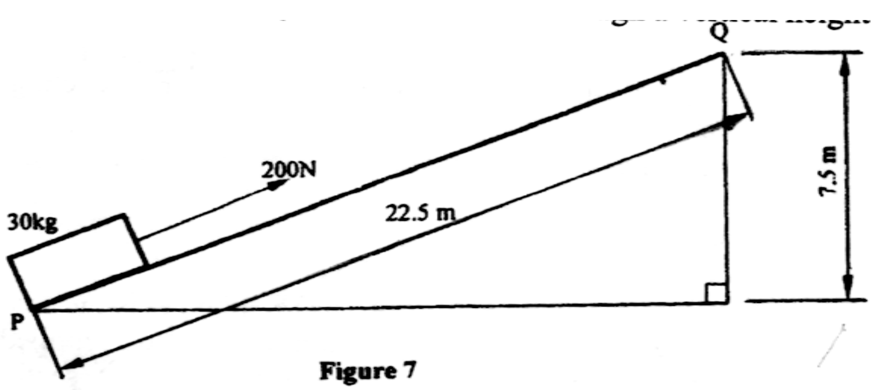


Figure 7

i) Determine the work done:

I by the force (2mks)

work done by force = fd = 200 x 22.5

= 4500J

II on the mass (2 mks)

= mgh = 30 x 10 x 7.5

= 2250J

III to overcome friction (2 mks)

Work done by force - work done on mass = 4500 - 2250

= 2250J

ii) Determine the efficiency of the inclined plane. (2 mks)

eff = work output x 100% / work input **OR** eff = work output / work input

$^{2250}/_{4500}$ x 100% = 50% $^{2250}/_{4500}$ = 0.5

i.e eff - $^{MA}/_{VR}$ x 100% = $^{1.5}/_{22.5}/_{7.5}$ x 100% = 50

c) Suggest one method of improving the efficiency of an inclined plane. (1 mk)

- Reduce friction by use of rollers/smoothening (polishing/oiling surface
- Method of reducing friction must be stated.

16. In an experiment to determine the density of sand using a density bottle, the following measurements were recorded:

Mass of empty density bottle - 43.2g

Mass of density bottle full of water = 66.4g

Mass of density bottle with some sand = 67.5g

Filled up with water = 82.3g

Use the above data to determine the:

a) Mass of the water that completely filled the bottle: (2 mks)

= 66.4 - 43.2

= 23.2g

b) Volume of water that completely filled the bottle: (1 mk)

$^{23.2g}/_{1gcm^3}$ = 23.2cm^3

(Nb: working must be shown)

c) Volume of the density bottle: (1 mk)

23.2cm^3

d) Mass of sand

(67.5 - 43.2) g - 24.3g (working must be shown)

e) Mass of water that filled the space above the sand. (1mk)

82.3 - 67.5 = 14.8g (working a must)

f) Volume of teh sand:

Volume of the sand = volume of bottle - volume of added water

= 23.2 - 14.8

= 8.4cm3

g) Density of the sand (2 mks)

P = M/V = 24.3g = 2.893cm3

8.4cm3

(NB: at least 2 dec places)

17. a) Explain why it is advisable to use the pressure cooker for cooking at high attitudes(2 mks)

- At high attitudes pressure is low so boiling point is low
- So pressure cooker pressure inside it which raises boiling point
- Pressure inside the cooker is higher raising the boiling point.

b) Water of mass 3.0kg initially at 20^{0}C is heated in an electric kettle rated 3.0KW. The water is heated until it boils at 100^{0}C. (Take specific heat capacity of water 4200jkg^{1}K^{-1}. Heat capacity of the kettle = 450JK-1, Specific latent heat of vaporization of water = 2.3mjkg-1)

Determine

i) The heat absorbed by the water. (1 mk)

Q = Mc$\Delta\theta$ or Mcθ or McΔT

= 3 x 4200 x 80 = 1008000J

ii) Heat absorbed by the electric kettle (2 mks)

Q = cθ / c$\Delta\theta$ / cΔT = 450 x 80

= 36000J

iiii)The time taken for teh water to boil (2 mks)

PL = Mc$\Delta\theta$ / c$\Delta\theta$ t = 34.8J

3000t = 1008000 + 36000

3000t = 1044000

iv) How much longer it will take to oil away all the water. (2 mks)

$Mlv = Pt$	**OR**	$Mlv = Pt$
$3 \times 2.3 \times 10^6 = 3000t$		$3 \times 2.3 \times 10-3 = 3000t$
$t = 2300s$		$t = 2.3 \times 10^{-6}s$
(38.3 minutes)		

18. Figure 8 shows a stone of mass 4.0kg immersed in water and suspended from a spring balanced with a string. The beaker was placed on a compression balance whose reading was 85N. The density of the stone was 3000kg^{-3} while the density of the liquid was 800kg^{-3}.

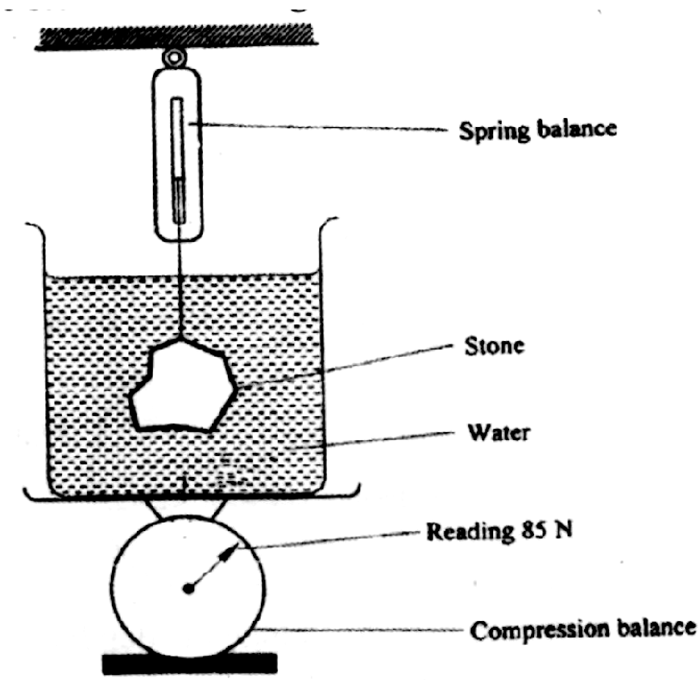


Figure 8

Determine the:

a) Volume of the liquid displaced. (2 mks)

