Marking Scheme Physics –July2015Grade:-12(2016)

M.C.Q *Answers*

1)	3	2)	1	3)	2	4)	2	5)	4	6)	4	7)	3	8)	1	9)	1	10)	1
11)	4	12)	2	13)	3	14)	5	15)	3	16)	5	17)	5	18)	2	19)	1	20)	2
21)	3	22)	2	23)	3	24)	2	25)	3										

25 x 2 = 50

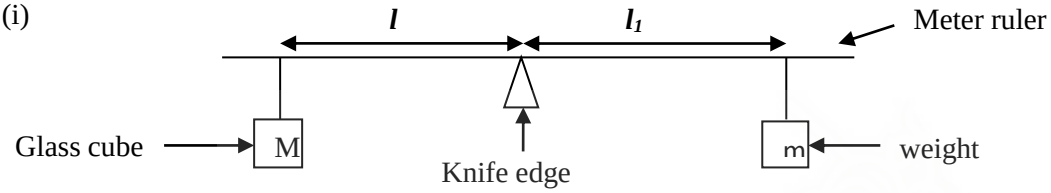
Structured Essay

1 (a) (i) Vernier Calliper ---------- --- ---------- (01)

(ii) for meter ruler:- fractional error increase / accuracy decrease in length measurement-------(01)

for micrometer screw gauge: - maximum measuring length is 2.5 cm ---------- (01)

(b) (i)



Correct diagram---------- (01)

Correct labeling ---------- (01)

(ii) Adjust the position of the ruler until it gets balance over the knife edge horizontally. ---------- (01)

(iii) To avoid, mass of the meter ruler in the calculation. ---------- (01)

(c) (i) Weight:- 50g ---------- (01)

Reason:- To decrease the fractional error in length measurement ---------- (01)

(d) (i) fully immerse the glass cube in water and rebalance the ruler by adjust weight (m).---------- (01)

(ii) distance between knife edge and new position of m. ---------- (01)

(e) m $l_2 = \left(M - \frac{dw}{dg} M\right) l$ ---------- (02)

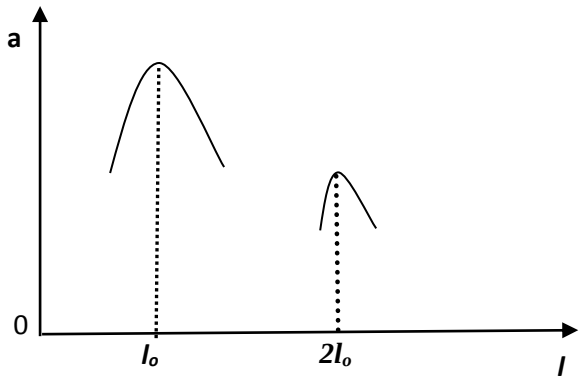
$d_g = \left(\frac{l1}{l2-l1}\right) d_w$ ---------- (01)

(f) $d_g = \left(\frac{35}{49-35}\right)$ 1000 = 2500 kgm^{-3} ---------- (01)

2. (a) (i) On the sonometer box.----------(01)

(ii) Stationary and transverse waves (both correct) ----------(01)

(iii)



Shape of the curves---------- (01)

Denote peak positions ---------- (01)

(b) Bring the two pegs closer together, while vibrating tuning fork place on sonometer box ---------- (01) + (01)

gradually increase the distance between the pegs until paper rider jums off,---------- (01)

finally measure the distance between the pegs.

