G.C.E A/L Examination March - 2019

Fied Work Centre

FWC

Grade - 13 (2019) **Physics** **Marking Scheme**

Part I

1)	3	11)	3	21)	1	31)	1	41)	4
2)	1	12)	2	22)	1	32)	3	42)	3
3)	1	13)	4	23)	2	33)	3	43)	2
4)	1	14)	5	24)	5	34)	4	44)	2
5)	1	15)	4	25)	4	35)	3	45)	2
6)	3	16)	1	26)	3	36)	2	46)	1
7)	5	17)	4	27)	3	37)	1	47)	1
8)	5	18)	1	28)	2	38)	2	48)	1
9)	5	19)	2	29)	3	39)	3	49)	5
10)	5	20)	5	30)	2	40)	2	50)	2

(50 × 1 = 50)

Part II

1) a) i) Stable and vertical, Tested with the help of plumb line — (1)

ii) Effective weight may not become different due to reaction of board — (1)

b) i) 1. with the help of ruler draw lines through P_1 and P_2, through Q_1 and Q_2 through S_1 and S_2

2) Taking a scale 3) Complete parallelogram OABC and join OC

4) measure OC — (2)

ii) weights are at rest — (1) iii) parallax error — (1)

iv) a) pulleys may have friction

2) Thread may have weight — (1) v) 210 g — (1)

vi) position O - move upward; AÔB - Increases, length OC - decreases — (2)

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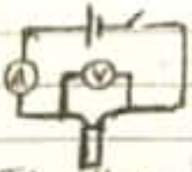
2) a)  — (2)

b) i) Balance or measuring cylinder

ii) Stop watch — (1)

c) To allow heater to reach temperature of the ice — (1)

d) i) 0°C — (1) ii) $mL = IVt$

$$L = \frac{IVt}{m} = \frac{1.6 \times 62.5 \times 2 \times 60}{(247.9 - 212.1) \times 10^{-3}} = 3.75 \times 10^5 \text{ J kg}^{-1}$$

iii) All melted ice by heat from heater is collected in beaker — (1) — (1)

e) mass of ice melted by room temperature is overlooked in calculation — (1)

f) Thermometer — (1)

g) decrease, part of the heat will use raising of temperature of ice — (1)

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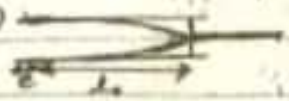
3) a)  — (1)

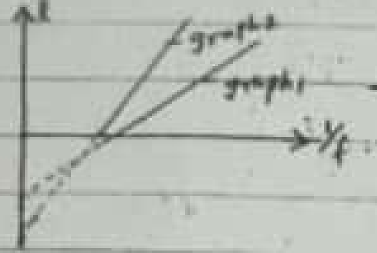
b) A, High frequency tuning fork have minimum fundamental resonance length.

and also when piston pull to continue, may get fundamental resonance length for other turning fork ——— (1)

c) To detect the fundamental note without missing. ——— (1)

d) 1) Tube do not move , 2) measuring scale is fixed. ——— (1)

e) $l = (V/4) \frac{1}{f} - e$ ——— (1)
$y = m x + c$

f)


——— (2)

g) $\frac{V}{4} = \frac{(31.5 - 22.75)\times10^{-2}}{(3.5 - 2.5)\times10^{-1}} = 350\,ms^{-1}$ ——— (1)

h) In graph ——— (1)

i) $350 \propto \sqrt{300}$
$V \propto \sqrt{309}$
$V = 355.2\,ms^{-1}$ ——— (1)

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4) a) $R = \rho l/A$ ——— (1)

b)

——— (2)

c) 1.68V ——— (1)

d) brightness decreases as length increases ——— (1)

e) No, V/I not constant ——— (1)

f) heating changes resistance of wire. ——— (1)

g) do not touch wire. ——— (1)

h) Increase, when a increases R decreases so voltmeter reading increases ——— (1)

i) low resistivity ——— (1)

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5) a) i) $v^2 = u^2 + 2as$
$12^2 = 30^2 - 2\times9\times s$
$s = 42m$ ——— (1)

ii) Greater than, If mass increases, deceleration decrease so velocity increase. ——— (1)

b) i) $P = mg\sin30 + F$
$F = 900 - 150\times10\times\frac{1}{2} = 150N$ ——— (1)

