G.C.E. A/L Examination July - 2016

FWC

Conducted by Field Work Centre, Thondaimanaru

In Collaboration with

Zonal Department of Education Jaffna.

Grade :- 12 (2017)	Marking Scheme	PHYSICS

PART - I

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

(4 × 25 = 100)

PART - II (A)

a) 1 – Rotating scale 2 - Anvil 3 – Spindle 4 - Lock
5 - Sleeve 6 - Thimble 7 - Ratchet head 8 - Main scale
...(4)

b) $\frac{0.5mm}{50} = 0.01mm$ .....(1)

c) When touch the anvil and spindle observe the zero reading of circular scale coincide with the reference line of main scale.....(2)

d) Negative Zero Error .....(1)
Zero Error = 2 × 0.01mm = 0.02mm.....(1)

e) Average Diameter = $\frac{15.51+15.49+15.51}{3}$ mm = 15.50 mm .....(1)

f) Vernier Caliper, Reading Percentage Error using Meter ruler greater than 1% but Reading Percentage Error using Vernier Caliper less than 1% .....(1+1)

g) 163.7g .....(1)

h) Density = $\frac{163.7}{8.50\times\frac{22}{7}\times0.775^2}$ = 10.202gcm^{-3} = 10202kgm^{-3} .....(2)

Total Marks - 15

a) (i) place the cube on an inclined plane with variable inclination and gradually increase its inclination until the block is about to slide .....(2)

(ii) Instance : When the block is about to slide .....(1)

Reading(x) : The angle made by the inclined plane with the horizontal .....(1)

(iii) $\mu = \tan x$ .....(1)

(iv) l_1= vertical height of the inclined plane

l_2= horizontal length of the inclined plane ..... (1)

(v) $\mu = l_1/l_2$ (or in case l_1 and l_2 are exchanged, $\mu = l_2/l_1$) .....(1)

b) (i) Relative to spring balance :Spring balance should be kept horizontally .....

Relative to block : When repeating the experiment the block should be kept

same place of the plane .....(1)

(ii) $\mu = \frac{P}{(M+m)g}$ .....(1)

(iii) $P = (\mu g)m + \mu Mg$ ..... (1)

$Y = m \quad x + c$

(iv) $\mu g = 4$

$\mu = 4/10 = 0.4$ .....(1)

$\mu Mg/\mu g = 2/4$

$M = 0.5kg$ .....(1)

(v) The method stated in section(b) .....(1)

In this method, μ is obtained using graphical method hence the value obtained

μ would be more accurate .....(1)

Total Marks - 15

3.

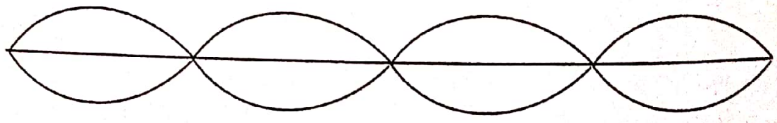
a) (i) Stationary wave, If incident wave and reflected wave superpose the stationary wave form .....(1+1)

(ii)1.28m .....(1)

(iii) 1500Hz .....(1)

(iv) $v = f\lambda = 1500 \times 1.28 = 1920 ms^{-1}$ .....(1)

b) (i)



.....(2)

(ii) $v = f\lambda = 3000 \times 0.64 = 9620 ms^{-1}$ ..... (1)

(iii) Tension of string , Unit mass of string .....(2)

c) (i) Resonance .....(1)

(ii) Large amplitude at specific frequency due to matching with driving frequency .....(2)

(iii) $\lambda = 2.75 \times 4 = 11cm$, $v = f\lambda = 3000 \times 0.11 = 330 ms^{-1}$ .....(1+1)

Total Marks - 15

(i) Draw the outline of the prism

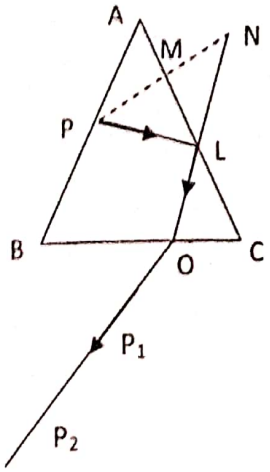
Move eye from C to B While looking through face BC until the image of pin P blurred suddenly

