

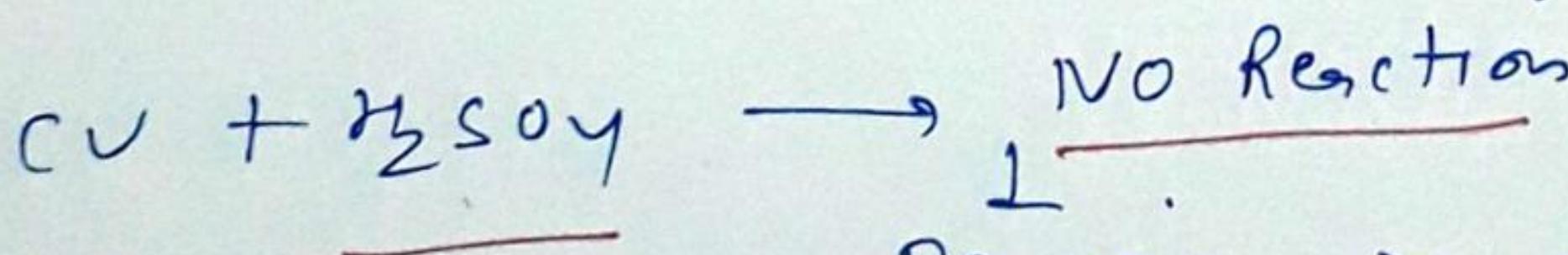
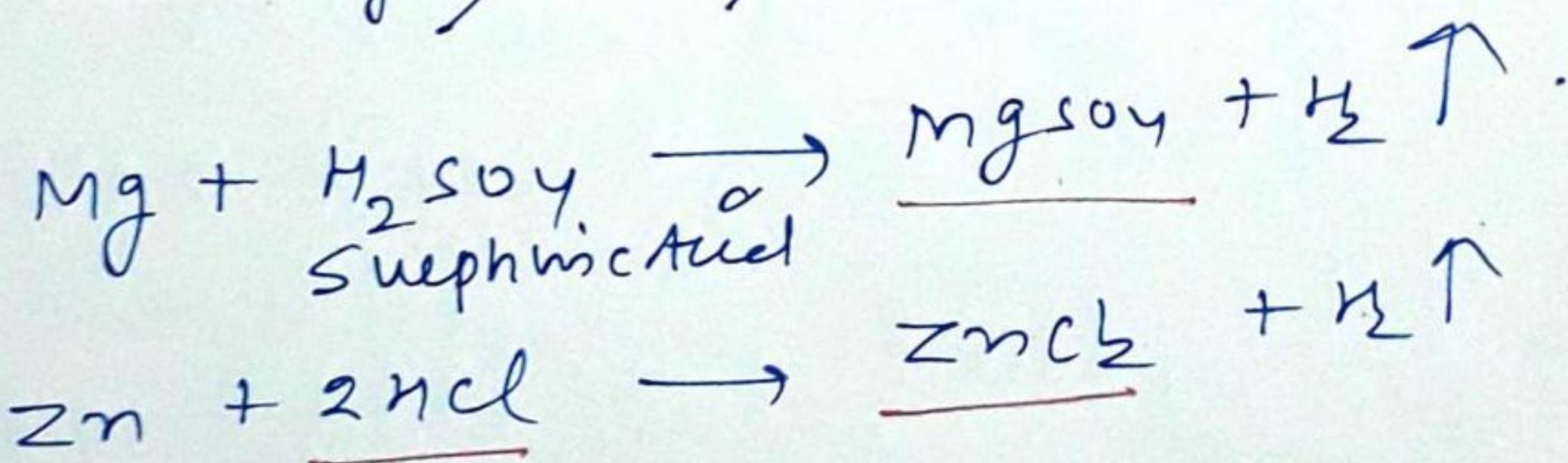
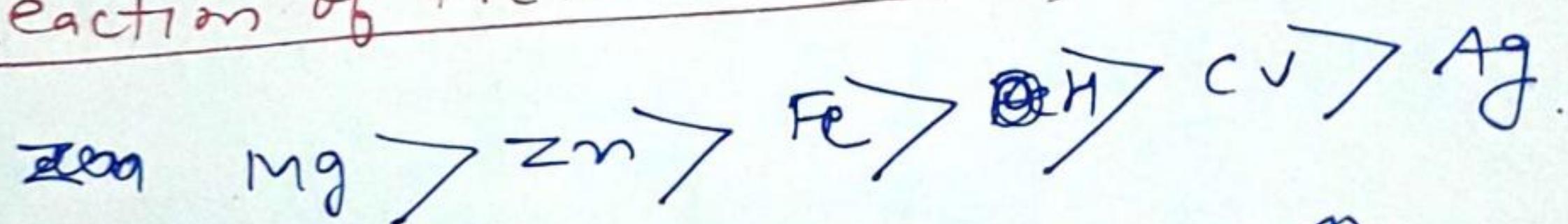
## Hydrogen :-

①

- आज्ञा एवं नाम यूनिट (First element of periodic Table)
- परमाणु संख्या = 1      Atomic Number = 1
- आणतसंखी वर्ग = IA.
- इलेक्ट्रॉनिक कonfiguration (electronic configuration  $\rightarrow$  1s<sup>1</sup>)
- पृथक रूप → Universe, sun, earth.
- सबसे लाकूर मध्ये (lightest Non metal)
- H यूनिट निरूपण कवांदिश
- Hydrogen नाम देवानग्र मात्रांकरण वर्गीय (Lavoisier)
- पृथक गति नियम (Priority of Faraday)  $\frac{92\%}{\text{Electrolysis}} > \text{sun} > \text{earth}$ .

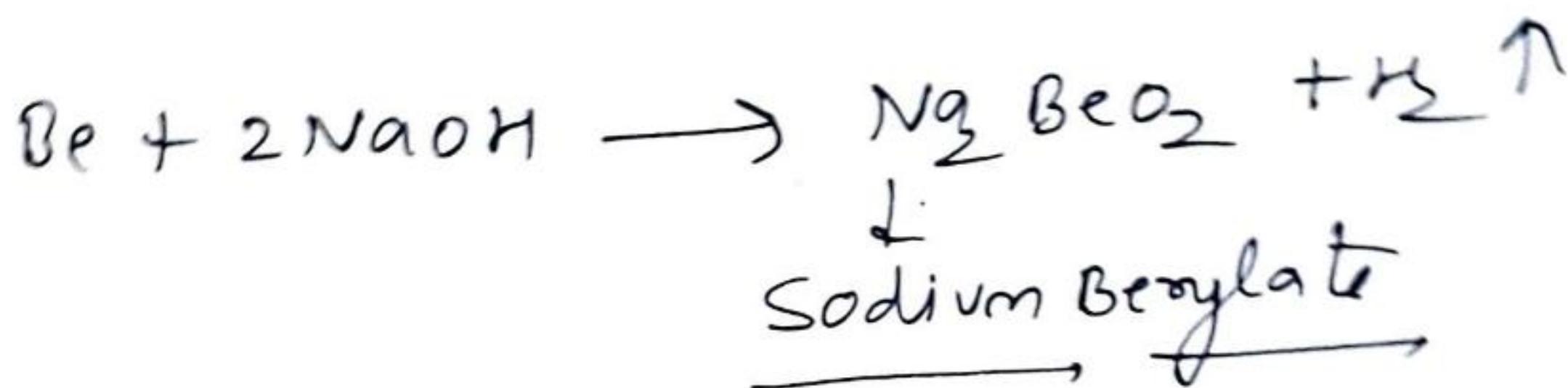
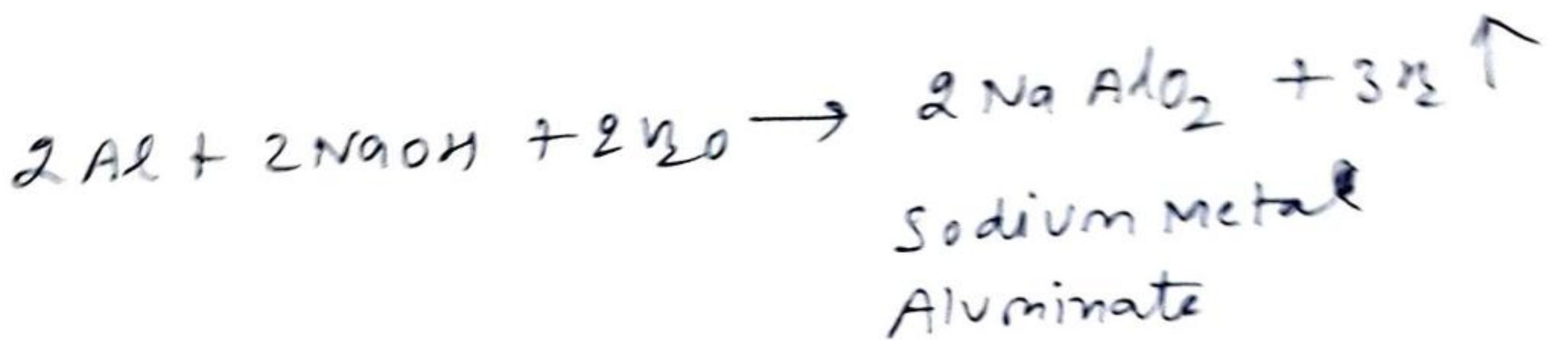
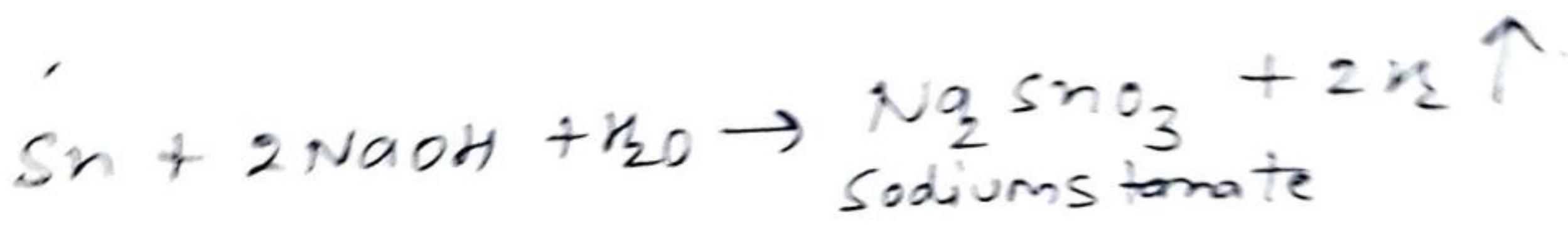
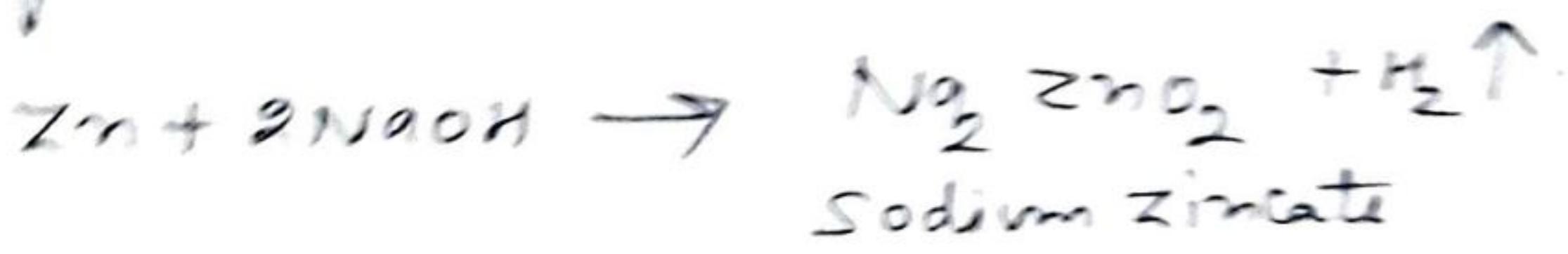
→ Preparation Method of H<sub>2</sub> gas (H<sub>2</sub> gas फॉर प्रॉपर्टीज़)

