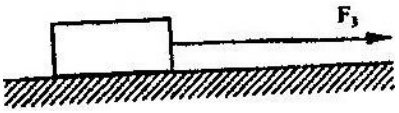
K.C.S.E 2006. MARKING SCHEME
PHYSICS PAPER 1

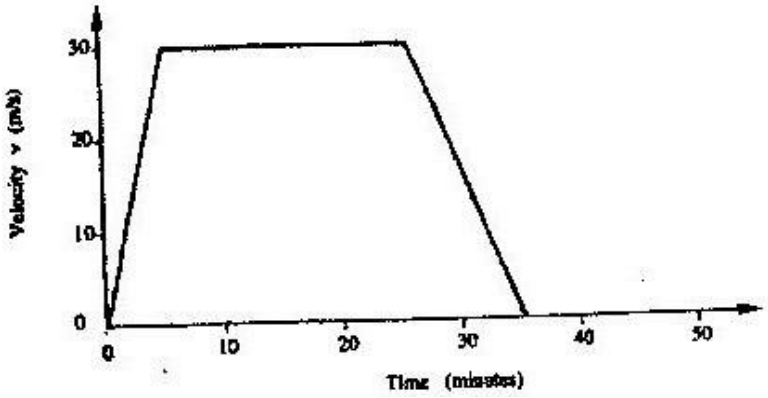
1. Volume = $68cm^3$
   Mass = 567g
   Density = $\frac{m}{V} = \frac{567}{68}$
   = $8.34\ gcm^{-3}$ (3 marks)

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 mark)

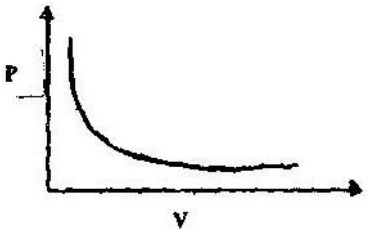
4. On heating, the bimetallic strip bends; This causes the position of the centre of gravity of the section to the left to shift to the right causing imbalance and so tips to the right (2 marks)

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

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 mark)

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 marks)

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 marks)

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 marks)

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 marks)

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

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 mark)

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

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

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

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

(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 marks)

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 marks)

(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 mark)

(iii) Work = Area under graph
$= \frac{0.75 + 1.65}{2} \times 1.7 \times 10^{-2}$
$= 2.04 \times 10^{-2}$ J (3 marks)

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

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

(ii) k is slope of graph
$K = (2.9 - 0) \times 10^5$
$(3.5 - 0) \times 10^6$
K = 0.083 NM

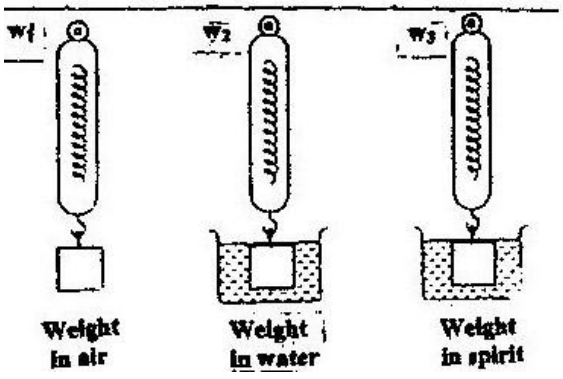
(iii) Work done on the gas (4 marks)

(iv) Use dry gas (1 mark)
Make very small changes in pressure (any 1 x 1 = marks)

(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 marks)

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

(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 marks)

(ii) Relative density = upthrust in spirit
Upthrust in water

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

= 0.76 (3 marks)

(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 marks)

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 mark)

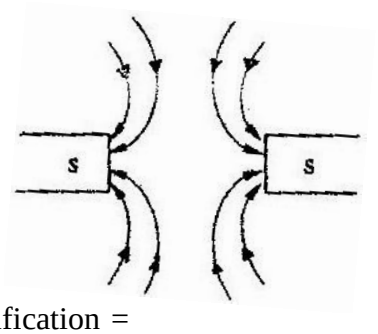
(b) (i) Q = ml
= 0.02 x 334000J
= 6680J (2 marks)

(ii) Q = mcθ
= 0.02 x 4200 (T-0)
= 84 TJ (2 marks)

(iii) Heat lost by warm water
= mcθ
= 0.2 x 4200 (60- T)
Heat lost by calorimeter = mcθ
0.08 x 900 (600 – T) (2 marks)

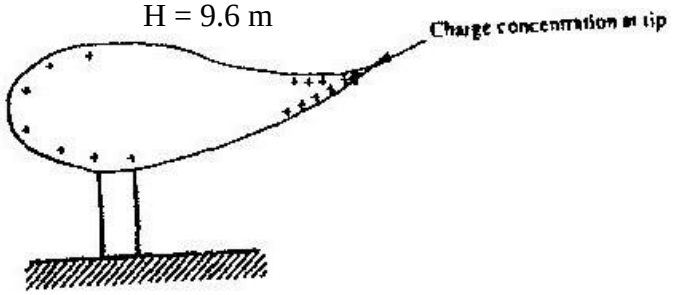
(iv) Heat gained = Heat lost
6680 + 84T = 0.2 x 4200 (60 –T) + 0.08 x 900 (60-T)
6680 + 84T = 50400 – 84OT + 4320 – 72T
996T = 48040
T = 48.2^0C (4 marks)

K.C.S.E 2006: MARKING SCHEME
PHYSICS PAPER 2

1. 

2. Magnification =

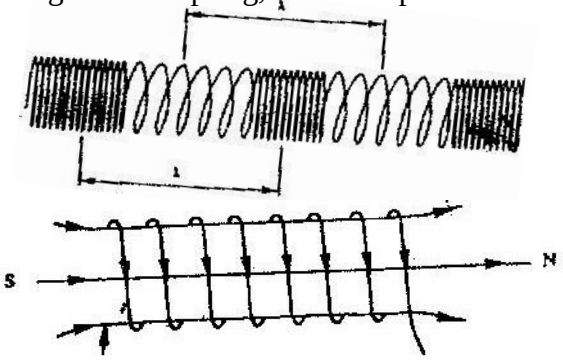
Im age dist = ht of image
Object dist height of object
10 = 16
600 h
H = 9.6 m

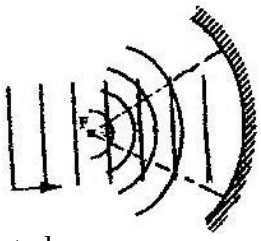
3. 

(3 marks)

4. To allow escape of gases (H_2 and O_2) from battery

5. (i) Longitudinal wave
(ii) Length of the spring, from one point to a similar point of vibration

6. 

