



G.C.E A/L Examination November - 2018

Field Work Centre

Grade - 13 (2019)

PHYSICS

Marking Scheme

PART - I

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

TOTAL = 50 x 1 MARK
= 50 MARKS.

PART-II A (STRUCTURED ESSAY)

- 01) A. 0.01 mm _____ (01)
- B. - 0.03 mm _____ (01)
- C. 1) 1.81 mm _____ (01)
- 2) $x = 1.84$ mm _____ (01)
- D. 1) Metre scale, Vernier Caliper. _____ (01)
- 2) By using the three legs, obtain the average distance between the legs by measuring the 3 distances between the tips of the legs.

OR

By using internal and external jaws of a Vernier caliper the distance between each pair of legs must be measured and mean distance between the legs must be obtained. _____ (01)

E, $R = \frac{x}{2} + \frac{y^2}{6x}$

$= \frac{0.184}{2} + \frac{3^2}{6 \times 0.184}$ For substitution (01)

$= 8.244$ cm. _____ (01)

- F. Length : Metre scale
 Breadth : Vernier caliper
 Mass : Triple beam balance
 Thickness : Micrometer screw gauge.

01

01

TOTAL
10
MARKS

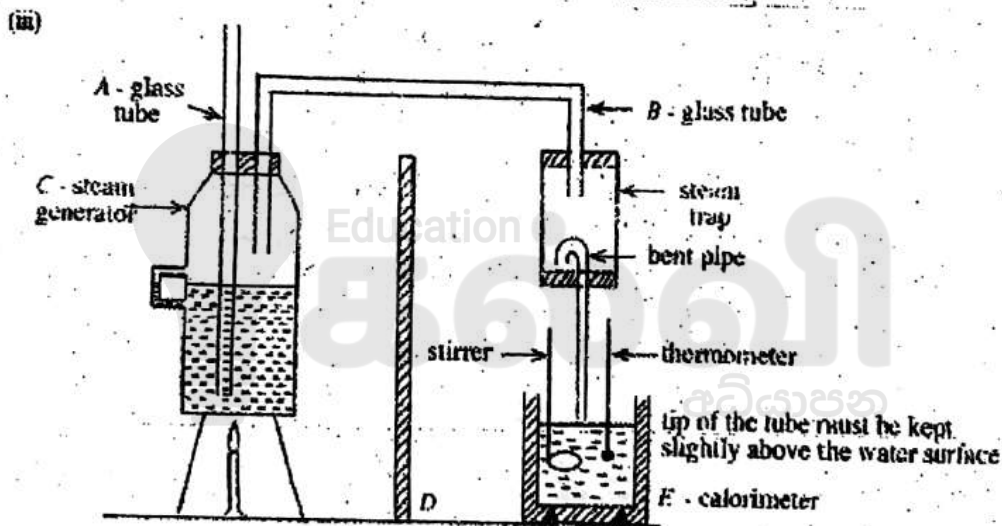
02) (a) (i) Heated water can splash out from the tube A. _____

01

(ii) To prevent building up of pressure inside the steam generator,
 To maintain the pressure inside the steam generator at atmospheric pressure. _____

01

(iii) _____



(1 mark)

(b) Asbestos sheet / Insulation sheet

To minimise the flow of heat (by radiation) from Bunsen burner to the calorimeter. _____

01

(c) Begin the experiment by reducing the temperature of water 4 or 5°C below ambient temperature and continue to send steam until its temperature is 4 or 5°C above the ambient temperature. _____

01

(d) (i) 1. Mass of empty calorimeter + stirrer . . . = m_1

2. Mass of empty calorimeter + stirrer + water = m_2

3. Initial temperature of water . . . = θ_1 °C

4. Final highest temperature of the system . . . = θ_2 °C

5. Mass of empty calorimeter + stirrer + water + steam . . = m_3

(Award 2 marks if all five or the first four are correct 1 mark if first three are correct)

02

$$(iv) m_1 c (\theta_2 - \theta_1) + (m_2 - m_1) c_w (\theta_2 - \theta_1) = (m_3 - m_2) L + (m_3 - m_2) c_w (100 - \theta_2)$$

[1 mark for each side of the equation] _____ (02)

(e) Since the Latent heat of vaporization of water is high, the mass of water collected will be small. Hence, the fractional error or percentage error will be large. _____ (01)

TOTAL
10
MARKS

Q3 (a) (i) Press the stem of the tuning fork vertically on the sonometer box, in between the bridges.