(c) $f = \frac{1}{2lo}\sqrt{\frac{T}{m}}$----------(01)

(d) (i) $f = \frac{n1}{2l1}\sqrt{\frac{T}{m1}}$, $f = \frac{n2}{2l2}\sqrt{\frac{T}{m2}}$---------- (01)

$\frac{m1}{m2} = 4$, $\frac{n1}{n2} = \frac{l1}{l2}\sqrt{\frac{m1}{m2}} = \frac{3}{2}\sqrt{4} = 3/1$---------- (01) + (01)

(ii) AB:- 3 BC:- 1 (both correct) ---------- (01)

(iii) $\frac{\lambda max}{2}$ = 40 cm , λ_{max} = 80 cm or 0.8 m ---------- (01)

(iv) $V = \sqrt{\frac{40}{1 \times 10-3}}$ = 200 ms^{-1} ---------- (01)

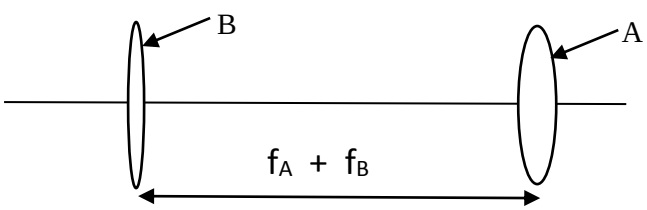
$f = \frac{V}{\lambda max} = \frac{200}{0.8}$ = 250 Hz ---------- (01)

3. (a) (i) Objective:- B

Eye piece:- A (both correct) ---------- (01)

(ii) focal length of B is grater than focal length of A. ---------- (01)

(b) (i)



Correct position and labelling the lenses-- (01)

Denote correct distance between the

Lenses ---------- (01)

(ii) infinity ---------- (01)

(iii) M = f_B / f_A ---------- (01)

(c) (i) M = D/ d ----------(01)

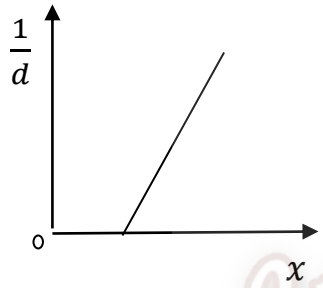
(ii) All of the rays come through objective , pass through the image of objective so that the position of image is best position for placing eyes to observe the image. ----------(02)

(d) $\frac{1}{V} - \frac{1}{U} = \frac{1}{f}$, $f_A = f$ say. $\frac{1}{V} + \frac{1}{x} = \frac{1}{f}$ ---------- (01)

$\frac{x}{V} + 1 = \frac{x}{f}$ ---------- (01)

$\frac{1}{d} = \frac{1}{Df} x - \frac{1}{D}$ ---------- (01)

(e) (i)



Correct graph ---------- (01)

Labeling the axes ----------(01)

(ii) focal length of A. or f_A ----------(01)

4. (a) Heat the tube , immerse open end of the tube into the mercury and cool it .---------- (01)

(b) V = *l*a ---------- (01) P = $\left(\pi + \frac{hH}{L}\right)$ cmHg ---------- (01)

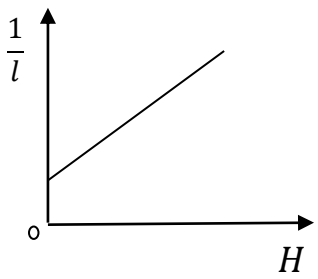
(c) change the inclined position of the tube and obtain the corresponding measurements of H and *l* --------- (01)

(d) PV = k k —constant ---------- (01)

$\left(\pi + \frac{hH}{L}\right) la = k$ ----------(01)

(e) $\frac{1}{l} = \frac{ah}{kL} H + \frac{\pi a}{k}$ ---------- (01)

(f)



Correct graph ---------- (01)

Labeling the axes ----------(01)

(g) (i) $\frac{c}{m} = \frac{\pi}{h} L$ ---------- (01)

$\pi = \frac{c}{m} \times \frac{h}{L} = \frac{0.05}{1.64 \times 10-4} \times \frac{10}{40}$ (correct substitution) ----------(01)

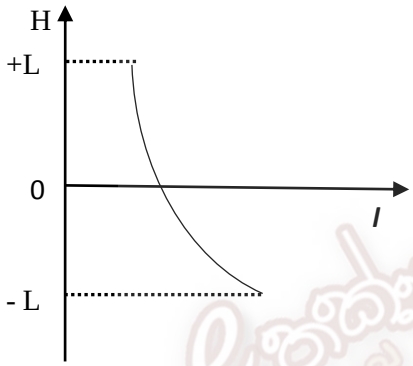
π = 76.25 cmHg.---------- (01)