7. 

Reflected waves are curved. Either converging circular reflected waves. Converging to F; OR two perpendicular lines from the surface of one of the curves meeting at F. (2 marks)

8. Distance moved by sound waves = 2x;
2x = speed x time

$X = \frac{330 \times 1.8}{2}$

= 297m (3 marks)

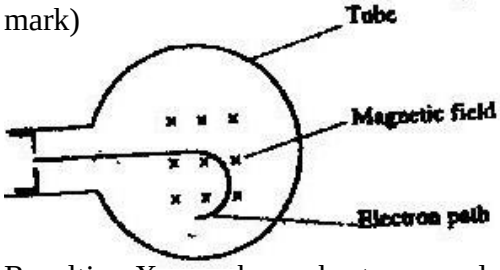
9.
- Constant temperature
- No mechanical strain (1 mark)

10. Work function of a metal is the minimum energy required to set free (release) an electron from the surface of the metal (1 mark)

11. Threshold frequency K.E of electron = 0 hence velocity of the electron would be zero; (No motion) thus photo electric effect cannot be observed (2 marks)

12. Straight beam from gun to screen OR no gravitational effect on the beam. (1 mark)

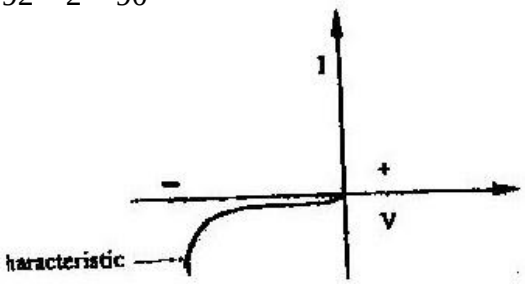
13.



14. Resulting X- rays have shorter wave length/ hard/ high frequency because electrons have higher K.E (2 marks)

15. a = 234 + 4 = 238
b = 92 – 2 = 90 (2 marks)

16.



17. (a) Charge Q, on C_1 is given by
Charge $Q_1 = C_1 V$;
= 0.3 μ F x 4.5;
1.35μC; (3 marks)

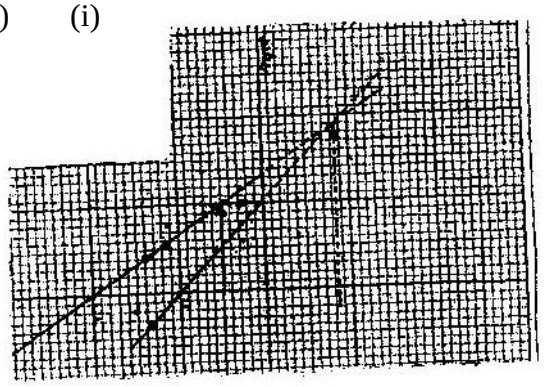
(b) $C_T = C_1 + C_2$;
= (0.3 + 0.5) μ F
= 0.8 μ F (2 marks)

(c) (i) 4.5v (1 mark)

(ii) Observed on voltmeter p.d drops to less than 4.5 (1 mark)

(iii) The drop of p.d in C (ii) is because the charge on C_1 is distributed to C_2. Since values of C_1 and C_2 remain constant, when Q on C_1 reduces, then $Q = C_1V$ implies V must reduce also, hence voltmeter reading reduced.

18. (a) (i)



(ii) Image at 10cm from mirror (using scale) (2 marks)

(iii) Magnification

$$\frac{\text{Size of image}}{\text{Size of object}} = \frac{4.0\text{ cm}}{2.0\text{ cm}} = 2$$

OR

$$\frac{\text{Image distance}}{\text{Object distance}} = \frac{2.0\text{ cm}}{1.0\text{ cm}} = 2$$

(b) (i) I Image distance

$$\frac{I}{f} = \frac{I}{v} + \frac{I}{u}$$

$$\frac{I}{v} = \frac{1}{5} - \frac{I}{20} = \frac{3}{20}$$

$$v = \frac{20}{3} = 6.67\text{ cm}$$

II Magnification

$$= \frac{v}{u} = \frac{6.67}{20} = 0.33;$$ (2 marks)

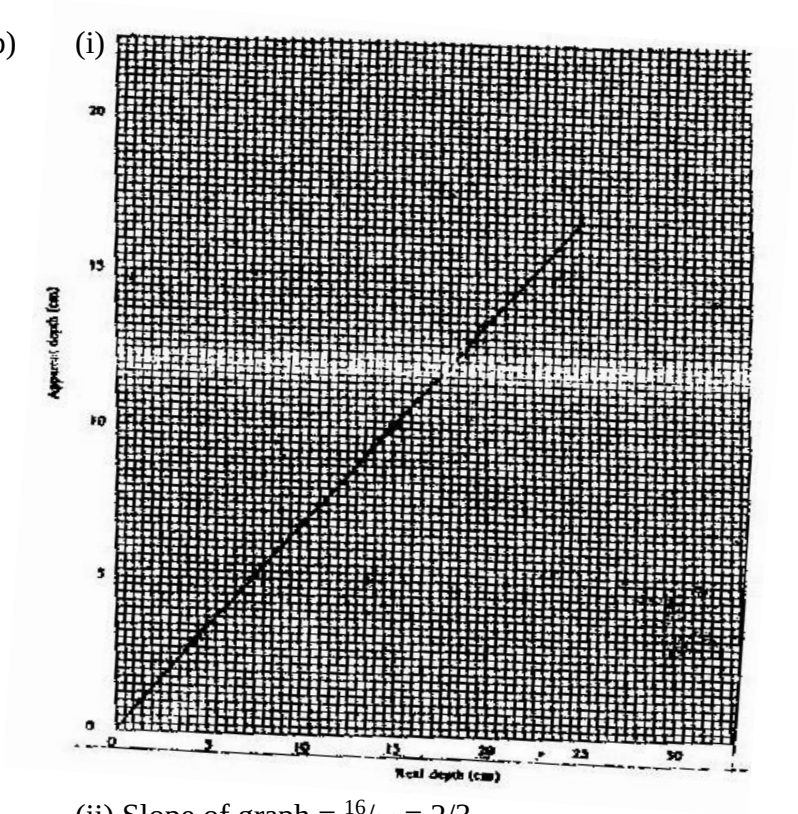
(ii) Image characteristics: real, inverted, diminished, less bright (2 marks)

1. (a) Refr. Index $n = \frac{\sin i}{\sin r}$ $\frac{\text{velocity in air}}{\text{velocity in substance}}$

OR

$n = \frac{\text{Real depth}}{\text{Apparent depth}}$ (1 mark)

