FWC

தொண்டைமானாறு வெளிக்கள நிலையம் நடாத்தும்
முதலாம் தவணைப் பரீட்சை - 2022
Conducted by Field Work Centre, Thondaimanaru.
1st Term Examination - 2022

Chemistry	Gr -12 (2023)	புள்ளித்திட்டம்

Part – I

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

structure

I (a) (i) Cl (ii) XeF_2 (iii) P (iv) $SrCO_3$ (v) $HClO_4$ (vi) SF_6 — 6×6 = 36

(b) (i) $CH_3-\overset{\overset{O}{\|}}{C}-\ddot{N}=\overset{+}{N}=\overset{-}{\ddot{N}}:$ — 08

(ii) $CH_3-\overset{\overset{O}{\|}}{C}-\ddot{\underset{\ddot{}}{N}}-\overset{+}{N}\equiv N:$

இதில்

$CH_3-\overset{:O:}{\overset{|}{C}}=\underset{\ddot{}}{N}-\overset{+}{N}\equiv N:$

இதில்

$CH_3-\overset{O}{\overset{\|}{C}}-N\equiv N-\ddot{N}:^{2-}$

இதில் மாறல்

OR

$CH_3-\overset{:O:}{\overset{|}{C}}=\overset{+}{N}=\overset{+}{N}=\ddot{N}:^{-}$

இதில்மாறல்

(3+1) × 3 = 12

(iii)

	O^1	N^2	C^3	C^5
VSEPR Pair	4	4	3	4
Electron Pair geometry	Tetrahedral	Tetra hedral	Trigonal Planer	Tetra hedral
molecular Shape	Angular	Trigonal Pyramidal	Trigonal Planer	Tetra hedral
Hybridization	sp^3	sp^3	sp^2	sp^3

4 × 4 = 16

(iv) O^1 – sp^3 $\quad N^2$ – sp^3

N^2 – sp^3 $\quad C^3$ – sp^2

C^3 – sp^2 $\quad C^5$ – sp^3

C^5 – sp^3 $\quad Cl^6$ – sp^3 / 3P — 8 × 1 = 8

(v) C^{-3} 2P C^{+4} 2P [02]

(C) (i)

	Species	Primary interaction (Bond Type)	secondary interaction.
(1)	$CH_4(g)$	Covalent bond	London force / dispersion force
(2)	$NaCl(s)$	ion / Electrostatic force	—
(3)	Mg	Metalic bond	—
(4)	C (Diamond)	Covalent	—
(5)	$CH_3OH(aq)$	Covalent	Hydrogen bond

[12 × 1 = 12]

(ii) (i) XeF_4 90° (ii) 120, 90 (iii) 119 / 108

[3 × 2 = 06]

[27] (i)

	Cr	S	O	
mass	26.52	24.52	48.96	
mole	$\frac{26.52}{52}$	$\frac{24.52}{32}$	$\frac{48.96}{16}$	(5)
	0.51	0.766	3.06	(5)
	1	1.5	6	(5)
	2	3	12	(5)

(i) $Cr_2S_3O_{12}$ (5)

(ii) $Cr_2(SO_4)_3$ (5)

(ii) dihydrogen sulfide
hydrogen perchlorate / Perchloric acid
Potassium dihydrogen phosphate
Ferric sulfide or iron(III) sulfide

[4 × 4 = 16]

(i) $Fe^{2+}_{(aq)} \longrightarrow Fe^{3+}_{(aq)} + e^-$ (5)

$3e^- + NO_3^-_{(aq)} + 2H_2O_{(l)} \longrightarrow NO_{(g)} + 4OH^-_{(aq)}$ (5)

$3Fe^{2+}_{(aq)} + NO_3^-_{(aq)} + 2H_2O_{(l)} \longrightarrow 3Fe^{3+}_{(aq)} + NO_{(g)} + 4OH^-_{(aq)}$ (5) (5)

(ii) $S_{(s)} + HNO_{3(aq)} \longrightarrow H_2SO_{4(aq)} + NO_{2(g)} + H_2O_{(l)}$ (5)

0 → +6 (−6e); +5 → +4 (+e)

$S_{(s)} + 6HNO_3 \longrightarrow H_2SO_4 + 6NO_2 + 2H_2O$ (5)