① अमीड़ी वाले धातु वर्गीय रूप (Reaction of Metal with Acid)



Reason  $\text{H} > \text{Cu}$   
 O-P  
 (अमीड़ी वर्गीय)

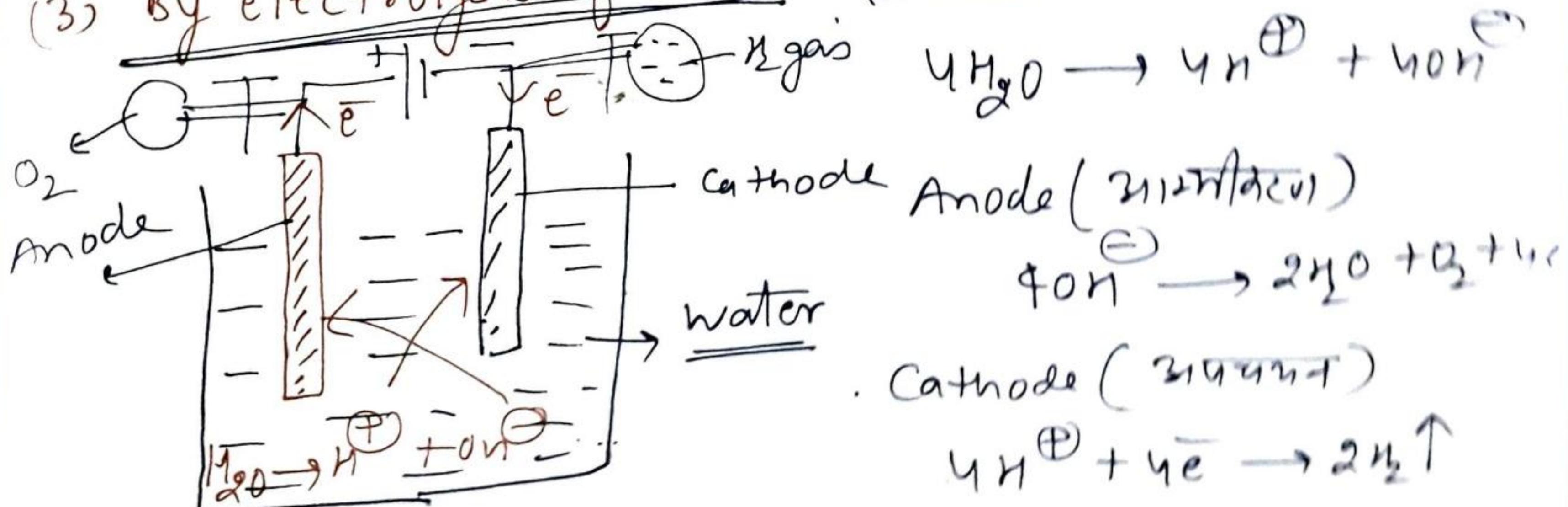
iii) by reaction of metal with base



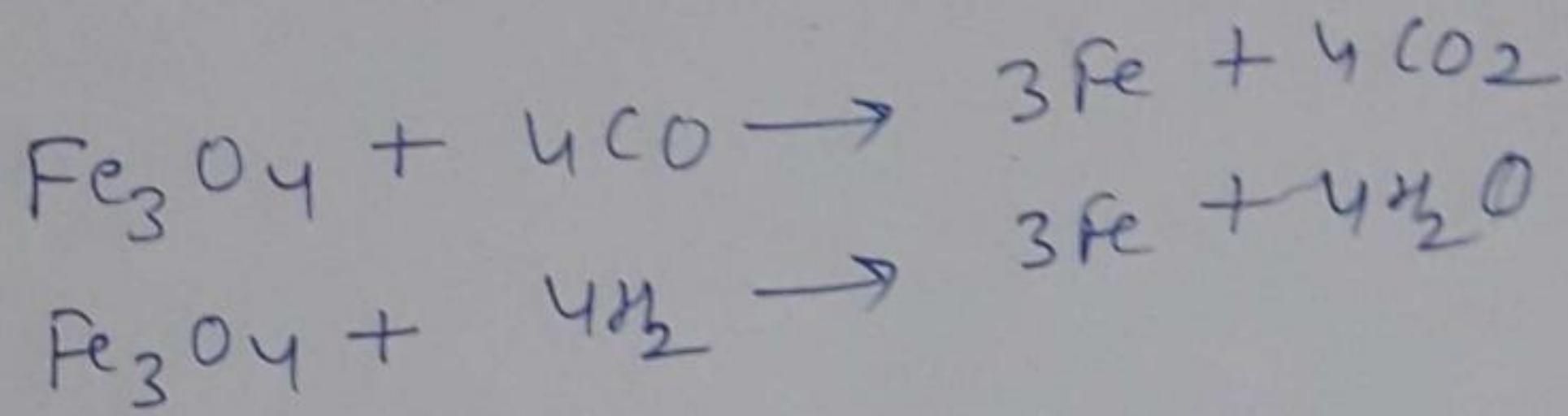
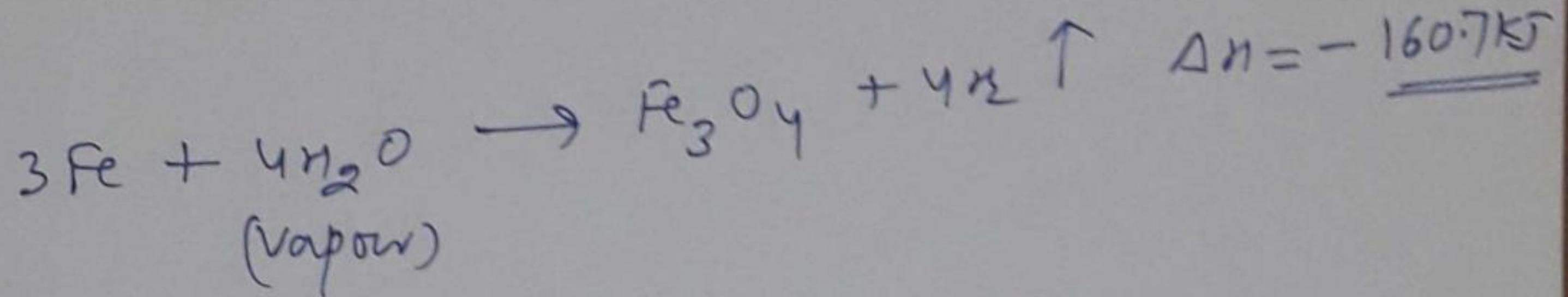
(Metal should be Amphoteric)

