



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

Conducted by Field Work Centre, Thondaimanaru

In Collaboration with

Provincial Department of Education Northern Province.

Grade - 12 (2019)

Chemistry

Marking Scheme

M.C.Q				
1) 5	6) 1	11) 1	16) 1	21) 1
2) 4	7) 2	12) 3	17) 2	22) 5
3) 3	8) 3	13) 2	18) 3	23) 2
4) 2	9) 4	14) 4	19) 4	24) 3
5) 1	10) 5	15) 2	20) 5 (b,c,d)	25) 4

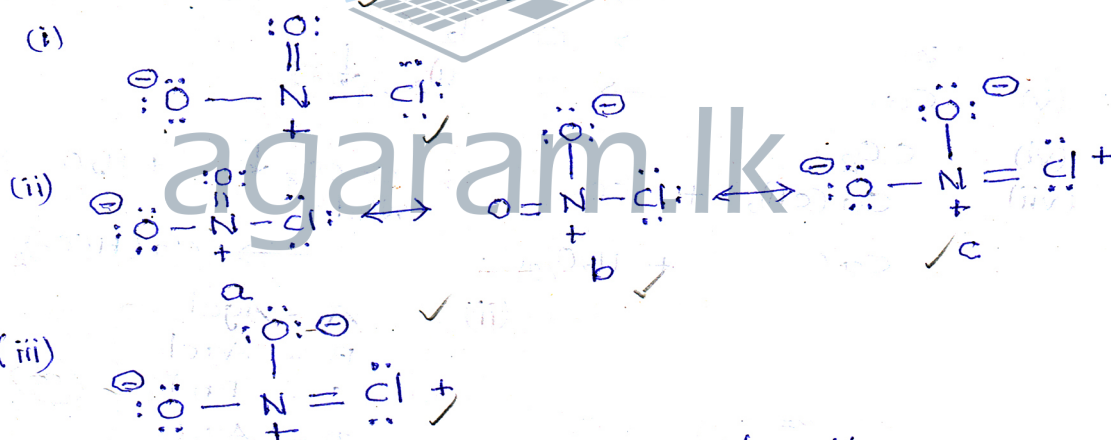
25x2 = 50 marks

structured essay

① (a) I) $Q = N_A - N_{LP} - \frac{1}{2} N_{BP}$

II) $Q = 6 - 0 - \frac{1}{2} (12) = 0$

III) (i)

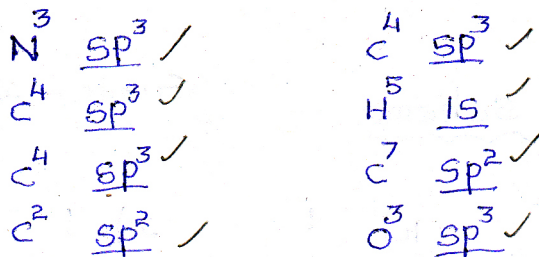


+ charge on electro negative atom
like charges on adjacent atoms
high charge separation

iv)

N^3	C^4	C^3	O^9
4 ✓	4 ✓	4 ✓	4 ✓
Tetrahedral ✓	Tetrahedral ✓	Trigonal planar ✓	Tetrahedral ✓
4 ✓	4 ✓	3 ✓	4 ✓
Trigonal pyramidal	Tetrahedral ✓	Trigonal planar ✓	angular ✓
sp^3 ✓	sp^3 ✓	sp^2 ✓	sp^3 ✓

V)



②

(b) I ion-dipole attractive force, H-bond, London force.

II dipole-induced dipole forces, London force.

III ion-induced dipole force, London force.

Question-01 x 50 = 50 marks

② (a) (i) A-Mg (01) B-Ca (01)

(ii) A - 1s² 2s² 2p⁶ 3s² (01)

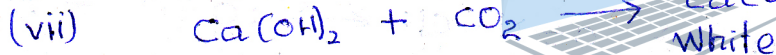
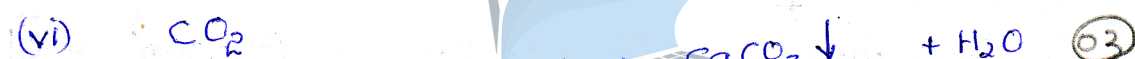
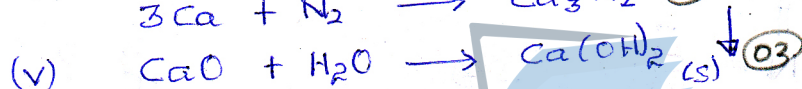
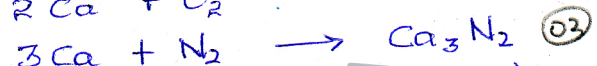
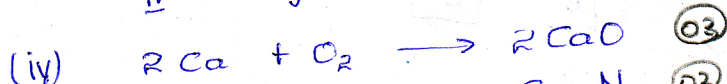
(iii) I Ca > Mg (01)

II Mg > Ca (01)

B - 1s² 2s² 2p⁶ 3s² 3p⁶ 4s² (01)