(iii) $C_3H_{8(g)} + 5O_{2(g)} \longrightarrow 3CO_{2(g)} + 4H_2O_{(l)}$ (5) (4)

(c) (i) $MnO_4^-_{(aq)} + 8H^+_{(aq)} + 5e \longrightarrow Mn^{2+}_{(aq)} + 4H_2O_{(l)}$

$H_2O_{2(aq)} \longrightarrow O_{2(g)} + 2H^+_{(aq)} + 2e$ — ×2, — ×5

$2MnO_4^-_{(aq)} + 5H_2O_{2(aq)} + 6H^+_{(aq)} \longrightarrow 2Mn^{2+}_{(aq)} + 5O_{2(g)} + 8H_2O_{(l)}$

$SO_3^{2-}_{(aq)} + H_2O_{(l)} \longrightarrow SO_4^{2-}_{(aq)} + 2H^+_{(aq)} + 2e$

$2MnO_4^-_{(aq)} + 5SO_3^{2-}_{(aq)} + 6H^+_{(aq)} \longrightarrow 2Mn^{2+}_{(aq)} + 5SO_4^{2-} + 3H_2O_{(l)}$

5 × 02 = 10

(ii) $n_{H_2O_2} = 0.1\,mol\,dm^{-3} \times 50 \times 10^{-3}\,dm^3$

$= 5 \times 10^{-3}\,mol$ (2+1)

n_{KMnO_4} reacted with $H_2O_2 = \frac{2}{5} \times 5 \times 10^{-3}\,mol$

$= 2 \times 10^{-3}\,mol$ (2+1)

$n_{SO_3^{2-}} = 0.1\ mol\,dm^{-3} \times 50 \times 10^{-3}\ dm^3$

$= 5 \times 10^{-3}\ mol$ (2+1)

$\therefore n_{KMnO_4\,(remaining)} = \frac{2}{5} \times 5 \times 10^{-3}\ mol$

$= 2 \times 10^{-3}\ mol$ (2+1)

$n_{Total\,(KMnO_4)} = 4 \times 10^{-3}\ mol$

$[KMnO_4] = \frac{4 \times 10^{-3}\ mol}{100 \times 10^{-3}\ dm^3} = 0.04\ mol\,dm^{-3}$

(2+1)

03 (i) A - Sodium (B) magnesium (C) Aluminium

5×3 = 15

(ii) A < C < B

atomic radius A > B > C

Electronic configuration of B or Mg is in full fill arrangement in S Orbit.

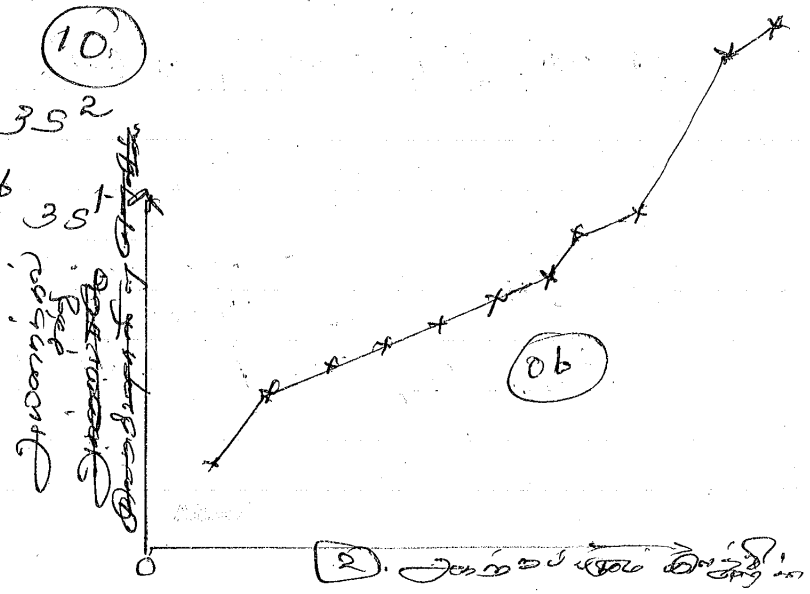
Therefore more Energy is needed to remove Valance electron of Mg.

Mg or give marks for suitable - resonance.

(10)

(iii) $1s^2\ 2s^2\ 2p^6\ 3s^2$

(iv) A $1s^2\ 2s^2\ 2p^6\ 3s^1$



(2) (06)

(v) suitable uses (10)

(B) (i) ClF_3.