$V = m/p$ or $V = 4/3000$

$V = 1.33 \times 10^{-3}m^3$

(at least 2 dec places)

b) Upthrust on the tone (4 mks)

Upthrust = weight of liquid disp = vpg upthrust = weight of liquid displaced = vpg

$= 800 \times 1.33 \times 10^{-3} \times 10$ $= 1000 \times 1.33 \times 10^{-3} \times 10$

$= 10.64N$ $= 13.33N$

c) Reading of the spring balance: (2 mks)

Weight of stone air = 4 x 10 = 40N

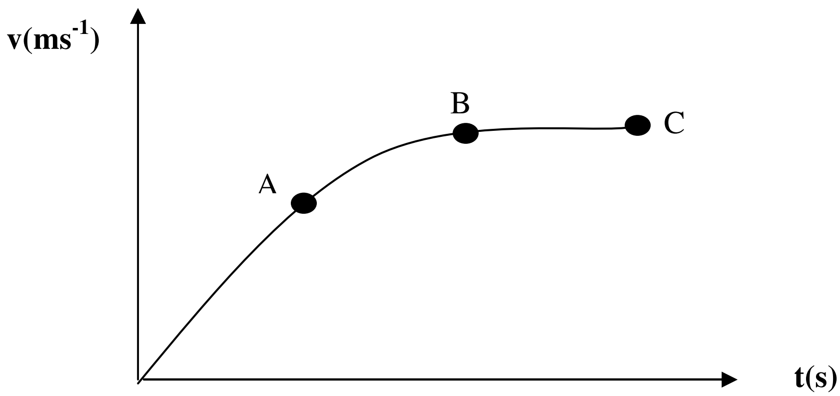
Reading of spring balance = 40 - 10 64 = 29.36N

40 - 13.33 = 26.67N

d) Reading of the compression balance when the stone was removed from the water. (2mks)

85 - 10.64 = 74.36N or 85 - 13.33 = 71.76N

19. a) Figure 9 shows a velocity-time graph for the motion of a certain body.



Describe the motion of the body in the region.

i) **OA** (1 mk)

Body moves with constant acceleration

Increasing velocity

or velocity increasing uniformly with time.

i) **AB** (1 mk)

Bodies moving with / decreasing or reducing /acceleration

iii) **BC** (1 mk)

Constant (uniform) velocity / zero acceleration

b) A car moving initially at $10ms^{-1}$ decelerates at $2.5ms^{-2}$

i) Determine

I its velocity after 1.5s:

$V = u + at$ } either

$V = 10- 2.5 \times 1.5$

$V = 6.25m/s$

II the distance travelled in 1.5s (2 mks)

$S = ut + {}^{1}/_{2}at^{2}$

$S = 10(1.5) - {}^{1}/_{2}(2.5)\ (1.5)^{2} = 12.1875m$

$= 12.19m$

III the time taken for the car to stop (2 mks)

$V = u + at$

$0 = 10 - 2.5t$

$t = {}^{10}/_{12} = 4s$

ii) Sketch the velocity-time graph for the motion of the car up to the time the car stopped. (1 mk)

iii) From the graph, determine the distance the car travelled before stopping. (2 mks)

Distance = Area of triangle

$= {}^{1}/_{2} \times 4 \times 10 = 20M$

or

$S = ut + {}^{1}/_{2}\ at^{2}$ $\quad$ a = gradient = -2.5m/s

$S = 10 \times 4 - {}^{1}/_{2} \times 2.5 \times 4^{2}$

$S = 40 - 20$

$S = 20m$

or

S = average velocity x time

$= \frac{\underline{(10 + 0)^{4}}}{2}$

$= 20m$

K.C.S.E 2011

PHYSICS PAPER 232/1

MARKING SCHEME

SECTION A (25 mks)

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

1.

Stable -*center of gravity is within base of lorry . or*
Line of action of weight is within the base

2. *upthrust*

3.

F= Ke	OR F=Ke
=125 X0.2	$\frac{125 \times 20}{100}$
= 25 N	=25N

4. *Cooling / reduced temp*
Aluminium contracts more /faster than steel

5. P - *cool layers from top descend and are replaced*
By hot layers OR
There is complete convection currents in p

6. *80m/s*

7. *Surface tension at x is reduced / weakened / broken*
Higher surface tension at y pulls the boat.

8. *-speed of molecules increases / k.e increases / molecules move faster*
-Molecules hit walls more frequently /with greater momentum /more collision per unit time

9. *Air speed /verocity is higher at contraction*
Pressure drops, higher pa pushes the petro either
Pressure drops or (atmospheric pressure) pushes the petro

10. *smaller /weaker intermolecular forces in liquids than solids or*

smaller cohesive in liquids than in solids

11.

NB; *R&w must be drawn a small distance from edge straight line with A*

11. Indicate on the figure two forces acting on the wooden block.

12.

sum of clockwise moments = sum of antclockwise moments

OR $F_1d_1 = F_2d_2$

$20 \times 2.5 = F \times 10$	*or* $F \times 15 = 20 \times 2.5$
$F = 5N$	$F = 3.33N$ *(must be I three sig. fig*

13.

$S = ut + \frac{1}{2} at^3$ *OR* $v = u + at$ *OR* $v = u + at$ *OR* $S = 1/2\,(u+v)t$

$9 = 0 + \frac{1}{2} \times a\, 3^2$ $s = \frac{1}{2}(u+v)t$ $v = 3a$ $9 = \frac{1}{2} \times 3v$

$V = 6m/s$ $v^2 = u^2 + 2as$ $v = 6\ m/s$

$A = 2m/s^2$ $a = \frac{v - u}{t}$ $9a^2 = 0 + 2a9$ $v = u + at$

$a^2 = 2a$ $6 = 0 + a \times 3$

$= \frac{6 - 0}{3}$ $a = 0$ or 2 $a = 2\ m/s^2$

$a = 2m/s^2$

$= 2\ m/s^2$

14. *Identical jets / same speed*

Pressure at same level is equal / pressure is transmitted equally throughout the liquid

15. (i) *Arrow ,horizontal line and straight line*

(ii) *Potential energy / potential/ P. E*

(b) i)

$Mgh = \frac{1}{2} mv^2$

$V = \sqrt{2 \times 10 \times 0.1}$

$= 1.41\ ms^{-1}$

(i) the velocity of the bob at pointC

(ii)

$$T = \frac{mv^2}{R} + mg$$

$$= \frac{0.005 \times 2}{8} + 0.005 \times 10$$

$$= 0.0625N$$

c) *used to do work against / air resistance /viscous drag / air friction*
or converted to heat energy

