FWC

வட மாகாணக் கல்வித் திணைக்களத்தின் அனுசரணையுடன்
தொண்டைமானாறு வெளிக்கள நிலையம் நடாத்தும்
Field Work Centre
தவணைப் பரீட்சை
Term Examination
புள்ளடித்தாள்

பாடம் :-	தரம் :-	சுட்டெண் :-

01. ① ② ③ ④ ⑤	11. ① ② ③ ④ ⑤	21. ① ② ③ ④ ⑤
02. ① ② ③ ④ ⑤	12. ① ② ③ ④ ⑤	22. ① ② ③ ④ ⑤
03. ① ② ③ ④ ⑤	13. ① ② ③ ④ ⑤	23. ① ② ③ ④ ⑤
04. ① ② ③ ④ ⑤	14. ① ② ③ ④ ⑤	24. ① ② ③ ④ ⑤
05. ① ② ③ ④ ⑤	15. ① ② ③ ④ ⑤	25. ① ② ③ ④ ⑤
06. ① ② ③ ④ ⑤	16. ① ② ③ ④ ⑤	26. ① ② ③ ④ ⑤
07. ① ② ③ ④ ⑤	17. ① ② ③ ④ ⑤	27. ① ② ③ ④ ⑤
08. ① ② ③ ④ ⑤	18. ① ② ③ ④ ⑤	28. ① ② ③ ④ ⑤
09. ① ② ③ ④ ⑤	19. ① ② ③ ④ ⑤	29. ① ② ③ ④ ⑤
10. ① ② ③ ④ ⑤	20. ① ② ③ ④ ⑤	30. ① ② ③ ④ ⑤

GCE(A/L) Examination, July 2017

Conducted by Field Work Centre, Thondaimanaru

In Collaboration with

Provincial Department of Education Northern Province

Grade :- 12 (2018)	Physics	Answer

PAPER I M.C.Q.

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

PAPER II A

[STRUCTURED ESSAY]

Q1. a) Parallelogram Law of forces. ——— (01)

b) $R = \sqrt{P^2 + Q^2 + 2PQ\cos\theta}$ and identifying the quantities. ——— (01)

c) Yes; the weights are acting in a vertical plane, Therefore the tensions in the strings must also act in the same vertical plane. ——— (01)

d) To have same tension at any point along any particular string ——— (01)

e) The system should return to the initial position when either middle pan or any other pan is pulled and released. ——— (01)

f) No; if there is no friction between the string and the pully, the string should slide over the pulley. ——— (01)

g) Yes, to avoid the mass of the strings appearing in the calculations. ——— (01)

h) i) Behind the strings, a white sheet of paper to be fixed on the drawing board.

ii) Behind the string a small strip of plane mirror to be placed on the white sheet of paper.

iii) The image of the string is observed in the mirror and the position of the string is marked on the white sheet of paper OR The string position is marked on the white sheet of paper using a set-square. ——— (01)

i) i) Friction appearing in the pulleys

ii) The drawing board may not be kept in a vertical plane.

iii) The influence of the mass of the strings

} For any one. ——— (01)

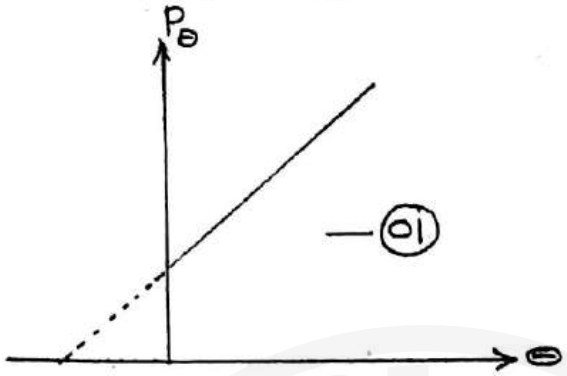
j) $\frac{1.26}{69.04} \times 100 = 1.825 \simeq 1.83\%$ ——— (01)

Q2.1) A - Thermometer
B - Glass bulb
C - Beaker containing water
D - Stirrer
E - Pressure Gauge.

