தொண்டைமானாறு வெளிக்கள நிலையம் நடாத்தும்
1ம் தவணைப் பரீட்சை
Field Work Centre, Thondaimanaru
1st Term Examination

Marking Scheme

Grade - 12 (2022) **Chemistry**

Part - I

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

திருத்தம்

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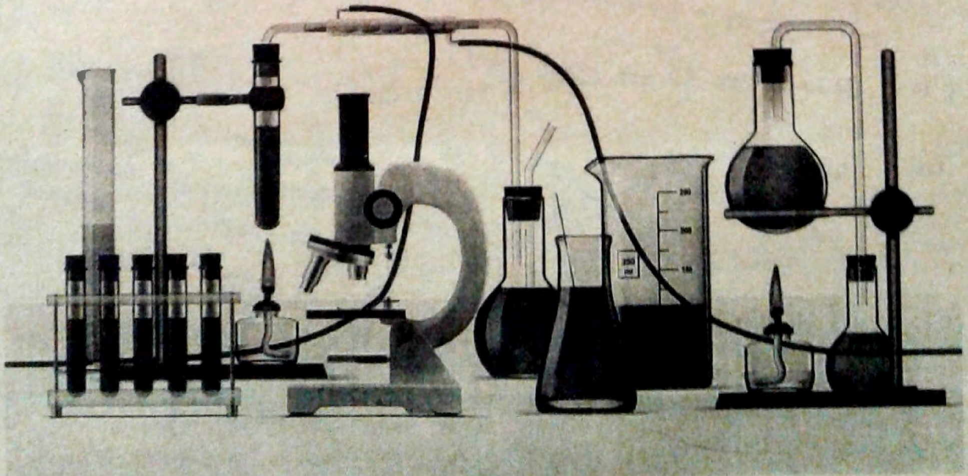
அமைப்புக்கட்டுரை வினா இல – 02

02 (A) - 15018

(V) AF_4

B) (3) ICl_4^-

MCQ (15) கரைசலின் அடர்த்தி $1.10 g\ cm^{-3}$



Marking scheme

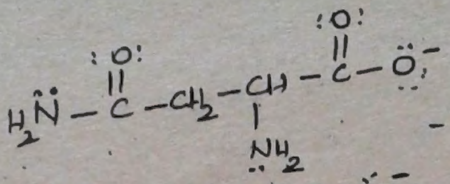
Part II-A – Structured Essay

① (a) (i) SiC (ii) BF_3 (iii) I_3^- (iv) KIO_3 (v) SF_6

100 (vi) SO_3

--- (6 × 05 = ㉚ marks)

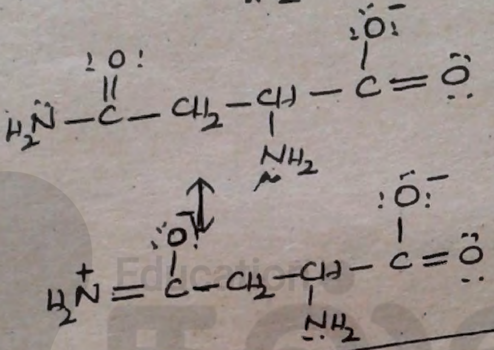
(b) (I) (i)



$H_2\ddot{N}-C(=O)-CH_2-CH(NH_2)-C(=O)-\ddot{O}^-$

------------ (04) marks

(ii)



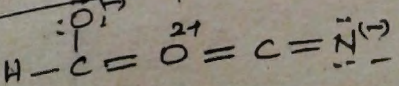
} 2 × 02 = (04) marks

(II) (i)

Atoms	Electron pair geometry	shape	Hybridization	oxidation number
C^x	trigonal planar	trigonal planar	sp^2	+2
O^y	tetrahedral	angular / V-shaped	sp^3	−2
C^z	linear	linear	sp	+4