16.

a) i) tanget X
ii) 2m/s
iii) obeys Newton's first law of motion

NB: *tangent can be drawn facing the other side /must be straight* (ruler used) *and if extended should not cut the circle*

(i) Indicate on the diagram with an arrow, the direction of the motion of the stone when the string breaks. (1 mk)

(ii) *2m/s*

(iii) *Obeys Newtons first law of motion / due to its inertial /no external force act on it /centripetal force is zero (does not act on it*

(b)

N > F
M does not act on the trailer

(c) (I)

$$F = ke$$

$$= 25 \times \frac{30}{100} = 0.75 \ N$$

(II) $F = ma$

$$0.75 = 2a$$

$$A = 0.375 m/s^2$$

(III) Force is the spring decreases as it recovers its original length
No force on the trolley after contact with wall b lost

17. (a) (i) *Water vapour / steam*

(ii) *Vapour pressure at boiling point exceeds prevailing / external pressure*

(b) (i) (Take g - 10m/$S^2$and density of mercury = 13600 kg/m^3). (3 mks)

P = pgh

= 13600 x 10 x 0.618

=840 x 10^3 N/m^3 or 84 X 10^3N/m^2

(ii) *Reading of BP at p = 84 x 10^3 is 96 $\pm$ 1 ^{0}c*

(c)

(i) the heat gained by the water + heat gained by;

Calorimeter = 0.08 x 4200 x (7.7; + 0.05 x 400 x 7.7;

= 2741.2J;

(ii) *Heat lost by metal = heat gained by water + calorimeter*

0.1 x 71.3 x C = 2741.2

$$C = \frac{2741.2}{7.13}$$

= 384.46J/kgk

= P(384J/kgk)

(d) *metal cooling is the process of transferring or metal carrying some hot water into the cold water*

18. a)

- *Measure the length of threaded part*
- *Divide the length by number of threads /pitches divide by number of peaks – 1*

(b)

Distance moved by effort = 2 Πr cm

= 50 πcm

Distance moved by load = 0.1

Velocity ratio $= \frac{50\pi}{0.1}$

= 1570.7963

= 1571

(c) (i)

K.E =heat + sound OR K.E ⟶ heat , sound OR K.E ⟶ heat ,sound(light)

(ii)

K.E = work done against friction OR $f = ma$

$\frac{1}{2} mv^2 = fd$

$\frac{1}{2} \times 0.006 \times 800^2 = f \times 0.15$

F= 12800N

OR

$f = ma$

$v^2 = u^2 + 2as$

$o = 800^2 + 2 \times 0.15a$

$a = \frac{640000}{0.3} = 2.133333.3 (2.13 \times 10^6)$

$F = ma = 2.133 \times 10^{\not{6}4} \times \frac{6\not{0}}{1\not{000}}$

19. (a) *Upthrust = weight or*

Weight of fluid displaced = weight of the body or

Its density is less than that of the fluid .

(b) *ship has a large air space / hollow or*

Average density of the ship is less than density of water

Upthrust of ship is equal to weight of the ship

(c) *To sink, water is allowed into ballast tanks*

To float, pumps are used to expel water from ballast tanks

(d) (i)

Upthrust $= w_1 - w_2$

$= 0.60 - 0.28$

$= 0.32\ N$

(ii)

$$RD = \frac{\text{weight of substance}}{\text{Weight of equal volume}}$$

$$= \frac{0.08}{0.32}$$

$$= 0.25$$

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PHYSICS PAPER 232/1

MARKING SCHEME

1. Total volume = 0.6 x 3
   = $1.8cm^3$
   Working for 1.8 must be shown.

   Reading = 7.6
   + 1.8
   $9.4cm^3$

2. Frictional force is equal to the applied force (out in the opposite direction), hence the net/ resultant force applied is zero.

3. $m = \frac{w}{g}$;
   $= \frac{16.5}{1.7}$
   = 9.71kg;

   Accept 9.7 sin 4 values in the question are given to an accurately of 1 decimal place.

   Accept calculator value of 9.70538235
   Accept trumcated values eg 9.705

4. The gas diffuse/ from the region of higher concentration to a region of low concentration.

5. Glass is apoor conductors; un equal expansion/uneven expansion non-uniform expansion leads to cracking.

6. - Oil film spreads over a large surface of the sea reducing inflow of ain/ oxygen needed by the aquatic life.
   - Causes death of aquatic animals and plants/ suffocation.
   - Beaches become dirty/causes pollution (of water)
   - Poisons marine animals when taken in
   - Contaminates sea water.

7. When upthrust is equal to the weight of the balloon (and its contents)

8. Mass must be constant/fixed/for a given mass/ for a particular mass for a specific mass.

9. The height of its centre of gravity (above the surface is) constant/position of centre of gravity is constant.
   Accept initials c.o.g

10. Yes it is within the elastic limit; because

The values of $\frac{F}{e}$ = constant / in all the cases $\frac{F}{e} = 5$

OR.

- Extension is proportional to the force applied
- Spring constant remains the same.
- It obeys Hooke's law.
- A graph of force against extension is straight line (through the origin)
  Conclusion from graph;

11. The body's velocity decreases uniformly from 20m/s and becomes zero after 5 seconds; the velocity then starts increasing in the opposite direction to a maximum value of 20m/s./ velocity increases to -20m/s.

12. Friction between the moving points of the pulley system
Work done lifting the moving parts of the pulley system;
OR
Some/part of the effort is used to overcome friction/work done against friction;

13. i) OA – Heat gained is used in breaking intermolecular forces of the molecules/melt the ice (without change in temperature)
OR Latent heat of fusion is absorbed;/ changing solid to liquid overcoming intermolecular forces.

ii) Temperature (of the water formed) starts to rise until it starts to boil.

14. a) Air above the plane moves faster than air below it (because of it's shape) creating a region of low pressure above the plane hence the plane experiences alift; due to the pressure difference.

b) At B/ narrowest part /smallest cross-section; Because the cross-sectional area is smaller hence the air moves faster in that region.

15. a) Graph

Extraction of graph to cut the temperature axis.

Continues of dash line is accepted.

Absolute zero = -278 $\pm 2^oc$ (-272^oc to - 280^oc)

b) When the tube is horizontal pressure of air is equal to atmospheric pressure. i.e 76cmHg/103360N/m2/0.76mHg/atmosphere/ standard pressure/normal pressure.