III Ca > Mg (01)

IV Mg > Ca (01)



(b) (i) I NaCl/HCl

II AgNO₃

III Pb(NO₃)₂

IV AgNO₃

V HCl

VI Na₂S₂O₃/K₂SO₃

(ii) A - AgCl

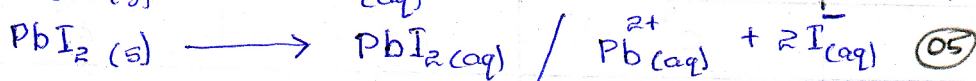
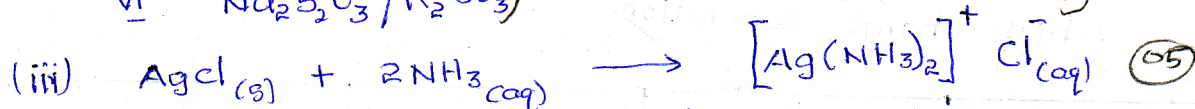
B - AgCl

C - PbI₂

D - Ag₂O

E - S

F - K₂SO₃



③ (a) I PV = nRT (02)

$$n_{He} = \frac{2 \times 10^5 \text{ Pa} \times 3 \text{ m}^3}{8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K}} = 240.56 \text{ mol.} (02)$$

$$\text{II } n_{N_2} = \frac{5 \times 10^5 \text{ Pa} \times 3 \text{ m}^3}{8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K}} = 601.39 \text{ mol.} (02)$$

Question-02 = 50 marks

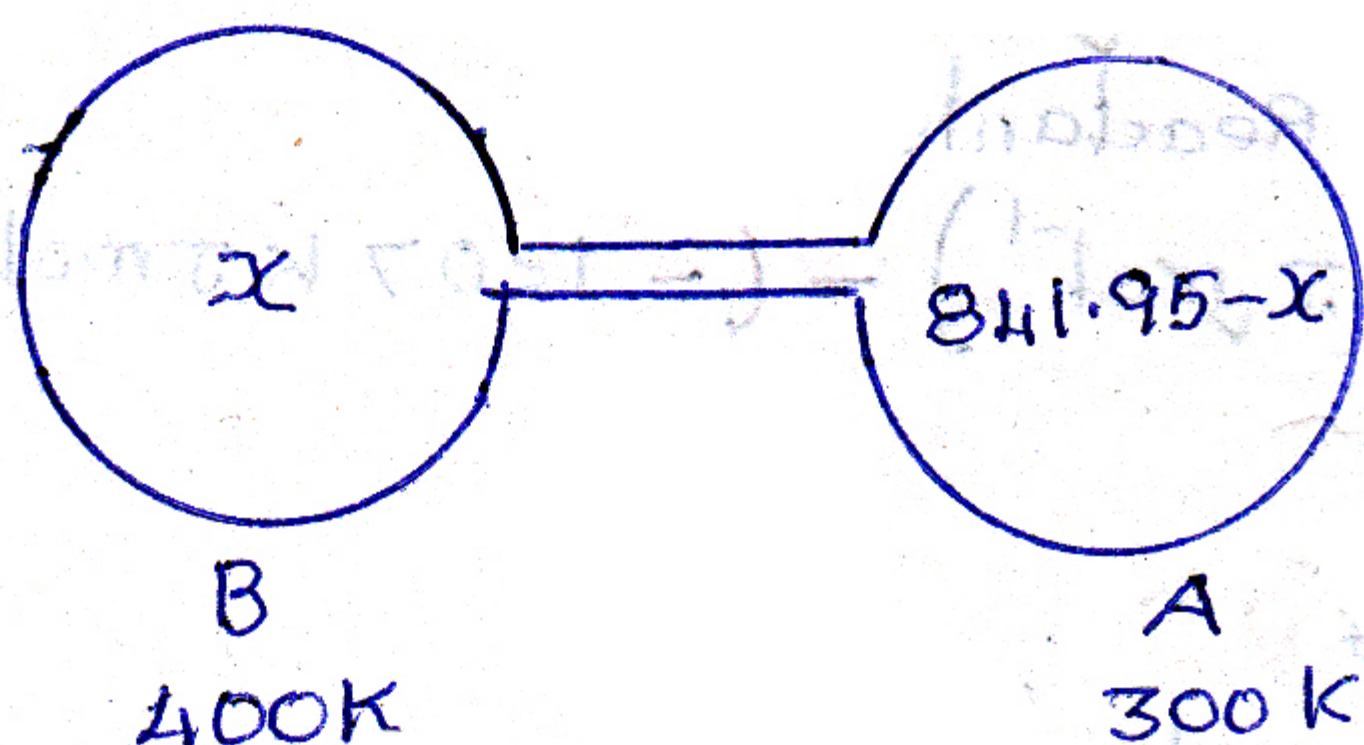
$$n_{\text{total}} = 240.56 + 601.39 \quad (02)$$

$$= 841.95 \text{ mol} \quad (02)$$

$$X_{N_2} = \frac{601.39 \text{ mol}}{841.95 \text{ mol}} \quad (02)$$

$$= 0.714 \quad (02)$$

III)