Fix P_1 and P_2 to mark this critical position / Pins P_1 and P_2 are fixed such a way to lie on a straight line with the image of P .....(3)

(ii) Pins P_1 and P_2 are fixed closer to each other .....(1)

(iii) In order to avoid refraction on AB /Avoid the deviation in path due to refraction on AB ..(1)

(iv)



For the ray with necessary construction

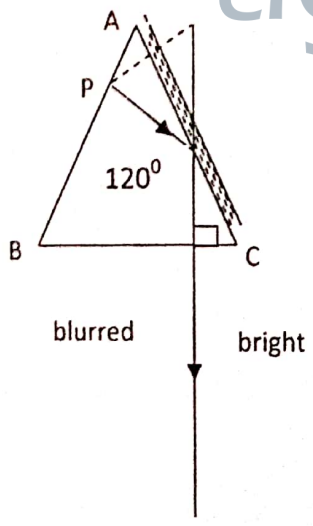
Construction should include PN drawn normal to AC such that PM = MN N and O joined

.....(3)

(v) $C = 41^0$ .....(1)

$n = 1/\sin c = 1/\sin 41^0 = 1.52$ .....(1)

(vi)



blurred bright

.....(2)

(vii) denoting the two region .....(1)

(viii) Critical angle for glass – liquid interface is $C^l = 60^0$ .....(1)

For glass –liquid interface , $n_g \sin 60^0 = n_l \sin 90^0$

$n_l = 1.52 \times \sin 60^0 = 1.32$ .....(1)

Total Marks - 15

5.

a) (i) The reaction acting on ski man is always normal to his direction of motion at all positions in his path .....(1)

(ii) $\frac{1}{2}mv^2 + mgh_2 = mgh_1$ .....(1)

$V^2 = 2(h_1 - h_2)g$

$= 2(8.2 - 5) \times 10$

$= 64$

$V = 8ms^{-1}$ .....(1)

(iii) ↓ $S = ut + \frac{1}{2}gt^2$

$5 = 0 + \frac{1}{2} \times 10 \times t^2$

$t = 1s$ .....(1)

→ $S = ut$

$= 8 \times 1 = 8m$ .....(1)

b) (i) $\frac{1}{2}mv^2 = mg \times 8.2$ .....(1)

$v^2 = 164$

$v = 12.85ms^{-1}$ .....(1)

(ii) $R_x - mg = m\,v^2/r$ .....(1)

$R_x = mg + m\,v^2/r$

$= m\,(10 + 164/4)$

$= 40 \times 51 = 2040N$ .....(1)

(iii) $g = v^2/r$

$r = v^2/g = 8^2/10 = 6.4m$ .....(1)

$\omega = v/r = 8/6.4 = 1.25\ rads^{-1}$ .....(1)

(iv) By reducing his moment of inertia by pulling his hands and legs closer to his body....(1)

c) (i) $\alpha = 12/4 = 3 rads^{-2}$ .....(1)

(ii) $\tau = I\alpha = 2 \times 10^{-6} \times 3 = 6 \times 10^{-6}$ Nm .....(1)

(iii) $4F \times 4 \times 10^{-2} = 6 \times 10^{-6}$ .....(1)

$F = 3.75 \times 10^{-4}$ N .....(1)

(iv) $F = \Delta mv/t = Av\rho \times v/l$

$F = Av^2\rho$

$v^2 = F/A\rho = 3.75 \times 10^{-5}/5 \times 10^{-6} \times 1000$ .....(1)

$v^2 = 0.75 \times 10^{-2}$

$v = 8.66 \times 10^{-2} ms^{-1}$ .....(1)

(v) $P = \tau\omega = 6 \times 10^{-6} \times 12 = 72 \times 10^{-6}$ W .....(1)