Be, Zn, Al, Sn, Pb, Si

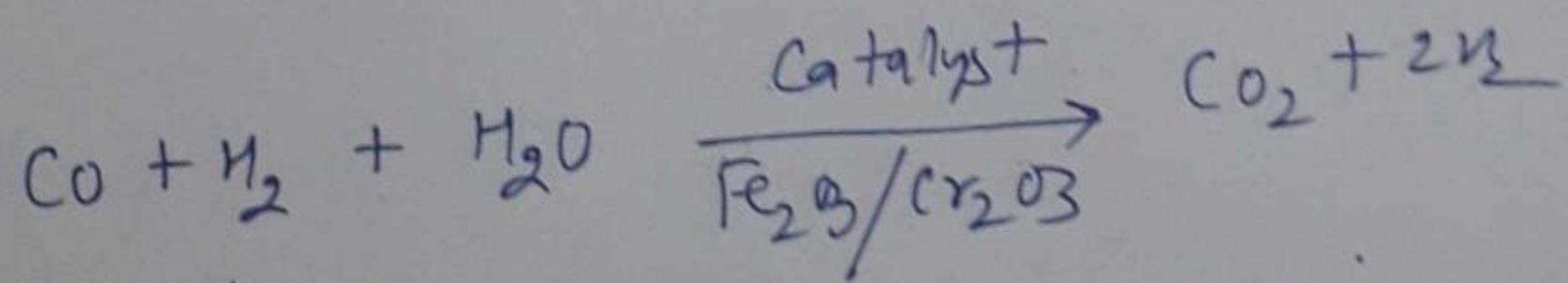
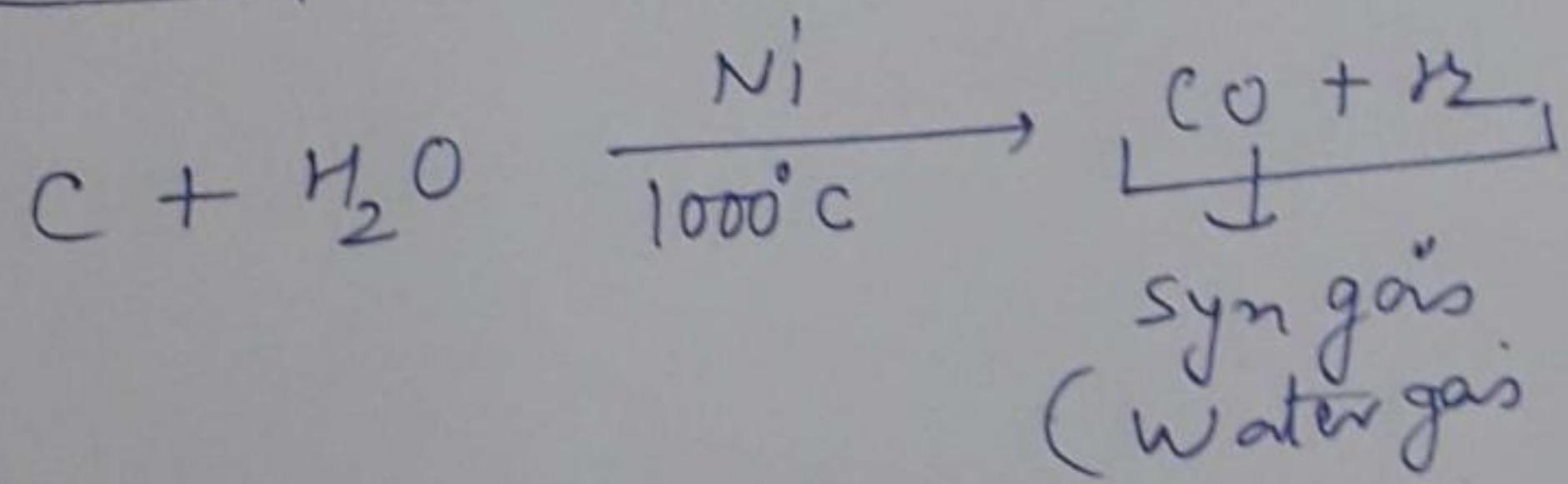
(3) By electrolysis of water (~~from Raoult's law~~)



(4) Davy process (মাই প্রেস)  $\rightarrow$  Industrial method (৩)  
 $\rightarrow$  Steam flow over HOT Iron. then H<sub>2</sub> gas is produced.

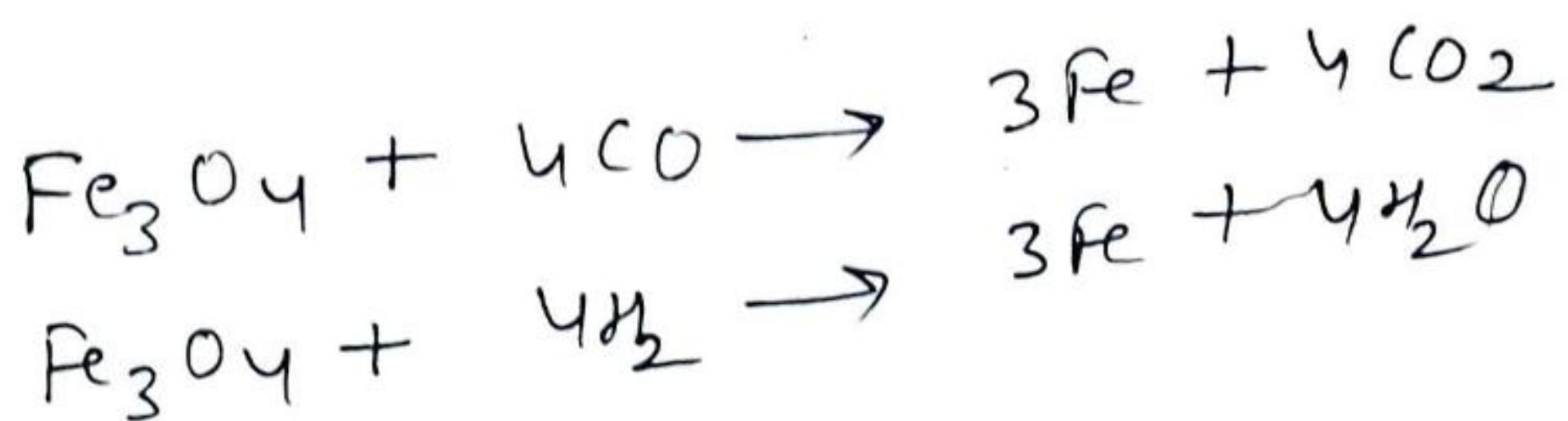
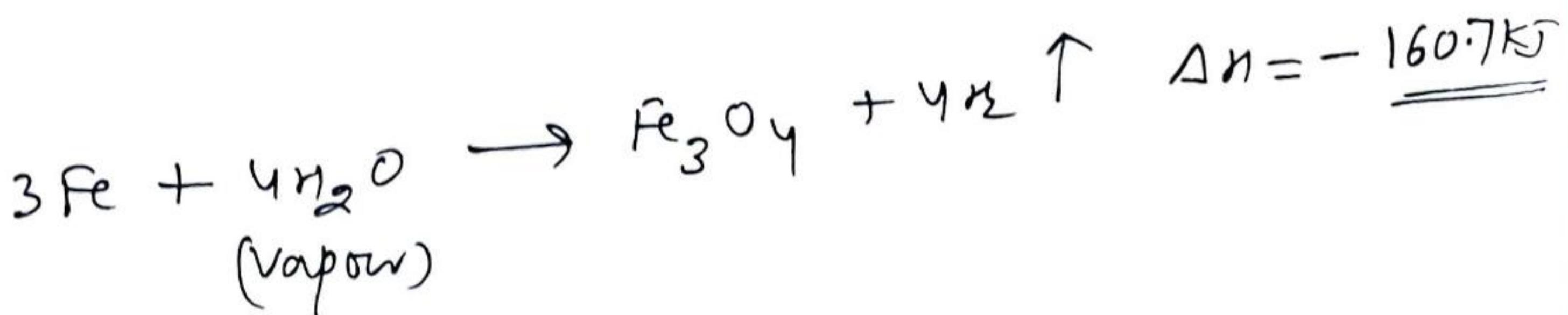


(5) Bosch process (বোস প্রেস)  $\rightarrow$  Industrial Method

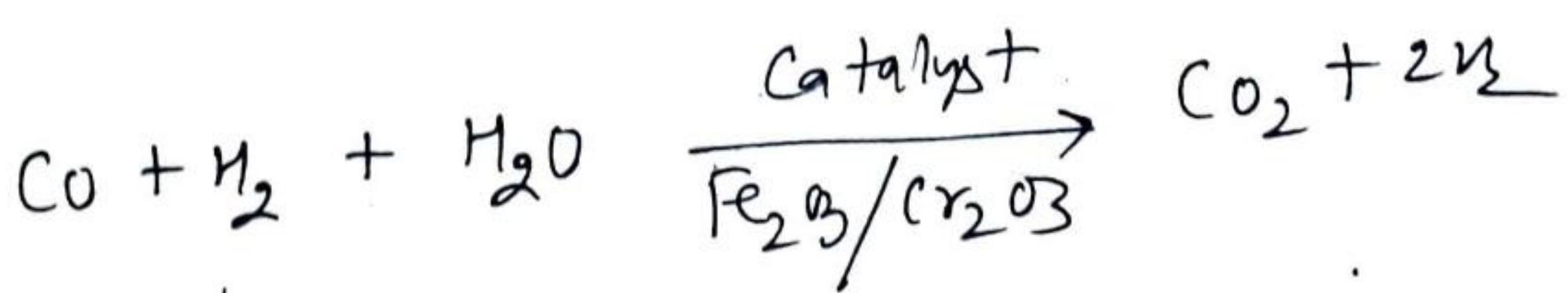
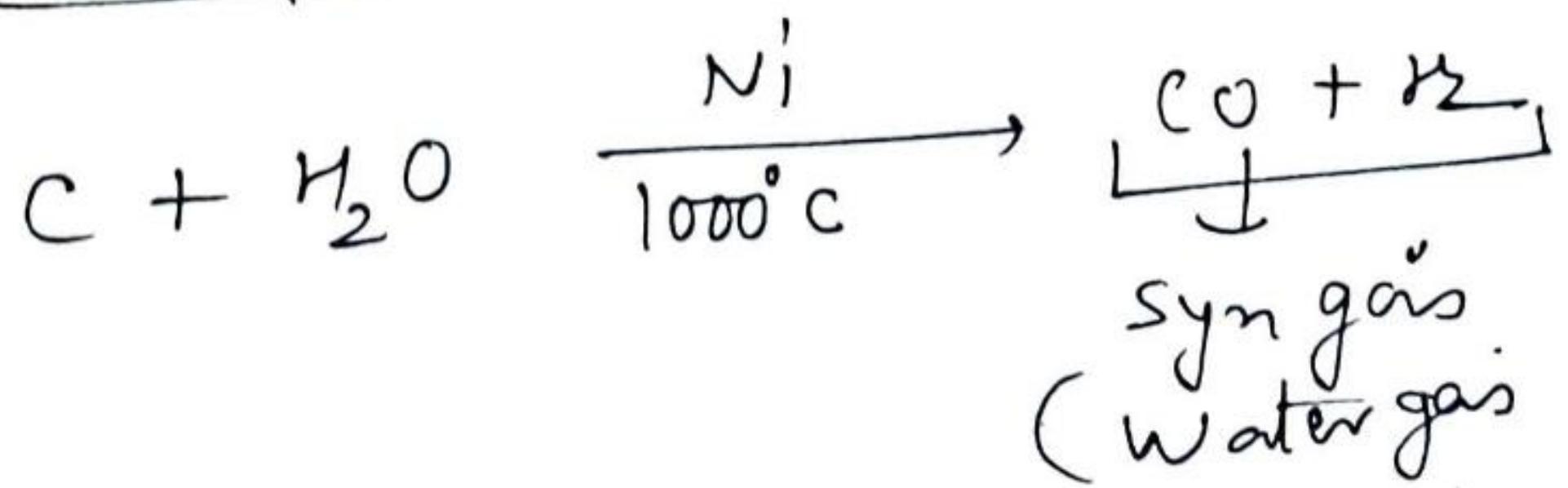


$\downarrow$   
Water gas Transfer Reaction  
(কনষ্টেন্ট কনিন্টেন্সি মেথড)

(4) Davy process (not perfect).  $\rightarrow$  Industrial method (3)  
 $\rightarrow$  Steam flow over HOT Iron. then H<sub>2</sub> gas is produced.