$$\frac{x \text{ mol} \times R \times 400K}{3m^3} = \frac{(841.95 - x) \times R \times 300K}{3m^3} \quad (02)$$

$$4x = 3(841.95 - x)$$

$$7x = 3 \times 841.95$$

$$x = \frac{2525.85}{7}$$

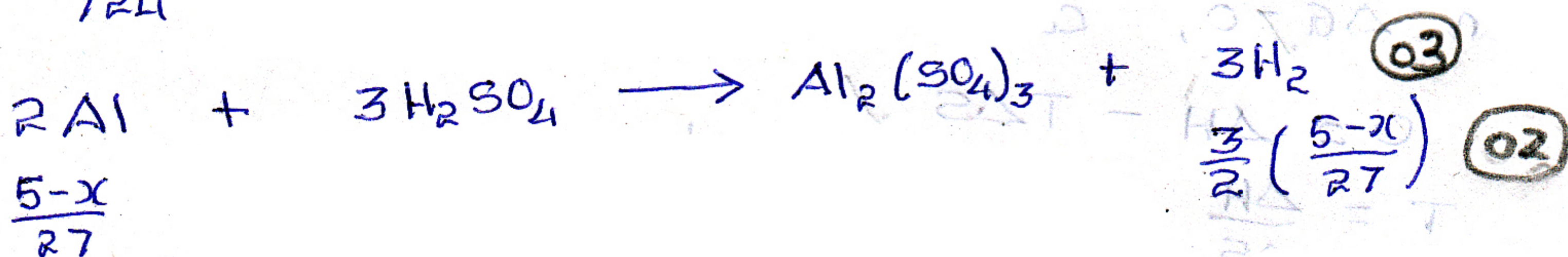
$$= 360.83 \quad (02)$$

$$P = \frac{360.83 \text{ mol} \times 8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 400K}{3m^3} \quad (02)$$

Question 3 @ 26 marks

$$= 3.99 \times 10^5 \text{ Pa} / 4 \times 10^5 \text{ Pa} \quad (02)$$

(b)



$$n_{H_2} = \frac{5.59}{22.4} \text{ mol} \quad (04)$$

$$\frac{x}{24} + \frac{3(5-x)}{2 \times 27} = \frac{5.59}{22.4} \quad (02)$$

$$\frac{x}{24} + \frac{15-3x}{54} = 0.249$$

$$\frac{54x + 24(15-3x)}{24 \times 54} = 0.249$$

$$54x + 360 - 72x = 3234.42$$

$$18x = 36.58$$

$$x = 2.03 \quad (02)$$

Question 3 @ 24 marks

$$\% \text{ of Mg} = \frac{2.03}{5} \times 100 = 40.6 \% \quad (02)$$

Question 3 26+25 = 50 marks

- ④ (a)(i) definition ✓
 (ii) definition ✓
 (iii) definition ✓

- (b) I increases ✓
 II increases ✓
 III increases ✓
 IV increases ✓
 V decreases ✓

(c) (i) $\Delta H^\theta = \sum H^\theta_{\text{products}} - \sum H^\theta_{\text{Reactants}}$
 $= (-635 \text{ kJ mol}^{-1} - 393 \text{ kJ mol}^{-1}) - (-1207 \text{ kJ mol}^{-1})$
 $= +179 \text{ kJ mol}^{-1}$ ✓

(ii) $\Delta S^\theta = \sum S^\theta_{\text{products}} - \sum S^\theta_{\text{Reactant}}$
 $= (38 \text{ J mol}^{-1} \text{ K}^{-1} + 214 \text{ J mol}^{-1} \text{ K}^{-1}) - (93 \text{ J mol}^{-1} \text{ K}^{-1})$
 $= +159 \text{ J mol}^{-1} \text{ K}^{-1}$ ✓

(iii) I $\Delta G = \Delta H - T\Delta S$ ✓
 θ indicated - no marks.

II $\Delta G^\theta = \Delta H^\theta - T\Delta S^\theta$ ✓
 $= 179 \text{ kJ mol}^{-1} - 298 \times \frac{159 \text{ kJ mol}^{-1}}{1000}$
 $= 179 \text{ kJ mol}^{-1} - 298 \times 0.159 \text{ kJ mol}^{-1}$
 $= 179 \text{ kJ mol}^{-1} - 47.382 \text{ kJ mol}^{-1}$
 $= 131.618 \text{ kJ mol}^{-1}$

$\Delta G = +ve$ ✓ $\therefore$ non spontaneous.

IV when $\Delta G = 0$, CaCO_3 start to decompose

$0 = \Delta H - T\Delta S$ ✓
 $T = \frac{\Delta H}{\Delta S} = \frac{179 \text{ kJ mol}^{-1}}{0.159 \text{ kJ mol}^{-1} \text{ K}^{-1}}$
 $= 1125 \text{ K}$
 $= 852 \text{ C}$ ✓

V ΔS and ΔH had not changed with temperature

Question 04 - $0.2 \times 25 = 504 \text{ minutes}$

Essay

⑤ (a) (i) Gases that obey ^{all} gas laws at all temperatures and pressures.