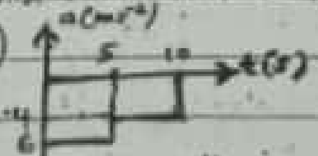
——— (1)

ii) I) Car decelerate upward along the slope until it reach zero velocity ——— (1)

II) $F = ma$
$-900 = 150\times a$
$a = -6\,ms^{-2}$ ——— (1)

III) $a = 30/t$
$t = 30/6 = 5s$ ——— (1)

IV) Acceleration $= \frac{20}{10-t} = \frac{20}{5} = 4\,ms^{-2}$ ——— (1)

V)


——— (1)

VI) changes the direction of friction force ——— (1)

c) i) $\omega = \omega_0 + \alpha t$
$= 0 + 7\times4 = 28\,rads^{-1}$ ——— (1)

ii) $E = \frac{1}{2}I\omega^2$
$588 = \frac{1}{2}\times I\times28^2$
$I = 1.5\,kgm^2$ ——— (1)

iii) $\omega^2 = \omega_0^2 + 2\alpha\theta$
$0^2 = 28^2 + 2\times\alpha\times\frac{14\times2\times22}{7}$
$\alpha = -4.45\,rads^{-2}$ ——— (1)

$\tau = I\alpha$ ——— (1)
$= 1.5\times(-4.45)$
$= -6.675\,Nm$ ——— (1)

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6. a) Spontaneous Emission ——— (1)

b) Give long life time to atoms ——— (1)

c) population inversion more efficient ——— (1)

d) laser medium, pumping device, population inversion. ——— (2)

e) Travelling Straights line.
Same phase.
Monochromatic. ——— (2)

f) Resonator ——— (1)

g) $E = hc/\lambda$ ——— (1)

$\lambda = hc/E = \frac{6.6\times10^{-34}\times3\times10^{8}}{2\times1.6\times10^{-19}} = 618.75\,nm$ ——— (1)

h) Intensity $= \frac{4\times10^{-2}}{1\times10^{-7}\times4\pi\times(1.5\times10^{5})^2}$ ——— (1)

$= 5.66\times10^{15}\,Wm^{-2}$ ——— (1)

i) $n_1\lambda_1 = n_2\lambda_2$ ——— (1) $m = \frac{30\times10^{-2}}{100/3\times10^{-9}\times2} = 4.5\times10^{5}$ ——— (1)

$1.8\lambda_{600} = 1.8\times\lambda_2$

$\lambda_2 = 100/3\,nm$ ——— (1)

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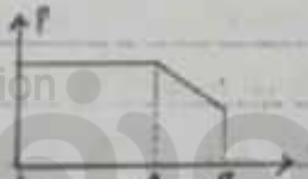
7. a) i) $\Delta p = \frac{8\eta L}{\pi r^4}Q$ ——— (1) ii) 

——— (1)

iii) using above equation

$P_A - P_B = \frac{8\times2\times10^{-3}\times2\times10^{-2}\times10^{-1}}{3\times(0.02\times10^{-2})^4\times10} = 6.36\times10^{7}\,Nm^{-2}$ ——— (1)

iv) Rate of flow no change, therefore pressure difference across AB is same in the two situation. (x - Atmosphere pressure)

$\therefore P_B - P_C = P_A' -$ blood pressure. (P_A' - new pressure at A)

$P_A' - P_A =$ blood pressure $- x$. ($\because P_B = x$) ——— (1)

$= 100\,mmHg = 100\times10^{-3}\times13.6\times10^{3}\times10 = 1.36\times10^{4}\,Nm^{-2}$

Apply Additional force $= (P_A' - P_A)\times0.75\times10^{-4} = 1.36\times10^{4}\times0.75\times10^{-4} = 1.02\,N$ ——— (1)

v) $Q = AV = \pi r^2 V$ ——— (1)

$\frac{7\times10^{-5}}{10} = 3(0.02\times10^{-2})^2 V$ $\qquad P = fv$

$V = 0.87\,ms^{-1}$ ——— (1) $\qquad = 1.02\times0.83 = 0.85\,W$ ——— (1)

8. b) i) $\Delta p = \frac{8\times2\times10^{-3}\times2\times10^{-2}}{3\times(2\times10^{-4})^4}\times1.15\times10^{-7} = 1\times10^{4}\,Nm^{-2}$ ——— (1)