The energy transfer is maximum when it is pressed against the box. _____ (01)

(ii) At the mid point between the bridges.

Because antinode is produced at the mid point between bridges.

The paper mount (rider) receives maximum kinetic energy when

the amplitude is maximum. _____ (01)

(iii) Having kept the vibrating tuning fork pressed on the sonometer box, obtain the resonating length which makes the paper mount (rider) to be thrown out, as the distance between the bridges is gently and gradually increased from a smaller value. _____ (01)

$$(b) (i) f = \frac{1}{2l} \sqrt{\frac{T}{m}}$$

$$= \frac{1}{2l} \sqrt{\frac{V_s w g - V_w g}{A s w}} \quad w = \text{density of water}$$

$$= \frac{1}{2l} \sqrt{\frac{V_s g - V_g}{A s}}$$

$$= \frac{1}{2l} \sqrt{\frac{V g}{A} \left[1 - \frac{1}{3} \right]} \quad \text{_____ (01)}$$

$$(ii) l^2 = \frac{V g}{4 A} \left[1 - \frac{1}{3} \right] \cdot \frac{1}{f^2} \quad \text{_____ (01)}$$

$$\frac{1}{y} = \frac{\downarrow m}{\downarrow m} \cdot \frac{\downarrow x}{\downarrow x}$$

(c) (i) Choosing two points on the graph which can be read easily in order to obtain the gradient. _____ (01)

$$\text{gradient} = 10^7 \text{ cm}^2 \text{ s}^2 \quad \text{-----} \quad (01)$$

$$(ii) \quad \frac{Vg}{4A} \left[1 - \frac{1}{s} \right] = \text{gradient} = 10^7 \text{ cm}^2 \text{ s}^2 \quad \text{-----} \quad (01)$$

$$\frac{400 \times 10^{-6} \times 10}{4 \times 0.8 \times 10^{-6}} \left[1 - \frac{1}{s} \right] = 10^7 \times 10^{-4}$$

$$s = 5 \quad \text{-----} \quad (01)$$

$$(d) \quad dB = 10 \log_{10} \left(\frac{I}{I_0} \right) \quad (\text{Here } I_0 = \text{threshold intensity of hearing})$$

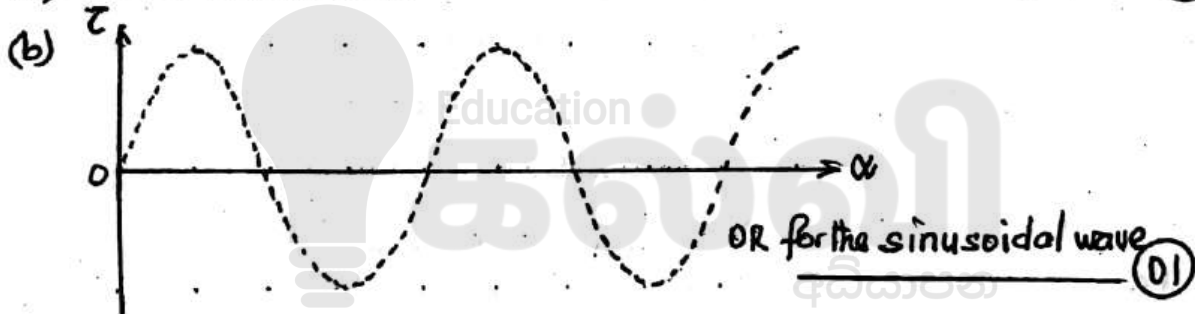
$$40 = 10 \log_{10} \left(\frac{I}{10^{-12}} \right)$$

$$I = 10^{-8} \text{ Wm}^{-2}$$

(01)