I When the verticals; pressure of air = pressure due to mercury + atmospheric pressure

= (24 + 76)cmHg

= 100cmHg. Or $136000N/M^2$.

II. Pv = constant ✓

76 x 15 = (76 + 24)L ✓

$L = \frac{76 \times 15}{100}$ ✓

= 11.4cm ✓

$P_1V_1 = P_2V_2$ (don't allow $P_1L_1=P_2L_2$)

c) i) To expel air/ to remove air/ push air out/ drive air out.

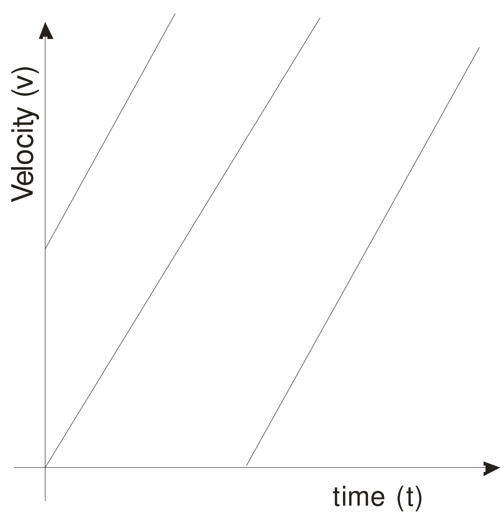
ii) Pressure of air outside the bottle is greater than pressure inside;/ atmospheric pressure outside is greater than pressure inside.

iii) Cooling causes condensation of vapour; creating a partial vacuum;/ creating fewer vapour and air molecules inside or lowering (reducing) pressure inside; falling pressure.

16.

i) Acceleration;

Constant acceleration



ii) Net force on the parachute becomes zero; (sum of downward forces on it should be equal to sum of upward forces.)

b) i) Net force $= mg + F$ $W + F = 2.4N$

$= 2 + 0.4$

$= 2.4N$

Resultant force is -2.4N

ii)

$F = ma$	Or $F = ma$
$-2.4 = 0.2a$	$2.4 = 0.2a$
$a = \frac{2.4}{0.2}$	$a = \frac{2.4}{0.2}$
$= -12 m/s^2$	$= -12$ (negative is a must)
Allow T.E from (i)	

iii) $V^2 = u^2 + 2as$; OR $s = \frac{u^2}{2a}$ Or $V = u + at$ $S = 4t + ½ a t^2$

$S = \frac{0.52}{-2 \times 12}$ $\frac{25}{2 \times 12}$ $t = {}^{5}/_{12}$ $s = 5({}^{5}/_{12}) + ½ (12) ({}^{5}/_{12})^2$

$= 1.04m$ $= 1.04$ $=$ $= 1.04m$

i) Weight of object; gravitional force
Tension in the string.

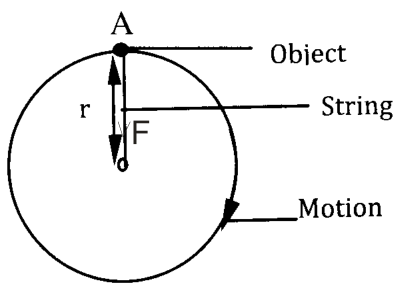
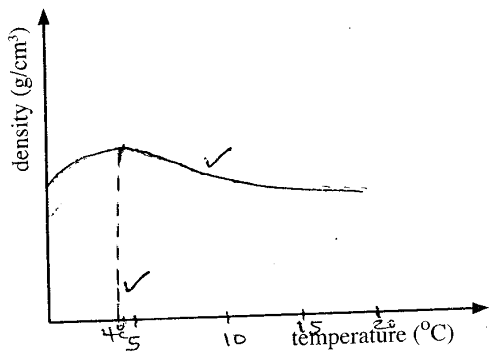


Figure 10

- Weight of objects; / gravitational force.
- Tension in the string.

17. - Fire heats air around region C which expands and becomes less dense
- The less dense air/smoke rises up the vent and emerges at A.
- Cool (more dense) air moves down the vent at B introducing fresh air into the room.

b) - The flask has double walls which are silvery / shining surface) on both sides
- The shiny surface is a good reflector of heat;



d) i) Heat gained by water = power x time

= 2.5 x 103 x 4 x 60

= 6.0 x 105J

ii) E = mcΔϑ/H mcΔϑ/ϑ or mcϑ or mcΔT.

$$\Delta\vartheta = \frac{2.5 \times 10^3 \times 4 \times 60}{2 \times 4.2 \times 10^3}$$

= 71.43^{o}c/ calculator value = 71.42857148 (accept truncation)

18. a) i) Lengths BC and CD

ii) 100 x BC = S x CD

$$S = \frac{100BC}{CD}$$

OR 1 x BC = 105 x CD

$$S = \frac{BC}{10CD}$$

Reject use of (g)/ mass.

b) i) Volume of 10g = $\frac{m}{e}$

$= \frac{20}{800}$

= 2.5 x 10^{-2}m^3;

ii) U = weight of water displaced = eVg or density x volume x gravity

$= \frac{20}{800} \times 1000 \times 10$

= 250N.

iii) Tension = u - mg;

= 250 – 200

= 50N;

19. a) Valve B rests/ closes/ fall under its own weight (and pressure/ weight above pressure in the cylinder decreases/lowers/ reduces the water rises in cylinder pushing valve A open (opening valve A) / pressure in the cylinder decreases (water pushed by) atmospheric/pressure opens valve A.

ii) Valve A rests/ closes its own weight / the weight of the water/ both pressure and weight of water above it. Increased / higher/ high pressure is created in region between valve A and valve B forcing valve b to open or water (pressure) opens valve B.

b) The water is upstroke/ lifted up by the piston and comes out through the spout;/ pulling up piston/ moving up piston.

c) $\ell_w g h_w = \ell_p g h_p$

$= 12.5m$

$h_p = \frac{1000 \times 10}{800}$

d) Force applied on piston. or
Ability of the parts of the pump to withstand the pressure of the liquid column.