$h\rho g = \Delta P$

$h = \frac{\Delta P}{\rho g} = \frac{1\times10^{4}}{1.15\times10^{3}\times10} = 0.8\,m$ ——— (1)

ii) Shortening height $= h'$

$h'\rho g = 3\times10^{3}$

$h' = 3\times10^{3}/1.25\times10^{4} = 0.24\,m$ ——— (1)

iii) If change of rate of flow is ΔQ, similar change of height Δh

$\Delta h \rho g = \frac{8 \times [illegible] \times 10^{-3} \times [illegible] \times 10^{-1}}{\pi \times (2 \times 10^{-3})^4} \times \Delta Q$ ——— (1)

$\Delta Q = \frac{\pi}{8} \times 10^{-11} \times 0.2 \times 1.25 \times 10^{3} \times 10 = 9.75 \times 10^{-8} m^3 s^{-1}$ ——— (1)

iv) Maximum rate of flow $= 1.5 \times 10^{-7} m^3 s^{-1}$

Minimum rate of flow $= (1.5 - 0.975) \times 10^{-7} m^3 s^{-1} = 1.125 \times 10^{-7} m^3 s^{-1}$

Average rate of flow $= (\frac{1.5 + 1.125}{2}) \times 10^{-7} = 1.3125 \times 10^{-7} m^3 s^{-1}$ ——— (1)

v) $t = \frac{5.25 \times 10^{-3}}{1.3125 \times 10^{-7}} = 40000 s$ ——— (1)

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8) a) i) $C = \frac{\varepsilon_0 A}{d}$ ——— (1)

$= \frac{9 \times 10^{-12} \times 1.5 \times 10^{-2}}{2 \times 10^{-3}} = 67.5 pF$ ——— (1)

ii) $Q = CV$ ——— (1)

$= 67.5 \times 10^{-12} \times 2.5 \times 10^{3} = 168.75 nC$ ——— (1)

iii) $E = \frac{1}{2} QV$ ——— (1)

$= \frac{1}{2} \times 168.75 \times 10^{-9} \times 2.5 \times 10^{3} = 210.94 \times 10^{-6} J$ ——— (1)

iv) $E = QV = 2 \times 210.94 \times 10^{-6} = 421.88 \times 10^{-6} J$ ——— (1)

v) Half of the energy delivered by source dissipate as heat energy in the circuit ——— (1)

vi) Increase, If plates are closely capacitance increases so charge increases ——— (1)

vii) $E = V/d$ ——— (1)

$d = V/E = \frac{2.5 \times 10^{3}}{3 \times 10^{6}} = 0.833 mm$ ——— (1)

b) i) $I = E/R = \frac{12}{1.4 \times 10^{3}} = 8.6 mA$ ——— (1)

ii) $\Delta E = \frac{1}{2} C V_1^2 - \frac{1}{2} C V_2^2 = \frac{1}{2} C (V_1^2 - V_2^2)$ ——— (1)

$= \frac{1}{2} \times 67.5 \times 10^{-12} (12^2 - 4^2) = 4.32 \times 10^{-9} J$ ——— (1)

iii) $\Delta E' = 6 \Delta E = 6 \times 4.32 \times 10^{-9} = 2.592 \times 10^{-8} J$ ——— (1)

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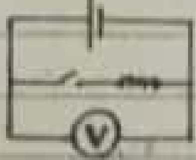
9 A) a) i) The E.m.f of a source of electrical energy converted in to electrical energy per unit charge supplied. potential difference is the energy changed from electrical energy to other forms of energy per unit charge ——— (1)

ii)



——— (2)

iii) Emf - Switch should be opened; PD - Switch should be closed. ——— (1)

iv) $V = E - Ir$ ——— (1)

b) i) If $R = 0$; $P = 0$

$R = r/2$; $P = \frac{2E^2}{9r}$

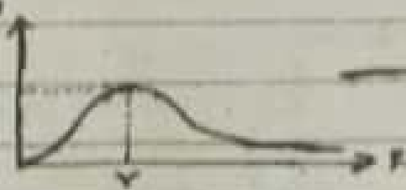
$R = r$; $P = \frac{E^2}{4r}$

$R = 3r/2$; $P = \frac{6E^2}{25}$

$R = \infty$; $P = 0$

——— (2)

ii)



——— (1)

c) i) At fig(a), Resultant Emf 12V therefor It may use
At fig(b), Resultant Emf 6V therefore It may use
At fig(c), Resultant Emf 2V therefore It can not use — (1)

ii) At fig(a), Resultant Emf 12V, resultant external resistance 3Ω
needed potential difference across bulb = 3V.