(5) Bosch process (কোষ পদ্ধতি)  $\rightarrow$  Industrial Method



$\downarrow$   
Water gas Transfer Reaction  
(কোষ পদ্ধতি পরিপন্থ মনোনিবেশ)

## Physical properties of H<sub>2</sub> gas

(5)

① lightest (सर्वोच्च)

colorless (सफेदी)

Tasteless (स्वादहीन)

smell less (गंदगी)

less soluble in water (जल में अल्प प्रवृत्ति)

Flammable (जल्दी जलता)

less Reactive (हमें रिएक्टिव)

B.P = -252°C निपोतन -252°C

F.P = -259.2°C उपरान्त -259.2°C

H-H Bond energy = 104 Kcal/mole.

H-H Bond length = 74 pm.

→ H<sub>2</sub> is less Reactive more (High Temperature is required for Reaction)

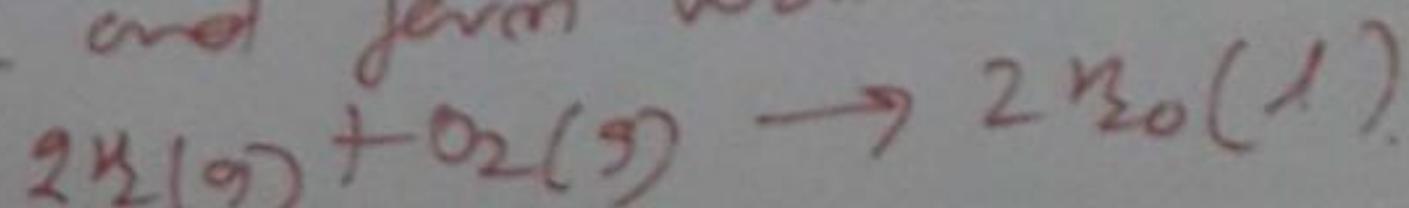
(H<sub>2</sub> gas उड़ने का रिएक्टिव है सही रिएक्टिव)  
उत्तर वर्षीय 3245 वर्ष का मिशन एटी)

→ Chemical Reaction of H<sub>2</sub> gas : →

① Neutral Character → It is Neutral to litmus

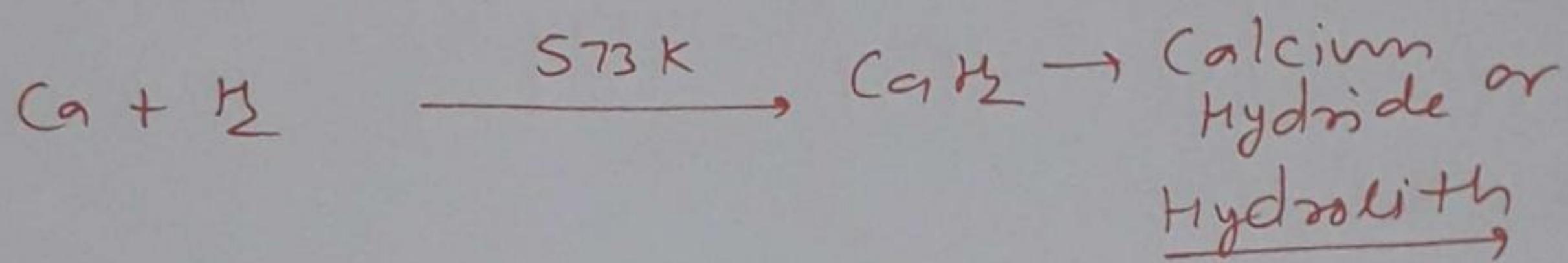
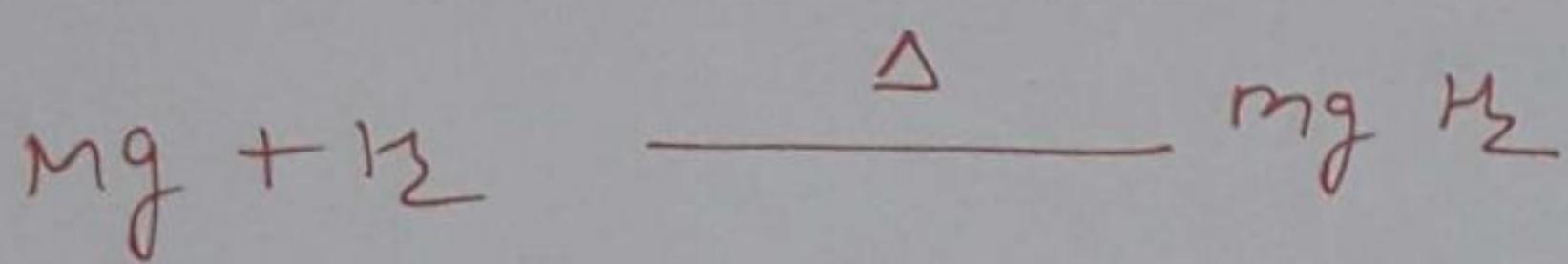
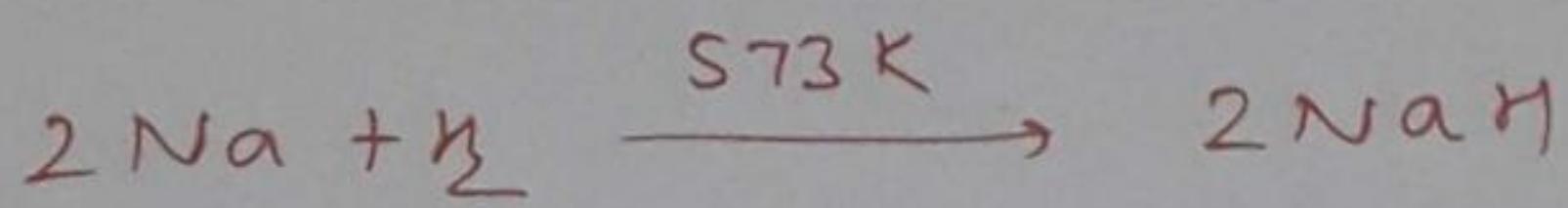
② Combustibility →

Highly combustible gas and burns in Air or oxygen.  
with pale blue flame and form water



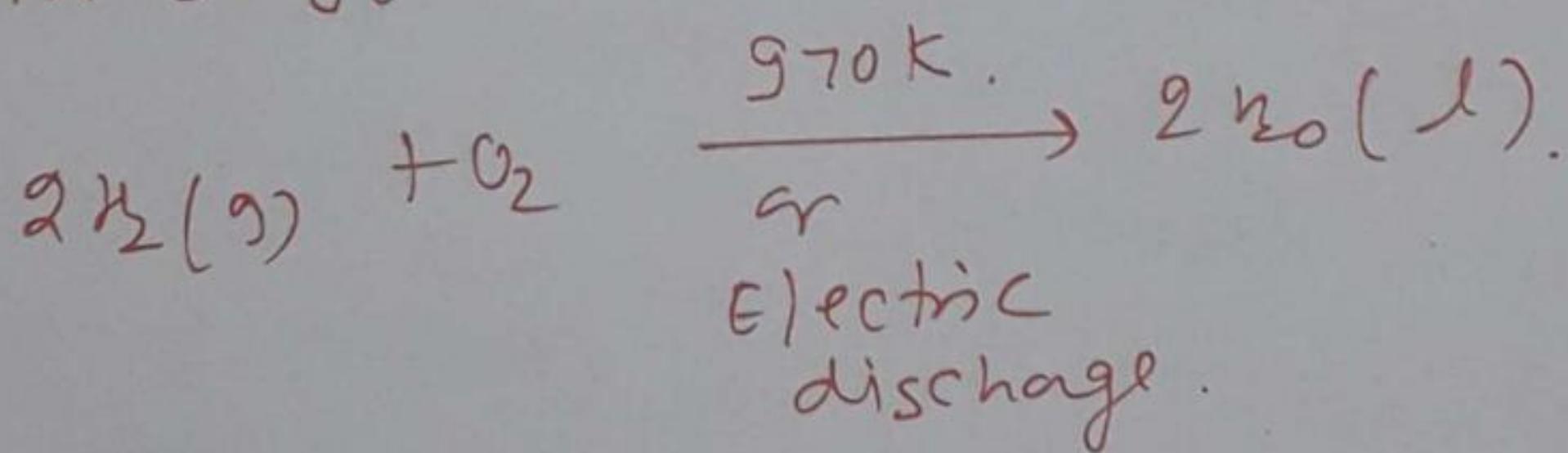
### (3) Reaction with Metal.

(6)