~~Number of valance Electron pair = 5~~

number of VSEPR pair = 5. (2)

" " σ pairs = 3 (2)

" " Lone pairs = 2 (2)

Shape T-shape. (4)

(ii) SF_4 Number of VSEPR pair = 5. (2)

" " σ pair = 4 (2)

" " Lone pair = 1 (2)

Shape - sea-saw (4)

(C)

I SiO_2

II Mg

III NaCl

IV CO_2

V Al_2O_3. $6 \times 5 = 30$

(4) (i) $[HCl_{(aq)}] = \frac{36.5}{100} \times \frac{1.17 \times 10^{3}\ g\ dm^{-3}}{36.5\ g\ mol^{-1}}$

$= 11.7\ mol\ dm^{-3}$ // (15)

(ii) hydrochloric acid (05)

(iii) $11.7\ mol\ dm^{-3} \times V\ cm^{3} = 5\ mol\ dm^{-3} \times 250\ cm^{3}$

$V = 106.84$ // (5)

Initially small amount of distilled water was taken into a $250\ cm^{3}$ volumetric flask. Then $106.84\ cm^{3}$

11.7 mol dm^{-3} conc. HCl was added slowly Then v water was added until the bottom of the volumetric flask. (5)

(iv) $HCl_{(aq)} + NaOH_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O_{(l)}$

$n_{HCl} = 2 mol dm^{-3} \times 100 \times 10^{-3} dm^3$

$= 0.2 mol$

$n_{NaOH} = 1 mol dm^{-3} \times 100 \times 10^{-3} dm^3$

$= 0.1 mol$

∴ remaining mole of H^+ is $= 0.1 mol$ (5)

(I) ~~Red~~ (5)

II $[H^+_{aq}] = \dfrac{0.1 mol}{200 \times 10^{-3} dm^3} = 0.5 mol dm^{-3}$ //. (10)

(v) $2KMnO_4 + 16HCl \longrightarrow 2MnCl_2 + 5Cl_2 + 2KCl + 8H_2O_{(l)}$. (15)

(B) (i) $A^{n+}_{(aq)} + 3H_2O \longrightarrow AO_3^-{}_{(aq)} + 6H^+ + (5-n)$

$MnO_4^- + 8H^+ + 5e \longrightarrow Mn^{2+} + 4H_2O_{(l)}$ (15)

$5A^{n+} + 15H_2O + (5-n)MnO_4^- + (5-n)8H^+ \longrightarrow 5AO_3^- + 30H^+_{(aq)} + (5-n)Mn^{2+} + 4(5-n)H_2O$ (10)

$\dfrac{n.A^{n+}}{n_{MnO_4^-}} = \dfrac{2.68 \times 10^{-3} mol}{1.61 \times 10^{-3} mol} = 1.66$ (5)

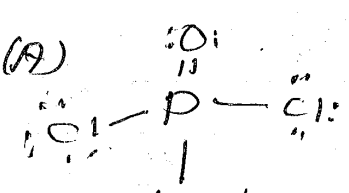
$1.66 = \dfrac{5}{(5-n)}$

$8.3 - 1.66n = 5$

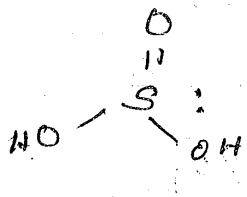
$1.66n = 3.3$

$n = 2$ // (5)

(5) (A)



109.5



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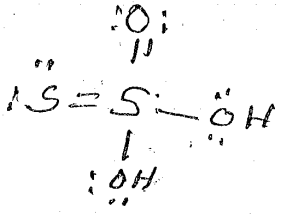


