**KISII CENTRAL FORM FOUR JOINT EVALUATION**
Kenya Certificate of Secondary Education
**PHYSICS**
Paper - 232/1
July/August - **2016**
**MARKING SCHEME**

**1.** Volume of water added
$= 0.2 \times 50 = 10$
$= 30.6 + 10$
$= 40.6\ cm^3$

**2.** Atmosphere present on surface of moon if very low.

**3.** a) Radiation
b) Increase the distance $x_2$ since dull black surface emits heat better than the shinny surface.

**4.** Molecules of solid absorb heat energy and rate of vibration of molecules increase increasing molecular distance.

**5.** Metal bench is better conductor than wooden bench hence conducts a way heat from the body.

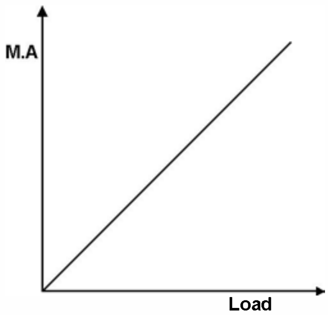
**6.** Sum of clockwise moment = sum of anticlockwise moments.
$0.5 \times 40 = (1 - x) \times 3$
$20 = 30 - 3x$
$30z = 10$
$x = 0.33$m

**7.** F = ke
$k = \frac{5}{2} \times 10^2 == 250$N/m

$$k\ in\ B = 250 \times 2$$
$$= 500 N/m$$
$$e = \frac{f}{k} = \frac{5}{500} = 0.01m$$
$$= 1cm$$

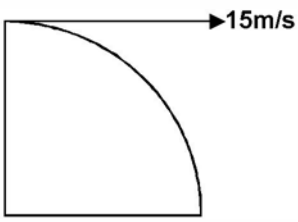
**8.** $A_1V_1 = A_2V_2$
$2.4 \times 10^{-4} \times 1.5 = 1.25 \times 10^{-3} \times 10^{-4}$
$$v = \frac{2.4 \times 10^{-4} \times 1.5}{1.25 \times 10^{-3} \times 10^{-4}}$$
$$v = 2880\ m/s$$

**9.**




**10.** When the container at high speed increase the rate of which water drips through the hole results of increase force on the water drips.

**11.**




$S = \frac{1}{2}ut^2$

$$h = \frac{1}{2}gt^2$$
$$1.8 = \frac{1}{2} \times 10 x t^2$$
$$t = 0.6s$$
$$R = 15 \times 0.6 = 9m$$

**12.** The volume of a fixed mass of a gas is directly proportional to its absolute temperature at constant pressure.

**13.** a)

$$T = \frac{1}{50} = 0.02s$$

$$V_B = \frac{5}{0.02} = 250cm/s$$

$$V_B = \frac{15}{0.02} = 750cm/s$$

$$V_B = \frac{750-250}{0.02\times 3} = 8333.33cm/s$$

b) i) The instantaneous velocity change direction therefore there is change in velocity

ii) $T_{max} = mr\omega^2 + mg$

$$T_{max} = 40\times 10^{-2}\times 50\times 10^{-2}\times(2\pi) + 40\times 10^{-2}\times 10$$

$$= 8.298N$$

**14.a)** Latent heat of fusion is the quantity of heat required to change any mass of a substance from solid to liquid without change in temperature ; while specific latent heat of fusion is the quantity of heat required to change a unit mass of a substance from solid to liquid without change in temperature.

**b)** i) Copper wire exerts pressure on ice beneath hence ice melts at temperature below the melting point, melted ice flows over the wire and solidifies its latent heat of fusion is conducted by the wire which melts the ice below and the process continues.

ii) the thread would not cut through the ice block, one the melted ice has solidified its latent heat is not conducted away by the thread.

c) i) To determine the mass of ice melted by natural heat / ensure that the ice is dry.

ii) I. Q = Pt = 24 × 11 × 60 = 15840 J

II. Mass of ice melted = 63 - 24 = 39g

III. Heat supplied by heater

= heat gained by ice.

$$15840 = 39\times 10^{-3}\times L_f$$

$$L_f = 4.0615\times 10^{-5} J/kg$$

**15.** a) i) When an object is partly or wholly immersed in a fluid it experience an upthrust equal to the weight of the fluid displaced.