### (4) Reaction with Nonmetal

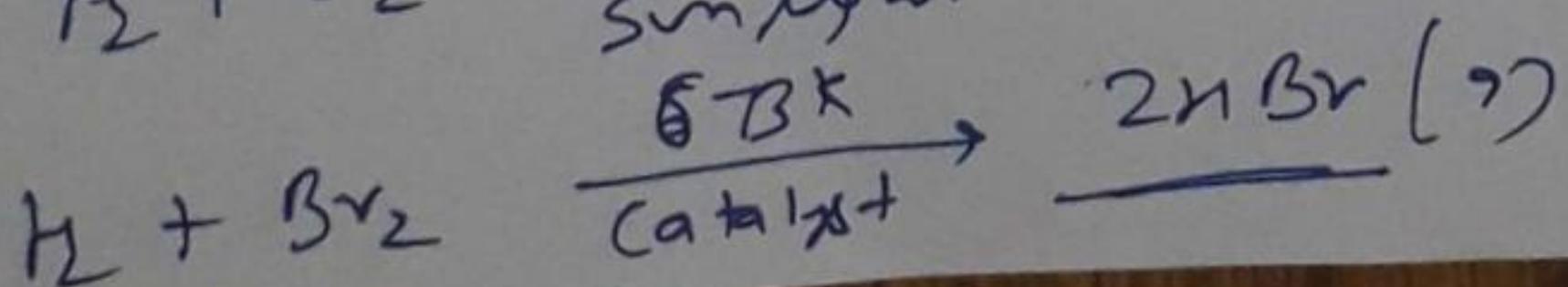
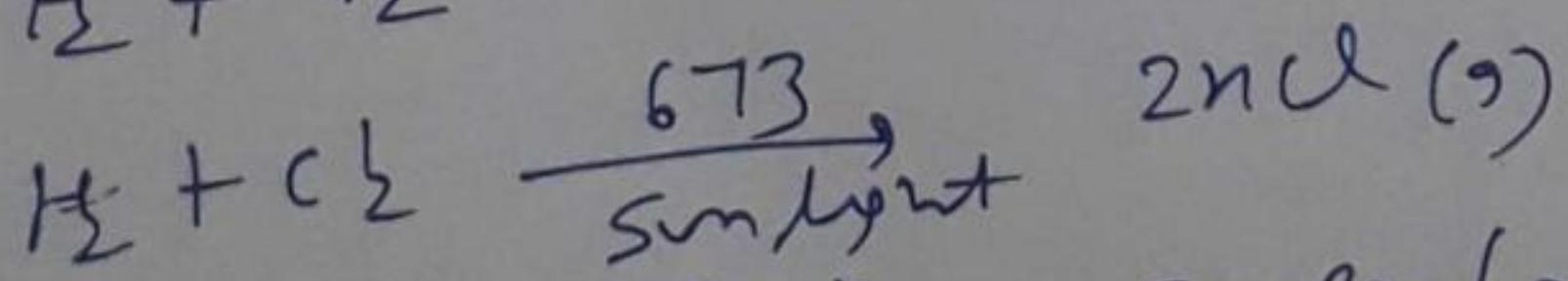
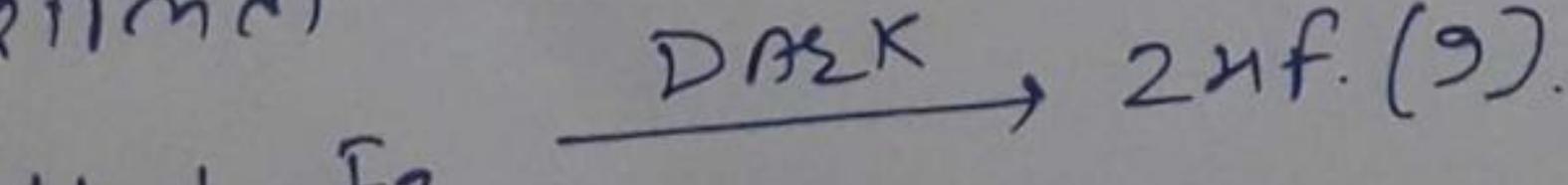
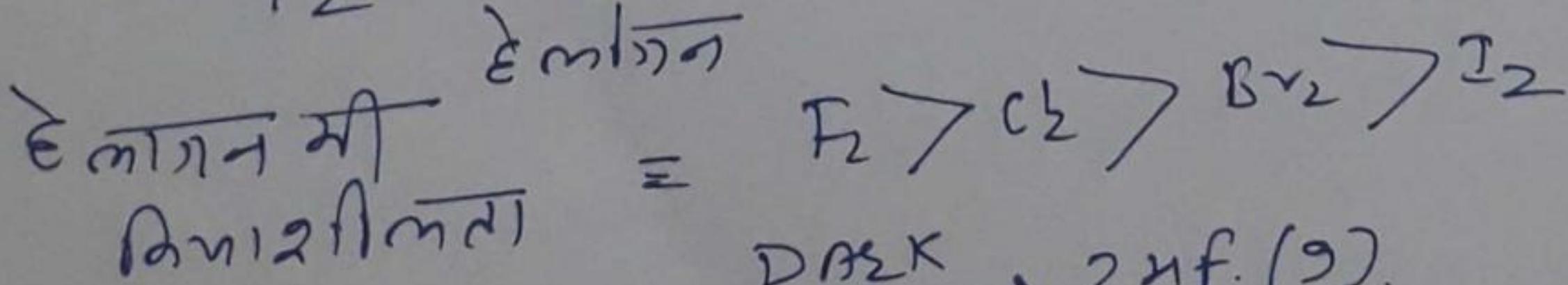
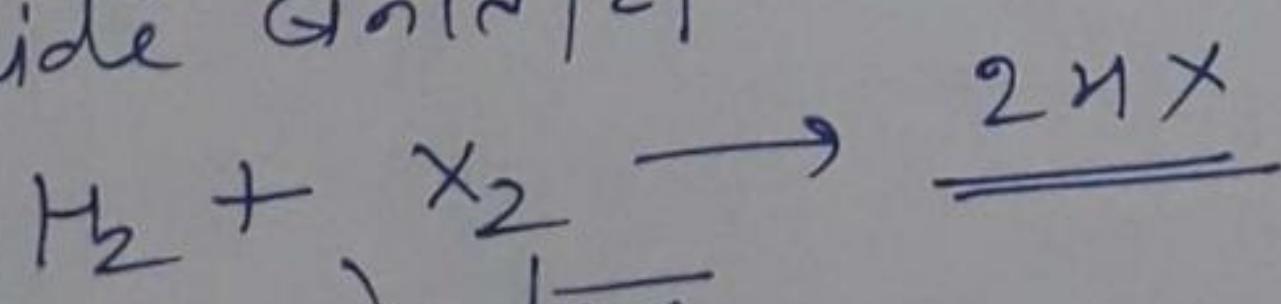
#### (1) with Oxygen

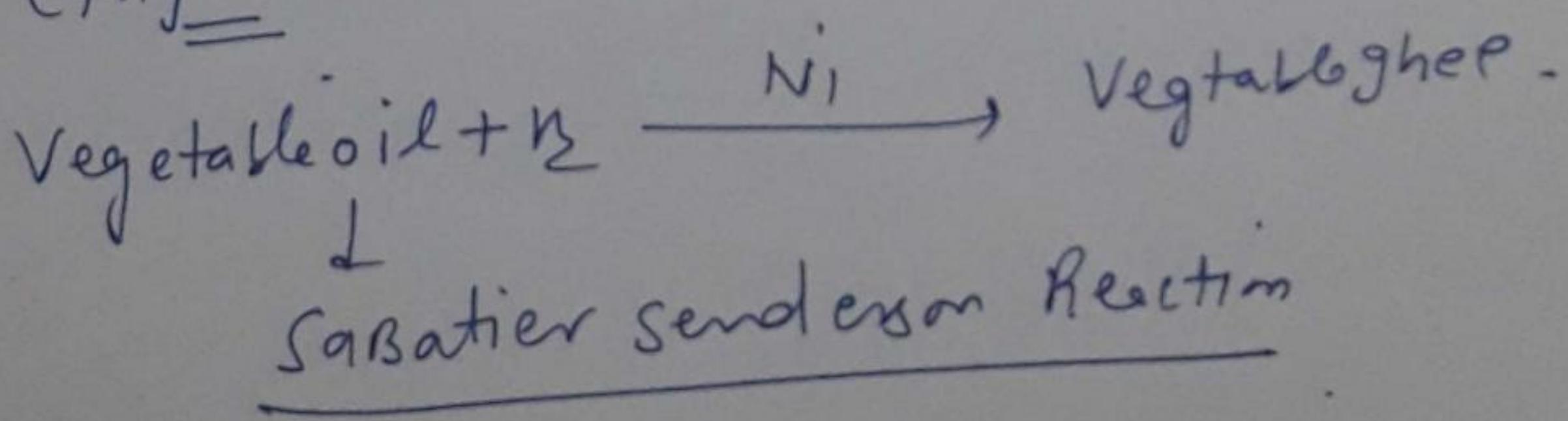
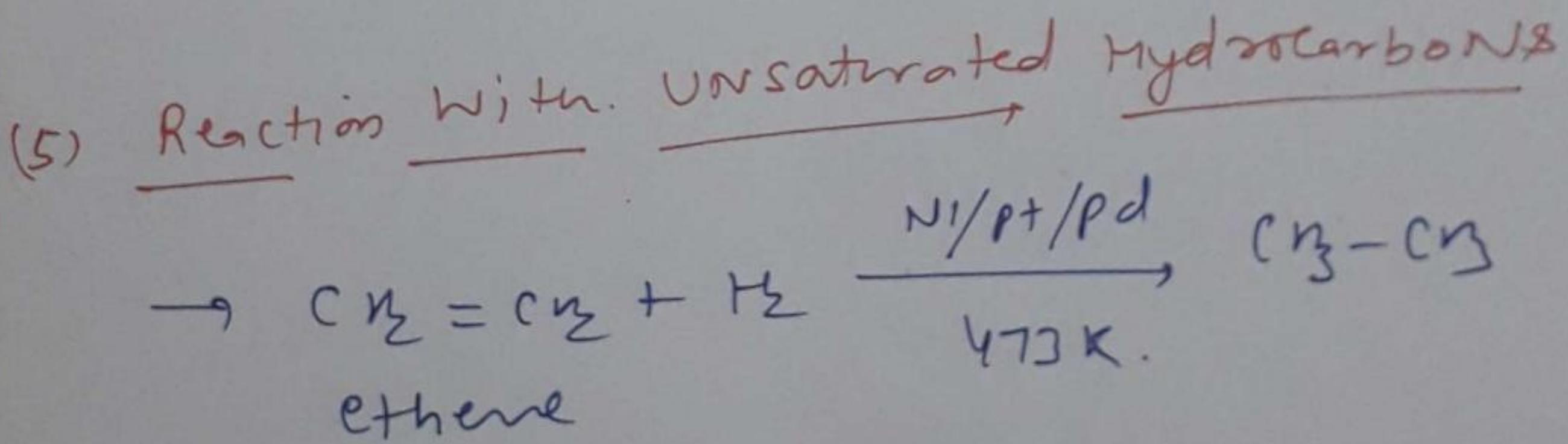
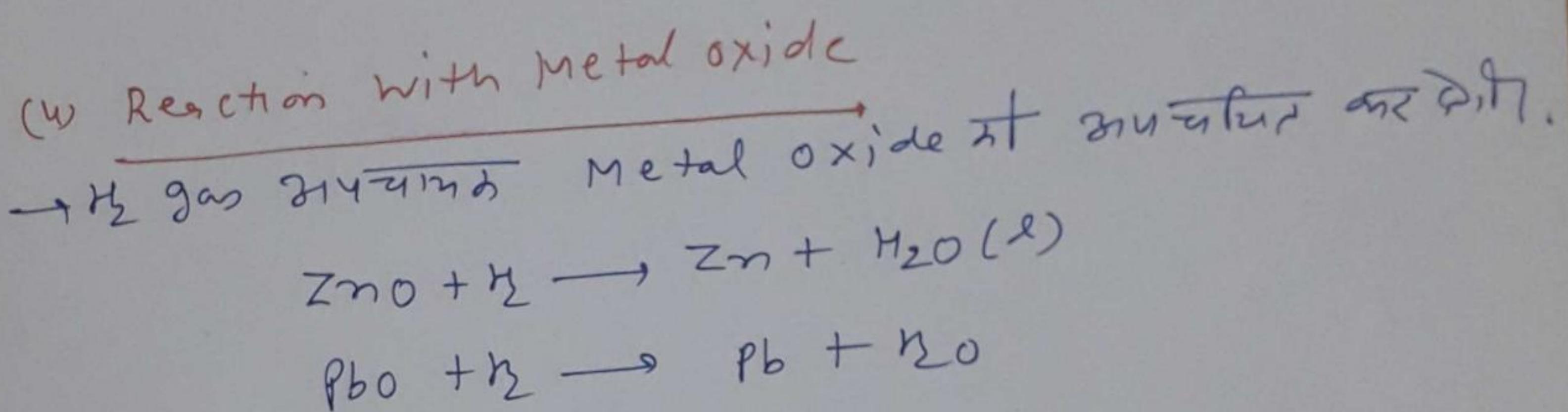
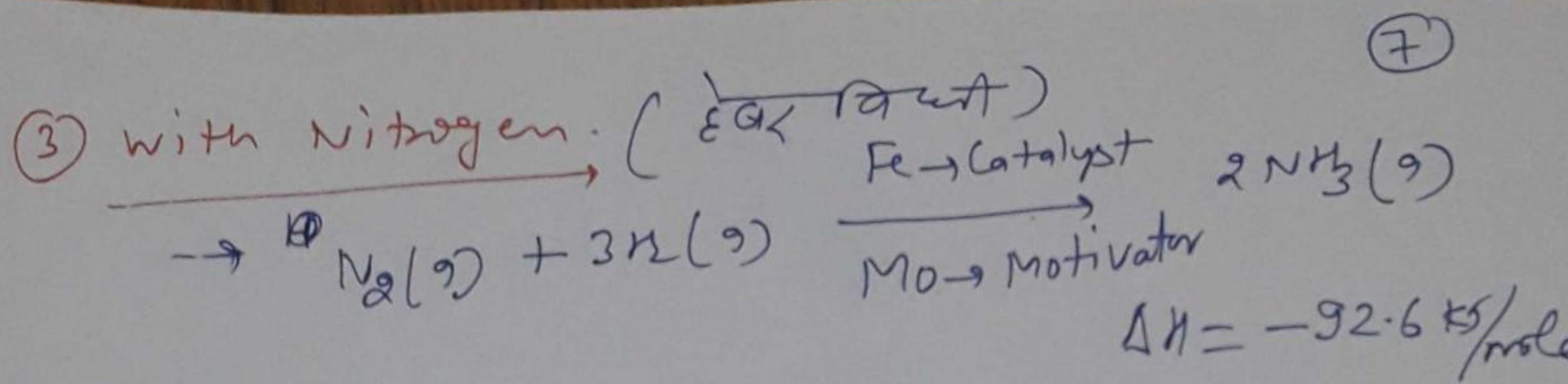


