SECTION A (25 Marks)

1.
   a)

b) $m = \dfrac{v}{u} = \dfrac{hi}{ho}$

$$= \frac{20}{300} = \frac{1.8}{ho} \checkmark$$

$$h_o = \frac{1.8 \times 300}{20} \checkmark$$

$$= 27 \text{ cm}$$

ii) $m = \dfrac{v}{u} = \dfrac{20}{300} = \dfrac{1}{15}$

$$= 0.0667$$

OR

$$\frac{1.8}{27} = 0.0677$$

2. Flame contains +ve & -ev ions $\checkmark$
   -ev ions will be attracted towards the sharp pin as the +ve ions are repelled hence splitting the flame $\checkmark$

3. Circuit breaks automatically switches off and unlike fuse melts hence has to be replaced $\checkmark$
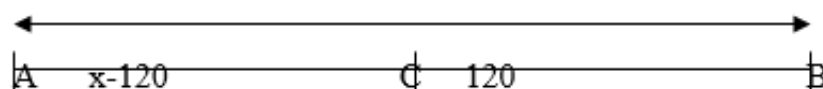
4.
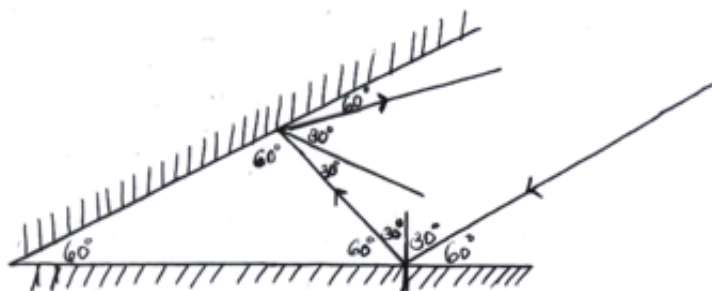
5. A == S
   B == N

6.

a) $2.5 = 25$

$1 = \dfrac{2}{2.5} = \dfrac{20}{25} = 0.8$ seconds

$f = \dfrac{1}{T} = \dfrac{1}{0.8} = 1.25$ H$_3$

7.

$S = \dfrac{2D}{T}$

$= \dfrac{2 \times 120}{0.8}$ ✓

$= \dfrac{240}{0.8} = \dfrac{2400}{8} = 300$ m/s ✓

$S = \dfrac{2D}{T}$

$300 = \dfrac{2(x-120)}{1.3}$ ✓
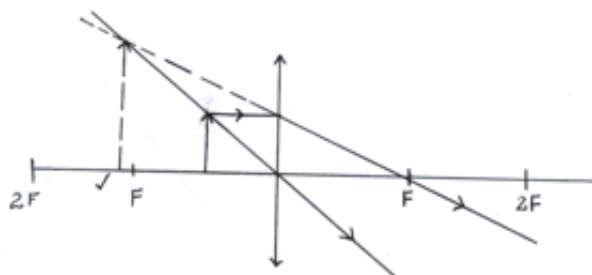
$390 = 2x - 240$
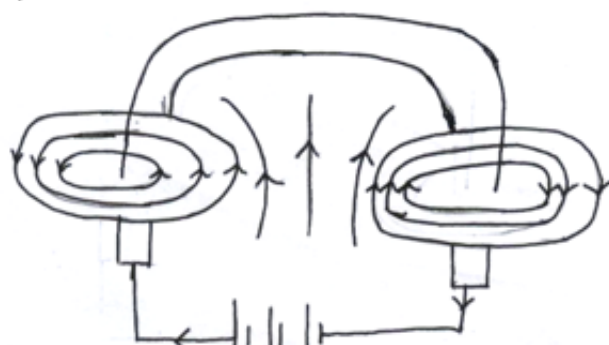
$2x = 630$

$X = 315$ m ✓

8. Accumulation of Hydrogen bubbles around Copper plate ✓

9.

10.)The magnitude of Induced E.m.f is directly proportional to the rate of flux linkage

11.

12.   i) C
       (ii) Communication
            Cooking in the microwave

SECTION B (55 Marks)

13.   a) Vibration of atoms interfere with the flow of electric current.