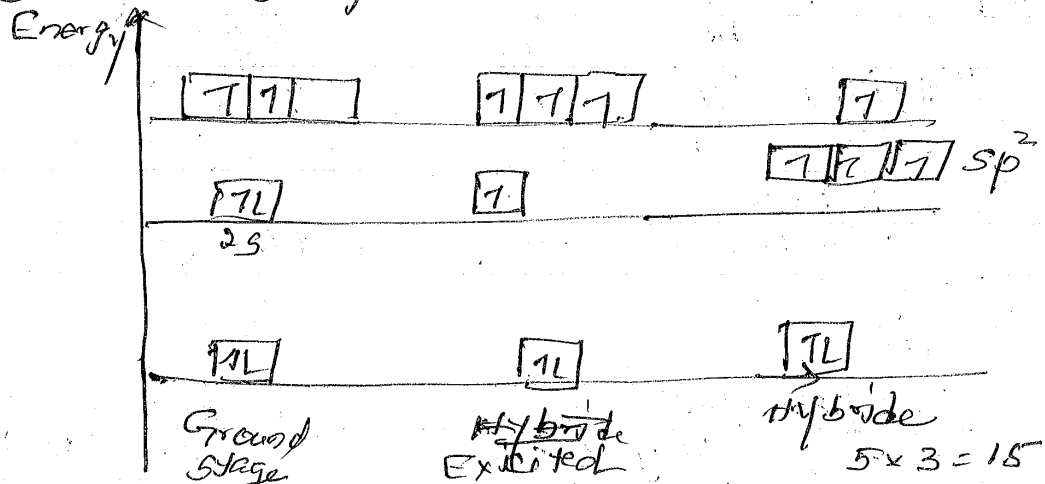
109.5

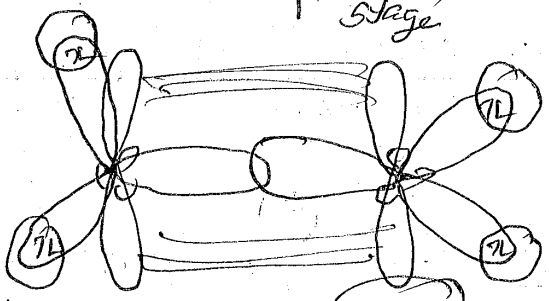
or/ other suitable angle.

Structure $10 \times 3 = 30$

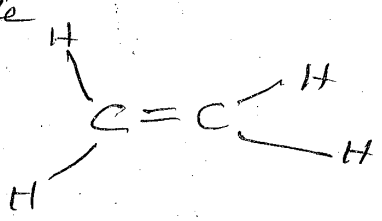
each angles $01 \times 11 = 11$

(B) C $1s^2\ 2s^2\ 2p^2$





2·5



(C) $:N \equiv N^+ - \ddot{O}:^- \longleftrightarrow :\ddot{N} = N = \ddot{O}:$

2 of

2 of

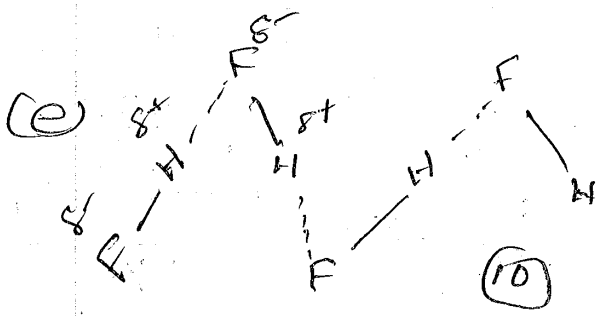
$:\ddot{N} - N \equiv O:$

2 of

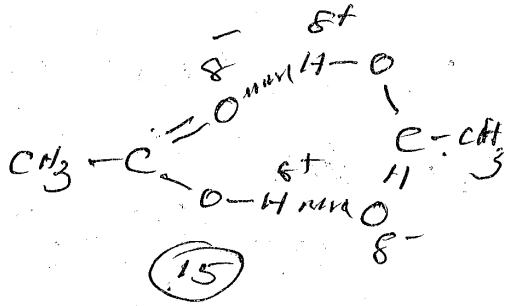
Structure $06 \times 3 = 18$

Stability $02 \times 3 = 6$] 24

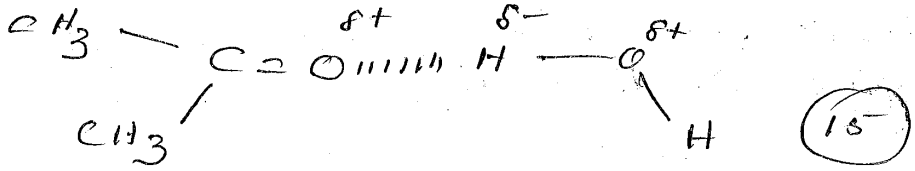
(e)



(10)



(15)



(15)

(d) (i) $H_2S < SO_3^{2-} < SO_4^{2-}$ (10)