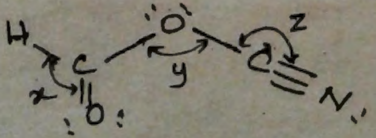
— 12 × 01 = (12) marks

(ii)



$H-C(-O^{-})=\overset{2+}{O}=C=\ddot{N}^{(-)}$ ------------ ((02) marks)

(iii)



(04)

x ≐ 120°
y ≐ 104°–105°
z ≐ 180°

} marking the correct value (03)

(iv) electronegativity $C^x < C^z$ -- (02)

C^x – sp^2 hybridized C^z – sp hybridized

Higher the s-character, greater is the electronegative n (02)

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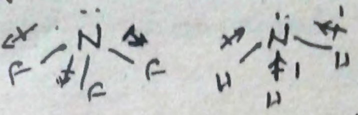
(b) (i) False

Reason



F is more electro-negative than N whereas H is less electro negative compared to N.
Net dipole moment is higher in NH_3 than in NF_3.

(ii) True

Reason: NH_3 has both dipole moment and London forces whereas CCl_4 has London forces as their intermolecular attraction

Due to higher molar mass of CCl_4, London forces are dominat and hence ~~th~~ overall secondary interaction is greater in CCl_4.

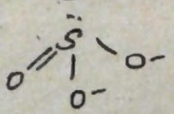
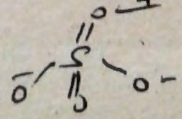
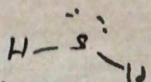
(iii) True.

In both compounds, anion is the same. charge of the cations Be^{2+} and Ca^{2+}, is the same but size $Be^{2+} < Ca^{2+}$

∴ Polarizing power of $Be^{2+} > Ca^{2+}$

∴ Ionic nature of $CaCO_3$ is greater than that of $BeCO_3$ and hence the decomposition temperature for $CaCO_3$ is higher than that of $BeCO_3$

(iv) False

	SO_3^{2-}	SO_4^{2-}	H_2S
			
Hybridization	sp^3	sp^3	sp^3
Oxidation state	+4	+6	−2

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Reason: Factors deciding electronegativity are hybridization, charge and oxidation state of the central atom.

In the given species SO_3^{2-}, SO_4^{2-} and H_2O, hybridization is the same (sp^3).

The more the positive charge on the atom, the more its ability to attract electrons.

∴ Electronegativity follow the order

$$SO_4^{2-} > SO_3^{2-} > H_2O$$

(v) True

Reason: O is more electronegative than S.

∴ The bond pair electrons are attracted more towards the central atom in H_2O than in H_2S.

∴ Greater repulsion between bond pairs.

True / False → 02 marks

Reason → 05 marks.

$07 \times 5 = \boxed{35}$

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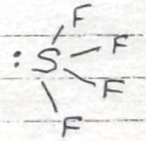
NO. Date: / /

(A)

02. (i) 16 — ⑩ (ii) S — (08)

(iii) $1s^2 2s^2 2p^6 3s^2 3p^4$ — (08) (iv) −2, −1, 0, +1, +2, +4, +5, +6 — (08)

(v)  , sea saw $\boxed{06 + 06}$

$\boxed{46}$

(B) (i) $BaCl_2 > CaCl_2 > MgCl_2 > BeCl_2$

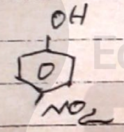
(ii) $N\bar{O}_4 > N\bar{O}_3 > N\bar{O}_2 > NO$

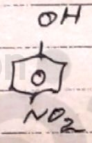
(iii) $BCl_3 > CCl_4 > NCl_3 > \bar{I}Cl_4$

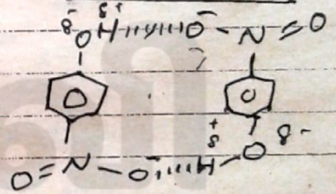
(iv) $SO_3 > SO_2 > SO_4^{2-} > S_2O_6^{2-}$