All correct — 03
Any three — 02
Any two — 01

2) Pressure Law. — (01)

3)



— (01)

$P_\theta = (P_0\alpha)\theta + P_0$

$y = m \cdot x + C$

4) To maintain same temperature at any point within water. — (01)

5) Absolute zero temperature — (01)

6) a) $\alpha = \frac{1}{273.15}\ K^{-1}$ — (01)

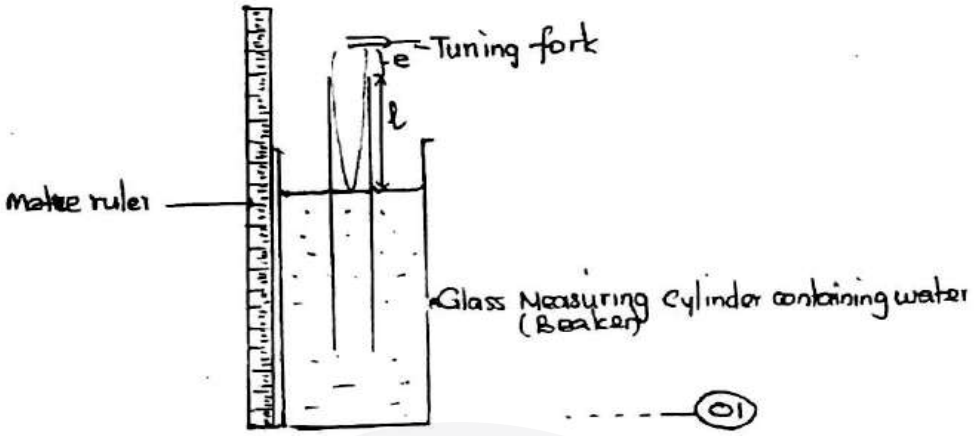
b) 0 K or $-273.15\ ^\circ C$ — (01)

c) $\frac{P_1}{T_1} = \frac{P_2}{T_2} \Rightarrow \frac{101\ kPa}{300} = \frac{P}{350}$

$\Rightarrow P = 117.83\ kPa$. — (01)

23. i) Metre ruler . . . ——— (01)

ii)



. . . . . (01)

iii) Keep the pipe completely immersed in the water or maintain at possible minimum value; vibrate the tuning fork by striking it and then hold it closer to the mouth of the open end and in the mean time gradually raise the tube at the same time listening for the first loud sound. ——— (01)

iv) Any one of them, but the reason for the choice must be stated ——— (01)

v) $\frac{\lambda}{4} = \ell + e \Rightarrow \lambda = 4(\ell + e)$

$V = f\lambda$

$V = f_0(\ell + e)4$

$\ell = \frac{V}{4} \cdot \frac{1}{f_0} - e$ ——— (01)

$y = mx - c$

vi) a) $\frac{V_0}{4} = 82.5 \Rightarrow V_0 = 330\ ms^{-1}$ ——— (01)

b) $e = 1\ cm$ ——— (01)

vii) The fundamental resonating lengths corresponding to each tuning fork would be reduced compared to previous lengths ——— (01)

viii) This is for a single tuning fork.

$\frac{\lambda}{4} = \ell_1 + e$

$\frac{\lambda}{4} = 16 + e$

$3\frac{\lambda}{4} = \ell_2 + e$

$3\frac{\lambda}{4} = 50 + e$

$\rightarrow \lambda = 68\ cm$, $e = 1\ cm$ ——— (01)

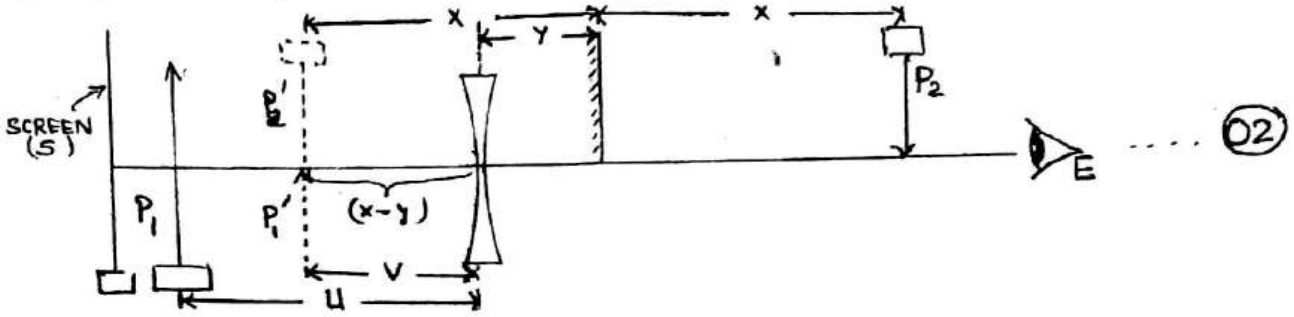
$\frac{5\lambda}{4} = L + e \Rightarrow L = \frac{5\lambda}{4} - e$

$= \frac{5 \times 68}{4} - 1$

$= 84\ cm$

Next resonance length cannot be obtained $84\ cm >> 75\ cm$ ——— (01)

Q4. i) Optical bench, screen.