(b) (i)



(ii) Slope of graph = $^{16}/_{24}$ = 2/3

Refr. Index n = $\frac{\text{Real}}{\text{Apparent}}$ = $\frac{\text{I}}{\text{slope}}$

= $\frac{3}{2}$ = 1.5 (4 marks)

(c) n= $\frac{\sin 90;}{\text{Sin } \theta}$ $\Rightarrow$ sin θ = $\frac{1;}{16}$ $\Rightarrow$ $\theta = 38.7^0$ = critical angle (3 marks)

20. (a) (i) P = slip rings
Q = Brushes (2 marks)

(ii) 0-90 magnetic flux cut changes from high to low. (decreasing);
90 – 180 magnetic flux change from low to high. (increasing)
At each peak 0 – 180 magnetic flux change is maximum though in different directions, (position of coil). (3 marks)

(b) (i) $\frac{€_s}{€_p} = \frac{N_s;}{N_p}$ $\Rightarrow €_s = 240 \times \frac{60}{1200} = 12$ volts (2 marks)

(ii) $P_p = P_s$ (power) or $l_s V_s = l_p V_p$

$I_S = I_p \frac{V_p}{V_s} = 0.5x\ 240; = 10A;$ (3 marks)

21. (a) (i) P = Ring circuit (1 mark)
X = Neutral (point or terminal)
Y = Live (point or terminal) (2 marks)

(ii) I Purpose of R – or fuse; is a safety element in a circuit against excess current

II R is connected to Y but not X to ensure that when it breaks a circuit any gadget/ appliance connected does not remain live. (1 mark)

(iii) Earthing is necessary in such a circuit to guard against electric shocks.

(b) Cost of electricity
1.5 kw x 30h x 8 Kshs = Kshs 360/=

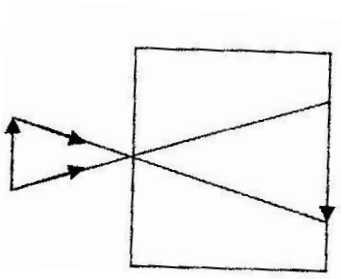
KCSE 2007 PHYSICS MARKING SCHEME
PAPER 1

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_2V_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_Ag x 24 = 1200 g x 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 = 16 x 3 = 14.11 m/S^2 17 x 0.2 (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. $S = \frac{\Delta u}{}$ Nd or $\frac{98.75 - 0 \text{ (m/s)}^2}{16 - 0}$ $= 6.17 ms^{-2}$ 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 $= 800 \times \sqrt{2 \times 1.2 \times 400}$ = 24787.07 = 24790	4 mks
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 $w = \underline{3.049}$ 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 marks 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

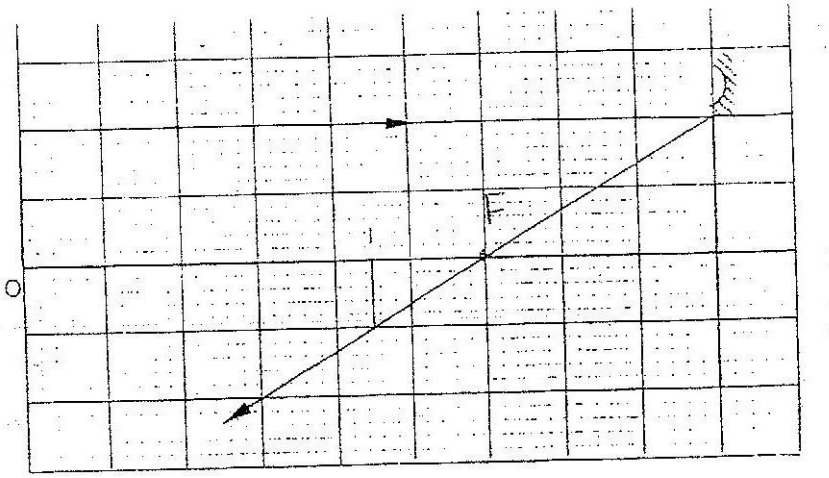
K.C.S.E 2007 PHYSICS MARKING SCHEME
PAPER 2

1. 

Rays
Image and object must be labeled
Image must be enlarged

2. Alkaline cell lasts longer than lead acid cell/ remain unchanged longer
Alkaline cell is more rugged than lead acid cell/ robust/ can withstand rough handling
Alkaline cell is lighter than lead – acid cell (any one (1 mark)

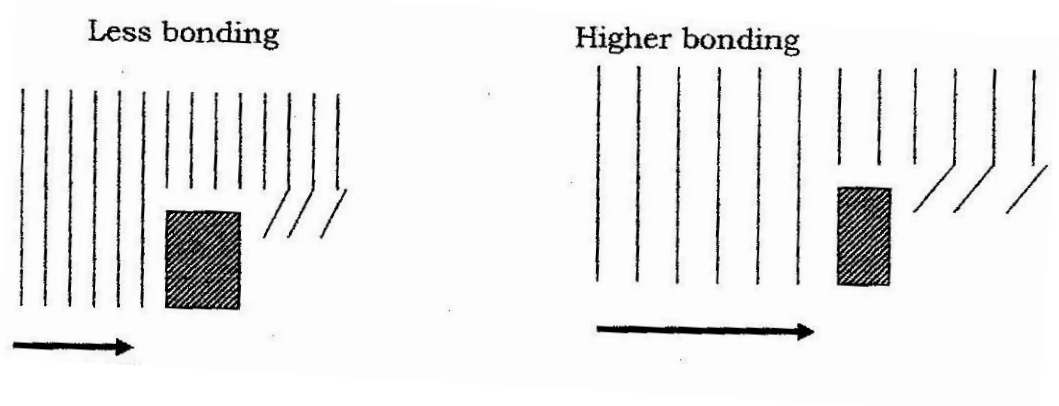
3. X is north (both correct)
Y is north (1 mark)

4. 