K.C.S.E 2013
PHYSICS PAPER 232/1
MARKING SCHEME

1. 5.32 cm (1 mk)

2. - magnitude of the force
   - The perpendicular distance between the force and the pivot. (1 mk)

3. Patmosphere = Pmercury + pair enclosed;

   Pair = 760 - 600;

   = 160 mm Hg;

   (3 mks)

4. (a) F = Ke;

   20 = 0.5 K;

   K = 40 Ncm^{-1} (2 mks)

   (b) F = 40 x 0.86 =

   = 34.4 N;

5. - Weight of object in air
   - Weight of object when fully immersed in fluids (2 mks)

6. Upthrust = weight in air - weight of object in fluid. (1 mk)

7. Wood is a poor conductor of heat; hence heat is used to burn paper, while most heat is conducted away by copper; hence paper takes long to burn. (2 mks)

8. Clockwise moments = anticlockwise moments;

   $0.18x = 1(50 - x) + 0.12(100 - x)$

   $0.18x = 50 - x + 12 - 12x$

   $0.18x = 62 - 1.12x$

   $7.30x = 62$

   $x = 47.69$ cm; (3 mks)

9. Air is compressible; so the transmitted pressure is reduced; (2 mks)

10. The high velocity of the gas causes a low pressure region;

    Atmospheric pressure is higher;

    Pressure difference draws air into the region; (3 mks)

11. Water molecules have a high adhesion forces; With glass molecules and hence rise up the tube while mercury molecules have greater cohesion;
Forces within than adhesion with glass hence do not rise up. (2 mks)

12. Allow for expansion;
Water expands on cooling between 4º C and 0º C; (1 mks)

13. Diffusion of the ink molecules; (1 mk)

SECTION B

14. (a) - increasing the angular velocity;
- Reducing the radius of the path; (2 mks)

(b) (i) Tension in the string; (1 mk)

(ii) Arrow to centre of circle; (1 mk)

(iii) Direction of motion of object changes and causes the velocity to change with time; (1 mk)

(iv) $F = \frac{MV^2}{r}$;

$= \frac{0.5 \times 8^2}{2}$

$= 16N$; (3 marks)

(c) (i) $V^2 = u^2 + 2as$;

$0 = u^2 - 2 \times 10 \times 100$

$u = \sqrt{2000}$

$44.72\ ms^{-1}$; (2 marks)

(ii) $V = u + at$;

$0 = 44.72 - 10 \times t$

$t = 4.472$

Total time $= 2 \times 4.472$

$= 8.94s$; (2 marks)

15. (a) Quantity of heat required to convert 1 kg of ice at 0º C to water without change in temperature; (1 mk)

(b) (i) E = Pt;

$= 60 \times 5 \times 60$;

= 18000 J; (3 marks)

(ii) Mass of water = 190 - 130 = 60g;

$ml_f = Pt$.

$$\frac{60}{1000} l_f = 60 \times 60 \times 5\ ;$$

$l_f = 3 \times 105$ J/Kg; (4 marks)

(iii) Heat from the surrounding melts the ice; (1 mk)

16. (a) F = Ma

F = 2 x 5

=10N

(b) (i) OA - the ball bearing decelerates; as the upthrust increases to a maximum; (2 mks)

AB - ball attains terminal velocity; when upthrust = weight; (2 mks)

(c) (i) VR = 2 (1 mk)

(ii) To change direction of effort; (1 mk)

(iii) $\text{Efficiency} = \frac{MA}{VR} \times 100$;

$$80 = \frac{MA}{2} \times 100\%$$

MA = 1.6;

$$\therefore 1.6 = \frac{L}{500}$$

L = 500 X 1.6

= 800 N; (3 marks)

17. (a) (i) F = mg

$= 10 \times 10$

= 100 N ;

$\text{Additional pressure} = \frac{100N}{100\ cm^2} = 1\ Ncm^{-2}$;

new reading = 10 + 1 = 11 N; (4 marks)

(ii) Pressure has increased; because, when the volume reduces, the collisions between the gas molecules and walls of the container increases; (2 mks)

(b) (i) Pressure = 11 Ncm^{-2}

(ii)

$$\frac{P_1}{T_1} = \frac{P_2}{T_2};$$

$$\frac{1}{300} = \frac{11}{T_2};$$

$$T_2 = \frac{300 \times 11}{10} = 330k;$$

$T_2 = 57^o C$ (4 marks)

18. (a) (i) (I) - Reading decreases on spring balance;
(II) - Reading on weighing balance increases.

(ii) As the block is lowered, upthust increases;
and hence it apparently weighs less; (4 mks)

(b) (i) Upthrust - weight in air - weight in water
= 2.7 - 2.46
= 0.24 N;
Reading in weighing balance = 2.8 + 0.24
= 3.04 N; (2 mks)

(ii) Relative density = $\frac{\text{weight in air;}}{\text{upthrust}}$
$= \frac{2.7}{0.24}$
11.25;

Density = R.d x density of water
= 11.25 x1000
= 11250 kgm^{-3}

(3 mks)

(c) The hydrometer sinks more;
The density of the water is reduced; (2 mks)

K.C.S.E 2014

PHYSICS PAPER 232/1
MARKING SCHEME

SECTION A: (25 mks)

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

1. A student measured the length of a wire four times using a metre rule and obtained the following readings: 18.6cm; 18.5cm and 18:5. Determine the length the student should record 2 mks

   $$\frac{18.6 + 18.5 + 18.6 + 18.5}{4}$$

   $$= \frac{74.2}{4} = 18.55) \qquad 18.6 \text{ cm}$$

2. Figure 1 shows a magnified scale of a micrometer screw gauge.

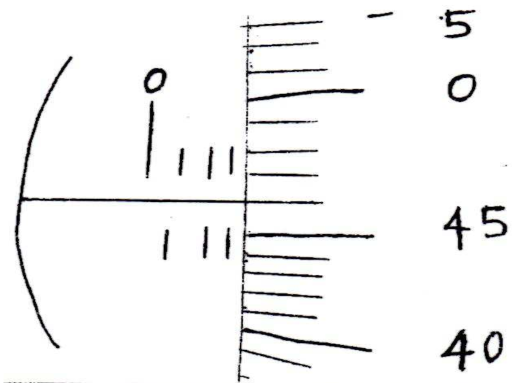
   

   Figure 1

   Record the reading indicated 1 mk)

3. State the reason why it is not correct to quote the weight of solid objects in kilograms. 1mk

   Kilogram is a unit of mass while weight is a force
   Weight is a force measured in newtons, kilogram is a unit of mass.

4. Figure 2 shows a section of a curved surface ABCD. Point A is higher than point B while BCD is horizontal. Part ABC is smooth while CD is rough. A mass m IS released from rest at A and moves towards D.