TOTAL
10
MARKS

$$04) (a) \quad \tau = NAB I \cos \alpha \quad \text{-----} \quad (01)$$



(c)(i) Use semi cylindrical magnetic poles with soft iron cylinder/
semi cylindrical magnetic poles/
Use a radial magnetic field. For any one answer (01)



(iii) Magnitude — constant
Direction — changes
Field — not uniform. (02)

$$(d) (i) \quad NAB I = C \Theta \Rightarrow I = \frac{C \Theta}{NAB} \quad \text{-----} \quad (01)$$

(ii) First, the coil would perform rotational simple harmonic motion about that position and finally comes to rest. (01)

(iii) Factor	Adjustment	
N	Should be increased	} (02) TOTAL 10 MARKS
A	Should be increased	
C	should be decreased	
B	should be increased	

PART II B
ESSAY

05) (a) (i) $P + \frac{1}{2} \rho v^2 + h\rho g = k$ (constant) _____ (01)

P = Pressure of fluid = pressure energy per unit volume.
 $\frac{1}{2} \rho v^2$ = Kinetic energy of unit volume of fluid.
 $h\rho g$ = Potential energy of unit volume of fluid.

(ii) (A) Streamline flow _____ (01)
 Incompressible _____
 Non viscous _____

(b) (i) 30 m s^{-1} ← _____ (01)

(ii) $V = r\omega = 3.5 \times 10^{-2} \times 2\pi \times 10 = 2.1 \text{ m s}^{-1}$ _____ (01)

(iii) 1. Velocity of air at point A = $30 - 2.1 = 27.9 \text{ m s}^{-1}$ (01)

2. Velocity of air at point B = $30 + 2.1 = 32.1 \text{ m s}^{-1}$ (01)

(iv) 1. $P_A + \frac{1}{2} \rho v_A^2 = P_0$

$P_B + \frac{1}{2} \rho v_B^2 = P_0$

$P_A + \frac{1}{2} \rho v_A^2 = P_B + \frac{1}{2} \rho v_B^2$

$P_A - P_B = \frac{1}{2} \rho (v_B^2 - v_A^2)$

$= \frac{1}{2} \times 1.3 [(32.1)^2 - (27.9)^2] = 163.8 \text{ Pa.}$ (01)

$$\begin{aligned}
 2. \quad F &= \Delta p \cdot A \\
 &= 163.8 \times \pi r^2 \\
 &= 163.8 \times \pi \times (2.5 \times 10^{-2})^2 \\
 &= 0.6 \text{ N}
 \end{aligned}$$



(iv) $\downarrow s = ut + \frac{1}{2}at^2$

$$1.8 = \frac{1}{2} \times 10 \times t^2$$

$$t = \sqrt{0.36} = 0.6 \text{ s}$$

$$\begin{aligned}
 \rightarrow s &= ut \\
 &= 30 \times 0.6 \\
 &= 18 \text{ m}
 \end{aligned}$$

(vi) Horizontal acceleration:

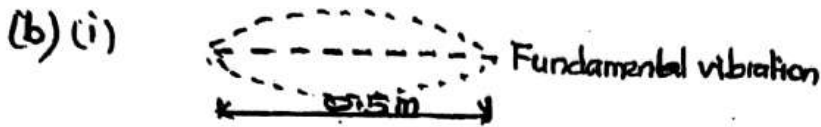
$$a = \frac{F}{m} = \frac{0.6}{150 \times 10^{-3}} \text{ ms}^{-2}$$

$$s = ut + \frac{1}{2}at^2 \quad (\text{For the lateral motion})$$

$$\begin{aligned}
 d &= 0 + \frac{1}{2} \left(\frac{0.6}{150 \times 10^{-3}} \right) (0.6)^2 \\
 &= \frac{2}{4} \times 0.36 \\
 &= 0.72 \text{ m}
 \end{aligned}$$