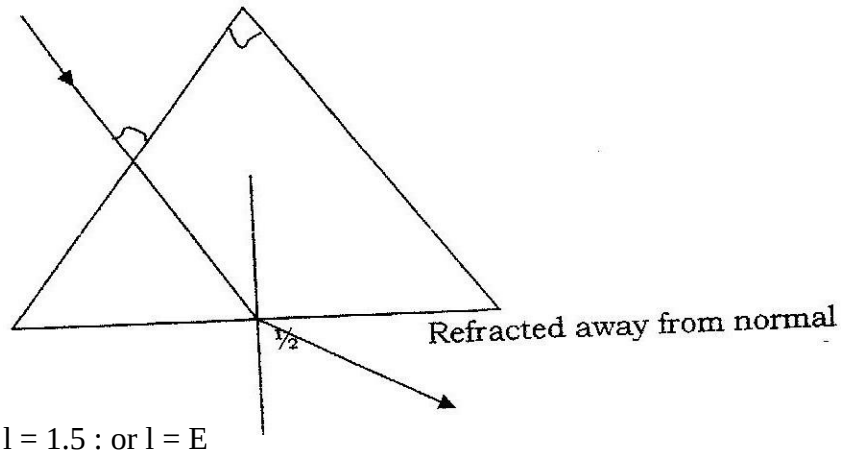
Correct rays
F marked

5. $T = \frac{0.007S}{3}$ (T)

$F = {}^{1}/_{T} = 3/0.007$ (f)
$= 429H_z$ 428.57 – 434. $80H_2$ (3 marks)

6. 

7.



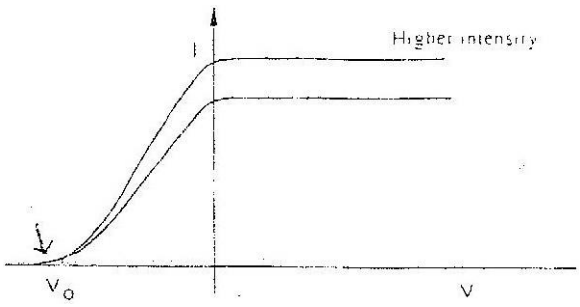
8. $l = 1.5$: or $l = E$
$R + r \qquad R + r$
$0.13 = \frac{1.5}{10 + r}$
$R + 1.5\Omega;$
$R = 1.5\ \Omega$ (3 marks)

9. $R_1 = \frac{V^2}{P} \qquad R_2 = \frac{V_2;}{8P}$

$\frac{R_1}{R_2} = \frac{V^2 \times 8P}{P \quad V^2}$
$= 8$ (3 marks)

10. The process of the eye lens being adjusted to focus objects at various distances (1 mark)

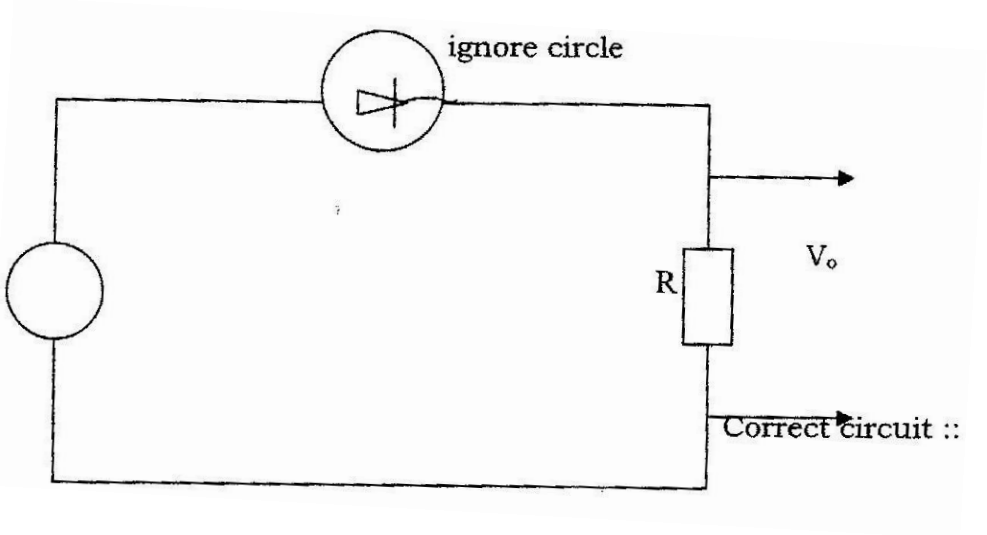
11.



12. The higher the intensity implies greater number of electrons and hence higher saturation current (1 mark)

13. a = 234
b= 82

14.



SECTION B

15 (a) The ratio of the pd across the ends of a metal conductor to the current passing through it is a constant (conditions must be given)
Also $^{V}/_{I} = R$

(b) (i) It does not obey Ohm's law; because the current – voltage graph is not linear through line origin / directly proportionate

(i) Resistance $= {}^{V}/_{I}$ = inverse of slope ; gradient $= \frac{\Delta I}{\Delta V}$

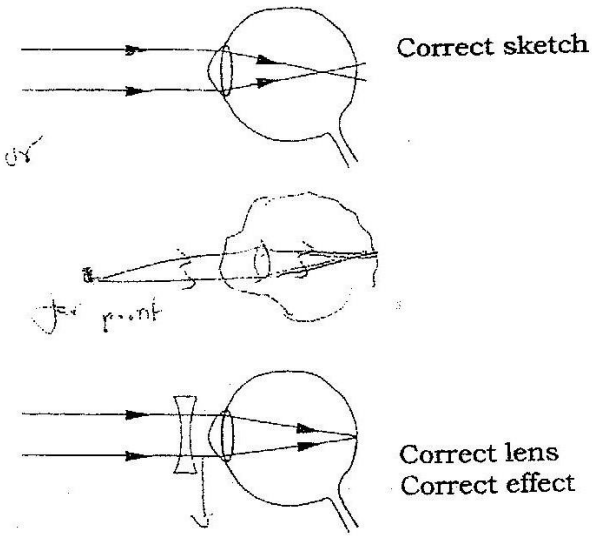
= (0.74 – 0.70) V
(80 – 50) mA
= $\frac{0.4V}{30 \times 10^{-3} A}$
= 1.33Ω
1.20 – 1.45 Ω (range) (3 marks)

(iii) From the graph current flowing when pd is 0.70 is 60.MA
Pd across R = 6.0 – 0.7 = 5.3v
R = 5.3 V
36mA
= 147Ω
= 139.5 – 151. 4Ω (3 marks)

(c) Parallel circuit 1/30 + 1/20 = 5/60 or 60/50
R = 12 Ω
Total resistance = 10 + 12 = 22Ω (2 marks)

(ii) $I = {}^{V}/_{R} = {}^{2.1}/_{22} = 0.095A$ (1 mark)]
(iii) V = IR = 10 x $\frac{2.1}{22}$
= 0.95

16.



Diverging effects should be seen (2 marks)

(b) (i) A diaphragm
B Film (2 marks)

(ii) The distance between the lens and the film / object is adjusted; so that the image is formed on the film
Adjust the shutter space/ adjust the aperture (2 marks)

(iii) Shutter – opens for some given time to allow rays from the object to fall on the film creating the image impression/ exposure time is varied
A (diaphragm) controls intensity of light entering the camera (3mks)
B (film) – coated with light sensitive components which react with ight to crate the impression register/ recorded or where image is formed.

