



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

Grade - 12 (2022)

Chemistry

Marking Scheme

Part - I

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

திருத்தம்

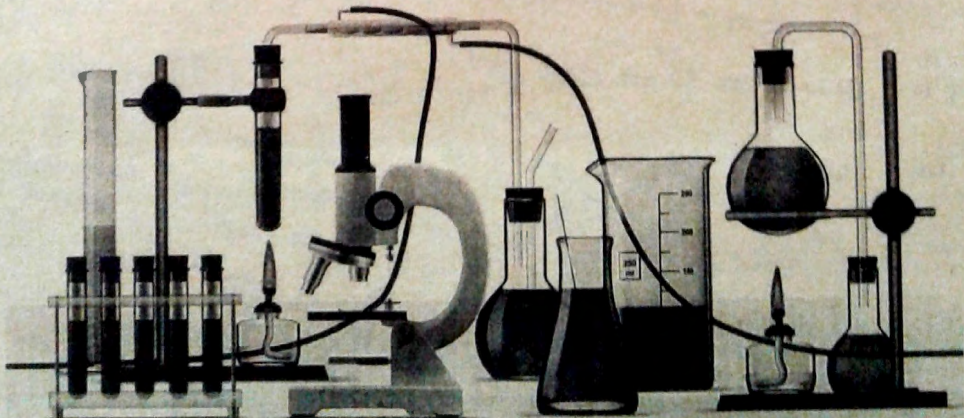
அமைப்புக்கட்டுரை வினா இல - 02

02 (A) - 15018

(V) AF_4

B) (3) ICl_4^-

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



Marking scheme

Part II-A - Structured Essay

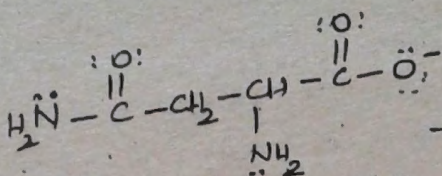
- ① (a) (i) $SiCl_4$ (ii) BF_3 (iii) I_3^- (iv) KIO_3 (v) SF_6

100

(vi) SO_3

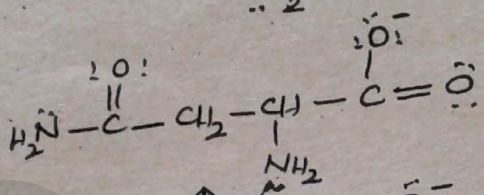
--- (6 x 5 = 30 marks)

(b) (i)

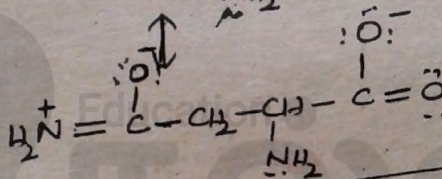


--- (4 marks)

(ii)



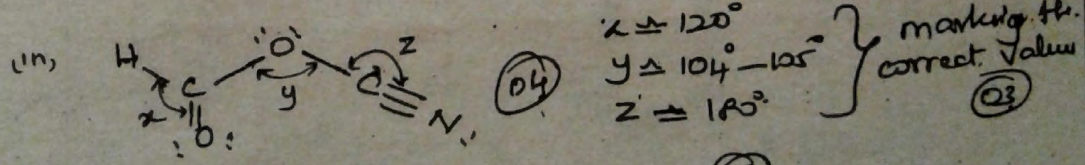
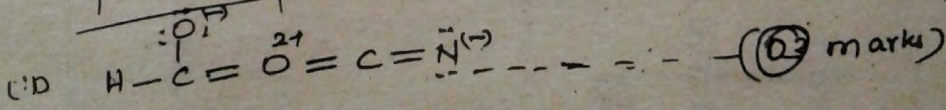
} 2 x 0.2 = 0.4 marks



(ii) (b)

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

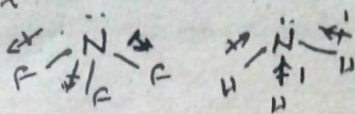
--- 12 x 0.1 = 1.2 marks



(iii) electronegativity $C^x < C^z$ --- (2)
 C^x - sp^2 hybridized C^z - sp hybridized
 Higher the s-character, greater is the electronegativity (2)

(b) (i) False

Reason



F is more electronegative than N whereas H is less electronegative 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 dominant and hence the overall secondary interaction is greater in CCl_4 .

(iii) True.