(ii) Hybride sp^3 sp^3 sp^3 (5)

charge 0 0 0 (5)

Oxidation number −2 +4 +6 (5)

150

(a)

[Q2] (a) $CaCO_3(s) \xrightarrow{\Delta} CaO(s) + CO_2(g)$ (4)

100 g, x mol; x mol, x mol

$MgCO_3(s) \xrightarrow{\Delta} MgO(s) + CO_2(g)$ (4)

x mol; x mol, x mol

$W_{CO_2} = (2.00 - 1.12)\,g$

$= 0.88\,g$ (4)

$n_{CO_2} = 2x = \frac{0.88\,g}{44\,g\,mol^{-1}} = 0.02\,mol$ (4)

$x = 0.01\,mol$ (4)

$W_{CaCO_3} = 0.01\,mol \times 100\,g\,mol^{-1}$

$= 1\,g$ // (4)

$W_{MgCO_3} = 0.01\,mol \times 84\,g\,mol^{-1}$

$= 0.84\,g$ // (4)

$W/. CaCO_3 = \frac{1\,g}{2\,g} \times 100\ /.$ (03)

$= 50\ /.$ // (03)

$W/. MgCO_3 = \frac{0.84\,g}{2\,g} \times 100\ /.$ (3)

$= 42\ /.$ // (3)

40

(B) $M_2SO_4 \cdot x H_2O \xrightarrow{\Delta} M_2SO_4(s) + x H_2O(g)$

8 g 3.75 g

$n_{M_2SO_4 \cdot xH_2O} = n_{M_2SO_4} = n_{xH_2O}$

$n_{H_2O} = \frac{3.75\,g}{18\,g\,mol^{-1}} = 0.21\ mol$ (10)

$W_{M_2SO_4} = (80 - 3.75)\,g$ (10)

$= 76.25\,g.$

$n_{M_2SO_4} = \frac{76.25\,g}{120\,g\,mol^{-1}} = 0.635\ mol$ (10)

$0.635\ mol = 0.21x$

$x = 3$ // (10)

(C) Relative atomic mass $A_r = \frac{12 \times 98.89 + 13 \times 1.11}{100}$

$A_r = \frac{12u \times 98.89 + 13u \times 1.11}{100}$ (10)

$= 12.01\ u$ // (10)

(D) $n_{Na_2CO_3} = 2 mol\,dm^{-3} \times 250 \times 10^{-3} dm^3$ (8)

$n_{Na_2CO_3} = 0.5 mol$

$W_{Na_2CO_3} = 0.5 mol \times 106 g mol^{-1}$

$= 53 g$ (8)

A 50g Na_2CO_3 (s) was measured accurately Then it was transferd into the 250 cm^3 volumetric flask with the help of funnel. The distile water was added and shaked then continuously distile water was added unitile the marked level. (06)

(E) $^{226}_{88}Ra \longrightarrow \boxed{4}^{4}He + \boxed{222}^{Rn}_{\boxed{86}}$

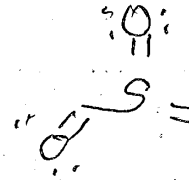
$^{7}_{4}Be + \boxed{0}^{\beta}_{\boxed{-1}} \longrightarrow \boxed{7}^{Li}_{\boxed{3}}$ $\quad 4 \times 7 = 28$

150

(3) SO_3.

VSEPR Pair = 3.
σ electron pair = 3] $3 \times 1 = 03$.
Lone Pair = 0]

shape trigonal Planar (03)



(4)

H_2S VSEPR Pair = 4
σ Electron pair = 2
Lone pair = 2] $3 \times 1 = (3)$

(04)

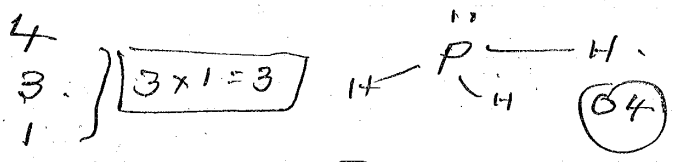
shape - angular

(03)

PH_3.

