FWC

தேசிய வெளிக்கள நிலையம் தொண்டைமானாறு
முதலாம் தவணைப் பரீட்சை - 2024
National Field Work Centre, Thondaimanaru
1st Term Examination - 2024

இரசாயனவியல்	Gr. 12 (2025)	புள்ளித்திட்டம்

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

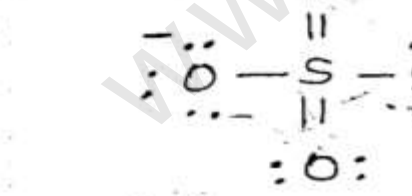
2 × 25 = (50)

Part II : A

A
I Ne
II C
III N^{3-}
IV Be
V F
VI B

4 × 6 = (24)

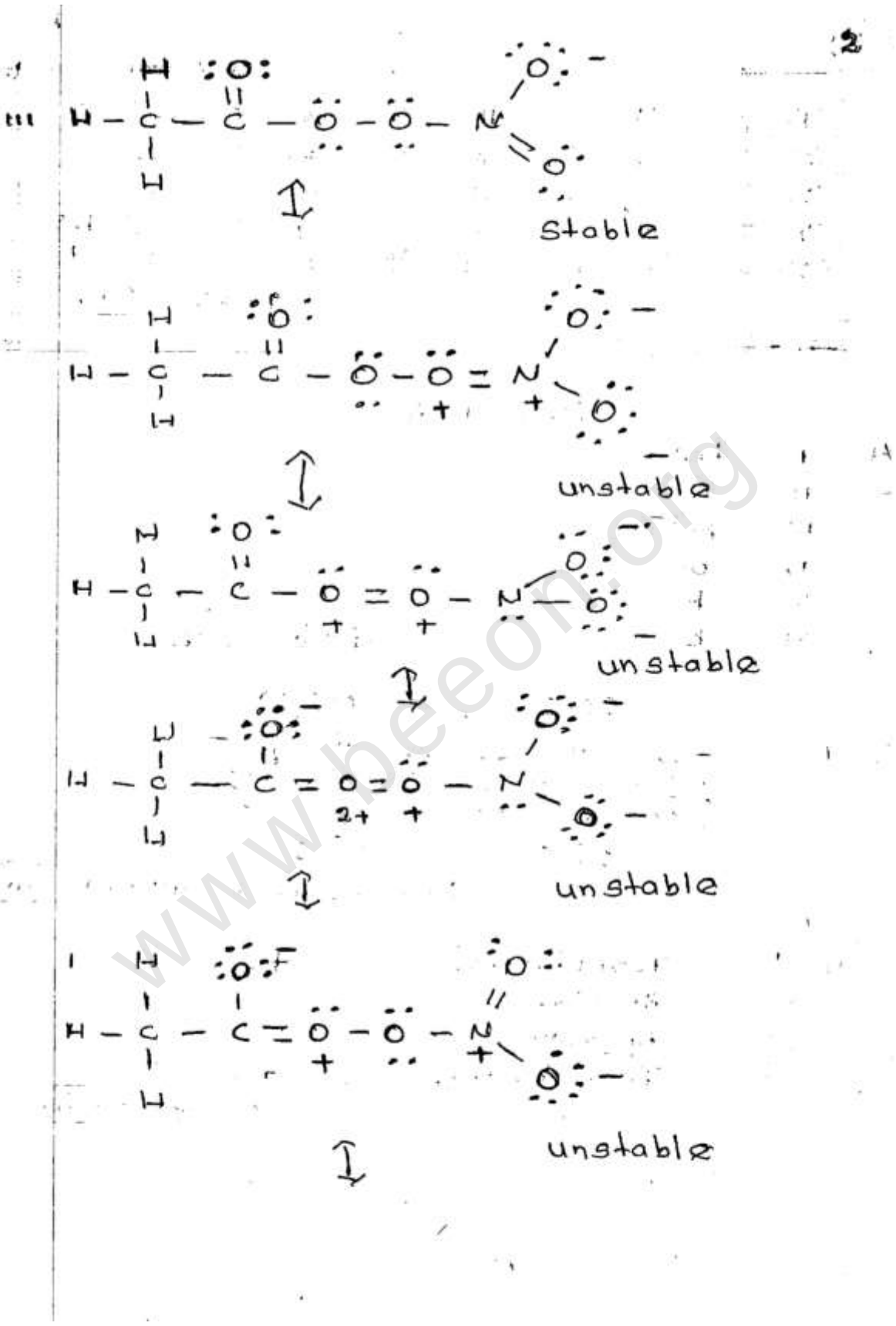
B I

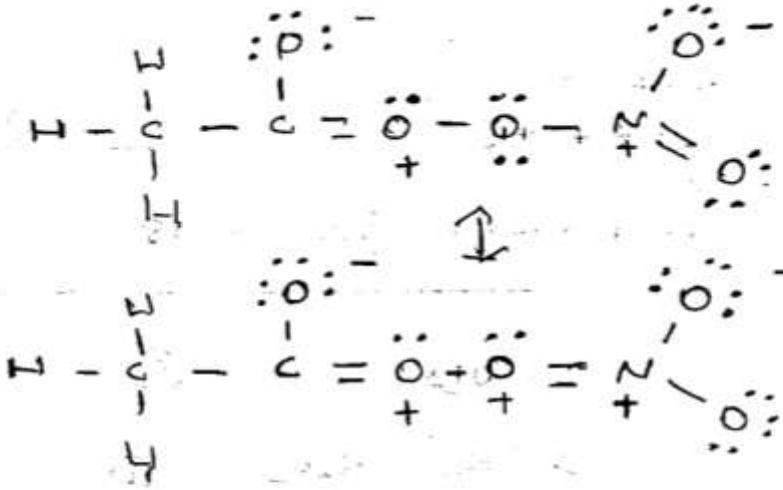


For correct answer (06)

II
S^1	Tetra hedral	+5
S^2	Angular	0
S^3	Angular	0
S^4	Tetra hedral	+5

2 × 8 = (16)





For Four resonance structure
$4 \times 3 = 12$
For stability $1 \times 4 = 4$

IV

	N^1	C^2	C^3	C^4
VESPR pairs	4	3	3	4
Electron pair geometry	Tetrahedral	Trigonal Planer	Trigonal Planer	Linear
Shape	Trigonal Pyramidal	Trigonal Planer	Trigonal Planer	Linear
Hybridization	Sp^3	Sp^2	Sp^3	Sp

$1 \times 16 = 16$

V

N^1	Sp^3	C^2	Sp^2
C^2	Sp^2	C^3	Sp^2
C^3	Sp^2	C^4	Sp
H	1S	N^1	Sp^3
C^4	Sp	N	$sp \mid 2p$
C^2	Sp^2	O	$sp^2 \mid 2p$

$1 \times 12 = 12$

C

I $V = A + B + C$

II $V = 0 + 7 + (+1)$
$= 8$
Group number VIII or 18

$5 \times 2 = 10$