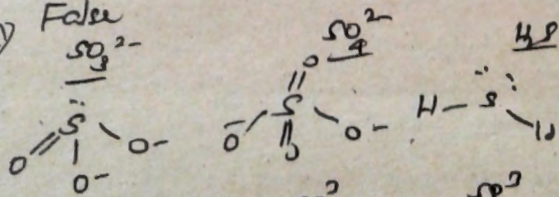
In both compounds, anion is the same. Of the cations Be^{2+} and Ca^{2+} , charge is the same but size $\text{Be}^{2+} < \text{Ca}^{2+}$.

\therefore Polarizing power of $\text{Be}^{2+} > \text{Ca}^{2+}$

\therefore 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)

(iv) False
 SO_3^{2-}



Hybridization

sp^3

sp^2

sp^3

Oxidation state

+4

+6

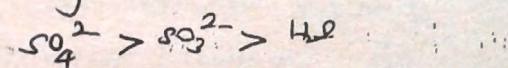
-2

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.

\therefore Electronegativity follows the order



(V) True

Reason: O is more electronegative than S.

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

\therefore Greater repulsion between bond pairs.

True / False \rightarrow 02 marks

Reason \rightarrow 05 marks.

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

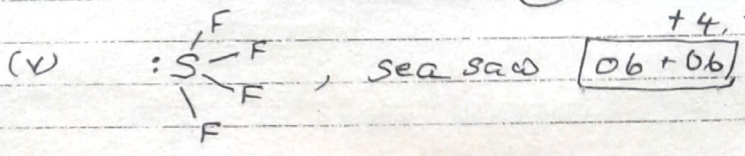
(A) NO. _____

Date: / /

OR (i) 16 - 10

(ii) 5 - 08

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



46

(B) (i) $\text{BOCl}_2 > \text{COCl}_2 > \text{MgCl}_2 > \text{BeCl}_2$

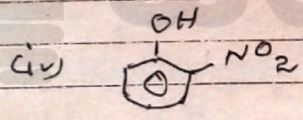
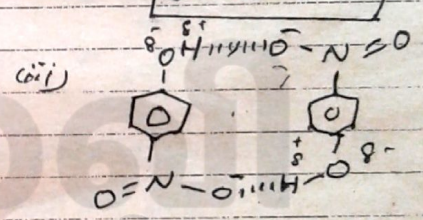
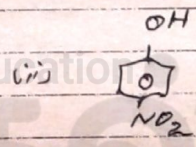
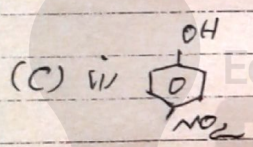
(ii) $\text{NO}_4^- > \text{NO}_3^- > \text{NO}_2^- > \text{NO}$

(iii) $\text{BCl}_3 > \text{CCl}_4 > \text{NCl}_3 > \text{FCl}_4^-$

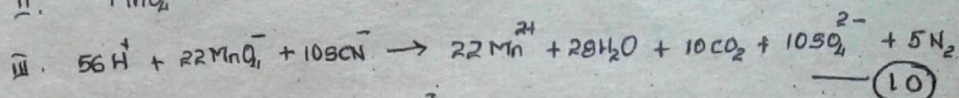
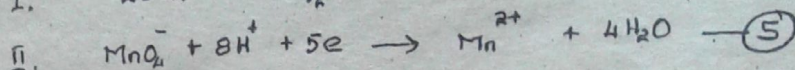
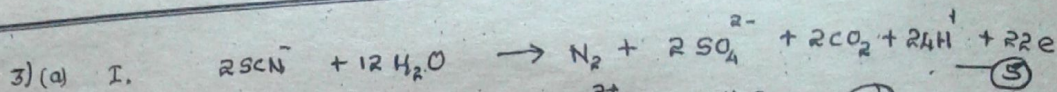
(iv) $\text{SO}_3 > \text{SO}_2 > \text{SO}_4^{2-} > \text{S}_2\text{O}_6^{2-}$

(v) $\text{ClO}_4^- > \text{ClO}_3^- > \text{ClO}_2^- > \text{ClO}^-$

$5 \times 06 = 30$



$4 \times 06 = 24$



IV (i) $n_{\text{MnO}_4^-} = 0.25 \text{ mol dm}^{-3} \times 10 \times 10^{-3} \text{ dm}^3$
 $= 2.5 \times 10^{-3} \text{ mol.}$ — (5)