ii)

$$\text{Relative density} = \frac{\text{upthrust in liquid}}{\text{upthrust in water}}$$

$$= \frac{1.05-0.73}{1.05-0.66}$$

$$= 0.8205$$

Density of liquid = 0.8205×1000=820.5kg/m³

b) i) A floating object displaces its own weight of the fluid in which it floats.

ii) Steel rod sinks because the weight of water it displeases it less than its weight while a ship floats since it displaces water equal of its weight.

iii) Volume of water displaced = $\frac{7}{8}$ × 0.045 =

0.0393765m³

Weight of water displaced

= 0.039375 × 1030 × 10 = 405.5625 kg

Tension = 405.5625 - 90 = 49.44N

**c)** Increase the size of the bulb

- Increase the length of stem.

**16.**a)i)

The rate of change of momentum is directly proportional to the resultant force and take place in the direction of force. $T = \frac{1}{50} = 0.02s$

ii) To increase the time of landing to lower reduce the impulsive force.

b) i)

ii) F= ma

= 100 × 10

= 1000N

c) i) Elastic collision is one in which bodies bounce off each other after impact while inelastic collision is one in which bodies stick together after impact.

ii) $m_1u_1 + m_2u_2 = (m_1 + m_2)\ v$

$800u - 5000 \times 40 = 58000 \times - 10$

$u = 1776.5 m/s$

**17.** a) The temperature at which the volume of a gas is assumed to be zero.

b)- The temperature of the air is increased in steps by heating the water bath.

- Record the values of pressure and corresponding temperature.
- Draw a graph of pressure against absolute temperature.
- The graph is a straight line through the origin.

c) $P_1V_1 = P_2V_2$

$h \times 1000 \times 10 + 10^5 \times 4.5 \times 10^{-6}$

$= 10^5 \times 18 \times 10^{-6}$

$h = 135m$

**KISII CENTRAL FORM FOUR JOINT EVALUATION**
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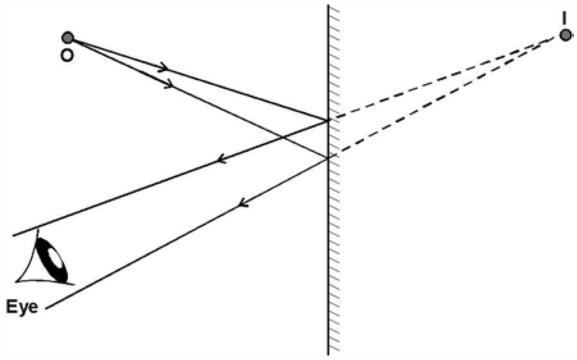
**MARKING SCHEME**

1. Light form of energy which enable us to see while cathode ray are stream of electron.

2.




3.
$$p = \frac{V^2}{R} = \frac{240 \times 240}{60} = 960W$$
$$t = \frac{288000}{960} = 300s$$

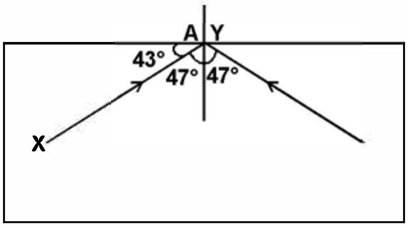
4. Magnetic materials have their domains pointing in the same direction while in non-magnetic materials domains point in different directions.
5. Using manganese IV oxide which oxidize hydrogen gas to water.
6.
$$W_0 = hf_0$$
$$2.5 \times 1.6 \times 10^{-19} = 6.63 \times 10^{-34} xf$$
$$f_0 = 6.033 \times 10^{14} Hz$$
$$f < f_0$$

7.
- There must be relative motion between the magnet and coil.
- There must be change of flux.

8.
$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$
$$\frac{1}{20} = \frac{1}{30} + \frac{1}{v}$$
$$v = 60cm$$
$$m = \frac{v}{u} = \frac{60}{30} = 2$$

9. i) Suspend all and let them settle freely. The one that settle in N - S direction is magnetised with opposite poles at the ends. ✓1.
Use the magnetized bar to identify the other two

10.



**11.** Hard X-rays are produced by relatively high potential while soft x-rays are produced by relatively low accelerating potential

**12.** Radio waves, infrared, UV, X-rays, Gamma rays.

ii) Infra-red.