TOTAL
15
MARKS

06(a) $V = \sqrt{\frac{T}{m}}$ } $T = \text{Tension in the string}$
 $m = \text{mass per unit length or linear density of the string}$ } _____ (01)



$V = f \lambda$

$350 = f_0 (2 \times 0.5) \Rightarrow f_0 = 350 \text{ Hz}$ _____ (01)

First overtone

$350 = f_1 (2 \times \frac{0.5}{2}) \Rightarrow f_1 = 700 \text{ Hz}$ _____ (01)

(2nd overtone, $f_2 = 1050 \text{ Hz}$ not possible)

(ii) The maximum possible frequency for the 2nd overtone must be 1000 Hz _____ (01)

$\sqrt{\frac{T}{m}} = 1000 \times \frac{0.5 \times 2}{3}$ Equation (1) _____ (01)

For initial situation:-

$\sqrt{\frac{0.15}{m}} = 350$ Equation (2) _____ (01)

Equation (1)² / Equation (2)² $\rightarrow T = \frac{1000^2 \times 0.15}{350^2 \times 3^2}$ _____ (01)

$= \frac{100}{735} = 0.136 \text{ N}$ _____ (01)

(c) (i) Density = $\frac{\text{mass}}{\text{Volume}}$
 $8000 = \frac{m}{A \times l}$, $A = \text{area of cross section of the wire}$ _____ (01)

$m = 8000A$

$\sqrt{\frac{0.15}{m}} = 350$

$\sqrt{\frac{0.15}{8000A}} = 350$

$\therefore A = \frac{0.15}{8000 \times 350^2} = 1.53 \times 10^{-10} \text{ m}^2$ _____ (01)

(ii) $m = 8000A = 8000 \times 1.53 \times 10^{-10} = 1.224 \times 10^{-6} \text{ kg m}^{-1}$ _____ (01)

(iii) For longitudinal waves, $V = \sqrt{\frac{E}{\rho}}$ _____ (01)

$= \sqrt{\frac{2 \times 10^{11}}{8000}}$

$= 5000 \text{ m s}^{-1}$ _____ (01)

(iv)

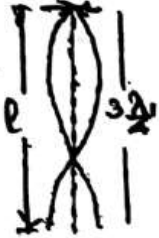


$$f_0 = \frac{v}{4l}$$

$$= \frac{5000}{4 \times 0.5}$$

$$= 2500 \text{ Hz}$$

01



$$f_1 = \frac{3v}{4l}$$

$$= 7500 \text{ Hz}$$

01

TOTAL 15 MARKS

07. (a) LT^{-2}

_____ 01

(b) $\frac{GM}{R^2}$

_____ 01

(ii) $\frac{GM}{r^2}$

_____ 01

(b)(i) $J kg^{-1}$

_____ 01

(ii) Maximum value of gravitational potential energy = 0

_____ 01

(iii) 1. $V = -\frac{GM}{R}$

_____ 01

2. $V = -\frac{GM}{r}$

_____ 01

(c)(i) At point Q.

_____ 01

$-1 MJ kg^{-1}$

_____ 01

(ii) At point Q

_____ 01

(iii) $10 N kg^{-1}$

_____ 01

(iv) Energy supplied to throw it from P to Q

$$W = m (V_Q - V_P)$$

$$= 10 [-1 \times 10^6 - (-4 \times 10^6)] J$$

$$= 30 \times 10^6 J$$

01

01

(v) If v is the velocity when reaching earth,

$$\frac{1}{2}mv^2 = m(60 \times 10^6 - 1 \times 10^6) \quad \text{--- (01)}$$

$$v^2 = 2 \times 59 \times 10^6$$

$$v = \sqrt{118} \times 10^3$$

$$= 10.8 \text{ km s}^{-1} \quad \text{--- (01)}$$

TOTAL
15
MARKS

08) (a) (i) $v = \frac{2.4 \times 10^2}{8000} = 0.03 \text{ m s}^{-1} \quad \text{--- (01)}$