2.) A

X	H	2.	OF_2	5
Y	He	3.	H_2O, H_2O_2	10
Z	Be		$H_2O_2 > H_2O$	
R	O	4	Be, H, O or Be < H < O	5
	$5 \times 5 = 25$	5	-1	5

B I i Dipole - dipole interactions
ii Ion - induced dipole interactions / H - bond
iii Dipole - dipole interaction / London forces (Dispersion interaction)
iv Dispersion interactions or London forces
$5 \times 4 = 20$

2 a True
b False
c False
d False
e False
f True
$5 \times 6 = 30$

3) A)

i $10\,\bar{O}H + 2Cr^{3+} + 3H_2O_2 \rightarrow 2CrO_4^{2-} + 6H_2O + 2H_2O$

(-2 × 3; +3 × 2)

$10NaOH + Cr_2(SO_4)_3 + 3H_2O_2 \rightarrow 2Na_2CrO_4 + 8H_2O + 3Na_2SO_4$

ii $6\bar{O}H + 2S + 2S \longrightarrow 2S^{2-} + S_2O_3^{2-} + 3H_2O$

(+4; -2 × 2)

$6NaOH + 4S \longrightarrow 2Na_2S + Na_2S_2O_3 + 3H_2O$

iii $12\bar{O}H + Cl_2 + 5Cl_2 \longrightarrow 10Cl^- + 2ClO_3^- + 6H_2O$

(-2 × 5; +10)

$12\bar{O}H + 6Cl_2 \rightarrow 10Cl^- + 6H_2O + 2ClO_3^-$

$6\bar{O}H + 3Cl_2 \rightarrow 5Cl^- + 3H_2O + ClO_3^-$

$6NaOH + 3Cl_2 \rightarrow 5NaCl + 3H_2O + NaClO_3$

$8 \times 3 = 24$

2) i $12H^+ + 2IO_3^- + 10I^- \rightarrow 5I_2 + I_2 + 6H_2O$

(+2 × 5; -10)