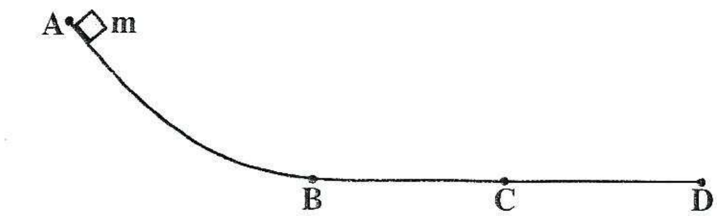


Figure 2

State the changes in the velocity of m between

a) B and C 1 mk

Constant velocity / uniform velocity
Velocity does not change

b) C and D. 1 mk

Decreasing velocity
Reducing velocity

5. Figure 3 shows two cylinders of different cross sectional areas connected with a tube. The cylinders contain an incompressible fluid and are fitted with pistons of cross-sectional areas $4cm^2$ and $24cm^2$.

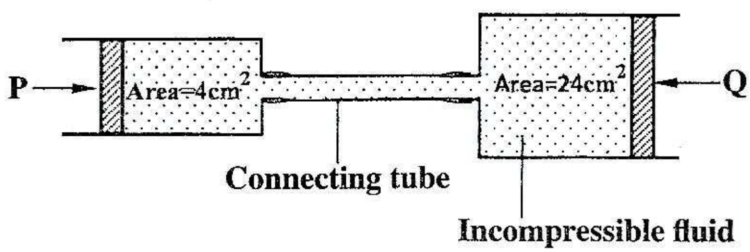


Figure 3

Opposing forces P and Q are applied to the pistons such that he pistons do not move. If the pressure on the smaller piston is $5N\ cm^{-2}$.Determine force Q. 2mks

F=PA	**F1= F2 = 5**	**P = F =F2**
= 5x24	**A1 A2**	**A1 A2**
=120 N	**F= 5 x 24**	**20 = Q**
	= 120N	**4 25**
		Q=120N

6. An oil drop of volume V m^3 introduced on the surface of water spreads to form a patch whose area is A m^2. Derive an expression or obtaining the diameter, d of a molecule of oil 2mks

Volume = Area diameter
V= A x d

$$d = \frac{V}{A}$$

7. Figure 4 show a shows a source of heat placed at equal distances from two identical flask X and Y containing air. The surface of X is painted black while Y is clear

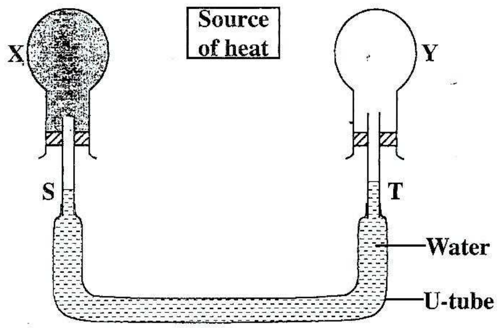


Figure 4

X and Y are linked by U- tube filled with water whose levels S and T are initially the same. It is later observed that S falls while T rises. Explain this observation

2mks

- **Flask painted black absorbs more heat causing more / faster expansion of air above S than T.**
- **Black is a better absorber of heat causing more / faster expansion of air.**

8. Figure 5 shows a uniform rod 4 m long and of mass 2 kg. It is pivoted 1 m from one end and balanced horizontally by a string attached near the other end.

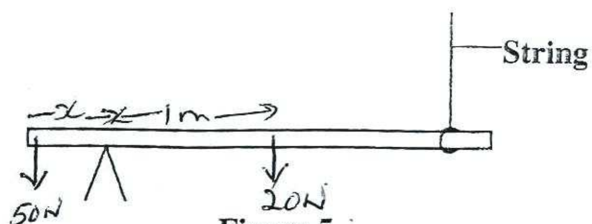


Figure 5

Determine the position where a mass of 5 kg should be placed on the rod so that the rod remains horizontal and the tension in the string is zero

50N x*x* = 20N x 1 m
***x* = <u>20Nm</u>**
50N

***x*= 0.4m**
From pivot

Clockwise moment = Anticlockwise
$F_1d_1 – F_2d_2$
50x=20 NM

x=0.4m

9. Figure 6 shows two identical rods JK and LK connected with a hinge at K.

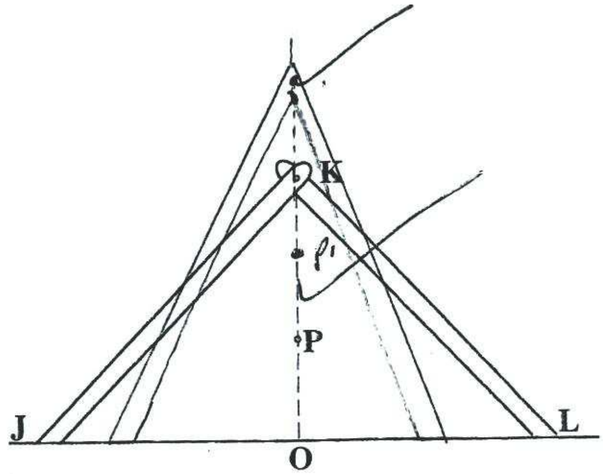


Figure 6

The position of the centres of gravity for the system is at P. The arrangement is now adjusted so that J and L move equal distances towards O. Sketch the new arrangement on the same diagram and mk the new position of the centre of gravity.   2 mks

10. A light spiral spring extends by 4mm when loaded with a weight W. The spring is connected in series with an identical spring. The combination is loaded with the weight W. Determine the extension of the combination   2mks

Extension = 4 mm + 4mm **= 8mm** **F= ke** **W= k(4)**	**k=**$\frac{w}{4}$ e = $\frac{w}{4/8}$ **8mm**	$\frac{1}{ks}=\frac{1}{k}+\frac{1}{k}=\frac{2}{k}$ **2 ks= k, k=** $\frac{F}{4}$ **F=4 x 2 ks** **e=8mm**

11. Figure 7 shows an incompressible fluid flowing through a pipe, A_1 and A_2 are the cross section areas of the pipes in the larger section and smaller section of the pipe respectively, while V1 a V2 are speeds of the fluid at the two section of the pipe.