$n_{\text{SCN}^-} = 0.05 \text{ mol dm}^{-3} \times 20 \times 10^{-3} \text{ dm}^3$
 $= 1 \times 10^{-3} \text{ mol.}$ — (5)

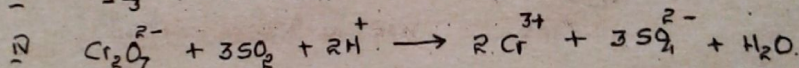
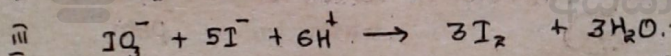
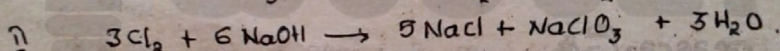
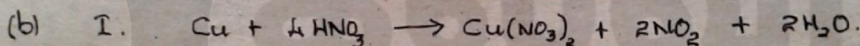
(ii) $\frac{n_{\text{MnO}_4^-}}{n_{\text{SCN}^-}} = \frac{22}{10}$ — (4)

2.2 mol MnO_4^- is needed to react with 1 mol of SCN^-
 $\therefore \text{MnO}_4^-$ is in excess. — (4)

\therefore limiting reagent is SCN^- . — (4)

(ii) $\frac{n_{\text{CO}_2}}{n_{\text{SCN}^-}} = \frac{1}{1}$ — (5)

$n_{\text{CO}_2} = 1 \times 10^{-3} \text{ mol.}$ — (5)



$4 \times 6 = (24)$

(c) I. Iron (II) sulfide

II. dihydrogen monoxide.

III. sodium hydrogen carbonate.

IV. perchloric acid.

$4 \times 6 = (24)$

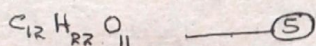
Total

100

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

(ii)

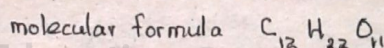
mass ratio	C	H	O	
	42.1	6.43	51.46	
mole ratio	$\frac{42.1}{12}$	$\frac{6.43}{1}$	$\frac{51.46}{16}$	(5)
	3.508	6.43	3.21	
simplest ratio	$\frac{3.508}{3.21}$	$\frac{6.43}{3.21}$	$\frac{3.21}{3.21}$	
	1.09	2.00	1	
	11.99	22	11	(5)



(empirical formula)_n = molecular formula.

$342n = 342$ — (5)

$n = 1$ — (5)



(b)

Let volume of 3mol dm^{-3} taken as $V\text{cm}^3$

n_{HNO_3} in 2mol dm^{-3} solution = n_{HNO_3} in 3mol dm^{-3} solⁿ + n_{HNO_3} in 0.2mol dm^{-3} solⁿ

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

$400 = 3V + 0.2(200 - V)$ — (5)

$400 = 3V + 40 - 0.2V$

$360 = 2.8V$

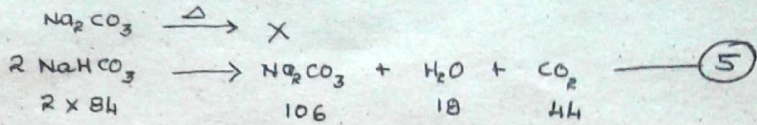
$V = \frac{360}{2.8} = \frac{900}{7} \text{cm}^3$ — (5)

Volume of 3mol dm^{-3} of $\text{HNO}_3 = 128.57 \text{cm}^3$ — (5)

Volume of 0.2mol dm^{-3} of $\text{HNO}_3 = (200 - 128.57) \text{cm}^3$
 $= 71.43 \text{cm}^3$ — (5)

5

(c)



If loss of mass is 62g, $W_{\text{NaHCO}_3} = 168\text{g}$. --- (1)

" " " " 2.48g, $W_{\text{NaHCO}_3} = \frac{168\text{g}}{62\text{g}} \times 2.48\text{g}$. --- (2)

$= 6.72$ --- (3)

$n_{\text{NaHCO}_3} = \frac{6.72\text{g}}{168\text{g mol}^{-1}}$ --- (2)

$= 0.04 \text{ mol}$. --- (2)

$n_{\text{NaHCO}_3} : n_{\text{Na}_2\text{CO}_3} = 2 : 1$ --- (1)