(vi) It is because, the torque due to the water pressure is equal and opposite to the torque due to friction and air resistance .....(1)

Total Marks - 20

6.

a) $\lambda = c/f$ .....(1)

b) (i) $f^1 = \left(\frac{c+v_0}{c}\right) f_0$ .....(2)

(ii) $f^{11} = \left(\frac{c-v_0}{c}\right) f_0$ .....(2)

c) (i) $\Delta\lambda = \frac{v_s}{f}$ .....(1)

$\lambda^1 = \lambda - \Delta\lambda = \frac{c}{f} - \frac{v_s}{f} = \frac{c-v_s}{f}$ .....(2)

$\lambda^{11} = \lambda + \Delta\lambda = \frac{c}{f} + \frac{v_s}{f} = \frac{c+v_s}{f}$ .....(2)

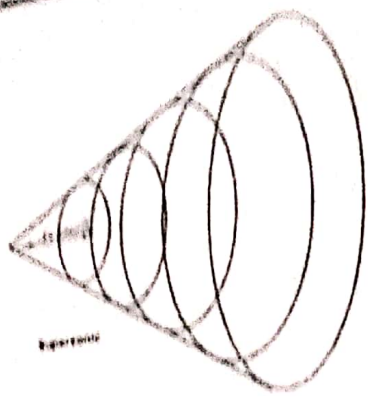
(ii) Observer A, $f_A = \frac{c}{\lambda^1} = \frac{cf}{c-v_s}$ .....(1)

Observer B, $f_B = \frac{c}{\lambda^{11}} = \frac{cf}{c+v_s}$ .....(1)

d) (i) $f_1 = \frac{cf}{c-v_s} = \frac{330 \times 320}{330-10} = 330Hz$ .....(2)

(ii) $f_2 = \left(\frac{c+v_0}{c}\right) f_1 = \frac{(330+10)}{330} \times 330 = 340Hz$ .....(2)

e) (i)



.....(2)

(ii) $\sin\theta = c/v_s$

$\theta = \sin^{-1}(\frac{c}{v_s})$ where θ = angle of mach cone .....(1)

(iii) mach No. = v_s/c

$V_s = 1.5 \times 330 = 495 ms^{-1}$ .....(1)

Total Marks - 2

7.

a) $M = \frac{\text{Angle subtend at the eye by the final image at the near plont}}{\text{Angle subtend at the unaided eye by the object at the least distance of distinct vision}}$

.....(2)

b) Focal length of objective Lens = 0.8cm .....(1)

To view a brighter final image /object could be placed near to the objective / To reduce the length of the instrument (any one) .....(1)

c) (i) virtual, Inverted, Magnified (any two) .....(1)

(ii) To increase the angular magnification / To view a detailed final image .....(1)
(any other appropriate answer)

(iii) Applying lens equation $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

For the objective $\frac{1}{v} - \frac{1}{+1} = \frac{1}{-0.8}$ (with any correct sign convention) .....(1)

V = - 4cm .....(1)

For the eye piece $\frac{1}{+25} - \frac{1}{u} = \frac{1}{-5}$ .....(1)

$\frac{1}{u} = \frac{1}{5} + \frac{1}{25} = \frac{6}{25}$

u = 4.17cm .....(1)

Distance of the image formed by the objective

= 4cm from the objective

= 4.17cm from the eye piece

(iv) α = *Angle subtend at the unaided eye by the object at the least distance of distinct vision*

β = *Angle subtend at the eye by the final image at the near piont*

$\tan\alpha = \frac{h_0}{D}$ $\tan\beta = \frac{h_2}{D}$ α,β very much small

$\alpha = \frac{h_0}{D}$ $\beta = \frac{h_2}{D}$ .....(1+1)

$$M = \frac{\beta}{\alpha} = \frac{h_2/D}{h_0/D} = \frac{h_2}{h_0} = \frac{h_2}{h_1} \times \frac{h_1}{h_0} = \frac{25}{25/6} \times \frac{4}{1} = 6 \times 4 = 24 \text{ .....(1)}$$

(v)

