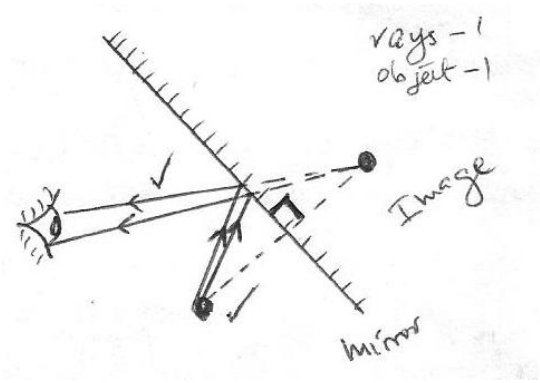
SAMIA SUB-COUNTY JOINT EXAMINATIONS – 2021
PHYSICS PAPER 2
Marking Scheme

SECTION A: (25 Marks)

1.



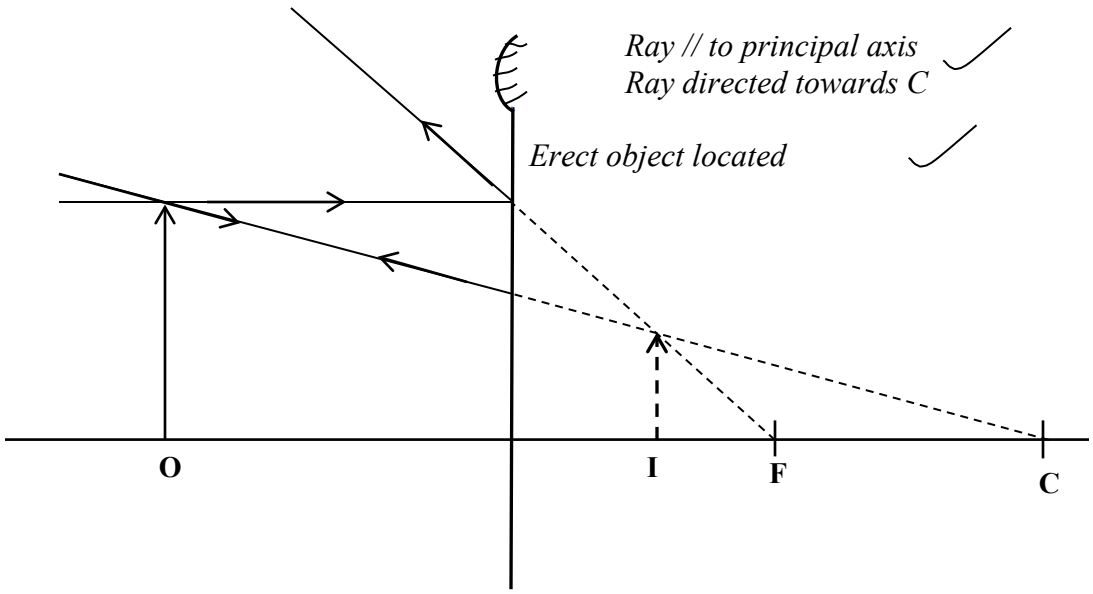
2. - *Moving the object towards the pinhole (Reducing the object distance)* ✓
   - *Moving the screen away from the pinhole (increasing the image distance)* ✓

3. - *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*

4. *Formation of hydrogen gas around the copper plate **insulates** the electrode.* ✓

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

6.



7. - *The rider moves to the left.*
   - *The rider experiences a force when placed to a magnetic field according to Fleming's left hand rule*

8. $T = 0.5\ s$

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

$= 2\ Hz$

9. - *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*

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

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

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

11. *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*

    b) The deflection is also halved

12. $N = N_O \left(\frac{1}{2}\right)^{\frac{T}{t}}$

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

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

$t = 16\ days$

SECTION B (55 MARKS)

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

b) *– it penetrates deepest*
– it is easily reflected by tiny grains of sand

c) *- 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.*

(ii) Steam condenses, creating a (partial) vacuum in the jar.
Sound, which requires material media for transmission, will not be heard.