OR

Gases that obey the equation $PV = nRT$, at all temperatures and pressures.

OR

Gases that obey Boyle's law, Charles law, Avogadro's law.

OR

Gases that obey

OR

Gases that obey combined gas law. (05)

(ii) $PV = nRT$ (05)

P - Pressure (01)

V - Volume (01)

n - number of moles (01)

R - universal gas constant (01)

T - absolute temperature (01)

(iii) $PV = nRT$.

At constant temperature, product nT for a fixed mass of gas is constant (03)

R - constant (03)

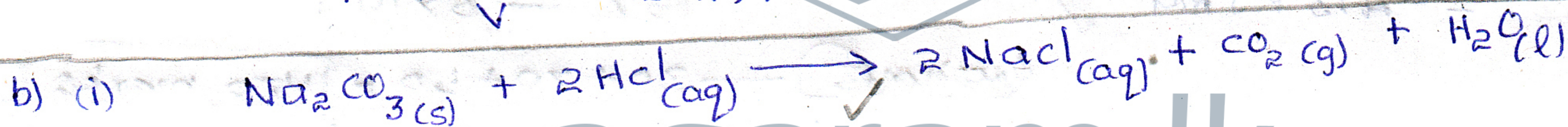
nRT - constant (03)

$PV = K$ (03)

$P \propto \frac{1}{V}$

[m], [T] (03)

5a - 30 marks



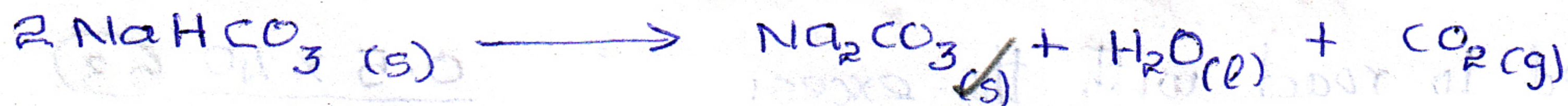
$$\Delta H = m \theta$$

$$= 100g \times 10 \text{ J g}^{-1} \text{ K}^{-1} \times 2.5 \text{ K}$$

$$= 2500 \text{ J} = 2.5 \text{ KJ}$$

$$\Delta H = \frac{2.5 \text{ KJ}}{0.05 \text{ mol}}$$

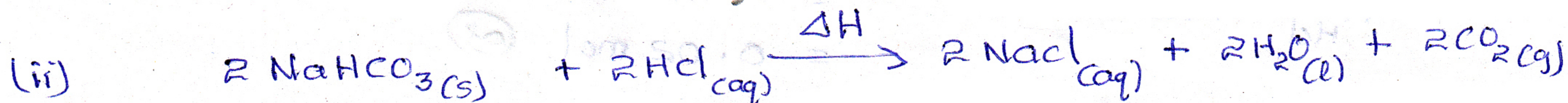
$$\Delta H_1 = -50 \text{ KJ mol}^{-1}$$



$$\Delta H_2 = \frac{20000 \text{ J}}{0.5 \text{ mol}}$$

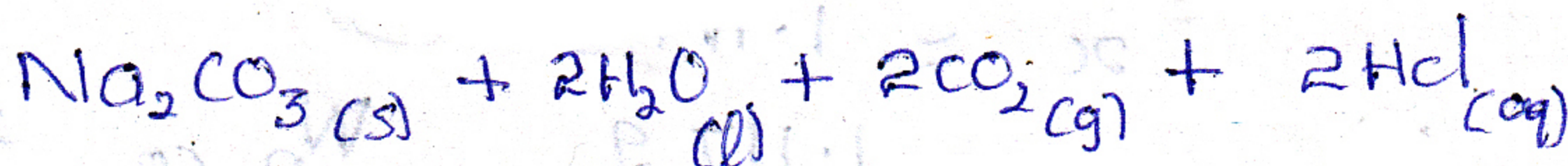
$$= \frac{20 \text{ KJ}}{0.5 \text{ mol}}$$