VSEPR pair = 4
σ pair = 3.
Lone Pair = 1

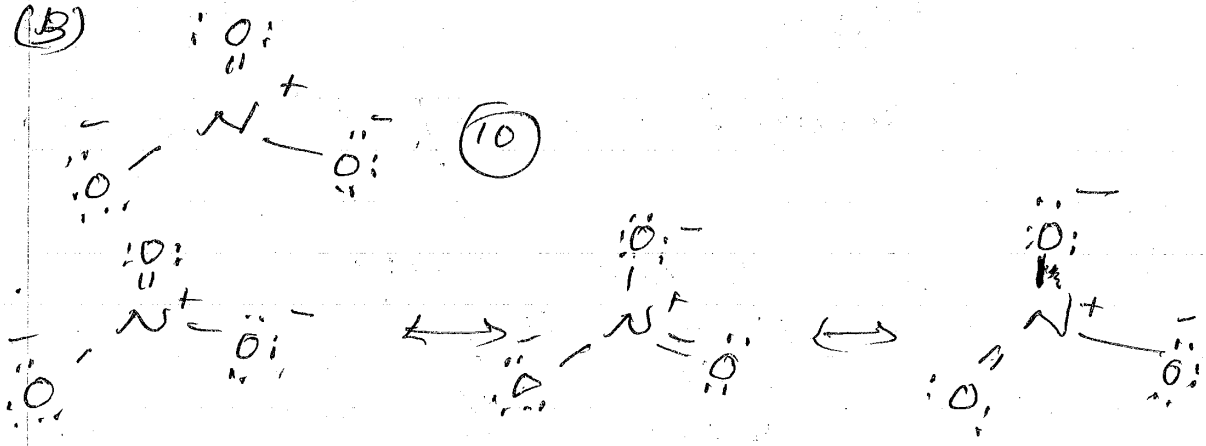
$3 \times 1 = 3$



(04)

Shape Trigonal Planar. (03)

(B)



(10)

$3 \times 5 = 15$

(C) $E = h\nu = \frac{hc}{\lambda}$

$E = \frac{6.626 \times 10^{-34}\ Js \times 3 \times 10^{8}\ ms^{-1}}{589 \times 10^{-9}\ m}$ (10)

for 1 mol $E = \frac{6.626 \times 10^{-34} \times 3 \times 10^{8}}{589 \times 10^{-9}} \times 6.022 \times 10^{23}$ (10) $J\,mol^{-1}$

$= 203.23 \times 10^{3}\ J\,mol^{-1}$

$= 203.23\ kJ\,mol^{-1}$ (10)

(D) CO_2 : H_2O

2 : 1

C : H

1 : 1 molecular (5)

~~Empirical~~ formula $(CH)_x O_y$. (5)

$13x + 16y = 152$ (5)

Approximated maximum mass of O

$= \frac{40}{100} \times 152 = 60.8\,g$ (5)

n_O (approximate) $= \frac{60.8\,g}{16} = 3.8$ (5)

∴ Accurate mole of 'O' = 3 (5)

$13x + 16 \times 3 = 152$

$13x = 104$

$x = 8$ (5)

$C_8H_8O_3$ (5) 40

(E) (i) $Cr_2O_7^{2-} + 14H^+ + 6e \longrightarrow 2Cr^{3+} + 7H_2O$

$H_2S \longrightarrow S + 2H^+ + 2e$.

$Cr_2O_7^{2-} + 8H^+ + 3H_2S \longrightarrow 2Cr^{3+} + 3S + 7H_2O$

$3 \times 5 = 15$

$K_2Cr_2O_7$

(ii) $MnO_4^- + 8H^+ + 5e \rightarrow Mn^{2+} + 4H_2O$

$Fe^{2+} \longrightarrow Fe^{3+} + e$. —(1)

$C_2O_4^{2-} \longrightarrow 2CO_2 + 2e$

$FeC_2O_4 \longrightarrow Fe^{3+} + 2CO_2 + 3e$ —(2)

$3MnO_4^- + 24H^+ + 5FeC_2O_4 \longrightarrow 3Mn^{2+} + 5Fe^{3+} + 10CO_2 + 12H_2O$

$3 \times 5 = 15$

150

திருத்தம்

அமைப்புக்கோள (2) b(i)

$Fe^{2+} + NO_3^- + H_2O \longrightarrow Fe^{3+} + NO + OH^-$

கூட்டுஅமைவு (2) (B) $MSO_4 \cdot xH_2O$

$M = 24$

$MSO_4 \cdot xH_2O$ இன் 80g