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

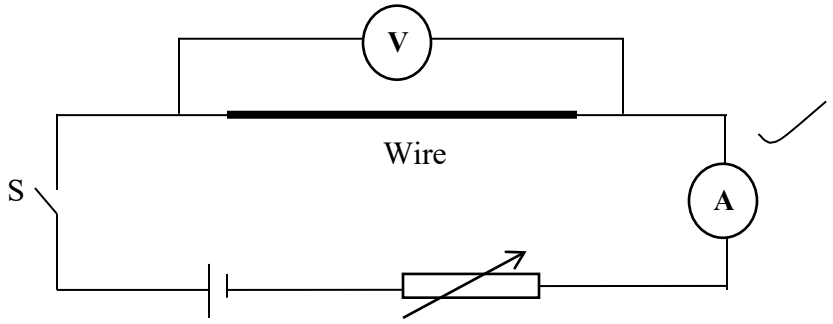
(ii) time for 1 clap $= \frac{10}{10} = 1\ s$

$$d = \frac{1}{2} \times 330 \times 1$$

$= 165$ m

14. *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.*

b)



- *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***

c) (i) $0.8\,R_1 = 10$

$R_1 = 12.5\ \Omega$

$0.5\,(12.5 + R_2) = 10$

$12.5 + R_2 = 20$

$R_2 = 7.5\ \Omega$

(iii) $R = \frac{7.5 \times 12.5}{7.5+12.5} = 4.688\ \Omega$

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

$= 2.133\ A$

15. a)- *the angle of incidence in the optically dense medium is greater than the critical angle*

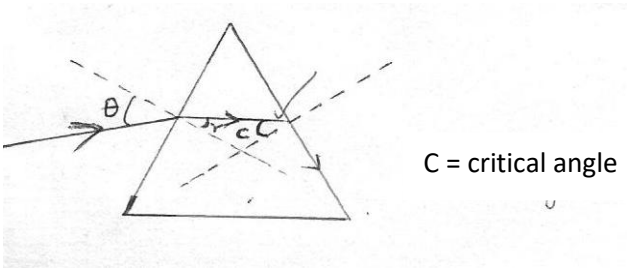
- *the ray must be travelling from optically dense medium to optically less dense medium*

b) i) $n = \frac{c}{v}$

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

$= 1.5957$

ii)



C = critical angle

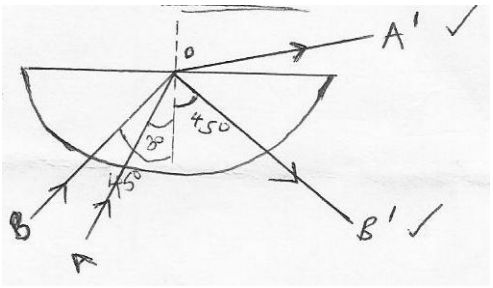
$$\sin c = \frac{1}{n} = \frac{1}{1.5957}$$

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

iii) $\frac{\sin i}{\sin 21.2^{\circ}} = 1.5957$ ✓ ✓

$\theta = \sin^{-1}(1.5957 \sin 21.2^{o}) = 35.24°$

c) i)



ii) $n = \frac{1}{sin\ 42^{o}}$ ✓

$= 1.4945$ ✓

16. 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 10^{17} 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*

(i) *Cathode rays – are deflected by both magnetic and electric fields*

d) $E = h\frac{c}{\lambda}$

$$\lambda = \frac{6.23 \times 10^{-34} \times 3.0 \times 10^{8}}{5.9 \times 10^{-19}}$$

$$= 3.168 \times 10^{-7} m$$

17. *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) $N_P = 800$, $N_S = 40$

$V_P = 240v$, $I_P = 0.2A$

$$\frac{N_S}{N_P} = \frac{V_S}{V_P}\frac{40}{800} = \frac{V_S}{240}$$

$V_S = 12$ V

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

$$P_S = \frac{100\%\ (240v)(0.2) \times 80}{100\%}$$

$= 38.4\text{N}$