$$= +40 \text{ KJ mol}^{-1}$$



$2 \times \Delta H_2$

ΔH_1



cycle ✓

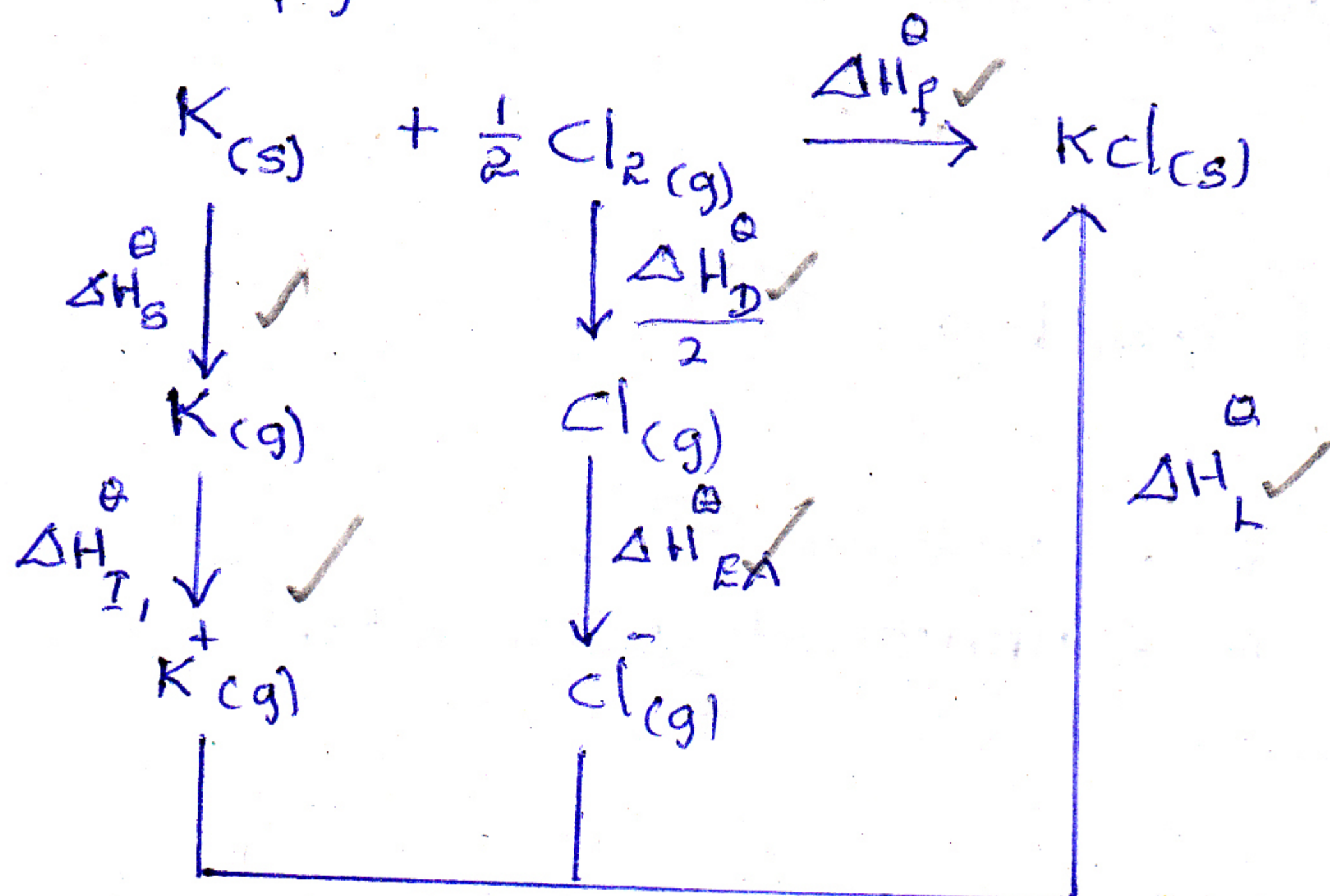
Using Hess' law ✓

$$\begin{aligned}\Delta H &= 2\Delta H_2 + \Delta H_1 \checkmark \\ &= 2 \times 40 \text{ kJ mol}^{-1} \checkmark + (-50 \text{ kJ mol}^{-1}) \\ &= +30 \text{ kJ mol}^{-1} \checkmark\end{aligned}$$

56 - 05 \times 14 = 70 marks

(iii) Enthalpy of solution of $\text{NaHCO}_3(\text{s})$ is neglected.

C)(i)

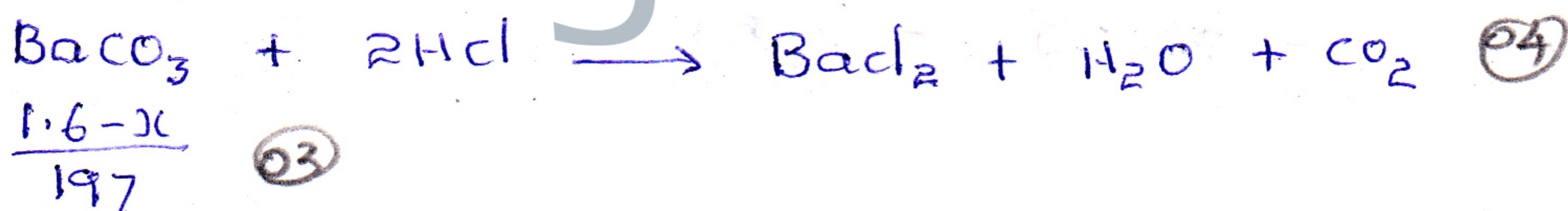


cycle ✓

$$\begin{aligned}\Delta H_L^\theta &= \Delta H_f^\theta - \Delta H_s^\theta - \Delta H_{I_1}^\theta - \frac{1}{2} \Delta H_D^\theta - \Delta H_{EA}^\theta \checkmark \\ &= -437 \text{ kJ mol}^{-1} - 89 \text{ kJ mol}^{-1} - 418 \text{ kJ mol}^{-1} - \frac{1}{2}(-244 \text{ kJ mol}^{-1}) - (-349 \text{ kJ mol}^{-1}) \\ &= -437 - 89 - 418 + 122 + 349 \\ &= -473 \text{ kJ mol}^{-1} \checkmark\end{aligned}$$