(c) (i) magnification = v/u = 3
Since v + u = 80
U = 80 – v

$\frac{v}{80 - v} = 3$

V= 240 – 3v
V= 60cm (3 marks)

(ii) From above u = 20cm

$^{l}/_{f} = l/v + l/u = l/60 + l/20$ (2 marks)
F = 15cm (15 marks

17. (a) The induced current flows in such a direction that its magnetic effect oppose the change producing it.

(b) As the diaphragm vibrates, it causes the oil to move back and forth in the magnetic cutting the filed lines, this causing a varying e.m.f to be induced in the coil which causes a varying current to flow. (1 mark)

(ii) Increasing number of turns in the coil – increasing of the coil
Increasing the strength of the magnet (any two correct) (2 marks)

$\frac{Vp}{Vs} = \frac{Np}{Ns}$

$\frac{400}{Vs} = \frac{1200}{120}$

$Vs = 40V$

(ii) $I_p = 600/400 = 1.5A$ (2 marks)

(iii) $Ps = P_p = 600W$

$l_s = {}^{600}/_{40} = 15A$ (1 mark)

18. (a) (i) A Grid
B Filament (2 marks)

(ii) Filament heats cathode
Electron boil off cathode (theremionic emission) (2 marks)

(iii) Accelerating (1 mark)
Focusing

(iv) Across X - plates (1 mark)

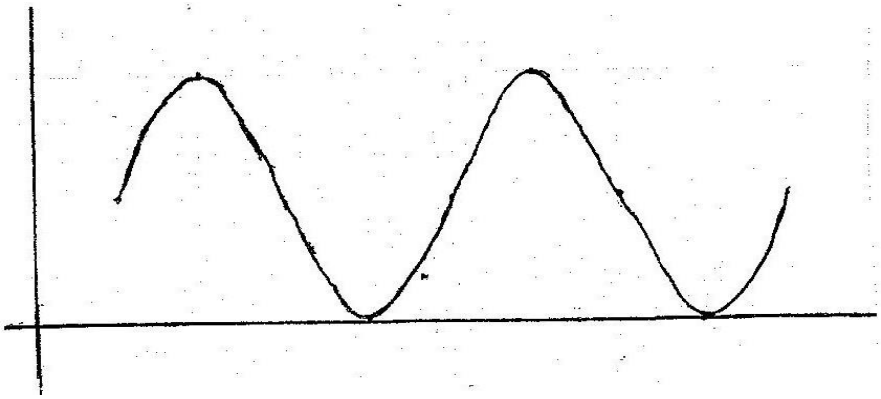
(v) To reduce collisions with air molecules that could lead to ionization

(b) Height = 4 cm
Peak value = 4 x 5
= 20V

(ii) $\frac{2 \text{ wavelength}}{T} = 16 \text{ cm}$
$= 8 \times 20 \times 10^{-3}$
$= 0.16S$

$f = {}^{1}/_{T} = {}^{1}/_{0.16}$
$= 6.25H_z$

(iii)



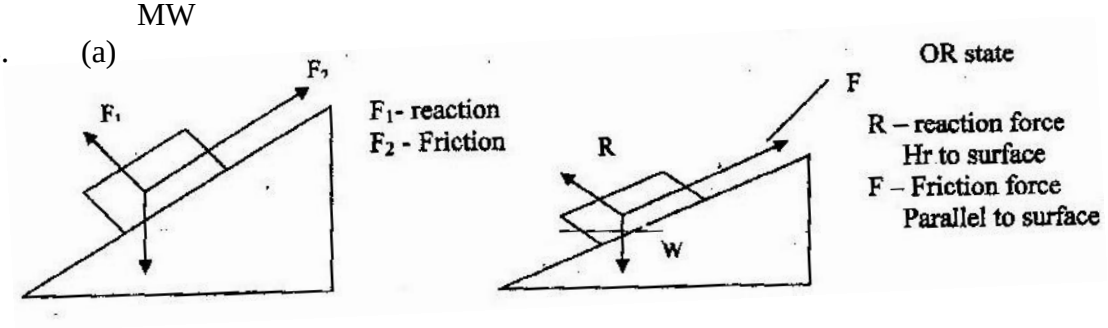
K.C.S.E 2008 EXAMINATIONS
PHYSICS PAPER 1
MARKING SCHEME.

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)

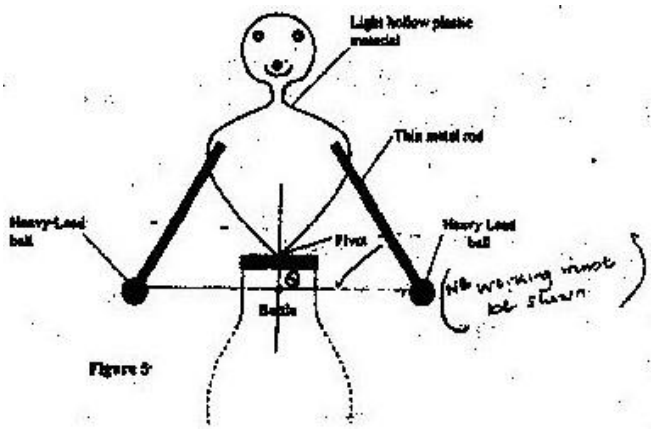
6. Heat conductivity/ rates of conduction/ thermal conductivity (NB: If heat conduction no mark)

7. X sectional area/diameter/thickness/radius

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

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) $S = ut + \frac{1}{2} at^2$
$49 = 0 + \frac{1}{2} \times a \times 7^2$
$a = 2M/S^2$

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

(c) (i) $S = ut + \frac{1}{2} gt^2$
$1.2 = 0 + \frac{1}{2} \times 10 \times t2$
either $V^2 = u^2 + 2gs$
$v = u + gt$
$V^2 = 0^2 + 2 \times 10 \times 1.2$

$T = \sqrt{\frac{1.2}{5}} =$
$= 0.49s$

$v = \sqrt{24} = 4.899$
$4.899 = 0 + 10t$
$T = 0.4899s$

(ii) $s = ut$

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

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

$= 40 \times (34 - 25) = 40 \times 9 = 360J$

(ii) MWCWDT

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

(iii) MmCMDT

$= 150 \times 10^{3} \times cm\ 6$

$= 9.9\ cmJ$

or sum of (i) and (ii)

$360 + 3780$

$= 4140J$

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

$cm = \frac{4140}{150 \times 10^{-3} \times 60}$

$418J/Kgk$

$9.9\ cm = 360 + 3780$

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

$418J/Kgk$

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) $4 \times 10^{-5} m^3 / 40 \times 10^{-6} m^3 / 40 cm^3$