$V = E - Ir$

$3 = 12 - I \times 3$

$I = 3A$ — (1)

Current passing through one bulb = $\frac{0.5}{3} = \frac{1}{6} A$

Number of bulb connect parallel = $3 \div \frac{1}{6} = 18$ — (1)

At fig(b), Resultant Emf 6V, resultant internal resistance $\frac{3}{4}\Omega$
needed potential difference across bulb = 3V

$V = E - Ir$

$3 = 6 - I \times \frac{3}{4}$

$I = 4A$ — (1)

Current passing through one bulb = $\frac{0.5}{\frac{1}{4}} = \frac{1}{8} A$

Number of bulb connect parallel = $4 \div \frac{1}{8} = 32$ — (1)

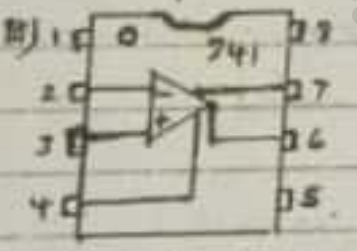
iii) fig(a), Long life use or fig(b), more bulb lit at the recommended rating — (1)

iv) At long time period, cell is discharge therefor current decrease — (1) /15

9 B) a) i) Input Impedance High, output Impedance Low, Voltage gain high — (1)

ii) Voltage difference between the inputs zero.
The inputs draw no current — (1)

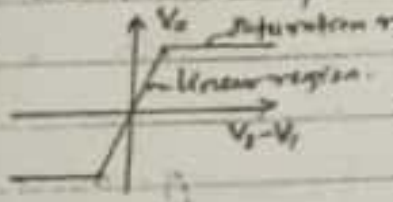
iii)



2 - V_2 7 - $+V_s$
3 - V_1 4 - $-V_s$ — (1)
6 - V_o

iv) circuit is already assembled. circuit is much smaller, Circuit is well protected — (1)

v)



— (1) $A = \frac{V_o}{V_2 - V_1}$ — (1)

b) i) 5kΩ, If choose 50Ω, Bulb will lit day and night — (1)

ii) If Resistance of LDR is 5kΩ at night. Non-Inverting input voltage is +6V, so V_o is +6V current is passing through bulb. If Resistance of LDR is 50Ω at day Non-Inverting input voltage is 0V so V_o is 0V current does not passing through bulb. — (1).

c) i) $10 = 0.7 + 100 \times 10^{-6} \times R_B + 0.7$

$R_B = 86 kΩ$ — (1)

ii) $I_C = 100 \times 100 \times 10^{-6} = 10mA$ — (1)

iii) $V_C = 10 - 1 \times 10^3 \times 10 \times 10^{-3} = 0$ — (1)

iv) 1) Potential difference across the diode = 0V. — (1) 2) $V_C = 10V$ — (1)

d) i) Input Logic levels when day : S = 0 ; R = 0, Input logic levels when night S = 1 ; R = 0 — (1)

ii) Alarm Sounds Continuously since it does not [illegible] a reset signal to reset the alarm — (1)
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10- a) i) A → B - Adiabatic process ; B → C - Constant volume process
C → D - Adiabatic process , D → A - Constant volume process. } —— (1)

ii) ΔQ = ΔU + ΔW , ΔQ - Absorbed/Supplied heat energy, ΔU - Change of internal energy, ΔW - work done —— (1)

iii) At process A → B , ΔU = 12600 J , ΔQ = 0 J

ΔQ = ΔU + ΔW
0 = 12600 + ΔW
ΔW = -12600 J
cell (5) = -12600 J —— (1)

At process B → C ΔV = 0 ; so ΔW = 0
ΔQ = ΔU + ΔW
ΔQ = -12600 + 0   cell (6) = 0 J
ΔQ = -12600 J   cell (3) = -12600 J } —— (1)

- At process B → C ΔQ = nC_v ΔT
-12600 = 5 C_v (360 - 720) —— ①
At process D → A ΔQ = 5 C_v (400 - 100) —— ②
①/② ⇒ 12600/ΔQ = 360/300
ΔQ = 10500 J —— (1)

∵ P_B/T_B = P_C/T_C
3×10^5/720 = 1.5×10^5/T_C ⇒ T_C = 360 K
1×10^5/T_D = 4×10^5/400 ⇒ T_D = 100 K

∴ D → A, ΔV = 0 so ΔW = 0
ΔQ = ΔU + ΔW
10500 = ΔU + 0
ΔU = 10500 J

cell (4) = 10500 J
cell (2) = 10500 J
cell (8) = 0 J } —— (1)