56 - 05 \times 10 = 50 marks

Question 5 — 30 + 70 + 50 = 150 marks



$n_{\text{HCl added}} = \frac{0.8 \times 50}{1000} = 0.04 \text{ mol}$ (03)

$n_{\text{NaOH required to react with the excess HCl}} = \frac{0.5 \times 40}{1000}$ (03)
 $= 0.02 \text{ mol}$ (03)

$n_{\text{NaOH}} : n_{\text{HCl}} = 1 : 1$ (03)

$n_{\text{HCl reacted}} = 0.04 - 0.02$
 $= 0.02 \text{ mol}$ (03)

$2 \left(\frac{x}{148} + \frac{1.6-x}{197} \right) = 0.02$ (03)

$x = 1.117 \text{ g}$ (03)

$W_{\text{SrCO}_3} = 1.117 \text{ g}, \quad W_{\text{BaCO}_3} = 0.483 \text{ g}$ (03)

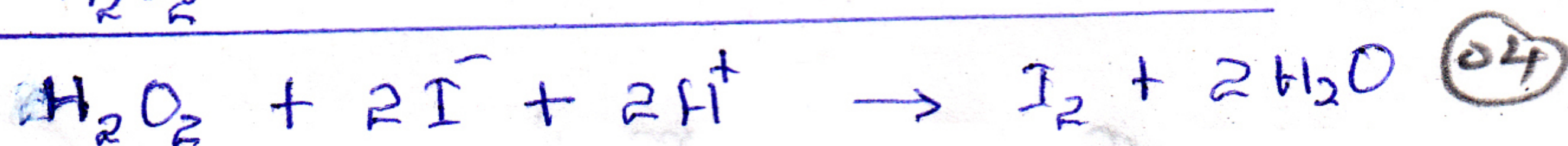
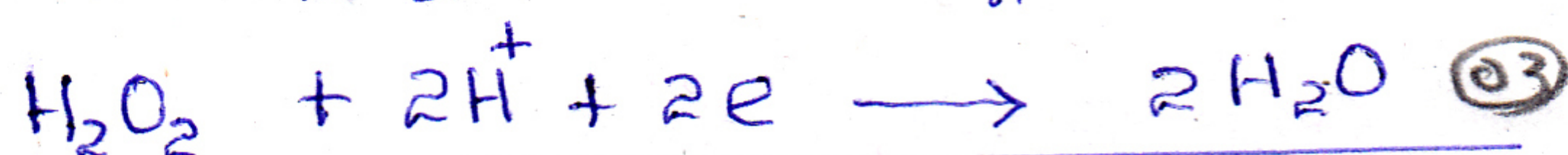
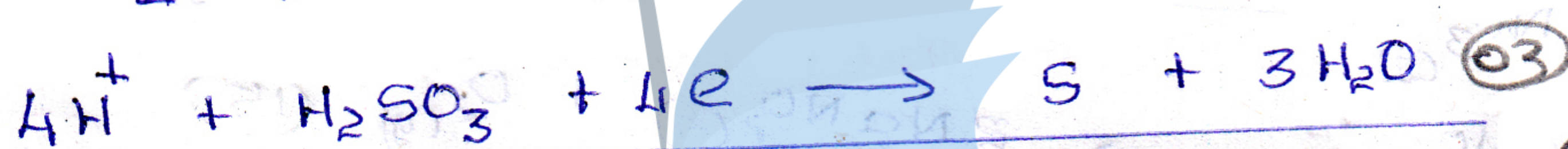
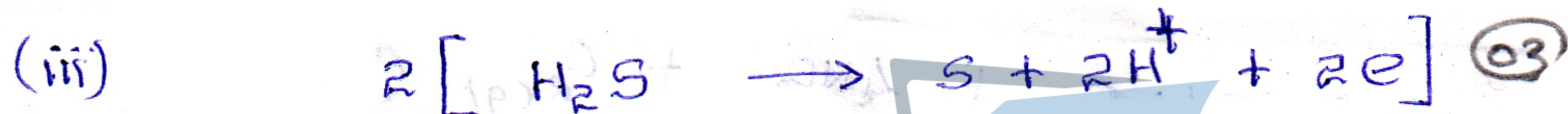
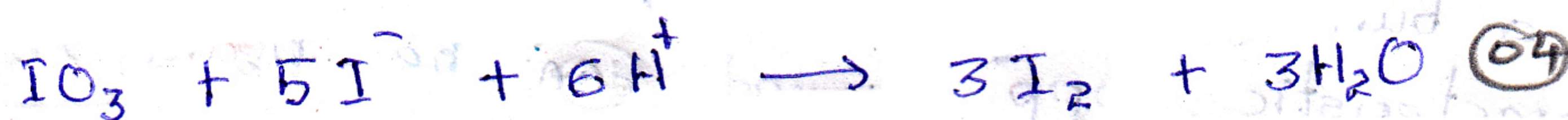
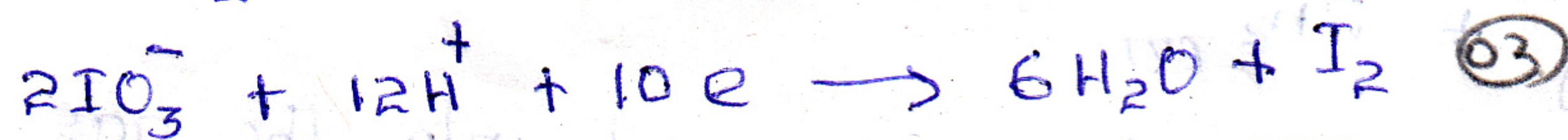
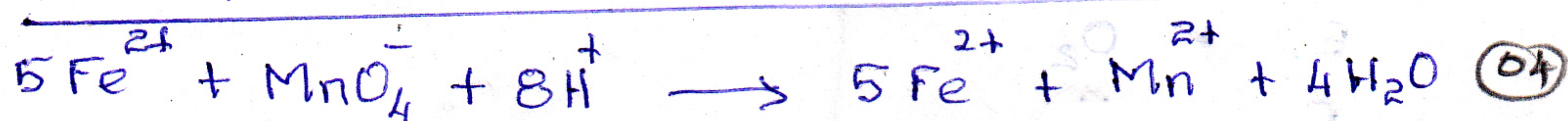
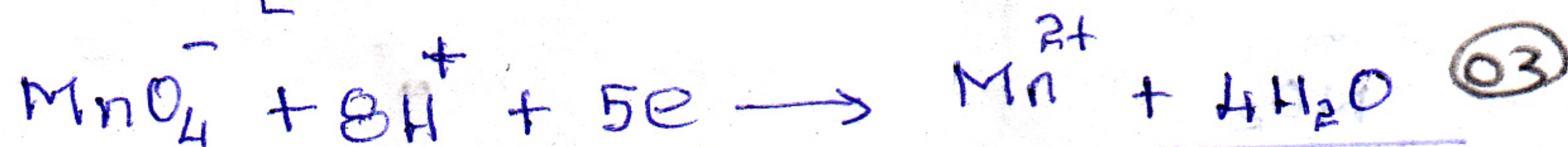
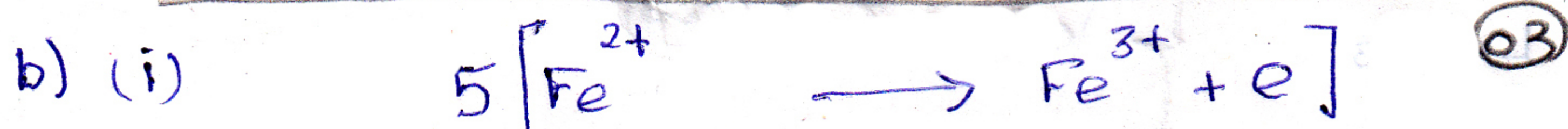
$$\% \text{ of } \text{SrCO}_3 = \frac{1.117\text{g}}{1.6\text{g}} \times 100 \quad (03)$$