(ii) $-275^0C – 280^0C$

(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 marks 3

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

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

= (90200pa) (90200 pa)
(90.2 x 10^3 pa) (90.2 x 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) $V = 100 \times 3 \times 0.6 = 180cm^3$

$M = VP$

$180 \times 2.7 = 486\ g$

$W = Mg$

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

$= 4.86\ N$

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; $20F = 15 \times 4.86$

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

Or

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

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

$F = R - 4.86$ ---- 1

$F = 3.645N$

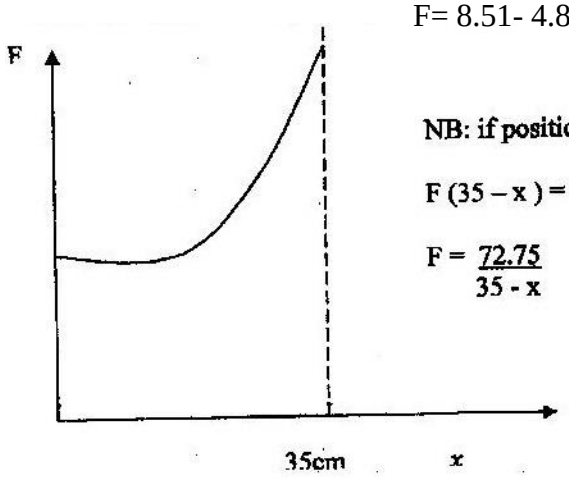
OR

Taking moments about $F = 20R = 4.86 \times 35$

$R = 8.51$ and $F = R - W$

$F = 8.51 - 4.86 = 3.645N$

(iii)



NB: if position of W is constant

$F(35 - x) = 4.86 \times 15$

$F = \frac{72.75}{35 - x}$

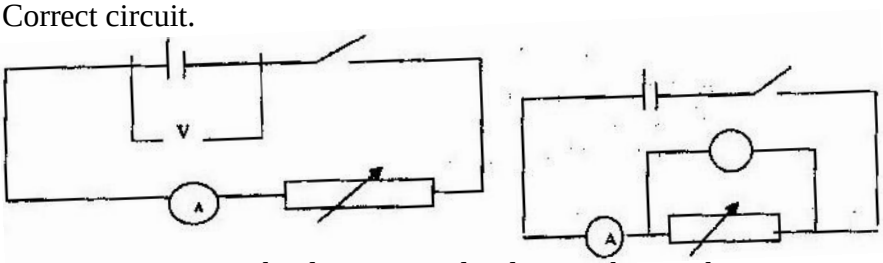
(iv) As x increase/ anticlockwise moments reduces/ moments to the left reduces/ distance between F and pivot reduces F has to increase to maintain equilibrium

K.C.S.E 2008 MARKING SCHEME
PHYSICS PAPER 2

1. BC - Total absence of light; umbra, completely dark
   - Total darkness
   Rays are completed blocked from this region by the object

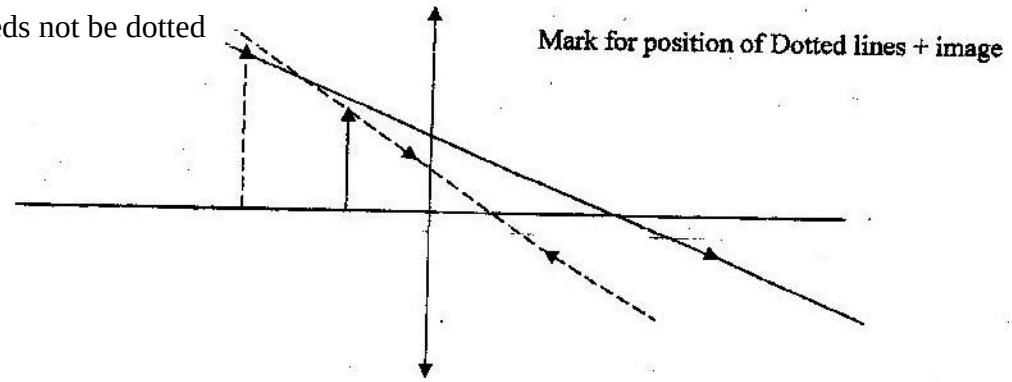
2. Leaf in A falls a bit while leaf in B rises a bit
   The two leaf electroscope share the charge

3. Correct circuit.



4. Hammering causes the domains or dipoles to vibrate when setting, some domains themselves in the N- S – direction due to the earth's magnetic field causing magnetisatioa.

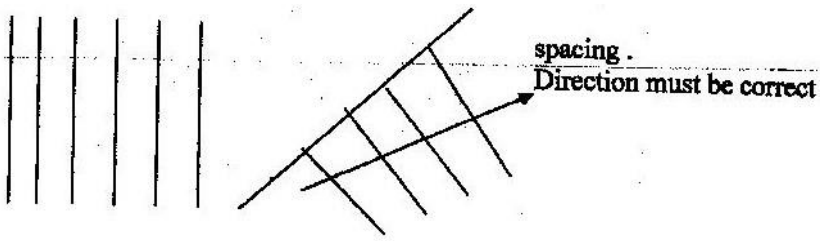
5. Needs not be dotted



6. When the switch is closed, 1 flows the iron core in the solenoid is magnetized attracting the flat spring this causes a break in contact disconnecting current.
   Magnetism is lost releasing the spring
   - Process is repeated (make and break circuit)

7. Movement equals 1.75 oscillations
   $T = {}^{0.7}/_{1.75}$
   = 0.4 sec
   $F = {}^{I}/_{T}$
   $= {}^{1}/_{0.4}$ = 2.5 HZ.

8.