#### (2) with Halogen

Hydrogen gas Halogens  $\rightarrow$  Halide Gases  $\leftarrow$  start Hydrogen

Halide Gases





## → Isotopes of Hydrogen →

(8)

→ Hydrogen के तीन समानिक  
प्रोटियम्      ड्यूटेनियम्  
त्रिटियम्

प्रोटियम्

${}_1^1 H$

P

1

1

नेउक्रोन

O

हेलियम्

99.98%

%

स्फीयम्

${}_1^2 H$

D

1

2

1

0.015%

2

${}^{10}_{-15} \%$

${}^{10}_{-15} \%$

Rxn. in SUN (जल वृक्ष जल वृक्ष)



ड्यूटेनियम्

त्रिटियम्

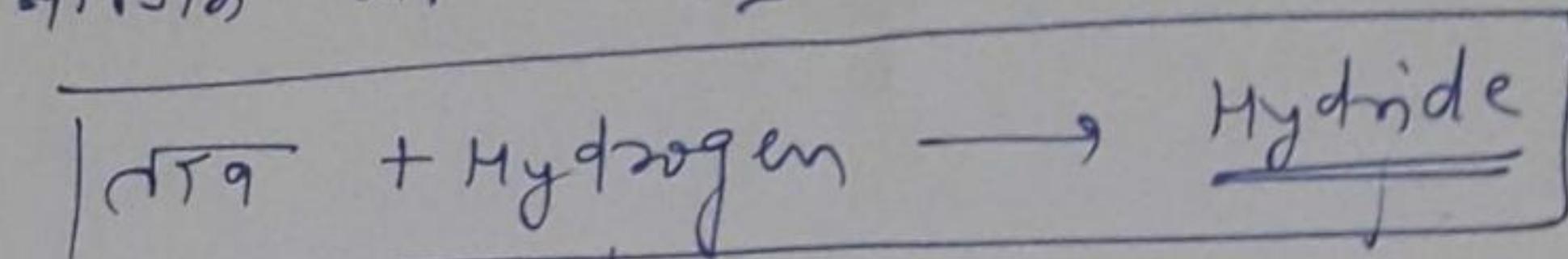
हेलियम्

निकासीय सम्बन्ध अवधार

## Hydrides (एक्सेस)

10

→ इसमें हाइड्रोजन के समिक्षण से निर्माण होते हैं।  
इसकी अवधारणा नहीं है।

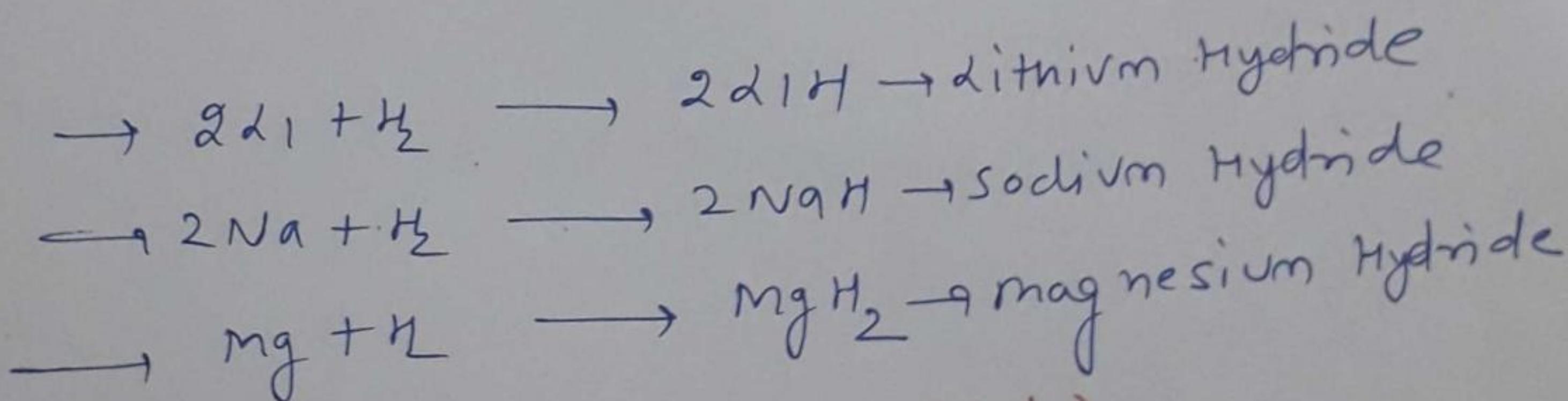


Hydrides of unit,

① पारवीन Hydrides → elements of IA and II A group + Hydrogen.

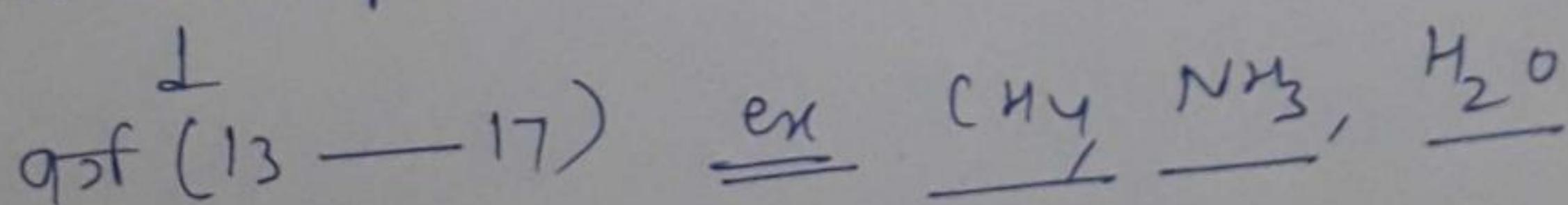
s block element + Hydrogen → एक्सेस  
Hydride