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

$3H_2SO_4 + KIO_3 + 5KI \rightarrow 3I_2 + 3K_2SO_4 + 3H_2O$

2) ii) $5H_2S + 2MnO_4^- + 6H^+ \rightarrow 2Mn^{2+} + 5S + 8H_2O$

-5×2

$+2 \times 5$

$5H_2S + 2KMnO_4 + 3H_2SO_4 \rightarrow 2MnSO_4 + 5S + K_2SO_4 + 8H_2O$

iii) $6H^+ + Fe_2O_3 + 2I^- \rightarrow 2Fe^{2+} + I_2 + 3H_2O$

$+2$

-2

$3H_2SO_4 + Fe_2O_3 + 2KI \rightarrow 2FeSO_4 + I_2 + 3H_2O$

$8 \times 3 = (24)$

B i) $2H_2O + 2e + H_2O_2 \rightarrow 2H_2O + 2OH^-$

$2e + H_2O_2 \rightarrow 2OH^-$ - (1) (8)

ii) $8OH^- + Cr^{3+} \rightarrow CrO_4^{2-} + 3e + 4H_2O$ - (2) (8)

iii) (1) $\times 3$ + (2) $\times 2$ =>

$3H_2O_2 + 16OH^- + 2Cr^{3+} \rightarrow 6OH^- + 2CrO_4^{2-} + 8H_2O$

$3H_2O_2 + 10OH^- + 2Cr^{3+} \rightarrow 2CrO_4^{2-} + 8H_2O$ (8)

iv) $3H_2O_2 + 10NaOH + Cr_2(SO_4)_3 \rightarrow 2Na_2CrO_4 + 8H_2O + 3Na_2SO_4$ (8)

v) Na^+; SO_4^{2-} (8)

See page number - 7

38 iv

$n_{Cr_2(SO_4)_3} = cV$

$= 0.1 mol\,dm^{-3} \times 250 \times 10^{-3}\,dm^3$

$= 2.5 \times 10^{-2}$ mol

Reacted $n_{Cr_2(SO_4)_3} : n_{H_2O_2}$

1 : 3

$n_{H_2O_2}$ (reacted) $= 3 \times 2.5 \times 10^{-2}$ mol

$= 7.5 \times 10^{-2}$ mol

Volume of H_2O_2 solution which contain 7.5×10^{-2} mol of H_2O_2

$V = n/c$

$= \frac{7.5 \times 10^{-2}\ mol}{0.1 mol\,dm^{-3}}$

$= 75 \times 10^{-2}\,dm^3$

$= 75 \times 10^{-2} \times 1000\,cm^3$

$= 750\,cm^3$

(12)

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4 I $(Empirical\ Formula)_n = Molecular\ formula$

$n = 1, 2, 3 \ldots$ (5)

II

C	H	O
$\frac{2g}{12 g mol^{-1}}$	$\frac{0.35g}{1 g mol^{-1}}$	$\frac{2.7g}{16 g mol^{-1}}$
0.17	0.35	0.17
$\frac{0.17}{0.17}$	$\frac{0.35}{0.17}$	$\frac{0.17}{0.17}$
1	2	1

(15)

Empirical Formula = CH_2O

$(CH_2O)n$ = Molecular formula
$(CH_2O)6$ = $C_6H_{12}O_6$ (5)

$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$

$n_{C_6H_{12}O_6} = \frac{5.5\,g}{180\,g\,mol^{-1}}$

$= 0.0306\ mol$

$n_{CO_2} = 0.0306 \times 6\ mol$
$= 0.1836\ mol$

$n_{H_2O} = 0.0306 \times 6\ mol$
$= 0.1836\ mol$

Mass of CO_2 = $0.1836\ mol \times 44\,g\,mol^{-1}$
$= 8.078\,g$

Mass of H_2O = $0.1836\ mol \times 18\,g\,mol^{-1}$
$= 3.3048\,g$

(20)

8 $CaCO_3 \longrightarrow CaO + CO_2$
$2NaHCO_3 \longrightarrow Na_2CO_3 + CO_2 + H_2O$