(ii) H = 0 , $\frac{1}{l} = \frac{\pi a}{k}$ ----------(01)

$\frac{1}{l} = 0.05$, l = 20 cm ----------(01)

(iii) No , When h is small as the pressure exerted on the air column is small so that length of air column will not change some extent. ----------(01)

(iv)



----------(01)

Part- B Essay

,(a) Gases are compressible, when pressure exert on the gas energy loss occur.---------- (01)

(b) liquid is an incompressible.----------(01)

(c) F = P x A
= 1.5 x 10^6 x 5.6 x 10-5 ---------- 1
= 84N ---------- (01)

(d) (i) F_a ---------- (01) $F_a = F$ ----------(01)

(ii) Taking moment at O $3 \times F_a = 21 \times F_b$ ---------- (01)

$F_b = \frac{3 \times 84}{21}$ = 12 N ---------- (01)

(e) (i) 1.5 x 10^6 Pa.---------- (01)

(ii) F' = 14.4 x 10^{-5} x 1.5 10^6 ----------(01)
= 216 N ----------(01)

(f) Force exerted on the disc due to a single brake pad is P = 0. 5 x 216 = 108 N ---------- (01)

(g) Let τ be the torque acting on the brake pad

(i) τ = P x r + P x r ---------- (01)

$= 108 \times 2 \times \frac{6}{100} = 12.96$ Nm ---------- (01)

(ii) Let α be the angular deceleration of the disc

$\tau = I \alpha$ ---------- (01)

$-12.96 = 0.12 \alpha$

$\alpha = -108$ rad s^{-2} ---------- (01)

Applying $\omega = \omega_o + \alpha t$

$0 = \omega_o + (-108 \times 1) \Longrightarrow \omega_o = 108$ rad s^{-1} ---------- (01)

(iii) Applying $\omega^2 = \omega_o^2 + 2 \alpha \theta$

$0 = 108^2 - 2 \times 108 \theta$ ---------- (01)

$\theta = 54$ rad

Number of revolutions $= \frac{\theta}{2\pi} = \frac{54}{6} = 9$ ----------(01)

(iv) increase the distance between axis and brake pads / any suitable argument. ---------- (01)

2. (a) (i) Grater than 20kHz ---------- (01)

(ii) The frequency of a. c = natural frequency of the piezoelectric disc ---------- (01)

(iii) To emit and receive ultrasound pulse ---------- (01)

(b) (i) Density and speed ---------- (01)

(ii) Due to low density of air ---------- (01)

(iii) kg m^{-2} s^{-1} ---------- (01)

(c) (i) To reduce reflection of ultrasound at air / material interface to send more ultrasound energy into the materials ---------- (01)

(ii) $Z_G = 6 \times 10^7$ kg m^{-2} s^{-1} $Z_S = 4 \times 10^7$ kg m^{-2} s^{-1} (both correct) ---------- (01)

R = 0.04 ---------- (01)

(d) Due to reflection at flaws (defects or boundaries) ---------- (01)

(e) (i) Due to reflection at the front wall of the material ---------- (01)

(ii) Distance between IP and BW pulses = 9.25 – 0.25 = 9.00 cm ----------(01)

Time interval between pulses IP and BW = 0.1ms cm^{-1} x 9.00cm = 9 x 10^{-4}s ----------(01)

Time taken by the ultrasound to travel from front wall to back wall = $\frac{1}{2}$ x 9 x 10^{-4}s

= 4.5 x 10^{-4}s ----------(01)

(iii) Length of the material = 3000 x 4.5 x 10^{-4}s

= 1.35 m ---------- (01)

(iv) Distance between pulses A and B = (7.25 – 4.75) cm = 2.5 cm ---------- (01)