9. (i) V = O volts
Reason No current

(ii) V = 3 volts
Current flows in the resistors

10. $P = {}^{V2}/_{R}$ $P = {}^{220\wedge 2}/_{240\wedge 2/100}$

$R = \frac{240^2}{100}$
$= 84$ J/S

11. Short sightedness/ myopia
Extended eyeball/ lens has short focal length/ eye ball too long any two

12. Spot moves up and down

13. Frequency increases
Accept Becomes hard
Wavelength decreases
Strength / quality

14. Beta particle
Gain of an electron OR
Mass number has not changed but atomic number has increased by 1
Atomic number has increased by one
Nature will not affect the speed

15. (a) Temperature
Density
(b) Graph
(i) 46.5 m accept 46 m to 47 m

(ii) $T = \frac{4x}{V}$
$V = \frac{4x}{t}$ or slope $= \frac{4}{v}$

$= \left(\frac{0.51}{43}\right)^{-1}$

$= V = 43 \times {}^{4}/_{0.51} = 337$ m/s

(iii) For max internal observer is at one end and so the distance = 2L
337 x 4.7 = 2L
L= 792 M

(c) (i) Distance moved by sound from sea bed = 98 x 2 m

$V = \frac{98 \times 2}{0.14}$

= 1400M/S

(ii) Distance = v x t

1400 x 0.10/2

= 70m

16. (a) Light must travel from dense to less dense medium

Critical angle must be exceeded (< i > c)

(b) $1 n 2 = \frac{\sin i}{\sin r} = \frac{\sin I}{\sin r}$

$= \frac{\sin 90}{\sin \theta}$ OR $= \frac{\sin \theta}{\sin 90}$

$= \frac{I}{\sin \theta} \quad \frac{I}{n}$

$= {}^{1}/_{\sin \theta}$

(c) (i) At greatest angle θ, the angle must be equal to critical θ angle of the medium

$\sin \theta = \sin c$

$= \frac{1}{2}$

$= 1/1.31 = 0.763 \qquad \theta = 49.8^0$

Angle $< 49.8^0$

(ii) $X = 90^0 - \theta$

$= 40.2^0$

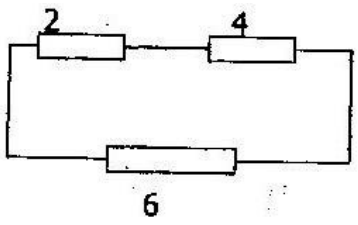
(iii) $\sin \theta / \sin X = 1.31$

$\sin \theta = 1.31 \sin 40.2^0$

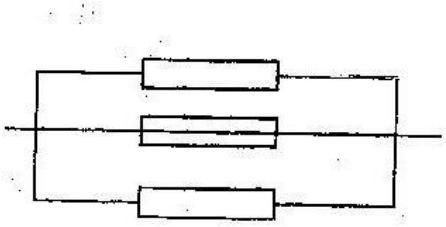
$= 0.846^0$

$= \theta = 57.8^0$

17. (a) (i)



(ii)



(b) (i) Open circuit p.d = 2.1 v

(ii) Different in p.d = p.d across
2.1 – 0.8 = 0.1 r
0.3 = 0.1 r
r= 0.3
0.1
= 3n

(iii) When I is being drawn from the cell, the p.d across the external circuit is the one measured
01 x R = 18
R = $^{1.8}/_{0.1}$
= 18 n

18. (a) Flux growing/ linking
No flux change
Flux collapsing

Switch closed: Flux in the coil grows and links the other coil inducing an E.M.F
Current steady: No flux change hence induced E.M.F
Switch opened: Flux collapses in the R.H.S coil inducing current in opposite direction

(b) (i) Reduces losses due to hystesis (or magnetic losses)
Because the domain in soft- iron respond quickly to change in magnetic (or have low reluctance) i.e easily magnetized and demagnetized.

(ii) Reduces losses due to eddy current
Because laminating cuts off the loops of each current
Reducing them considerably

(c) (i) $\frac{V_P}{V_s} = \frac{N_P}{N_s}$ $P = I_s V_s$
$I_s = \frac{800}{40}$
$\frac{400}{Vs} = \frac{200}{200}$
Vs = 40 Volts = 20A

(ii) $P_p \quad P_s$
800 = 400 I_p
$I_p = \frac{800}{400}$
= 2A

19. (a) (i) Hard X – Rays
(ii) They are more penetrating or energetic

(b) (i) A cathode rays/ electrons/ electron beam
B Anode/ copper Anode

(ii) Change in P.d across PQ cause change in filament current
OR temperature of cathode increases
This changes the number of electrons released by the cathode
hence intensity of X- rays

(iii) Most of K.E is converted to heat
(iv) High density

(c) Energy of electrons is = QV= ev
$= 1.6 \times 10^{-19} \times 12000$

Energy of X- rays = Hf
$= 6.62 \times 10^{-34} xf$
$6.62 \times 10^{-34} \times f = 1.6 \times 10^{-19} \times 12000$
F = 1.6 x 10- 19 x 12000
6.02×10^{-3f}
$= 2.9 \times 10^{18}$Hz

Accept ev = Gf
$F = {}^{ev}/_{g}$

K.C.S.E PHYSICS YEAR 2009

1. Volume run out= 46.6 cm^3

   Density = $^m/_v$ = 54.5 / 46.6 = 1.16953

   = 1.17g/ cm^3

2. $T^2 = 4 \Pi \, ^{2L}/g$

   $= 1.7^2 = \frac{4 \Pi^2 \times 0.705}{g}$

   $g = 9.63 m/s^2$

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

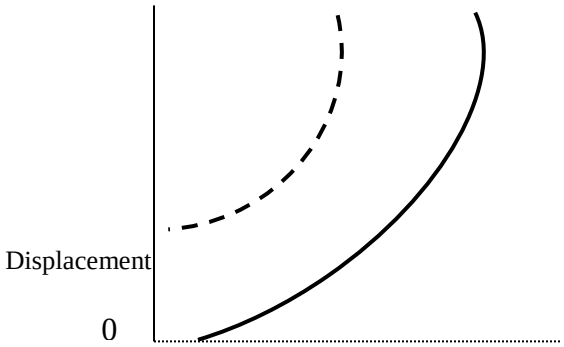
OR Extension of each spring = 10

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

= 0.08 x 21 V 33m/s

= 16.6m/s

OR T = 1/33 = 0.030303

T = 2V / w =

w = 2v/0.0303 = 207.525

V= rw

0.08 x 207. 5292

= 16.5876m/s

SECTION B (55 MARKS)

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 $\Delta\theta$

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 x 10^5J/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 = work output x 100% = $\frac{1980}{2184}$ x 100
Work input

= 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 $^{m}/_{v}$ = $^{0.008}/_{50 \times 106\ m^3}$

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 = 1.88×10^5 Pa

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

(iii) $\Delta P = (1.88 - 0.8) \times 10^5$ pa = 1.08 x 105 Pa

$\Delta P = \ell gh = \ell \times 0.80 \times 10$

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

$= 13500\ kg/m^3$

(iv) Pressure at top = atmospheric

0.8×10^5 pa

c. $p_1v_1/T_1 = p_2v_2/T_2$ $= \frac{2.7 \times 10^5 \times 3800}{298} = \frac{2.5 \times 10^5 \times v_2}{288}$

$25^0C = 298$ 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

$= 0 + 2\ (0.28)h$

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

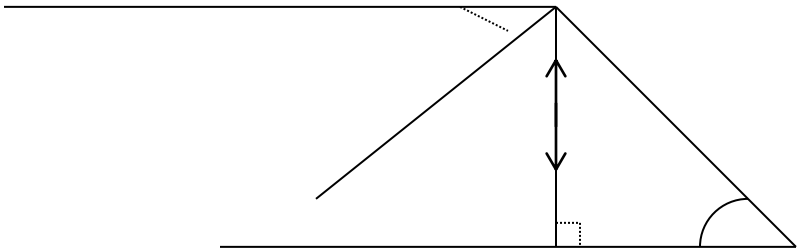
$= rw$

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

PHYSICS PAPER 2 YEAR 2009

SECTION A

1. Infinite (very many, uncountable, several

2. 