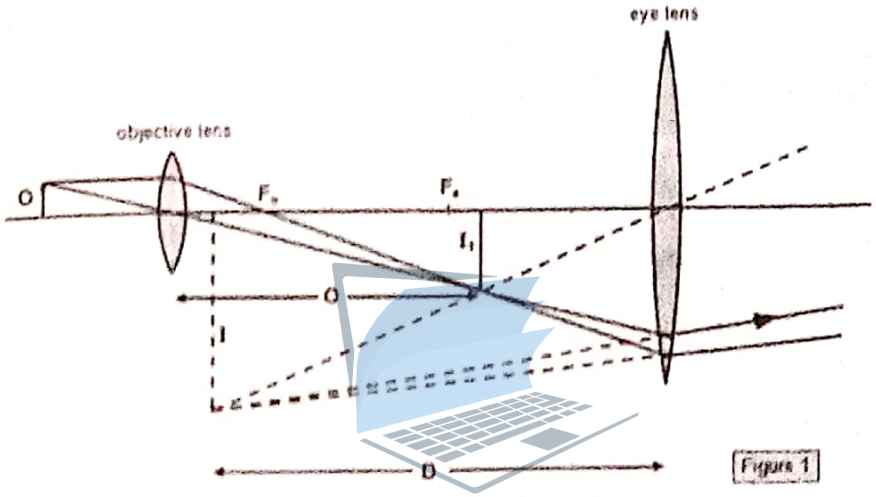


Figure 1

.....(4)

(vi) Substituting V=+30cm, f=-5cm in the lens equation $\frac{1}{+30} - \frac{1}{u^1} = \frac{1}{-5}$ .....(1)

$$u^1 = \frac{30}{7}cm = 4.29cm\text{.....(1)}$$

Distance by which eye-piece should be moved =4.29 – 4.17 = 0.12cm away from the objective lens .....(1)

Total Marks - 20

8. (i) (a) $V_\theta = V_0(1+3\alpha\theta)$ ——— (01)

$V_{100_{GLASS}} = 1\left(1+3\times3\times10^{-6}\times100\right)$ ——— (01)

$= 1.0009cm^3 \left(or 1.0009\times10^{-6}m^3\right)$ ——— (01)

(b) $V_{100_{Hg}} = 1\left(1+20\times10^{-5}\times100\right)$ ——— (01)

$= 1.02\ cm^3$ ——— (01)

Increase in volume of mercury = 1.02 - 1.0

= 0.02 cm³ ——— (01)

or

{Increase in volume $= 1\times20\times10^{-5}\times100$

$= 0.02cm^3$

(c) Rise of mercury volume in the capillary tube

= 1.02 - 1.0009 = 0.019 cm³ ——— (02)

(d) Cross - sectional area of the capillary = rise of mercury volume / length

= 0.019/25 ——— (01)

= 0.00076 cm² ——— (01)

(7.6 x 10⁻¹⁰ m³)

(ii) Rise of mercury volume at 3000C

= 3 x (answer in part (i) (c))

= 3 x 0.019 = 0.057 cm³ ——— (02)

Volume of the cavity = 0.057 - 0.019

= 0.038 cm³

(3.8 x 10⁻⁶ m³) ——— (02)

or

$V_{300_{GLASS}} = 1\left(1+3\times3\times10^{-6}\times300\right) = 1.0027cm^3$

$V_{300_{Hg}} = 1\left(1+20\times10^{-5}\times300\right) = 1.06cm^3$

The rise in mercury volume = 1.06 - 1.0027

= 0.057 cm³

Volume of the cavity = 0.057 - 0.019

= 0.038 cm³

(3.8 x 10⁻⁶ m³)

(iii) Correct temperature $= \frac{(99.8-(-0.3))}{100}\times40-0.3$ ——— (02)

= 40.04 - 0.3

= 39.74° C ——— (01)

(iv) Large expansivity
Uniform expansion
Opaque
Do not wet glass / large angle of contact
Higher boiling point
Lower vapour pressure
High thermal conductivity ——— (03)

Total Marks - 20