$n_{\text{Na}_2\text{CO}_3}$ produced from $\text{NaHCO}_3 = 0.02 \text{ mol}$. --- (1)

initial $W_{\text{Na}_2\text{CO}_3} = (8.84 - 6.72) \text{g}$.
 $= 2.12 \text{g}$. --- (5)

initial $n_{\text{Na}_2\text{CO}_3} = \frac{2.12\text{g}}{106\text{g mol}^{-1}}$
 $= 0.02 \text{ mol}$ --- (5)

final $n_{\text{Na}_2\text{CO}_3} = 0.02 + 0.02 = 0.04 \text{ mol}$. --- (3)

$\frac{\text{initial } n_{\text{Na}_2\text{CO}_3}}{\text{final } n_{\text{Na}_2\text{CO}_3}} = \frac{0.02 \text{ mol}}{0.04 \text{ mol}} = \frac{1}{2}$ --- (5)

Total (35)

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 (tively) 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

$$\lambda = \frac{c}{\nu} = \frac{3 \times 10^8 \text{ ms}^{-1}}{460 \times 10^9} \dots \dots \textcircled{15} \textcircled{10}$$
$$= 6.52 \times 10^{-14} \text{ s}^{-1} \dots \dots \textcircled{15} \textcircled{10}$$

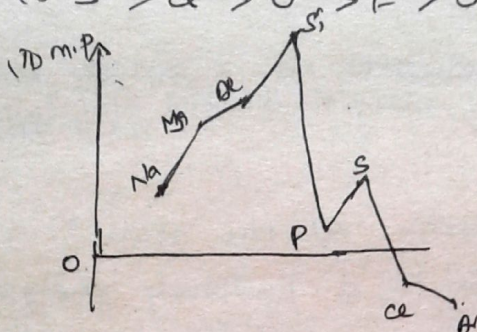
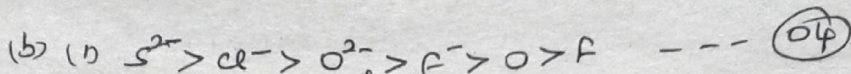
Energy of a photon = $h \frac{c}{\lambda}$

$$= 6.63 \times 10^{-34} \text{ J s} \times \frac{3 \times 10^8 \text{ ms}^{-1}}{460 \times 10^9 \text{ m}}$$
$$= 4.32 \times 10^{-19} \text{ J} \textcircled{10} \textcircled{10}$$

Energy of 1 mole of photon

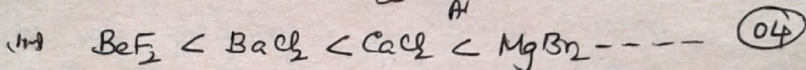
$$= 4.32 \times 10^{-19} \text{ J} \times 6.022 \times 10^{23} \text{ mol}^{-1}$$

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



Plot → (05)

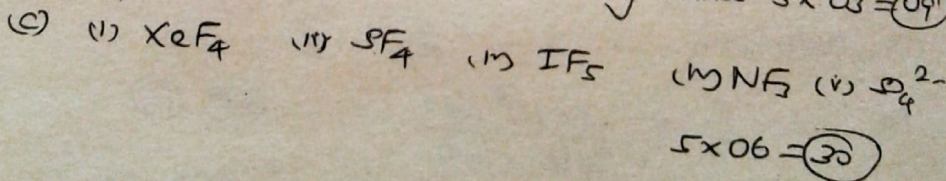
Explanation for the variation trend → (05)



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

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

- Factors ∴
- hybridization
 - charge
 - oxidation state.
 - surrounding of the atom.
- any three $3 \times 03 = (09)$



6) (a) 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)

i) (i) The resonance hybrid has comparatively lower energy and thus a greater stability than any of the contributing structures.

(ii) Equal resonance structures contribute equally in the hybridisation of resonance.

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

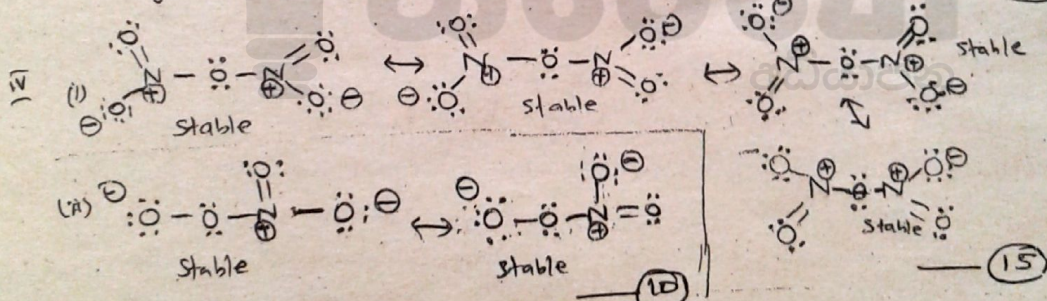
(iv) bond lengths of resonance units of equal resonance structures are equal. — (20)

ii) (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.