$n_{H_2O} = \frac{1.2044 \times 10^{23}}{6.022 \times 10^{23}\,mol^{-1}}$

$= 0.2\ mol$

reacted n_{NaHCO_3} : released n_{H_2O}
2 : 1

$n_{NaHCO_3} = 0.2\ mol \times 2 = 0.4\ mol$

$NaHCO_3$ $23+1+12+16\times3 = 84$

$n_{NaHCO_3} = 0.4\ mol$

Mass of $NaHCO_3 = 0.4\ mol \times 84\ g\ mol^{-1}$

$= 33.6\ g$

$n_{CaCO_3} = 0.2\ mol$

$m_{CaCO_3} = 0.2\ mol \times 100\ g\ mol^{-1}$

$= 20\ g$

$CaCO_3\ \% = \frac{20\ g}{(20+33.6)\ g} \times 100\ \%$

$= 37.3\ \%$

$NaHCO_3\ \% = \frac{33.6\ g}{(20+33.6)\ g} \times 100\ \%$

$= 62.7\ \%$

(25)

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4) 2 $c = \frac{10\ d\ w/w\ \%}{M}\ mol\ dm^{-3}$

$M = \frac{10\ d\ w/w\ \%}{c}\ g\ mol^{-1}$

$= \frac{10 \times 15 \times 30}{5}\ g\ mol^{-1}$

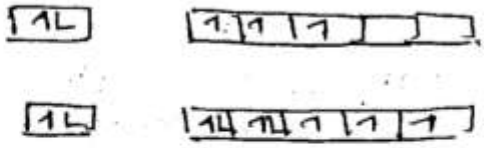
$= 90\ g\ mol^{-1}$

(15)

we can use any alternative method to determi
molar mass of ✗

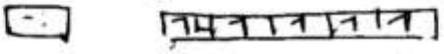
4 C

Possible orbital diagram of 4s, 3d for X

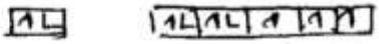
X 

Three unpair e^n

However, X^{3+} contains 4 unpair electrons there possible orbital diagram for X^{3+}



Then we can say. orbital diagram of 4s, 3d for ground state of X element.



atomic number of X is 27

Co

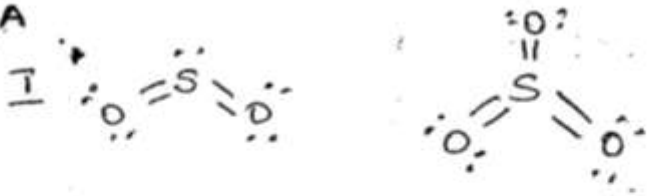
$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^7$

+3

5 x 3 = (15)

100 x 4 = 400

2) A

I 

(10)

II No change hybridization in S (10)

III SO_2 angular shape
SO_3 trigonal planar (10)

IV For suitable answer (10)

V SO_2 Polar molecule
SO_3 non polar molecule (5)
Suitable explanation (5)

VI SO_2, SO_3
✓ equal hybridization in central atom of both molecules.
✓ Charge is zero in both molecules
✓ Oxidation number
SO_2 +4
SO_3 +6 (10)

therefore the electronegativity of sulphur in $SO_3 > SO_2$

A = 60 marks

B I For suitable explanation
II For suitable explanation
III For suitable explanation
IV For suitable explanation
V For suitable explanation 5 × 10 = (50)

C
(I) $Al^{3+} < Mg^{2+} < Na^{+} < Cl^{-} < S^{2-} < P^{3-}$ (10)
(II) Na, Cl (10)

C (III) Mg < Al < Na < P < S < Cl (10)
IV H = P
C = S (10)

for Question 1 = 150

2 Essay Part B I - P (10) ✓

A II electronic configuration of P is
$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$
The first five electrons are removed from last third energy level (3p and 3s)
Sixth electron is to be removed from 2nd Energy Level (2p) which is much closer to the nucleus and only screened by the $1s^2$ electrons therefore sixth ionization energy of P so large ✓
For suitable answer (10)

III $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$ (10)
IV $3s^2\ 3p^3$ ↑↓ ↑ ↑ ↑ (10)
V 3 (10)
VI $P_{(g)} \longrightarrow P^+_{(g)} + e$ (10)
VII
VIII Z = NH_3
Y = PH_3 Boling point $NH_3 > PH_3$ (10)

A = 7 70

B a) PPm or ppb (10)

b) $ppm = \frac{m_{components}}{M_{mixture}} \times 10^6$

$= \frac{4 \times 10^{-4} g}{2 g} \times 10^6$

$= 200$ ppm (12)

c) density of solution is $1 g\,cm^{-3}$ or
density of pure water = density of solution

dI (10)

mass of solvent = $dv = 1 g\,cm^{-3} \cdot g\,cm^3$
$= 90 g$

moles of solute ($C_6H_{12}O_6$) $= \frac{4.5 g}{180 g\,mol^{-1}}$
$= 0.025$ mol

molality = $\frac{\text{moles of solute (mol)}}{\text{mass of solvent (kg)}}$

$= \frac{0.025 \text{ mol}}{90 \times 10^{-3} \text{ kg}}$ (12)