..... (02)

ii) For marking images and u, v. ——— (01)

iii) Adjust the position of the pin P_2 such that the image P_2' formed by the reflection of the plane mirror coincides with the image P_1' formed by the refraction of the lens without parallax error. ——— (02)

iv) $V = +(x-y)$ ——— (01)

v) i) The images of other objects can be seen through the lens — It can be prevented by placing a screen behind the lens

OR

ii) The image formed by the refraction of lens would be smaller in size and less bright compared to the image formed by the reflection of mirror. — use bright light together with white/silver pins. (01)

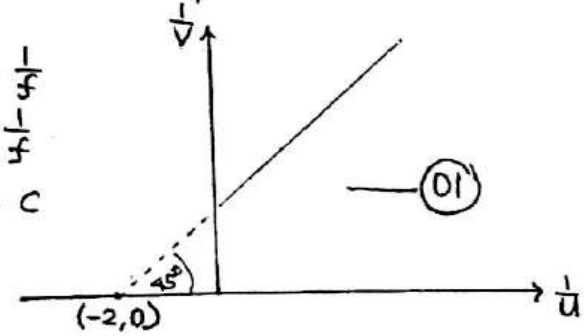
OR

iii) It may be difficult to coincide the images when the plane of the plane mirror is not perpendicular to the principal axis of the lens. — Use set square

iv) $\frac{1}{V} - \frac{1}{u} = \frac{1}{f}$

$\frac{1}{V} = -\frac{1}{u} + \frac{1}{f}$

$y = mx + c$



(01)

$\tan 45° = \frac{1/f}{2}$

$\frac{1}{f} = 2$

$f = 0.5$ cm

(01)

v) Plane mirror is used inorder to produce a virtual image and make it to coincide with the virtual image formed by the diverging lens. (01)

PAPER II B
[ESSAY]

Q5 i) The mass of water pushed in 1 second

$$\left(\frac{m}{t}\right) = 2 \times A\rho V \quad \text{——— (01)}$$
$$= 2 \times 12 \times 1000 \times 20$$
$$= 4{\cdot}8 \times 10^{5}\ kg\,s^{-1} \quad \text{——— (01)}$$

ii) If the total force exerted by the two propellers is F,

$$F \times t = mv - mu \quad \text{——— (01)}$$
$$F \times t = m(v - 0)$$
$$F \times 1 = 4{\cdot}8 \times 10^{5} \times 20$$
$$F = 96 \times 10^{5}\ N \quad \text{——— (01)}$$

iii) If the acceleration of the ship is a,

$$F = ma$$
$$96 \times 10^{5} = 2 \times 10^{7}\, a$$
$$a = 48 \times 10^{-2}\ m\,s^{-2} \quad \text{——— (01)}$$

iv) If the ship is raised by a height h,

Load removed = change in up Thrust

$$2{\cdot}4 \times 10^{8} = (1000 \times x) \times 1000 \times 10 \quad \text{——— (01)}$$
$$\Longrightarrow \quad x = 24\ m$$
$$2 \times 10^{8} = (1000 \times y) \times 1000 \times 10 \quad \text{——— (01)}$$
$$\Longrightarrow \quad y = 20\ m$$
$$\therefore \quad h = x - y = (24 - 20)$$
$$= 4\ m \quad \text{——— (01)}$$

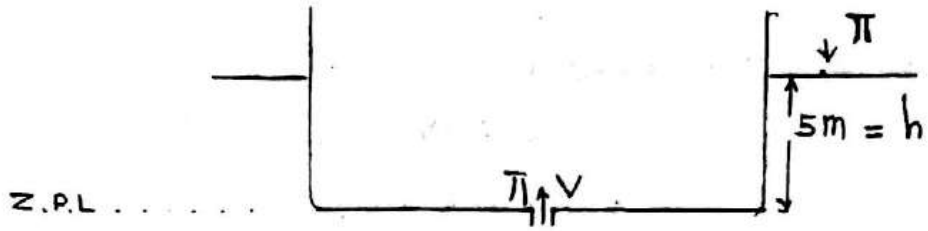
v) If the volume of water taken inside is V,

Load removed = weight of water taken inside

$$4 \times 10^{6} \times 10 = V \times 1000 \times 10$$
$$\therefore \quad V = 4{,}000\ m^{3} \quad \text{——— (01)}$$

Q5 Contd...

vi)