**13.**a) Transverse waves are those whose direction of wave motion in perpendicular to direction of vibration of particles while longitudinal are those whose direction of wave motion is parallel to direction of vibration of particles.

b) i) T = 0.4s

ii)

iii) $f = \frac{1}{T} = \frac{1}{0.4} = 2.5Hz$

$\lambda = \frac{v}{f} = \frac{330}{2.5} = 132\,m$

c) - There is partial vacuum

- Some sound is transmitted by glass.

**14.**i) The capacitance reduces; ✓1 since the area of overlap is reduced; ✓1 i.e. C α A

ii) I. $C = C_x + C_y = 8 + 10 = 18\mu F$

$C_T = \frac{CC_Z}{C + C_Z} = \frac{18 \times 6}{18 + 6} = \frac{9}{2}$

$= 4.5\mu F's$

II. Q = CV✓1

$Q_Z$ = Total charge in the cct.

$\therefore Q_Z = 45 \times 10^{-6} \times 24$ V ✓1

III. Q = Area under the graph ✓1

= ½ × C × V1

= ½ × 6 × $10^{-6}$ × 20 ✓1

= 6 × $10^{-5}$ C ✓1

**15.** a) i) Low work function ✓1 R - Mixture of metal ✓1 oxides (barium and strontium)

ii) The tube is evacuated so that electrons do not lose some of their energy through collision with molecules on their way to the target. ✓1

iii) The wavelength of the x-ray emitted is reduced by increasing the heating voltage through the filament ✓1

b) i) ½ $mv^2$ = ev ✓1

$v^2 = \frac{2er}{m}$

$m = \sqrt{\frac{2ev}{M}}$

$v = 3 \times 10^{2} V$

$e = 1.6 \times 10^{-19} C$

$m = 9 \times 10^{-31} kg$

ii)

$\lambda \min = \frac{h}{ev}$

h = 6.63 × $10^{-34}$

c = 1.0328 × $10^{7}$

e = 1.6 × $10^{-19}$

v = 3 × $10^{2}$

$$V = \sqrt{\frac{2\times1.6\times10^{-19}\times3\times10^{2}}{9\times10^{-31}}};$$

$$V = \sqrt{\frac{9.6\times10^{-17}}{9\times10^{-31}}}$$

$$V = \sqrt{1.0667\times10^{14}}$$

$$V = 1.0328\times10^{7};$$

$$\lambda\min = \frac{6.63\times10^{-31}\times1.0328\times10^{7}}{1.6\times10^{-19}\times3\times10^{2}}$$

$$= \frac{6.847464\times10^{-27}}{4.8\times10^{-17}}$$

$$\lambda\min = 1.4266\times10^{-1\bullet}m$$

c) i) Carry no charge
- travel at speed of light

ii) X - Ray radiography
- Crystallography

**16.**a) Emission of electrons from surface of metal by shining light on surface of the metal.

b) i) X - anode
Y - cathode.

ii) Increase intensity increase the amount of photocurrent.

c) i) f = 4.5 × $10^{14}$ Hz

ii)

**17. a)** i) Full wave rectification

ii) In the first half cycle A is positive with respect to B, current flows through the diode D1 is forward braised
- In the second half cycle B is positive with respect A, Current flows through $D_2$ and d forward biased.
- In both cases current flows through the load in the same direction.

iii) Smoothening the wave.

**b)**- Radiation enters the chamber and ionize air in the chamber.
- Saturated vapour condenses on the ions forming tracks observed through perpex lid.
- The nature of tacks formed can be used to identify the type of radiation emitted.

**c)** 1 - ½ - ¼ - $^1/_8$
No. of half life = 3
total time - 3 × 2.5 = 7.5 hours.

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**MARKING SCHEME**
**QUESTION 1**