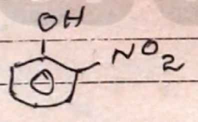
(v) $ClO_4^- > ClO_3^- > ClO_2^- > ClO^-$

$\boxed{5 \times 06 = 30}$

(C) (i) 

(ii) 

(iii) 

(iv) 

$\boxed{4 \times 06 = 24}$

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3) (a) I. $2SCN^- + 12H_2O \longrightarrow N_2 + 2SO_4^{2-} + 2CO_2 + 24H^+ + 22e$ — ⑤

II. $MnO_4^- + 8H^+ + 5e \longrightarrow Mn^{2+} + 4H_2O$ — ⑤

III. $56H^+ + 22MnO_4^- + 10SCN^- \longrightarrow 22Mn^{2+} + 28H_2O + 10CO_2 + 10SO_4^{2-} + 5N_2$ — ⑩

IV (i) $n_{MnO_4^-} = 0.25\ mol\ dm^{-3} \times 10 \times 10^{-3}\ dm^3$

$= 2.5 \times 10^{-3}$ mol. — ⑤

$n_{SCN^-} = 0.05\ mol\ dm^{-3} \times 20 \times 10^{-3}\ dm^3$ — ⑤

$= 1 \times 10^{-3}$ mol.

(ii) $\dfrac{n_{MnO_4^-}}{n_{SCN^-}} = \dfrac{22}{10}$ — ④

2.2 mol MnO_4^- is needed to react with 1 mol of SCN^-

∴ MnO_4^- is in excess. — ④

∴ limiting reagent is SCN^- — ④

(iii) $\dfrac{n_{CO_2}}{n_{SCN^-}} = \dfrac{1}{1}$ — ⑤

$n_{CO_2} = 1 \times 10^{-3}$ mol. — ⑤

(b) I. $Cu + 4HNO_3 \longrightarrow Cu(NO_3)_2 + 2NO_2 + 2H_2O$.

II. $3Cl_2 + 6NaOH \longrightarrow 5NaCl + NaClO_3 + 3H_2O$.

III. $IO_3^- + 5I^- + 6H^+ \longrightarrow 3I_2 + 3H_2O$.

IV. $Cr_2O_7^{2-} + 3SO_2 + 2H^+ \longrightarrow 2Cr^{3+} + 3SO_4^{2-} + H_2O$.

$4 \times 6 =$ ㉔

(c) I. Iron (II) sulfide

II. dihydrogen monoxide.

III. sodium hydrogen carbonate.

IV. perchloric acid.

$4 \times 6 =$ ㉔

Total $\boxed{\dfrac{}{100}}$

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4) (a) (i) A formula, which indicates the number of atoms of each element in a molecule of a compound —⑤

(ii)

	C		H		O	
mass ratio	42.1	:	6.43	:	51.46	
mole ratio	$\frac{42.1}{12}$	:	$\frac{6.43}{1}$	:	$\frac{51.46}{16}$	—⑤
	3.508	:	6.43	:	3.21	
simplest ratio	$\frac{3.508}{3.21}$	:	$\frac{6.43}{3.21}$	:	$\frac{3.21}{3.21}$	
	1.09	:	2.00	:	1	
	11.99	:	22	:	11	—⑤

$C_{12}H_{22}O_{11}$ —⑤

$(\text{empirical formula})_n$ = molecular formula.