Based on Bernoulli's principle: $P + \frac{1}{2}\rho v^2 + \rho gh = k$ —— (01)

$$\pi + \frac{1}{2}\rho v^2 + 0 = \pi + 0 + \rho gh$$

$$\frac{1}{2}\rho v^2 = \rho gh$$

$$v = \sqrt{2gh}$$

$$v = \sqrt{2 \times 10 \times 5}$$

$$v = 10\ ms^{-1} \quad \text{——} \quad (01)$$

vii) If the time taken for the ship to submerge is t,

$$t = \frac{A \times h}{Q}$$

$$= \frac{1000 \times (25-5)}{10} \quad \text{——} \quad (01)$$

$$= 2000\ \text{Sec.} \quad \text{——} \quad (01)$$

viii) $\uparrow F + U = mg$

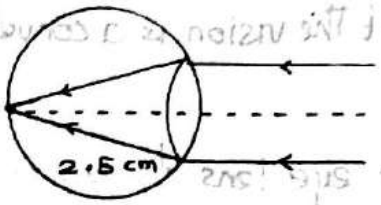
$\therefore F = mg - U$

$$= \{(1000 \times 25) \times 2500 \times 10\} - \{1000 \times 25 \times 1000 \times 10\} \quad \text{——} \quad (01)$$

$$= 375 \times 10^6\ N \quad \text{——} \quad (01)$$

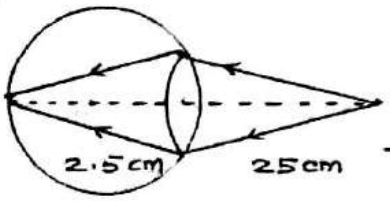
Q6.

a)



— (01)

b)



— (01)

$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$ — (01)

$\frac{1}{-2.5} - \frac{1}{25} = \frac{1}{f}$ — (01)

$f = -2.273$ OR $2.273\ cm$ — (01)

c)

i)

— (01)

Calculation for the distance of far point:-

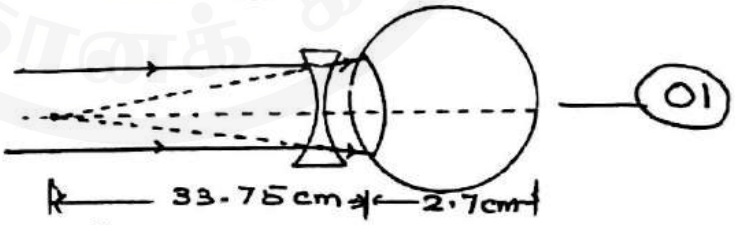
$\frac{1}{-2.7} - \frac{1}{u} = \frac{1}{-2.5}$ — (01)

$\Rightarrow u = 33.75\ cm$ — (01)

Calculation for the distance of near point :-

$\frac{1}{-2.7} - \frac{1}{u} = \frac{1}{2.273}$ — (01)

$\Rightarrow u = 14.373 cm.$ — (01)



— (01)

திரத்தும் லென்சின் குவியத்தூரம்.

$\frac{1}{-2.7} - \frac{1}{-2.5} = \frac{1}{f}$

$f = 33.75\ cm$

— (01)

d) The additional lens needed to correct the vision is a converging lens.

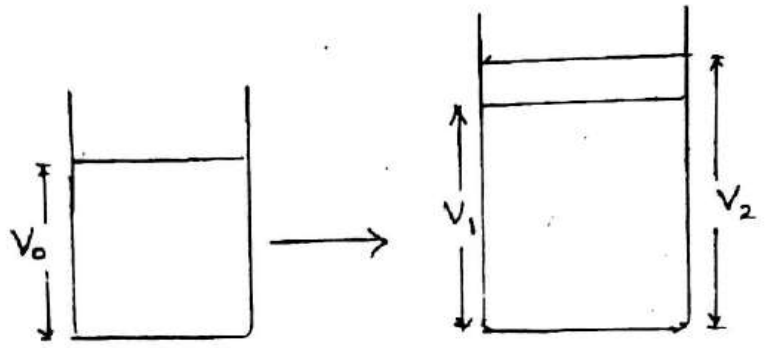
REASON: The image formed by the eye lens to be shifted forward in order to focus the image on the retina.

OR.

When the eye lens becomes weak, the image of the object at the normal near point will be formed behind the retina.

——— (02)

Q7.