3. Negative change

4. Allow gassing/ release of gases

   OR, release H_2 and O_2 produced at the electrodes

5. Increase the magnitude of l

   Increase the number of turns per unit length

   Use of U shaped iron core

6. F = 0.5 sec

   F = 1/T

   = 1/0.5

   = 2 Hz

7. $1.33 = 3/v \times 10^5$

   $V = 3 \times 10^5$

   1.33

   $= 2.26 \times 10^8$ m/s

8. T = lA

9. (L-q) cm

10. (i) Movement of magnet causes flux linkage to change

E.M.F is produced in the cell.

(ii) When 1 flow from Q to P, a N. pole is created which opposes the approaching pole (long's law).

11. Increases in P d increases 1 in filament OR. Increase in P d increases heating effect this produces more electrons by Thermionic Emission.

Hence results on more intense x - rays

12. $^{2d}/_{05} = {}^{2d}/_{0.6} + 34$ OR $V = {}^{d}/_{t}$

$D = 17/0.2 = 85$ m $= \frac{17 \times 2}{0.1}$

Speed $= \frac{2 \times 86}{0.5}$ $= 340$ m/s

$= 340$m/s

13. Diode in (a) is forward biased while in 6 (b) is reversed biased Or Battery in 6 (a) enhances flow of e. across the barriers while in 6 (b) barriers potential is increased.

SECTION B (55 MARKS)

14. (a) Capacitances decreases

Area of the overlap decreases

(b)

(i) Parallel, Cp = 5 + 3 = 8 pf

Whole circuit ¼ + 1/8

$C = {}^{32}/_{12} = 2.6 + Pf$

(ii) Q = CV

= 8/3 x 12 PC

= 32 PC

(iii) $B = Q/C$

$= \frac{32 \times 10^{6}}{8 \times 10^{6}}$

$= 4$ V

OR $Q_B = {}^{5}/_{8} \times 32$

$= 20$ PC

$V_B = \frac{20 \times 10^{-6}}{5 \times 10^{-6}}$

$= 4$V

15. (a) Increase in 1 causes rise in temp

Rise in temp causes rise in R

(b) $R = v/l$

$\frac{2.5}{1.2}$

$= 2.1\ \Omega$

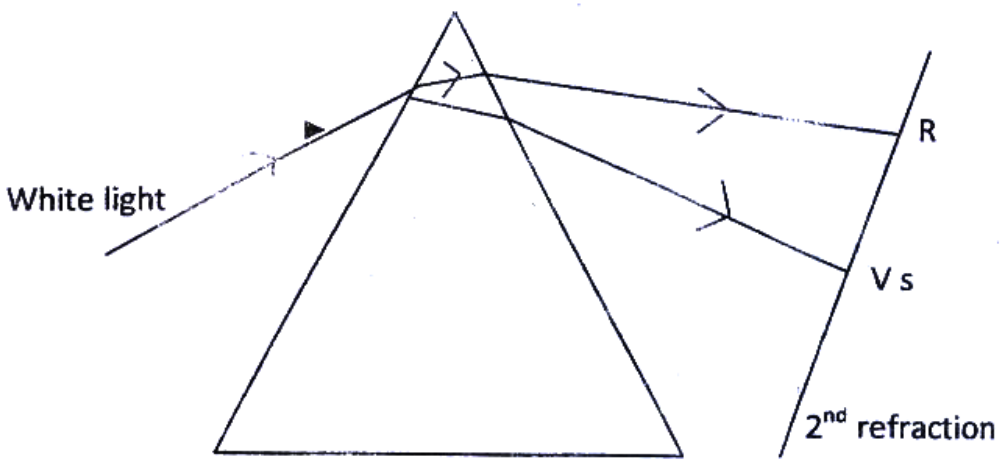
(c) Read off P d across Y = P.O.V from graph

(d) Power P = IV

= 0.8 x 3

2.4 watts

16. (a) (i)



(ii) Highest reading near red light

Red light has more heat than violet OR

Red light is close to ultra red which has more heat energy

(b) Depth = 11.5 – 3.5 = 8.0 cm

$= \frac{11.5}{8}$ = 1.4375

17. (a) β = particle

(b) (i) Ionizes attracted towards electrodes

Collusions with other molecules cause avalanche of ions which on

attraction to the electrodes causes the discharge.

(ii) are attracted towards electrodes

Collusion with other molecules causes avalanche are of ions which on

attraction to the electrodes causes

(c) (i) x = 36

Y = 92

(ii) Small, decreases in mass

Loss of mass

Mass defec

(iii) Each of the neutrons produced at each collision further collision with

Uranium atom causing chain reaction.

18. (a) (l) Electrons are emitted from Zn plate

Reduced of charge on the leaf

(ii) Any electron emitted is attracted back to the electroscope

(iii) Photons of infra red have to lower f than U – V have energy to eject to the electrons.

(b) (i) Number of electrons emitted will increases

(ii) Max K.E of the emitted electrons will increase

(c) (i) $V = \lambda f_0$

$F_0 = \frac{3.0 \times 10^8}{8.0 \times 10^{-7}}$

$= 3.75 \times 10^{14}$ Hz

(ii) $W = hf_0$

$= 6.63 \times 10^{-34} \times 3.75 \times 10^{14}$

$= \underline{2.49 \times 10^{-19}J} = 1.55$ e V

$\times 10^{-19}$

(iii) $KE_{MAX} = hf - hf_0$

$= h (8.5 – 3.75) \times 10^{14}$

$= 6.63 \times 4.75 \times 10^{14}$

$= 3.149 \times 10^{-19}$ joules

= 1.96828 e

19. (a)

(i) Attach two identical dippers to the same vibrator, switch on and the circular waves produced OR

Use one straight vibrator with two identical slits to produce coherent waves.

(ii) Constructive - Bright

Destructive – Dar

(b) C I –Two waves arrive at a point in phase

DI – Crest meets a trough and gives a zero intensity

- Path diff is ½ odd number of λ