   (b) $R_E = \dfrac{R \times 12}{R + 12} = 8$

   $\dfrac{12R}{R + 12} = 8$

   $12R = 8R + 96$

   $4R = 96 \quad R = 24\omega$

   (c) $E = I(R + r)$

   $E = IR + Ir$

   $\dfrac{E}{I} = R + r$

   $I\dfrac{1}{I} = \dfrac{R}{E} + \dfrac{r}{E}$

   $\dfrac{1}{I} = \dfrac{1}{E}(R) + \dfrac{r}{E}$

   $y = mx + c$

   $\dfrac{1}{I} = \dfrac{1}{E}(R) + \dfrac{r}{E}$

   $0.25 = \dfrac{r}{E}$

   $Gradient = 1 = \dfrac{1}{E}$

   $E = 1 \times 1$

   $E = 1v$

14.

$m = \dfrac{v}{u}$

$m_1 = 4$

$m_2 = -1.7$

Total magnification $= 4 \times 1.7$

$= 6.8 \pm 0.2$

(c) Used in compound microscope

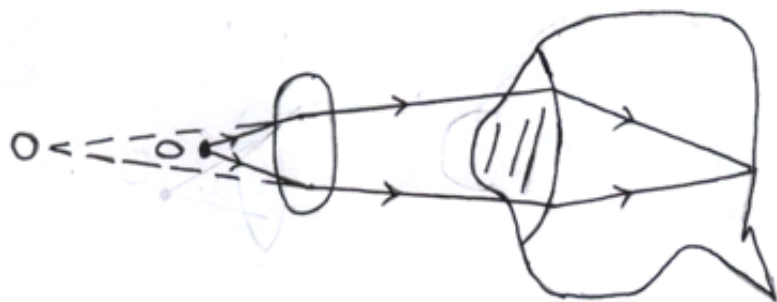(d) $P = \dfrac{1}{f}$

$= \dfrac{1}{0.012} = 83.3\,D$

$= 833.3D$

e)i) Long sightedness(Hypermetropia)

ii)

iii)Short eyeball/Long focal length

15.   a) Sound is transmitted in alternate compression & rarefraction where compression is region of high pressure & rarefraction is region of low pressure.

(b) 20 echos $\Rightarrow$ 18.5 sec

/echo $\dfrac{18.5}{20} = 0.925$ seconds.

$S = \dfrac{2D}{T}$

$$= \frac{2 \times 150}{0.925}$$

$$= \frac{300}{0.925}$$

$$= 324.32 m/s$$

iii) The number of echoes increases.

iv) Let the speed i) the wat I be x

t in wall $= \frac{75}{x}$

t in air $= \frac{75}{340}$

t in air — t in wall = 0.165

$$\frac{75}{340} - \frac{75}{x} = 0.165$$

$$\frac{75}{340} - 0.165 = \frac{75}{x}$$

$$0.0556 = \frac{75}{x}$$

$$X = \frac{75}{0.0556}$$

$$= 1348.92 \ m/s$$

II   f $= \frac{90}{60} = 1.5$ H3 ✓

b) V = λf

V $= \frac{20}{2.5} = 80 m/s$ ✓

V = fλ

$$\frac{8}{1.5} = \frac{1.5}{1.5} \times \pi$$

$$\lambda = \frac{80}{15}$$

$$= 5.333 \ m ✓$$

16.

1. a) Capacitance Increases due to increase in the area of overlap ✓

b) i) 5+3=8

$$C = \frac{8 \times 4}{8+4} = \frac{32}{12} = 2.667 \ \mu F ✓$$

ii) $C = \frac{Q}{V} = Q = CV = \bullet$

2.667x12 ✓

$$\frac{8}{3} \times 12 = 32 \ mc ✓$$

iii) $V = \frac{Q}{C}$

$$= \frac{32}{4} \ mc ✓$$

=8 V ✓

Voltage across B=12V-8V ✓

=4 V.

17.

=8 V ✓

Voltage across B=12V-8V ✓

=4 V.

a) $\eta = \frac{Sin \ i}{\sin r}$ ✓

b) (a) GRAPH

ii) Gradient = $\frac{\Delta \ in \ real \ depth}{\Delta \ in \ Apparent \ depth.}$

(10, 6.7) (15,10)

$$= \frac{10 - 6.7}{15 - 10} = \frac{3.3}{5}$$

=0.66

$$\Omega = \frac{1}{Sin \ c} ✓$$

$$1.6 = \frac{1}{Sin \ \theta} ✓$$

$$Sin \theta = \frac{1}{1.6}$$

Θ = Sin^{-1} 0.625 ✓

=38.68° ✓