$$= 69.81\% \quad (03)$$

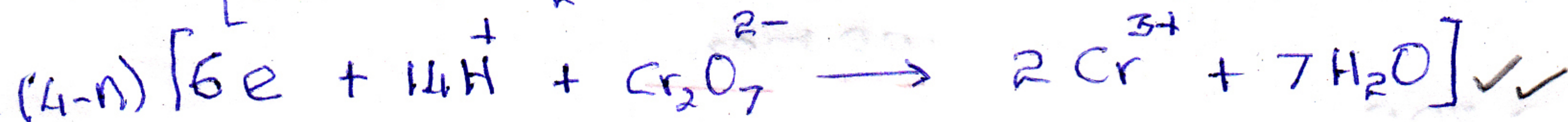
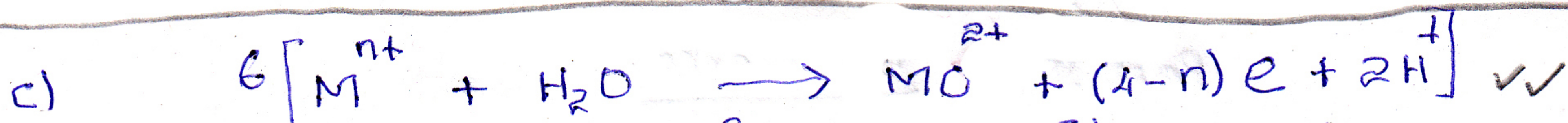
$$\% \text{ of } \text{BaCO}_3 = \frac{0.483\text{g}}{1.6\text{g}} \times 100 \quad (03)$$