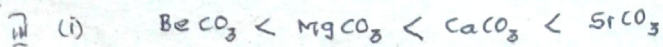
(iii) When atoms possess opposite charges, the electronegative atom must be negatively charged and the electropositive atom must be positively charged.

(iv) If two atoms F and O which are electronegative atoms, contain negative charge, then it is unstable. — (20)



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

ii) When an anion moves towards a cation, the spherical electron cloud of the anion changes into an elliptical shape by the positive electric field is called polarisation. — (15)



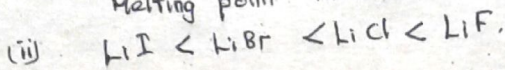
There is no change in size and charge of anion.

There is no change in the charge of cation. Size increases along group. Polarising ability of cation decreases.

covalency reduces / ionic property increases.

Melting point increases.

(25)



There is no change in the charge and size of cation.

There is no change in the charge of anion. The size increase along the group.

The polarisability of anion increases.

The property of covalency increases / ionic property decreases.

Melting point is in the above order

(25)

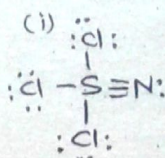
Q6. $75 + 75 = \boxed{150}$

Education

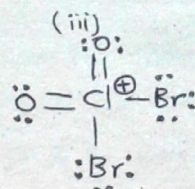
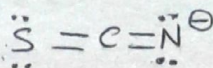
கல்வி

අධ්‍යාපන

7 (a) I



(ii)



$3 \times 5 = 15$

II) (i)

	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.

III) that could be obtained directly: * charge of atoms $12 \times 1 = 12$
 * distribution of valence electrons

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

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

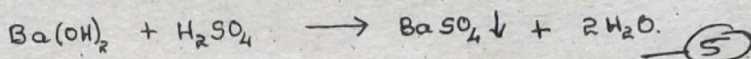
$3 \times 4 = 12$

Total 50

11

b) Number of moles of H_2SO_4 = $0.5 \text{ mol dm}^{-3} \times 40 \times 10^{-3} \text{ dm}^3$
 = $20 \times 10^{-3} \text{ mol}$. (5)

number of H_2SO_4 moles required to react with 250 cm^3 = $\frac{20 \times 10^{-3} \text{ mol}}{50 \text{ cm}^3} \times 250 \text{ cm}^3$
 = $100 \times 10^{-3} \text{ mol}$.
 = 0.1 mol (5)



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

$n_{Ba(OH)_2} = 0.1 \text{ mol}$ (5)

mass of $Ba(OH)_2$ = $0.1 \text{ mol} \times 171 \text{ g mol}^{-1}$
 = 17.1 g . (5)

mass of KCl = $30 \text{ g} - 17.1 \text{ g}$
 = 12.9 g . (5)

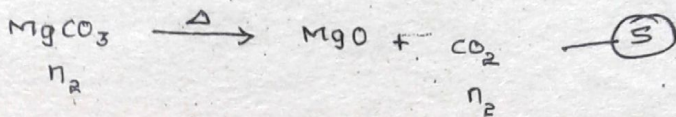
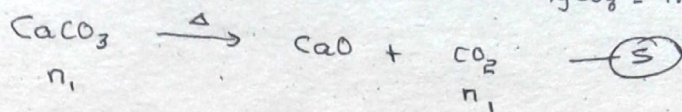
$\frac{n_{H_2SO_4}}{n_{BaSO_4}} = \frac{1}{1}$ (5)

$n_{BaSO_4} = 0.1 \text{ mol}$ (5)

mass of $BaSO_4$ = $0.1 \text{ mol} \times 233 \text{ g mol}^{-1}$
 = 23.3 g . (5)

Total 50

c) Let initial moles of $\text{CaCO}_3 = n_1$ and $\text{MgCO}_3 = n_2$ — (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 50

Q5.

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



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.



Viber
Community



Whatsapp
Channel



Facebook
Page