2. The mass of air in the balloon = $1.3 \times 0.5 = 0.65 \text{ kg} \quad \text{--- (01)}$

3. If the volume of the balloon being equal to V_B ,

Weight = Upthrust

$$2.4 \times 10^2 \times g = (V_B + 0.03) \rho_w g$$

$$V_B = 0.24 - 0.03$$

$$= 0.21 \text{ m}^3 \quad \text{--- (01)}$$

4. For the air inside the balloon:-

$$P_i V_i = P_f V_f$$

$$0.5 \times 1 \times 10^5 = P_f \times 0.21 \quad \text{--- (01)}$$

$$P_f = 2.38 \times 10^5 \text{ Pa.} \quad \text{--- (01)}$$

5. $P_f = P_i + h \rho_w g$

$$h = \frac{P_f - P_i}{\rho_w g} = \frac{2.38 \times 10^5 - 1 \times 10^5}{10^4} \quad \text{--- (01)}$$

$$= 13.8 \text{ m} \quad \text{--- (01)}$$

(b) 1. Volume of balloon = $0.21 \text{ m}^3 \quad \text{--- (02)}$

2. For the air in the balloon:-

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{1 \times 10^5 \times 0.5}{300} = \frac{P_2 \times 0.21}{290} \quad \text{--- (01)}$$

$$P_2 = \frac{0.5 \times 10^5 \times 290}{0.21 \times 300}$$

$$= \frac{145 \times 10^5}{63} = 2.3 \times 10^5 \text{ Pa.} \quad \text{--- (01)}$$

3. $\frac{145 \times 10^5}{69} = 1 \times 10^5 + h \rho_w g$ _____ (01)

$h = \frac{1450}{69} - 10$

$h = \frac{920}{69} = 13.01 \text{ m}$ _____ (01)

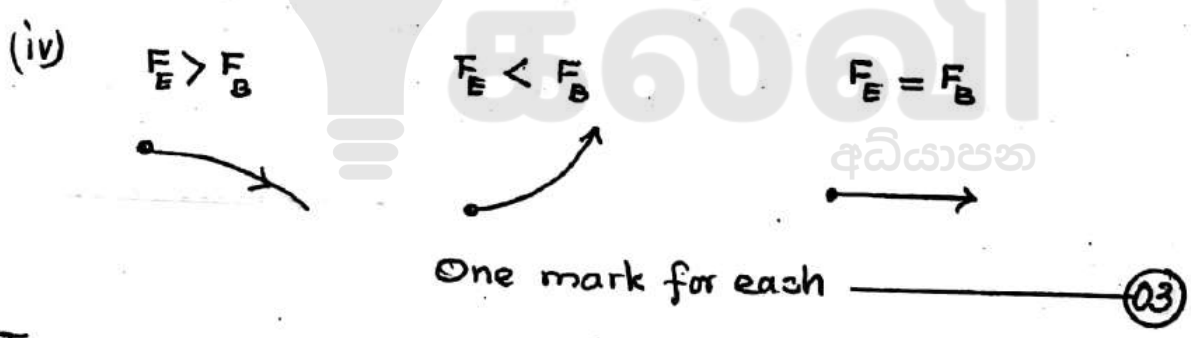
(c) 1. Adding additional load and explanation _____ (01)

2. The body of bacteria will be destroyed due to vast expansion of air within it. _____ (01)

TOTAL 15 MARKS

09) (a) (i) $F_E = Eq$ _____ (01)

(ii) $F_B = BqV$ _____ (01)



b) To escape:

$F_E = F_B$
 $Eq = BqV$
 $E = BV$ or $V = \frac{E}{B}$

_____ (01)

Not to escape

$F_E \geq F_B$
 $E \geq BV$ or $V \leq \frac{E}{B}$

For any one or for both relationships. _____ (01)