$342\,n = 342$ —⑤

$n = 1$ —⑤

molecular formula $C_{12}H_{22}O_{11}$ —⑤

(b)

Let volume of $3\,moldm^{-3}$ taken as $V\,cm^3$

n_{HNO_3} in $2\,moldm^{-3}$ solution = n_{HNO_3} in $3\,moldm^{-3}$ solⁿ + n_{HNO_3} in 0.2 moldm solⁿ

$2\,moldm^{-3} \times 200 \times 10^{-3}\,dm^3 = 3\,moldm^{-3} \times V \times 10^{-3}\,dm^3 + 0.2\,moldm^{-3} \times (200-V) \times 10^{-3}\,dm$ —⑩

$400 = 3V + 0.2(200-V)$ —⑤

$400 = 3V + 40 - 0.2V$

$360 = 2.8V$

$V = \frac{360}{2.8} = \frac{900}{7}\,cm^3$ —⑤

Volume of $3\,moldm^{-3}$ of HNO_3 = $128.57\,cm^3$ —⑤

Volume of $0.2\,moldm^{-3}$ of HNO_3 = $(200-128.57)\,cm^3$

= $71.43\,cm^3$ —⑤

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(c) $Na_2CO_3 \xrightarrow{\Delta} X$

$2\,NaHCO_3 \longrightarrow Na_2CO_3 + H_2O + CO_2$ —— ⑤

$2 \times 84 \qquad 106 \qquad 18 \qquad 44$

If lose of mass is 62g, $W_{NaHCO_3} = 168g$. —— ①

" " " " 2.48g, $W_{NaHCO_3} = \frac{168g}{62g} \times 2.48g$. —— ②

$= 6.72$ —— ③

$n_{NaHCO_3} = \frac{6.72g}{168\,g\,mol^{-1}}$ —— ②

$= 0.04$ mol. —— ②

$n_{NaHCO_3} : n_{Na_2CO_3} = 2:1$ —— ①

$n_{Na_2CO_3}$ produced from $NaHCO_3$ = 0.02 mol. —— ①

initial $W_{Na_2CO_3} = (8.84 - 6.72)\,g$

$= 2.12\,g$. —— ⑤

initial $n_{Na_2CO_3} = \frac{2.12g}{106\,g\,mol^{-1}}$

$= 0.02$ mol —— ⑤

final $n_{Na_2CO_3} = 0.02 + 0.02 = 0.04$ mol. —— ③

$\frac{\text{initial } n_{Na_2CO_3}}{\text{final } n_{Na_2CO_3}} = \frac{0.02\text{ mol}}{0.04\text{ mol}} = \frac{1}{2}$ —— ⑤

Total ㉟

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Part II B Essay Question.

⑤ (a) (i) Observations:

- Major part of α-particles penetrated without any deflection.
- A small fraction was deflected by small angles.
- Only a tiny fraction of α particles was deflected in the opposite direction (180°)

$3 \times 05 =$ (15)

Inferences:

- Major portion of the atom is vacuum
- There must be a positively charged portion which is responsible for the deflection of (+)vely charged α particles. (It is called the nucleus)
- The size of the nucleus is negligible in comparison to the size of the whole atom

$3 \times 05 =$ (15)

(ii) Particle nature : • Having momentum or mechanical energy (rotating the peddle wheel)

Wave nature : Diffraction / formation of shadows

$2 \times 05 =$ (10)

(iii) Definition ---- ~~(05)~~ (10)

(iv) $\nu = \frac{c}{\lambda} = \frac{3 \times 10^8 \, ms^{-1}}{460 \times 10^{-9}}$ ---- ~~(05)~~ (10)

$= 6.52 \times 10^{14} s^{-1}$ --- ~~(05)~~ (10)

Energy of a photon $= h \frac{c}{\lambda}$

$= \frac{6.63 \times 10^{-34} \, Js \times 3 \times 10^8 \, ms^{-1}}{460 \times 10^{-9} \, m}$

$= 4.32 \times 10^{-19}$ J (10) ~~(05)~~

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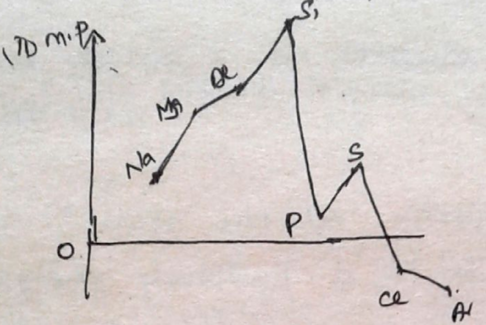
Energy of 1 mole of photon