V_0 = Initial volume (liquid, vessel)
V_1 = Final volume (vessel)
V_2 = Final volume (liquid)

For the vessel: $V_1 = V_0(1+gt)$ ——(1) —— (01)
For the liquid: $V_2 = V_0(1+\gamma t)$ ——(2) —— (01)

Apparent cubical expansivity = $\frac{\text{Apparent cubical expansion}}{\text{Initial volume} \times \text{change in temp.}}$

$$\gamma_{ap} = \frac{V_2 - V_1}{V_0(t_2 - t_1)} \quad \text{——— (01)}$$

$$= \frac{V_0(1+\gamma t) - V_0(1+gt)}{V_0 t} \quad \because t = t_2 - t_1 \quad \text{— (01)}$$

$$= \gamma - g$$

$$\Rightarrow \gamma = \gamma_{ap} + g \quad \text{——— (01)}$$

where γ = real expansivity
γ_{ap} = apparent expansivity
g = cubical expansibity vessel

$$\gamma_{ap} = \gamma - g$$
$$= 200 \times 10^{-6} - 3 \times 4 \times 10^{-6}$$
$$= 200 \times 10^{-6} - 12 \times 10^{-6}$$
$$= 1.88 \times 10^{-4}\ ^\circ C^{-1} \quad \text{——— (01)}$$

i) a) $(V_{100})_g = 2\{1 + 3 \times 4 \times 10^{-6} \times 100\}$
$= 2.0024\ cm^3$ OR $2.0024 \times 10^{-6}\ m^3$ —— (01)

b) $(V_{100})_{Hg} = 2\{1 + 2\times10^{-4} \times 100\}$

$= 2 \times 1.02$

$= 2.04\ cm^3$ ——— (01)

∴ Increase in volume of Hg $= 2.04 - 2$

$= 0.04\ cm^3$

OR

Increase in volume of Hg $= V_0 \gamma t$

$= 2 \times 2 \times 10^{-4} \times 100$

$= 0.04\ cm^3$ ——— (01)

c) The volume increase of Hg inside the capillary tube

$= 2.04 - 2.0024 = 0.0376\ cm^3$

OR $= 3.76 \times 10^{-8}\ m^3$ ——— (01)

OR Increase in volume of Hg $= V_0 \gamma_{ap} t$

$= 2 \times 1.88 \times 10^{-4} \times 100$

$= 3.76 \times 10^{-2}\ cm^3 / 3.76 \times 10^{-8}\ m^3$

d) Cross-sectional area of the capillary tube $= \frac{\text{Volume of Hg risen}}{\text{length}}$

$\pi r^2 = \frac{0.0376}{0.5}$

$\Rightarrow r = 10^{-3} (25066)^{1/2}$ ——— (01)

$= \ldots$

ii) $(V_{350})_{glass} = 2\{1 + 3\times4 \times 10^{-6} \times 350\}$

$= 2.0084\ cm^3$ ——— (01)

$(V_{350})_{Hg} = 2\{1 + 2\times10^{-4} \times 350\}$

$= 2.14\ cm^3$ ——— (01)

Volume of Hg risen $= 2.14 - 2.0084$

$= 0.1316\ cm^3$ ——— (01)

∴ the volume of glass bubble (minimum) $= 0.1316 - 0.0376$

$= 0.094\ cm^3$

OR $9.4 \times 10^{-8}\ m^3$ ——— (01)

28 a) Definition of Doppler effect ——— (02)

b) * When the observer is moving, the velocity of the wave relative to the observer ($V_{w,o}$) would change and hence/as a result of this the frequency felt by the observer would change. ——— (01)

* When the source is moving, the wavelength (λ) of the wave reaching the observer would change and hence/as a result of this the frequency felt by the observer would change. ——— (01)

c) i) $f' = \left(\frac{V - V_o}{V - V_s}\right) f_o$ ——— (02)

ii) $f' = \left(\frac{320 - 25}{320 - 40}\right) \times 100$ ——— (01)

$= 105.36$ Hz ——— (01)

d) i) $V_{s.E} = 320 + 30 = 350\ ms^{-1}$ ——— (01)

ii) $f' = \left(\frac{350 - 25}{350 + 40}\right) \times 100$ ——— (01)

$= \frac{3250}{31}$

$= (104\ Hz \longrightarrow 105\ Hz)$ ——— (01)

iii) $f'' = \frac{(V + V_o)}{(V - V_s)} \times f'$

$= \frac{[(320 - 30) + 40]}{[(320 - 30) - 25]} \times f'$ ——— (01)

$= \frac{330}{315} \times \frac{3250}{31}$

$= 110 \sim 109$ Hz ——— (01)

$\therefore f_{beats} = f'' - f_o$

$= 109 - 100$

$= 9\ Hz \sim 10 Hz$. ——— (01)

e i) $f = \left(\frac{c}{c - v}\right) f_o$ ——— (01)

$$\text{Final Marks} = \frac{4 \times \text{Paper I} + \text{Paper II A} + \text{Paper II B}}{2}$$

(100, 40, 60)