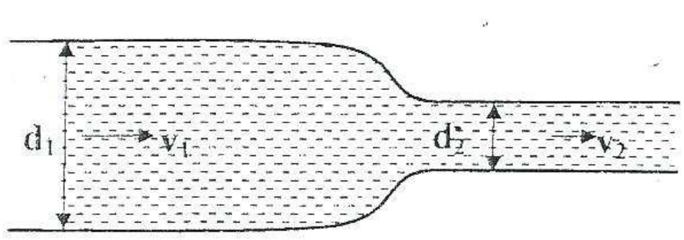


Figure 7

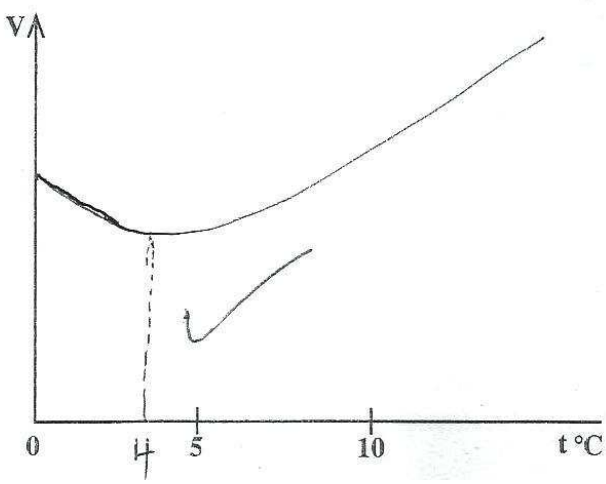
Derive an expression for the ratio of the speeds V_2/V_1 in terms of A1 and A2 2mks

$$A_1V_1 = A_2V_2$$

$$\frac{V_2}{V_1} = \frac{A_1}{A_2}$$

12. On the axis provided, sketch the graph which shows the relationship between volume and temperature of a fixed mass of water in the temperature range O^0 to 10^0C.

1mk



4^0C Must be shown
Minimum volume is at 4^0C

13. Figure 8 shows a graph of the variation of temperature with time for a pure substance heated at a constant rate.

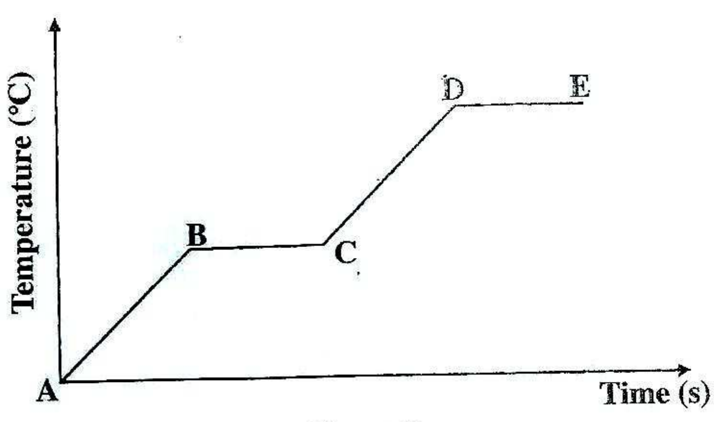


Figure 8

Assuming that heat transfer to the surroundings is negligible, state the changes observed on the substance in region;

a)BC 1mk

Melting / solid changes to liquid

b)DE 1mk

Liquid changes to vapour / gas/ vaporization

14. In a smoke cell experiment to demonstrate Brownian motion, smoke particles are seen moving randomly. State the cause of the randomness. 1mk

Collision / bombardment of particles / molecules with air molecule s / particles which are in random motion / haphazard / zigzag

SECTION B: 55 mks

Answer all the questions in this section in the spaces provided

15. Figure 9 shows a velocity time graph for the motion of a body of mass 2 kg

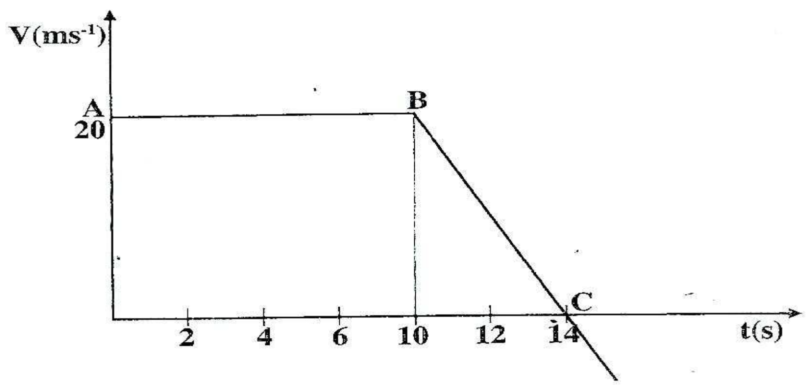


Figure 9

a) Use the graph to determine the;

i. Displacement of the body after 8 seconds 3mks

Area under graph
= 20 x 8m
= 160 m

Dulant = ut
s =ut , a=0
s=20x8
= 160m

ii)Acceleration after point B 3mks

a = gradiant

$\frac{\underline{DV}}{Dtt^1 - t^2} = \frac{\underline{V-u}}{}$

$= \frac{0-20}{4} = 5M/^{S2}$

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

$O=20^2 +2a (½ x 4 x 2)$

O=4w + 80a

$a=-5M/S^2$

iii) Force acting on the body in part (a) (ii) 3mks

F=ma

2kg x -5m/s²

-NO

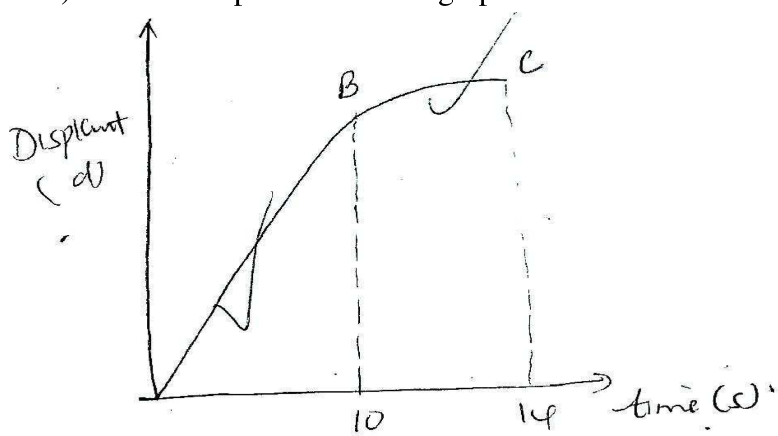
Ft=MV-MU

2 x d- 2 x 20

4f= -40

F=-10N

b).Sketch a displacement time graph for the motion from point A to C 2mks



Must start from origin

Must indicate 10 or show point B

Axis must be correct

16. Figure 10 shows a trolley of weight 20N pulled by a force of 4 N form the bottom to the top of a inclined plane at a uniform speed.