Time interval between pulses A and B = 2.5 x 0.1 x 10^{-3} = 2.5 x 10^{-4}s ----------(01)

Horizontal distance between defects A and B = $\frac{1}{2}$ x 2.5 x 10^{-4} x 3000

= 0.375 m or 37.5 cm ---------- (01)

(f) (i) Any two of :- non destructive , unharmful , time saving , efficient ---------- (01)

(ii) Difficult to measure the time intervals due to high speed of electromagnetic waves ---------- (01)

3. (a) (i) Cornea , refractive index high ---------- (01)

(ii) The focal length of eye lens can be adjusted by action of ciliary muscles ---------- (01)

(b) (i) f = $\frac{1}{P}$ ---------- (01)

= $\frac{1}{50}$ m = 2cm ---------- (01)

Distance between eye lens and retina = 2 cm ---------- (01)

(ii) $\frac{1}{V} - \frac{1}{U} = \frac{1}{f}$ ---------- (01)

$-\frac{1}{2} - \frac{1}{25} = \frac{1}{f}$ ---------- (01)

$f = \frac{50}{27}$ cm of convex lens, $f = \frac{1}{54}$ m

$P = \frac{1}{f}$ = 54 D ---------- (01)

(iii) $P_1 + P_2 = 54$, $44 + P_2 = 54$ ----------(01)

Where f - focal length of eye lens $P_2 = 10$ D , $f = \frac{1}{10}$ m , $f = 10$ cm ---------(01)

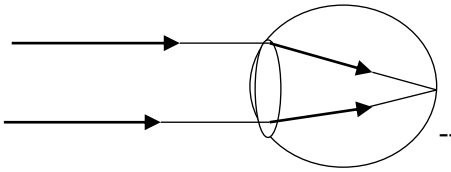
(iv) eye is in relax position

---------- (01)

eye is in full accommodation

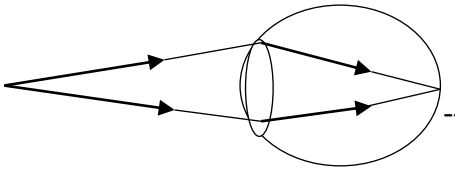
----------(01)

(c) (i) far point of normal eye



---------- (01)

far point of defect eye



---------- (01)

(ii) f = 250 cm concave lens P = - 0. 4D ---------- (01)

(iii) $\frac{1}{V} - \frac{1}{U} = \frac{1}{f}$

$\frac{1}{15} - \frac{1}{U} = \frac{1}{250}$ ---------- (01)

(v)

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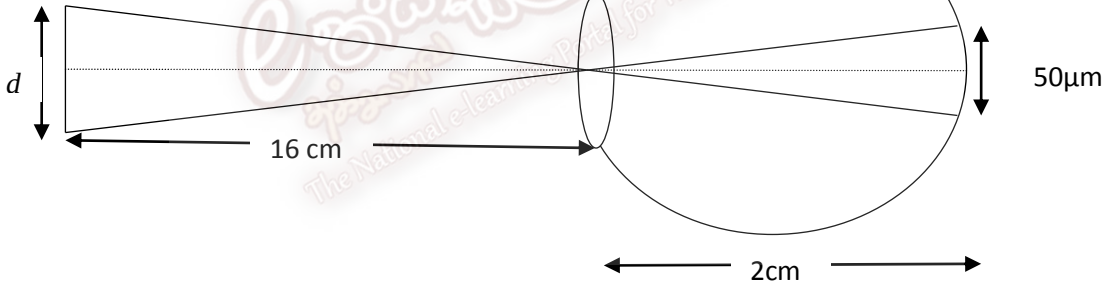

$\frac{d}{50\ x10-6} = \frac{16}{2}$ ---------- (01)

d = 4 x 10^{-4} m

= 0.4 mm. ---------- (01)

Final Marks = $MCQ\ marks + \frac{15\ x\ 4\ +\ 20\ x\ 2}{2}$