$$= 30.18\% \quad (03)$$

6a - 50 marks



6b - 50 marks



$$\frac{n_{\text{M}^{n+}}}{n_{\text{Cr}_2\text{O}_7^{2-}}} = \frac{6}{4-n} \quad \checkmark$$

$$\text{no. of moles of } \text{K}_2\text{Cr}_2\text{O}_7 = \frac{0.1 \times 20}{1000} \text{ mol} \quad \checkmark$$

$$\text{no. of moles of } \text{M}^{n+} = 4 \times 10^{-3} \text{ mol} \quad \checkmark$$

$$\frac{n_{M^{nt}}}{n_{Cr_2O_7^{2-}}} = \frac{6}{4-n} = \frac{4 \times 10^{-3}}{2 \times 10^{-3}} \checkmark$$

$$12 = 4(4-n)$$

$$n = 1 \checkmark$$

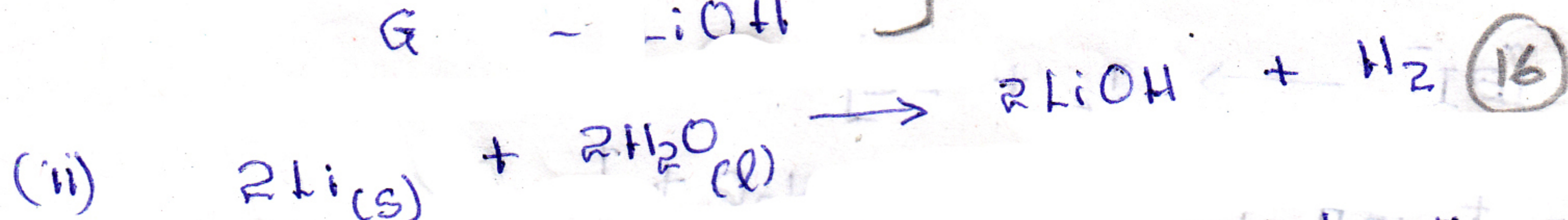
$$50 + 50 + 50 = 150 \text{ marks}$$

$$60 - 05 \times 10 = 50 \text{ marks}$$

⑦ a) (i)

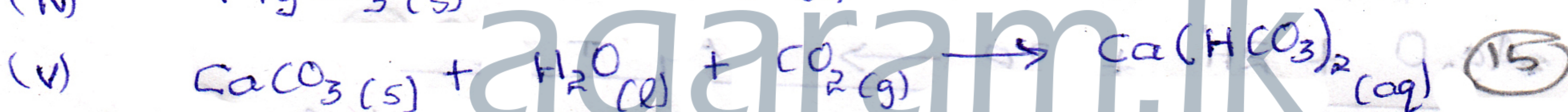
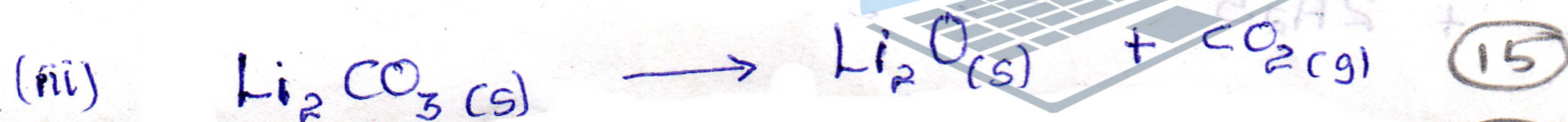
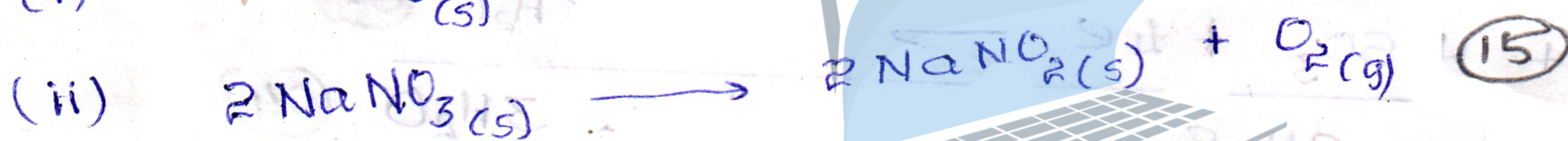
- A - Li
- B - $LiNO_3$
- C - Li_2O
- D - NO_2
- E - O_2
- F - H_2
- G - $LiOH$

$$0.7 \times 7 = 4.9$$



(iii) If a burning splinter is dipped into the gas jar, it is extinguished with a characteristic 'pop' sound (10)

$$7a - 75 \text{ marks}$$



$$7b - 75 \text{ marks}$$

$$\text{Question - 7 - } 150 \text{ marks}$$

$$M.C.Q \Rightarrow 50 \text{ marks}$$

$$(\text{Part II}) \Rightarrow 50 \text{ marks}$$

$$100 \text{ marks}$$

$$\text{Structure } 50 \times 4 = 200$$

$$\text{Essay } 150 \times 2 = 300$$

$$\text{Part II} \Rightarrow \frac{500}{10} = 50$$