$= \frac{25}{90}$ mol kg^{-1} = 0.28 mol kg^{-1}

(iii) $n_{NaCl} = \frac{m_{(NaCl)}}{M_{(NaCl)}}$ (03)

NaCl: 23 + 35.5 = 58.5 g mol^{-1}

$= \frac{5.85 \text{ g}}{58.5 \text{ g mol}^{-1}}$

$= 0.1 \text{ mol}$

$n_{glucose} = \frac{4.5 \text{ g}}{180 \text{ g mol}^{-1}}$ (03)

$= 0.025 \text{ mol}$

$n_{H_2O} = \frac{90 \text{ g}}{18 \text{ g mol}^{-1}}$ (03)

$= 5 \text{ mol}$

Total moles = 0.1 mol + 0.025 mol + 5 mol

= 5.125 mol

Mole Fraction of NaCl in Mixture

$= \frac{n_{NaCl}}{n_{mixture}}$ (03)

$= \frac{0.1 \text{ mol}}{5.125 \text{ mol}}$

= 0.0195

(iv) Total mass of solution

= 5.85 g + 4.5 g + 90 g

= 100.35 g mol^{-1} 06

(iv) $c = \frac{n}{V}$

$= \frac{0.025 \text{ mol}}{90 \times 10^{-3} \text{ dm}^3}$

0.28 mol dm^{-3}

(12)

volume of solution = 90 cm^3

$d = \frac{m}{V}$ (12)

$= \frac{100.35 \text{ g}}{90 \text{ cm}^3}$ = 1.115 g cm^{-3}

B = 80

3) Essay part B

A I Extremely pure
Stable
not hydrated
highly water soluble
higher molecular weights.
For suitable answer - (10)

2 anhydrous Na_2CO_3
$K_2Cr_2O_7$
KIO_3 (9)

3 * Dissolving an accurately measured mass or volume of pure, compound in a suitable solvent
* Diluting a stock solution. (10)

4 For suitable steps. (10)

5

(a) $C = \frac{10d\ w/w\%}{M_1}$ mol dm^{-3}

$= \frac{10 \times 1.2 \times 36}{36.5}$ mol dm^{-3} (16)

$= 11.8$ mol dm^{-3}

(b) $n = cv$

$= 1$ mol $dm^{-3} \cdot 250 \times 10^{-3}$ dm^3 (10)

$= 2.5 \times 10^{-2}$ mol

(c) $V = \frac{n}{c}$ (5)

$= \frac{2.5 \times 10^{-1}\ mol}{11.8\ mol\ dm^{-3}}$

$= 0.0212\ dm^3$ (15)

$= 21.2\ cm^3$

7.1

Accurately measured volume of $21.2\ cm^3$ of concentrated HCl is diluted up to the mark of the volumetic flask to prepare the solution of $250.00\ cm^3$ $1.0\ mol\ dm^{-3}$ HCl solution. (15)

A Part 100

B a) $Ba(OH)_2 + H_2SO_4 \longrightarrow BaSO_4 + 2H_2O$

(Reacted $n_{Ba(OH)_2}$: $n_{H_2SO_4}$ ratio)

$n_{H_2SO_4} = cV$

$= 1\ mol\ dm^{-3} \cdot 25 \times 10^{-3}\ dm^3$ (10)

$= 2.5 \times 10^{-2}\ mol$

b) 1 : 1 (Reacted $n_{Ba(OH)_2} : n_{H_2SO_4}$) (10)

c) $n_{Ba(OH)_2} = 2.5 \times 10^{-2}\ mol$ (10)

(d) $c = \frac{n}{V} = \frac{2.5 \times 10^{-2}\ mol}{25 \times 10^{-3}\ dm^3}$ (10)

$= 1\ mol\ dm^{-3}$.

(e) Reacted $n_{Ba(OH)_2}$: [illegible] produced n_{BaSO_4}

1 : 1

Produced $n_{BaSO_4} = 2.5 \times 10^{-2}\ mol$

Mass of produced $BaSO_4 = n \cdot M$ (10)

$= 2.5 \times 10^{-2}\ mol \ 233\ g\ mol^{-1}$

$= 5.825\ g$

B Part = 50

Total marks for question three is 150 Marks.

Part I 50

Part II $\frac{400+300}{14} = 50$

Total = 50 + 50

100.