IA                    II A  
Li, Na, K, Rb, Cs,      Be, Mg, Ca, Sr, Ba



② संरक्षित Hydride (covalent Hydride)

elements of p block + Hydrogen → संरक्षित Hydride



→ संरक्षित एक्सेस तीन याजिक में से दो

① संरक्षित एक्सेस

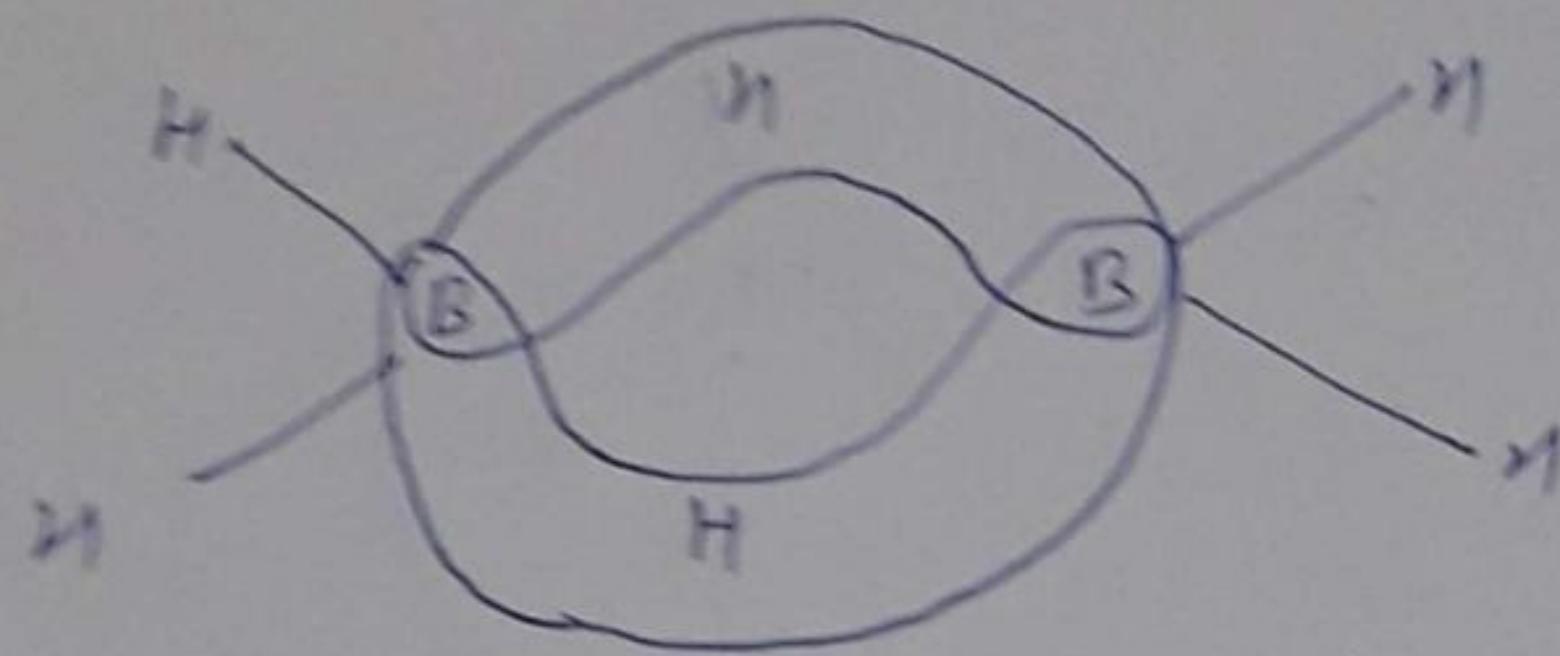
② संरक्षित precise  
Hydride

③ संरक्षित एक्सेस

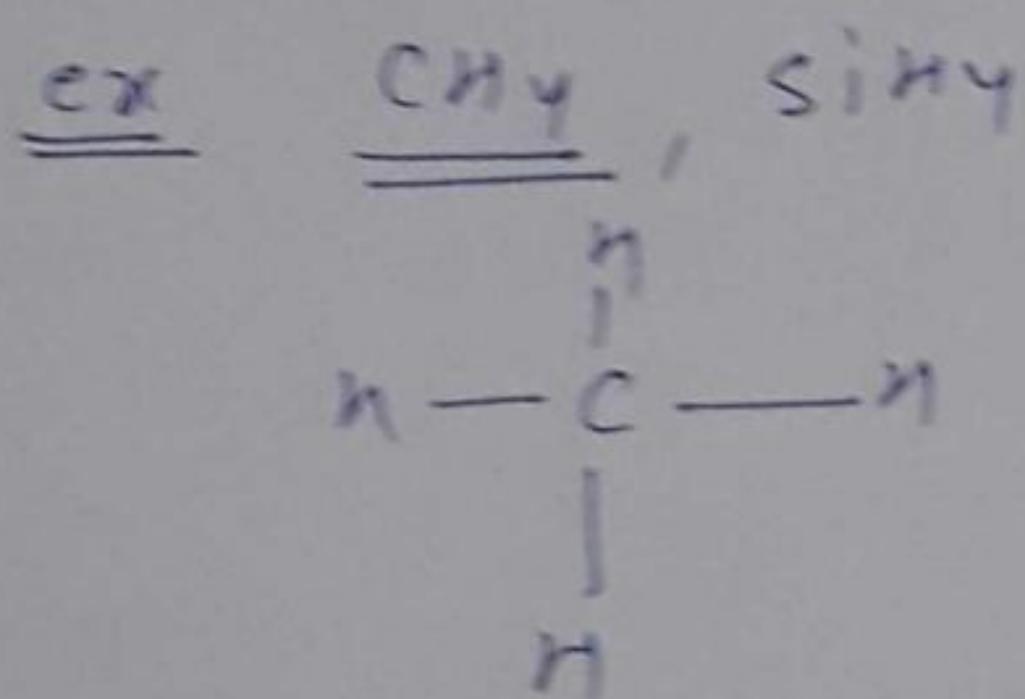
(1) सिंगल ब्लॉक एन्ट्रीज़ :-

(11)

→ Hydrogen ने इन्हें > electron ने हासि  
ex B<sub>2</sub>H<sub>6</sub>, → DiBorane.



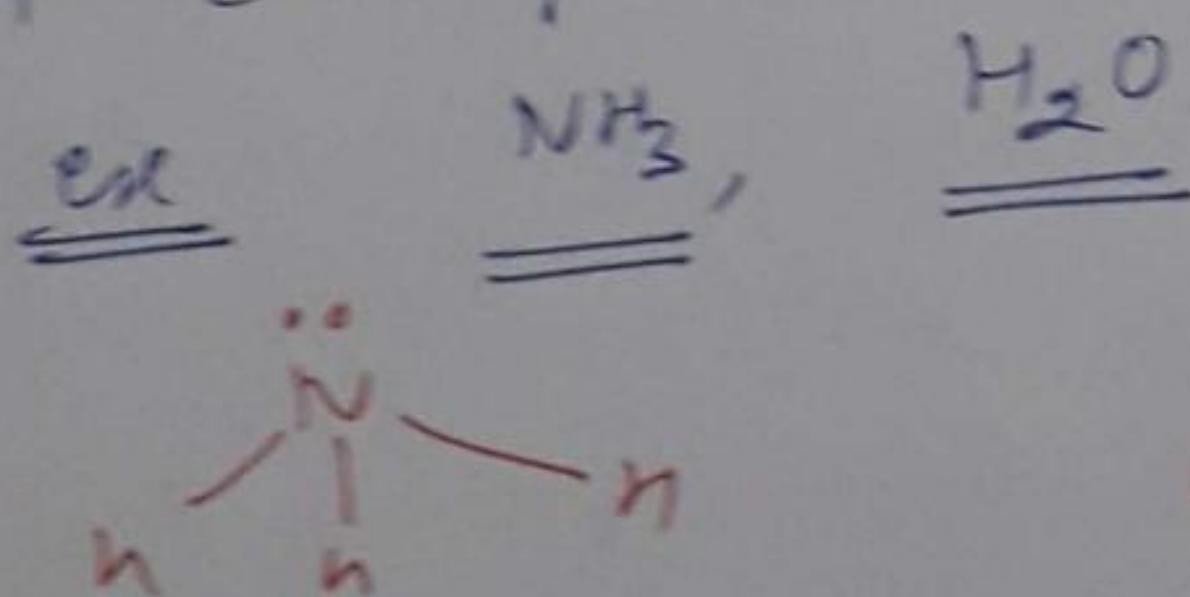
(2) ट्रिमोलर अम्बर्ग ऐंड्राइड → इन्हें फिराग  
electron ने आइन और hydrogen ने आइन सितरे हैं।



C के outermost  
electron = 4

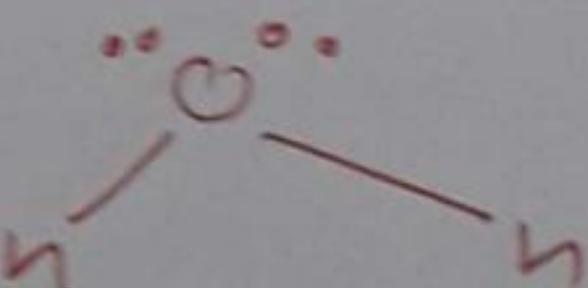
Hydrogen ने आइन = 4

(3) ट्रिमोलर अम्बर्ग ऐंड्राइडेज़ :- इन्हें फिराग  
Hydrogen ने आइन इन्हें आइन और आइन के  
अन्तर्गत हैं।



ब्रिंगर्डे = 5

Hydrogen = 3



= 6

= 2

12

Water

कड़ा जल  
 (HARD water)  
 ↓  
 बृह जल ने किं  
 सावुन में साध लाए  
 नहीं देल है।

मृद्ग जल  
 (Soft water)  
 बृह जल ने सावुन  
 ने साल आलानी की  
 लाए दिनाएँ।

कड़ा जल में असरों के उपर ने दिये

अवैधतिकता  
 (Temporary Hardness)

① कारो → Calcium or magnesium  
 के bicarbonate घृत देते।  
 $\text{Ca}(\text{HCO}_3)_2, \text{Mg}(\text{HCO}_3)_2$

② दूरगति

से उपलब्ध → ① बोयलिंग (Boiling)

प्रक्रि

② Clark process

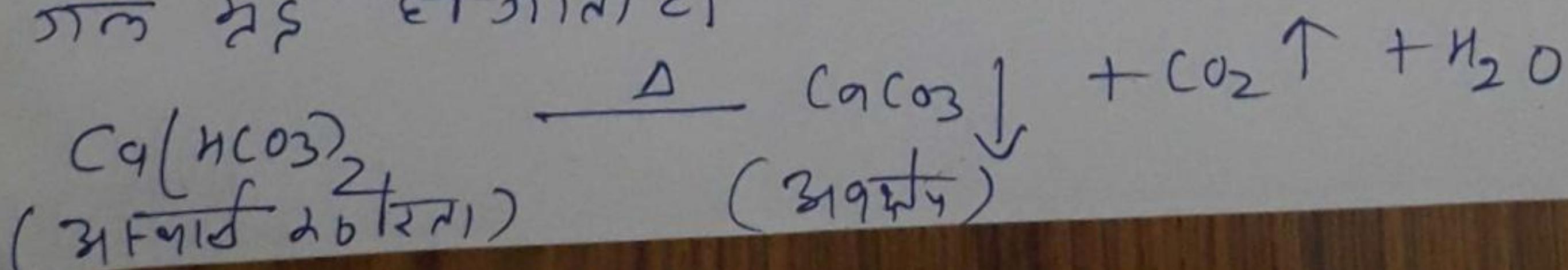
वैधतिकता  
 (Permanent Hardness)