**Part A**

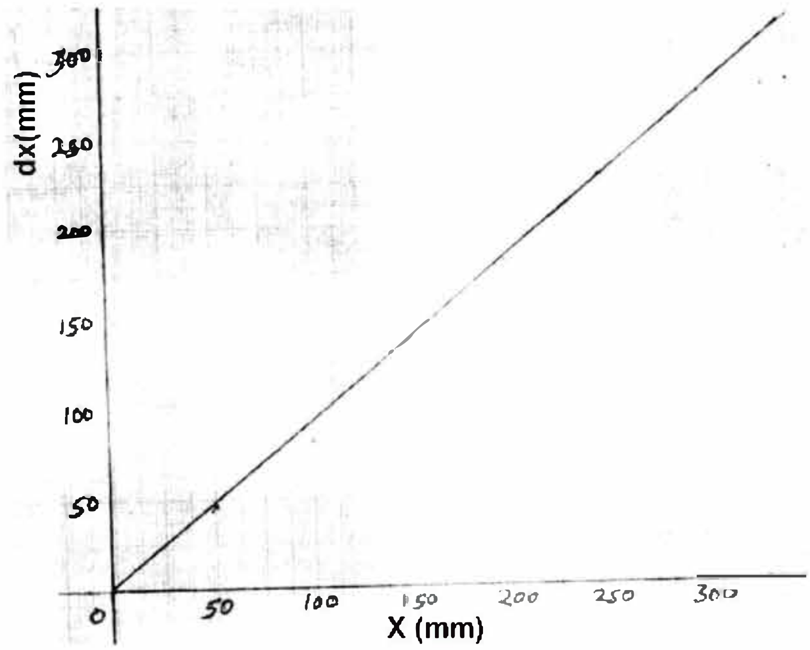
a) G = 500nun

b) Table

| x (mm) | 50 | 100 | 150 | 200 | 250 | 300 |
|---|---|---|---|---|---|---|
| d (mm) | 46 | 182 | 137 | 181 | 227 | 272 |

***Each value of d correct = ½ mark***
***Total score = 3 marks***

c) Axes - 1 = labelled with units.
Scale - 1 = simple and uniform.
Plotting - 2 = each correctly plotted point = ½ mk maximum score = 2 marks
Line - 1 = straight line with a positive gradient passing through the origin and any other three correctly plotted points.
***total marks = 5***




d)

$$S = \frac{272-137}{300-150}$$

$$= \frac{135}{150}$$

$$= 0.9$$

e) i)

$$0.9 = \frac{F}{I}$$

$$F = 0.9N$$

ii) F = W - U
0.9 = 1.0 - U
U = 0.1 N

PART B

h) Table

| U(cm) | V (cm) | M = v/u | (m + 1) |
|---|---|---|---|
| 30 | 26 | 0.8667 | 1.8667 |
| 40 | 22 | 0.55 | 1.55 |

Values of V correct - ½ mk each, maximum score - 1 makr
Values of m - ½ mk for both
Values of (m + 1) - ½ mk for both
Total marks = 2 marks

i)

$$f_1 = \frac{26}{1.8667}$$
$$= 13.928cm$$
$$f_2 = \frac{22}{1.55}$$
$$= 14.194cm$$
$$f_{av} = \frac{13.928 + 14.194}{2}$$
$$= 14.06cm$$

***total marks = 3 marks***

**Question two**

**a)** i) Diameter of wire W. D = $0.36 \times 10^{-3}$m ✓1

ii)

$$A = \frac{\pi D^2}{4} = \frac{\pi \times 0.36^2 \times 10^{-6}}{4} = 1.017 \times 10^{-6} m^2$$

Sub 1 mark

Cal. 1 mark

b) Repeat steps (iii) for values of l = 20cm, 30cm, 40cm, 50cm, 70cm and 80cm and complete the table.

| *l* (cm) | 10.0 | 20.0 | 30.0 | 40.0 | 50.0 | 70.0 | 80.0 |
|---|---|---|---|---|---|---|---|
| L (cm) | 91.0 | 81.0 | 73.0 | 65.5 | 60.0 | 55.0 | 46.5 |
| | 1.10 | 1.23 | 1.37 | 1.53 | 1.67 | 1.96 | 2.15 |

c) Plot a graph of *l* cm against $\frac{1}{L}\left(cm^{-1}\right)$ (5 marks)

d) From the graph find the slope S of your graph. (3 marks)

$$S = \frac{85 - 20}{2.2 - 1.23} = \frac{65}{0.97 \times 10^{-2}} = 1.586$$

e) From the graph state the value of $\frac{1}{L}(cm^{-1})$ when $l = 0$ (1 mark)

x - intercept = $0.94 \times 10^{-2}cm^{-1}$ ✓ correct reading for x-intercept.

f) Given that $l = \frac{100R}{JL} - \frac{R}{j}$ find the value of J when R = 10Ω. (2 marks)

$$y \text{ intercept} = C = \frac{R}{J} = 65$$
$$\frac{10}{J} = 65$$
$$\frac{10}{65} = 0.153$$