**SAMIA SUB-COUNTY JOINT EXAMINATIONS – 2021**

 **PHYSICS PAPER 2**

 **Marking Scheme**

**SECTION A: (25 Marks)**



1.

1. - *Moving the object towards the pinhole (Reducing the object distance)*
* *Moving the screen away from the pinhole (increasing the image distance)*
1. *- Leaf divergence of A decreases while the leaf divergence of B increases*
* *Due to the repulsion of charges in electroscope A, some charges move to electroscope B*
1. *Formation of hydrogen gas around the copper plate* ***insulates*** *the electrode.*

1. *Hammering causes the dipoles to vibrate, making them lose their alignment*

*Ray // to principal axis*

 *Ray directed towards C*

 *Erect object located*

**O**

**I**

**F**

**C**

1. *- The rider moves to the left.*
* *The rider experiences a force when placed to a magnetic field according to Fleming’s left hand rule*
1. $ T=0.5 s$

$$f=\frac{1}{0.5}$$

*= 2 Hz*

1. *- the charges in the plates induces opposite charges at ends of the mica sheet*
* *the induced charges produce electric field that opposes the electric field due to the plates hence reducing the resultant electric field and since V =* $\vec{E}d$*, V reduces*

1. $I= \frac{P}{V}$

 *=* $\frac{3 000}{240}$

 = *12.5 A*  *The fuse is* ***not*** *suitable*

1. *a) - the galvanometer deflects*
* *magnetic field in P builds up from zero to a maximum, cutting coil Q and inducing an e.m.f in it, hence current flows*
1. *The deflection is also halved*
2. $N=N\_{O}\left(\frac{1}{2}\right)^{\frac{T}{t}}$

$\frac{32}{1 024}= \left(\frac{1}{2}\right)^{\frac{80}{t}}= \left(\frac{1}{2}\right)^{5}$*Accept alternative method*

$$\frac{80}{t}=5$$

 *t = 16 days*

**SECTION B (55 MARKS)**

1. a) *light is an electromagnetic/ transverse wave while sound is a mechanical/longitudinal*

*wave*

1. *– it penetrates deepest*

*– it is easily reflected by tiny grains of sand*

1. *- An increase in temperature* ***increases the kinetic energy*** *of the air particles*
* *This leads to an* ***increase in the speed*** *of sound.*

*d) (i) Sound becomes less audible until it cannot be heard any more.*

1. *Steam condenses, creating a (partial) vacuum in the jar.*

*Sound, which requires material media for transmission, will not be heard.*

1. *(i) - the* ***distance*** *between the boy and the wall*
* *the* ***time*** *taken to hear the echo*

1. time for 1 clap = $\frac{10}{10}=1 s $

$$d= \frac{1}{2} ×330 ×1$$

 = 165 m

1. *a) the amount of current flowing through a conductor is directly proportional to the*

*potentialdifference across its ends, provided that temperature and other physical*

*conditions arekept constant.*

 Wire

 S

* *Close the switch and adjust the rheostat to obtain the value of current, I and the corresponding value of voltage, V. Record the values in a table.*
* *Repeat the experiment for other values of I and the corresponding values of V.*
* *Plot a graph of V against I. The graph should be* ***a straight line through the origin***
1. *(i)*$ 0.8 R\_{1}=10$

$$R\_{1}= 12.5 Ω$$

$$0.5 \left(12.5+ R\_{2}\right)=10$$

$ 12.5+R\_{2}=20$

$R\_{2}=7.5 $*Ω*

1. $R= \frac{7.5 ×12.5}{7.5+12.5}=4.688$ *Ω*

$$I= \frac{10}{4.688}$$

 *= 2.133 A*

1. a*)- the angle of incidence in the optically dense medium is greater than the critical angle*
* *the ray must be travelling from optically dense medium to optically less dense medium*

*b) i) n =* $\frac{c}{V}$

$$ = \frac{3.0 × 10^{3}}{1.88 × 10^{8}}$$

*= 1.5957*



ii)

C = critical angle

$$\sin(c)=\frac{1}{n}=\frac{1}{1.5957}$$

c = sin-1$\left(\frac{1}{1.5957}\right)$ = 38.81o

iii)$\frac{\sin(i)}{\sin(21.2^{°})}$ = 1.5957

$θ$ = sin-1 (1.5957 sin 21.2o) = 35.24°

c) i)

ii) *n =* $\frac{1}{\sin(42^{o})}$

*= 1.4945*

1. a)i.)

-To travel at the speed of light in a vacuum 

- Cause some substances to fluoresce 

- Undergoes diffraction, Refraction, interference 

- Penetrates matters 

- Obeys the wave equation 

ii.) K.E = eV = hf

f = eV/h x 5 % = 1.6 x 10-19 x 10000x5/60620x 10-34 x 100

f = 1.208 x 1017 Hz

b.)- Dope a group 3 element with a pure semiconductor

- 3 outermost electrons from the group 3 element form bonds with their neighbours leaving a hole

which acts as a positive charge.

- This creates P type (positive charge) semiconductor

c) (i)*Sound wave – cannot travel in a vacuum*

1. *Cathode rays – are deflected by both magnetic and electric fields*
2. $E$ *=h* $\frac{c}{λ}$**

*λ =* $\frac{6.23 × 10^{-34} × 3.0 × 10^{8}}{5.9 × 10^{-19}}$

 *=* $3.168 ×10^{-7}$*m*

1. *a)the direction of induced current is such that it opposes the change causing it*

*b) (i) North (N)*

 *(ii) Change of flux linkage*

c) i) NP = 800, NS = 40

VP = 240v, IP = 0.2A

$\frac{N\_{S}}{N\_{P}}= \frac{V\_{S}}{V\_{P}}\frac{40}{800}= \frac{V\_{S}}{240}$

 VS = 12 V

ii) $\frac{Power out}{power input} ×100\%=80\% $

$$P\_{S}= \frac{100\% \left(240v\right)(0.2)×80}{100\%}$$

= 38.4N