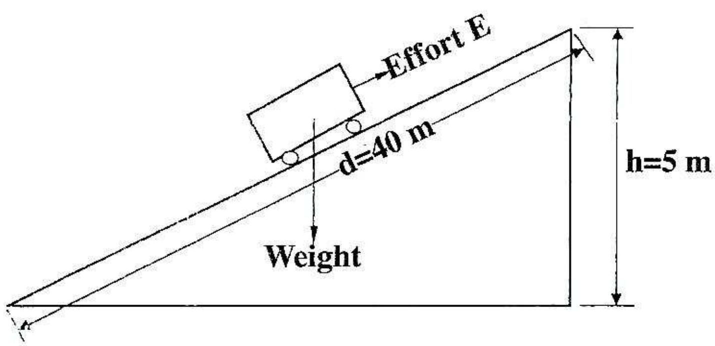


Figure 10

a) (i)State the value of the force acting downwards along the inclined plane 1mk

F=4N

ii) Explain how the value in part (a) (i) is obtained 2mks

Resultant fone is zero

Force downwards is equal to fone upward.

b) For the s system, determine the:

I) Mechanical advantage 3mks

M.A = $\frac{Load}{Effort}$ = $\frac{20}{4}$ = 5

ii)Velocity ratio 3mks

V.R . = $\frac{\text{Effort dufuce}}{\text{Load dufuce}}$

$\frac{40}{5}$ = 8

V.R = $\frac{1}{Speed}$

Speed = $^5/_{40}$ = $^1/_8$

$V.R = \frac{1}{\frac{1}{8}} = 8$

iii) Efficiency 2mks

efficiency = $\frac{M.A}{VR}$ x 1 w

$\frac{5}{8}$x 1 W

= 62.5%

17.a) Along horizontal capillary tube of uniform bore sealed at one end contains dry air trapped by a drop of mercury. The length of the air column is 142 mm at 17^{0}C. Determine the length of the air column at 25^{0}C 3mks

$\frac{V_1}{V_1}$ = $\frac{V_2}{T_2}$ $\frac{142 \times 298}{290}$

V_2 = $\frac{V_1T_2}{T_1}$ = 145.92mm

b) The pressure of the air inside a car tyre increases if the car stands out in the sun for some time on a hot day. Explain the pressure increase in terms of the kinetic theory of gases 3mks

- **Speed of air molecules increases /K.E of air molecules increases**
- **The rate of collision between air molecules and the tyre increases / collision per unit time between molecules and tyers increases**
- **The rate of change of momentum of molecules also increases**

c) In an experiment to determine the specific latent heat of vaporization of water, steam of mass 10g at 100^{0}C is passed into 100 g of water initially at 20^{0}C in a container of negligible heat capacity. The temperature of the water rises to 70^{0}C

(Take the specific heat capacity of water as 4.2 x 10^3 J kg^{-1} K^{-1} and the boiling point of water as 100^{0}C)

i) Determine the specific latent heat of vaporization of water 4mks

Heat lost by steam = heat gained by water

MLv + McDd = McDW

0.01 Lv+ 0.01 + 42W x 30 = 0.1 x 4200 x 50

0.01LV=21000 – 1260, LV=1974000J/Kg.

ii) State two sources of error in this experiment 2mks

All the heat lost by steam not absorbed by water

Heat lost to the surrounding /environment / Afm

Wrong reading of instruments / thermometers / balance

18.a)When a bus goes round a bend on a flat road, it experiences a centripetal force. State what provides the centripetal force 1mk

Frictional force

b) State the purpose of banking roads at bends 1mk

- **Increases the centripetal force acting on the bus**
- **Provide more centripetal force**
- **Prevent skidding force, overturning /rolling**
- **Enable higher speed / critical yield**

c) A student whirls a stone of mass 0.2 kg tied to a string of length 0.4 m in a vertical plane at a constant speed of 2 revolutions per second. (***Take acceleration due to gravity gas 10ms^{-2}***)

(i) St ate two forces acting on the stone when it is at the highest point 2mks

The weight /force of gravity

The tension on the string

iii) Determine the

1) Angular velocity of the stone 3mks

W=2πf F=2 rev/s	**W=V/R**
2 x 2 x π	**$2\pi r x^2$ x 2**
12.56 rad s^{-1}	**12.57 rad s^{-1}**

ii) Tension in the string when the stone is at the highest point; 3mks

T;$\frac{mv^2}{r}$-mg	**T+mg =$\frac{mv^2}{r}$**	**= 12.636-2**
Mw^{2}r-mg	**T= $\frac{mv^2}{r}$ – mg**	**10.6363**

=10.63N $= \frac{0.2 \times (4\pi^2)^{r2}}{r}$ **- mg**

19. Figure 11 shows a test tube whose cross sectional area is $2cm^2$ partially filled with led shot floating vertically in water

(Take gravitational acceleration as $10ms^2$ and density of water pw s 1 g cm^{-3})

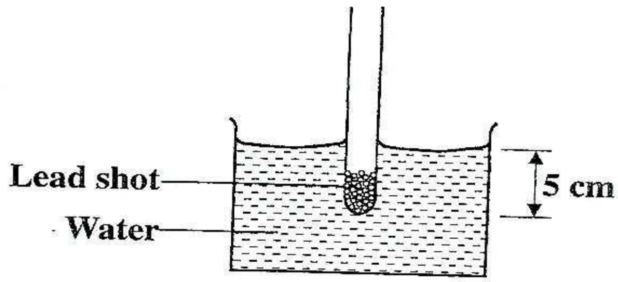


Figure 11

(a) (i) Determine the:

1) Volume of the water displaced 2mks

V=AXL

2x5(show workings)

$=10cm^3$

II Weight of water displaced 3mks

Mass	**=**	**Vol x density**	**w=mg**
$= 10cm^2$ x 1 g/cm^3			**= 0.01 x 10 N/Kg^{-1}**
= 10 g or 0.1 kg			**= 0.1N**

ii) State the combined weight of the test tube and the lead shot 1mk

Combined weight = upthrust

= 0.1 N

iii) Determine the length of the test tube that would be submerged in a liquid of density 0.8 g cm^{-3} 4mks

egh1=egh2

800 x h1 x 10 = 1000 x 10 x 0.05

$h1 = \frac{10 \times 10 \times 5}{8000}$ = 0.0625m

b) The set up in figure 11 can be used as a hydrometer to measure densities of liquid. State how such a hydrometer would be improved to measure small differences in densities of liquids. 1mk

By use of a narrower / thinner / smaller diameter test tube