ΔU)_ABCDA = 12600 - 12600 + cell (1) + 10500 = 0 ⇒ cell (1) = -9900 J —— (1)
At process C → D ΔQ = ΔU + ΔW ⇒ 0 = -9900 + ΔW ⇒ ΔW = 9900 J , cell (7) = 9900 J —— (1)

iv) ① ⇒ -12600 = 5 C_v (-360) ⇒ C_v = 7 J mol⁻¹ K⁻¹ —— (1)

v) H = m s_w (30 - 0) + mL + m s_i (0 - (-20))
= 30 × 4200 × 30 + 30 × 3×10^5 + 30 × 2100 × 20 = 1.404×10^7 J
Number of cycle = 1.404×10^7 / 10500 = 1337 —— (1)

vi) H/t = 1.404×10^7 / (60×60) = 3.9×10^3 W
Heat enter through wall } —— (1)

b) i) choose high thickness wall
choose low thermal conductivity for wall } —— (1)

ii) dQ/dt = ms dθ/dt
= 30 × 2100 × 2.3×10⁻⁴ = 14.49 J s⁻¹ —— (1)

iii) dQ/dt = mL/t
30 × 3×10^5 / t = 14.49
t = 6.21×10^5 s —— (1)

iv) dQ/dt = KA (θ₁ - θ₂)/x
14.49 = 0.05 × 2.3 × (θ₁ - 0)/(10×10⁻²)
θ₁ = 12.6 °C —— (1)

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Part I = 50
Part II = 100
Total = Part I + Part II/2
= 50 + 100/2
= 100

எங்கள் குறிக்கோள்

எண்ணிம உலகத்தில் மாணவர்களிற்கென சிறந்ததொரு கற்றல் கட்டமைப்பை உருவாக்குதல்.

அனைத்தும் டிஜிட்டல் மயப்படுத்தப்பட்ட இந்த காலத்தில் பல்வேறு துறைகளும் கால ஓட்டத்துடன் இணைந்து டிஜிட்டல் தளத்தில் பல்கிப்பெருகி வருகின்றன. அந்த வகையில் கல்வித்துறையும் இதற்கு விதிவிலக்கல்ல. இணையவழி கல்வியின் மூலம் கலவித்துறை புதியதொரு பரிமாணத்தை எட்டியுள்ளது. குறிப்பாக கொரோனா பேரிடர் காலத்தில் நாடே முடக்கப்பட்டிருந்தது. இதனால் மாணவர்களிற்கும் பாடசாலை, கல்வி நிறுவனங்களிற்கு இடையிலான தொடர்பு துண்டிக்கப்பட்டது. அந்த இக்கட்டான சூழ்நிலையில் இணையவழி வகுப்புகள் மாணவர்களிற்கு வரப்பிரசாதமாக அமைந்தது என்பதே உண்மை.

இன்று தொழில்நுட்பம் மாணவர்களை தவறான பாதைக்கு இட்டு செல்வதாக ஓர் எண்ண ஓட்டம் மக்கள் மத்தியில் உள்ளது. தொழில்நுட்பம் என்பது ஒரு கருவி மட்டுமே அதை எவ்வாறு பயன்படுத்துகிறோம் என்பதில் அதன் ஆக்க மற்றும் அழிவு விளைவுகள் தீர்மானிக்கப்படுகிறது. உளியை கொண்டு சிலையை செதுக்க நினைத்தால் அவன் நிச்சயம் சிற்பி ஆகலாம். இங்கு பிரச்சினையாக காணப்படுவது மாணவர்களை வழிப்படுத்த தொழில்நுட்ப உலகில் ஓர் முறையான கட்டமைப்பு இல்லாமையே. அதை உருவாக்குவதே எங்கள் நோக்கம். அதை நோக்கியே எங்கள் பயணம் அமையும்.

எமது இணையத்தினூடக ஊடாக உங்களிற்கு தேவையான பரீட்சை வினாத்தாள்களை இலகுவான முறையில் தரவிறக்கம் செய்து கொள்ளமுடியும்.

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கல்வி சார் செய்திகளை உடனுக்குடன் அறிந்து கொள்ள எமது சமூக ஊடக தளங்களின் ஊடாக உடனுக்குடன் அறிந்து கொள்ள முடியும்.

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