$= 4.32 \times 10^{-19}\ J \times 6.022 \times 10^{23}\ mol^{-1}$

$= 26.01 \times 10^{4}\ J\ mol^{-1}$ --- (05)

(b) (i) $S^{2-} > Cl^{-} > O^{2-} > F^{-} > O > F$ --- (04)

(ii)



Plot → (05)

Explanation for the variation trend → (05)

(iii) $BeF_2 < BaCl_2 < CaCl_2 < MgBr_2$ ---- (04)

Explanation based on polarizability and polarizing power. ——— (04)

(iv) Electronegativity is a measure of the ability of an atom bonded with others in a molecule/ion to attract the (bonded) electrons towards itself. ----- (04)

Factors :
- hybridization
- charge
- oxidation state.
- surrounding of the atom.

any three 3 × 03 = (09)

(c) (i) XeF_4 (ii) SF_4 (iii) IF_5 (iv) NF_3 (v) SO_4^{2-}

5 × 06 = (30)

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6) (a) I. If two or more Lewis structures could be drawn for a molecule or ion, which differ only by the arrangement of electrons in their structures ~~can~~ be called resonance. — (10)

II. (i) the reasonance hybrid has comporatively lowe engry and thus a greater stability than any of the Contributing structures.

(ii) Equal resonance structures contributes aqually in the hybridisation of resonance.

(iii) unequal resonance structures do not contribute equally in resonance. Also a structure with higher stability contributes more.

(iv) bond lengths of resonance units of equal resonance strudures are equal

— (20)

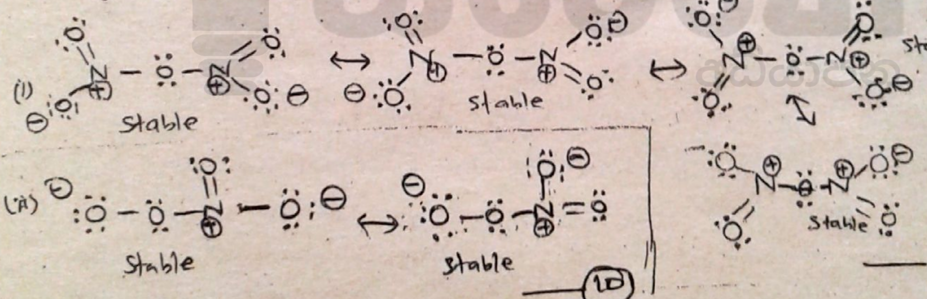
III. (i) The most stable resonance structure must have The highest covalent bond and least formal charge.

(ii) If a neighbouring atom contains similar charge, it is unstable.

(iii) When atoms possess opposite charges, the electro negative atom must be negatively charged and the electropositive atom must be positively charged.

(iv) If the atoms F and O which are electronagative atoms, contain negative charge, Then it is unstable — (20)

IV



(b) I. The abitity of attracting The electron cloud of an anion, by The electric field of a cation is knoown as polarisability. — (10)

II. When an cation moves towards an anion, the spherical electron cloud of The anion changes into elliptical shape by the positive electric field is called polarisation.

— (15)

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iii (i) $BeCO_3 < MgCO_3 < CaCO_3 < SrCO_3$

There is no change in size and charge of anion.
There is no change in the charge of cation. Size increases along group. Polarising ability of cation decreases.
∴ [illegible] covalency reduces / ionic property increases. —— ㉕
Melting point increases.

(ii) $LiI < LiBr < LiCl < LiF$.