(c) (i) Circular motion (\therefore path) _____ (01)

(ii) Since the magnetic force is always perpendicular to the direction of motion/velocity. _____ (01)

(iii) $B_0 q v = m \frac{v^2}{(d/2)}$ For using this equation _____ (01)

$B_0 q = \frac{m}{d/2} \cdot \frac{E}{B}$ - For the substitution of $\frac{E}{B}$ for v _____ (01)

$$\frac{m}{q} = \frac{B_0 B d}{2E} \quad \text{_____ (01)}$$

(d) Based on the result obtained in (c)(iii) $m \propto d$, hence the distance d increases as the mass m increases. _____ (01)

(e) Isotopes of same element has same charge but different mass. Hence this device can separate them. _____ (01)

TOTAL
15
MARKS

10) (a) (i)  _____ (01)

(ii) $E = \frac{V}{d}$ _____ (01)

$$V = Ed = 2 \times 10^3 \times 2 \times 10^{-2} = 40V$$

$$V_{\text{lower plate}} - V_{\text{upper plate}} = 40V$$

$$0 - V_{\text{upper plate}} = 40V$$

$$V_{\text{upper plate}} = -40V \text{ (Negative sign is essential)} \quad \text{_____ (01)}$$

(iii) $E = \frac{\sigma}{\epsilon_0}$ _____ (01)

$$E = \frac{Q/A}{\epsilon_0}$$

$$2 \times 10^3 = \frac{Q}{10 \times 10^{-2} \times 10 \times 10^{-2} \times 9 \times 10^{12}} \quad \text{For substitution} \quad \text{_____ (01)}$$

$$Q = 2 \times 9 \times 10^{11}$$

$$= 1.8 \times 10^{10} \text{ C} \quad \text{_____ (01)}$$

(b) (i) $Eq = ma$ _____ (01)
 $\therefore a = \frac{Eq}{m}$ _____

$\uparrow v^2 = u^2 + 2as$ _____ (01)
 $0 = (v \sin 60^\circ)^2 - 2 \frac{Eq}{m} \cdot d_2$ _____

$d_2 = \frac{(6 \times 10^6 \times \frac{\sqrt{3}}{2})^2 \cdot 9 \times 10^{-21}}{2 \times 2 \times 10^3 \times 1.6 \times 10^{19}}$ _____ (01)

$= 3.79 \times 10^{-2}$ _____ (01)
 $= 3.79 \text{ cm}$ _____

(ii) $C = \frac{\epsilon_0 A}{d}$

$\therefore \Delta C = \epsilon_0 A \left[\frac{1}{d_1} - \frac{1}{d_2} \right]$ _____ (01)

$= 9 \times 10^{-12} \times 100 \times 10^{-4} \left[\frac{1}{2} - \frac{1}{3.79} \right] \times \frac{1}{10^{-2}}$ _____ (01)
 $= 2.125 \times 10^{-12} \text{ F (decrease)}$ _____

(iii) Work done $= \frac{1}{2} \frac{Q^2}{\epsilon_0 A} (d_2 - d_1)$ _____ (01)

$= \frac{1}{2} \times \frac{(1.8 \times 10^{-2})^2 (3.79 - 2) \times 10^{-2}}{9 \times 10^{12} \times 10^{-2}}$ _____ (01)
 $= 3.22 \times 10^{-9} \text{ J} = 3.22 \text{ nJ}$ _____

(iv) Yes, $\Delta V = E \Delta d$ _____ (01)
 $= 2 \times 10^8 \cdot (3.79 - 2) = 35.8 \text{ V}$ _____

TOTAL
15
MARKS



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 கல்வித்துறை 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 ஊடக உங்களிற்கு தேவையான பரீட்சை வினாத்தாள்களை இலகுவான முறையில் தரவிறக்கம் செய்து கொள்ளமுடியும்.

kalvi.lk

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