There is no change in the charge and size of cation.
There is no change in the charge of cation. The size increase along the group.
The polaraisability of anion increases.
The property of covalency increases / ionic property decreases.
Melting point is in the above order —— ㉕

Q6. $75 + 75 = \boxed{150}$

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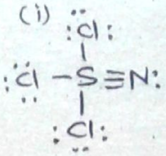
7 (a) I

(i)



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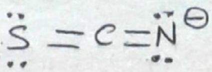
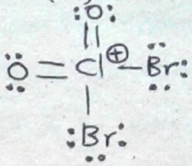


(iii)



3×5 = ⑮

II)

	$XeOF_4$	ICl_2^-	SF_4
Number of VSEPR pairs	6	5	5
Number of σ bonds	5	2	4
Number of lone pairs	1	3	1
Shape.	square pyramid	straight line	distorted tetrahedral or see saw.

12×1 = ⑫

III) that could be obtained directly : * charge of atoms
* distribution of valence electrons — ⑤

that could not be obtained directly : shape, bond angle, type of hybridisation, which orbitals are used for the formation of bonds, geometry of electron pair — ⑥

IV) * water being in liquid state at room temperature.
* ice floating in the polar area.
* specific heat capacity of water being high.
* latent heat of vaporisation of water being high.
* DNA acquires hardness
* surface tension of water being high

3×4 = ⑫

Total $\boxed{50}$

b) Number of moles of H_2SO_4 $= 0.5\,mol\,dm^{-3} \times 40 \times 10^{-3}\,dm^{3}$

$= 20 \times 10^{-3}\,mol.$ —⑤

number of H_2SO_4 moles required to react with $250cm^3$ $= \frac{20 \times 10^{-3}\,mol}{50\,cm^3} \times 250\,cm^3$

$= 100 \times 10^{-3}\,mol.$

$= 0.1\,mol$ —⑤

$$Ba(OH)_2 + H_2SO_4 \longrightarrow BaSO_4\downarrow + 2H_2O.$$ —⑤

$$\frac{n_{Ba(OH)_2}}{n_{H_2SO_4}} = \frac{1}{1}$$ —⑤

$n_{Ba(OH)_2} = 0.1\,mol$ —⑤

mass of $Ba(OH)_2$ $= 0.1\,mol \times 171\,g\,mol^{-1}$

$= 17.1\,g.$ —⑤

mass of KCl $= 30g - 17.1g$

$= 12.9\,g.$ —⑤

$$\frac{n_{H_2SO_4}}{n_{BaSO_4}} = \frac{1}{1}$$ —⑤

$n_{BaSO_4} = 0.1\,mol$ —⑤

mass of $BaSO_4$ $= 0.1\,mol \times 233\,g\,mol^{-1}$

$= 23.3\,g.$ —⑤

Total $\boxed{50}$

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c) Let initial moles of $CaCO_3 = n$ and $MgCO_3 = n_2$ — ⑤

$$\underset{n_1}{CaCO_3} \xrightarrow{\Delta} CaO + \underset{n_1}{CO_2}$$ — ⑤

$$\underset{n_2}{MgCO_3} \xrightarrow{\Delta} MgO + \underset{n_2}{CO_2}$$ — ⑤

initial mixture, $100n_1 + 84n_2 = 4.4$ —(1) ⑤

for CO_2, $44n_1 + 44n_2 = 2$ —(2) ⑤

$$\frac{(1)}{(2)} \Rightarrow \frac{100n_1 + 84n_2}{44(n_1+n_2)} = \frac{4.4}{2}$$ ⑤

$$\frac{100}{44}\left(\frac{n_1}{n_1+n_2}\right) + \frac{84n_2}{44(n_1+n_2)} = 2.2$$ ⑤

$$\frac{100x + 84(1-x)}{44} = 2.2$$ ⑤

$$\frac{16x + 84}{44} = 2.2$$ ⑤

$$16x = 12.8$$

$$x = 0.8.$$ ⑤

Total $\boxed{50}$

Q5. $50+50+50 = \boxed{150}$

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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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