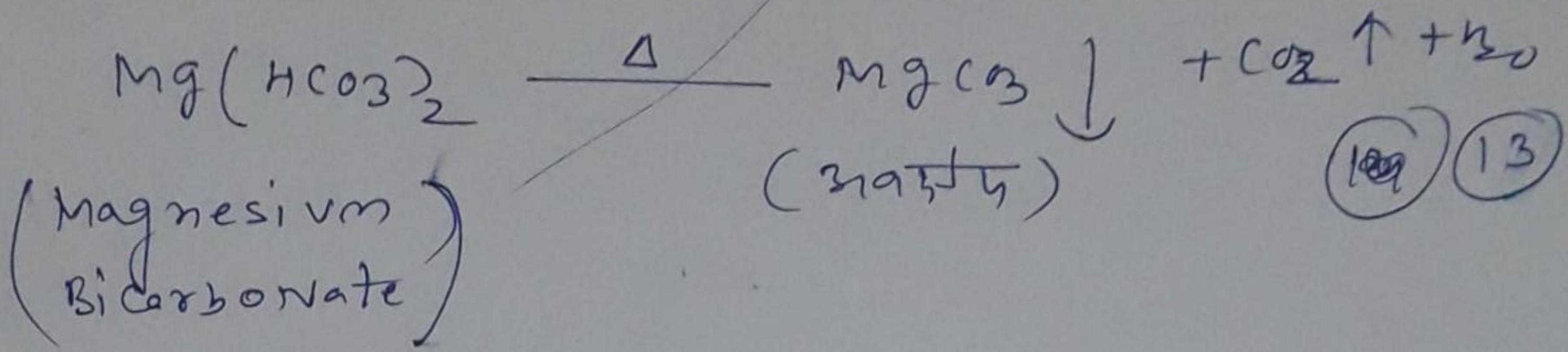
Calcium or magnesium  
 और chloride और sulphate  
 और धूली ने कारो  
 CaCl<sub>2</sub>, CaSO<sub>4</sub>, MgCl<sub>2</sub>, MgSO<sub>4</sub>

① आयन विनियोगिता  
 (2) प्रक्षेपण विधि

जलक्षणीय असरों के दूर करने के उपाय

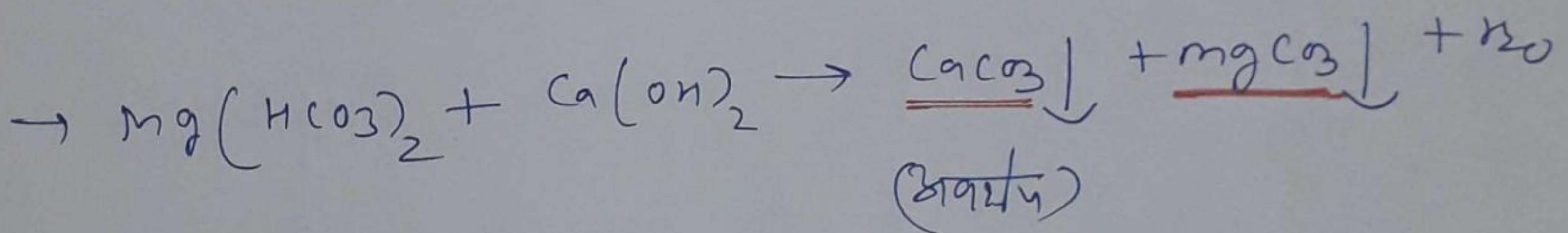
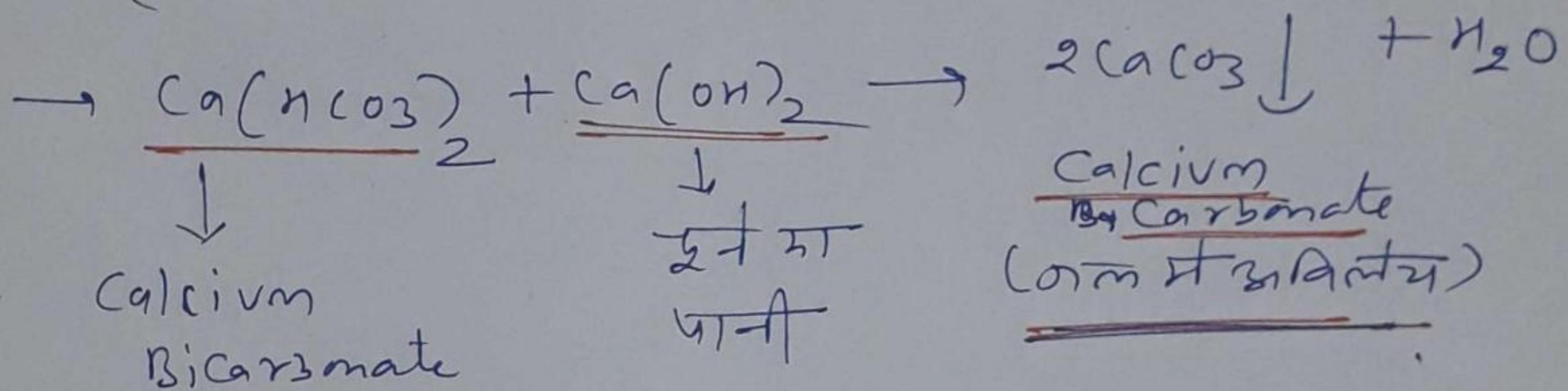
① बोयलिंग (Boiling) → अवैधतिकता जल ने उपलब्ध के असर दूर करता। Bicarbonate जलों ने दिये गए जल के असर दूर करता।  $\text{CO}_2$  के साथ बाहर निकल जाते हैं। जल मृद्ग हो जाता है।





② CLARK Process (+ लोट विधि)

→ इस विधि में अन्तर्भूत उत्पादक यह है कि जल और नाले  
द्वारा प्राप्त युक्ति ऐसी होती है कि Bicarbonate  
लगातार Carbonate में परत होती है एवं लगातार  
(अविलम्ब)



ग्राल मा अल्की नियन्त्रण के द्वारा जल की प्रक्रिया

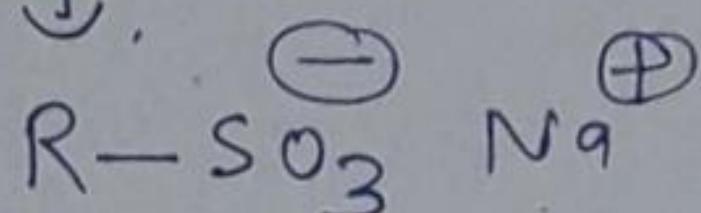
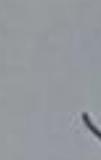
(14)

(1) अल्की Exchange प्रक्रि.

at container

घरानीय

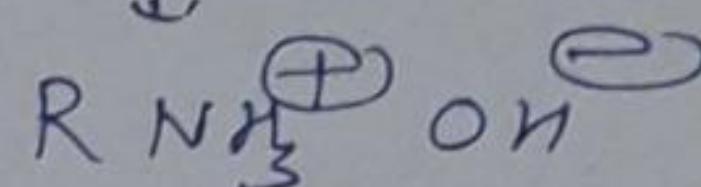
विनीय का



sodium Alkyl  
Sulphonate

घरानीय

हॉट

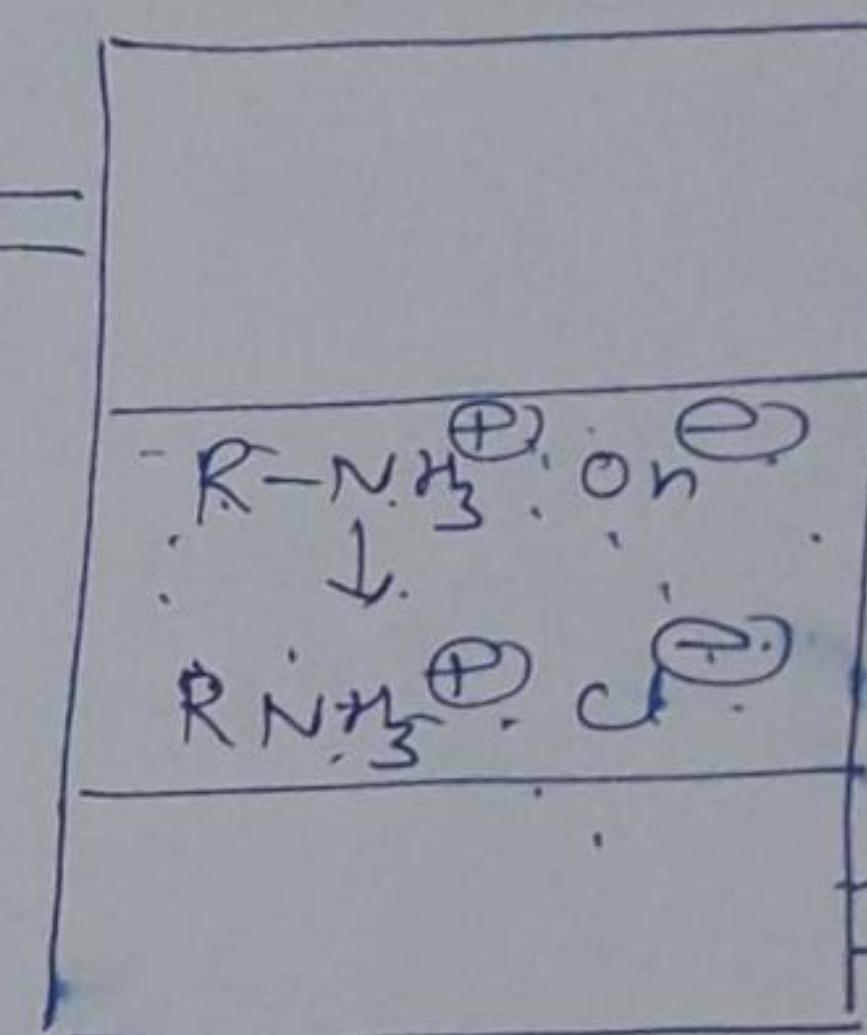
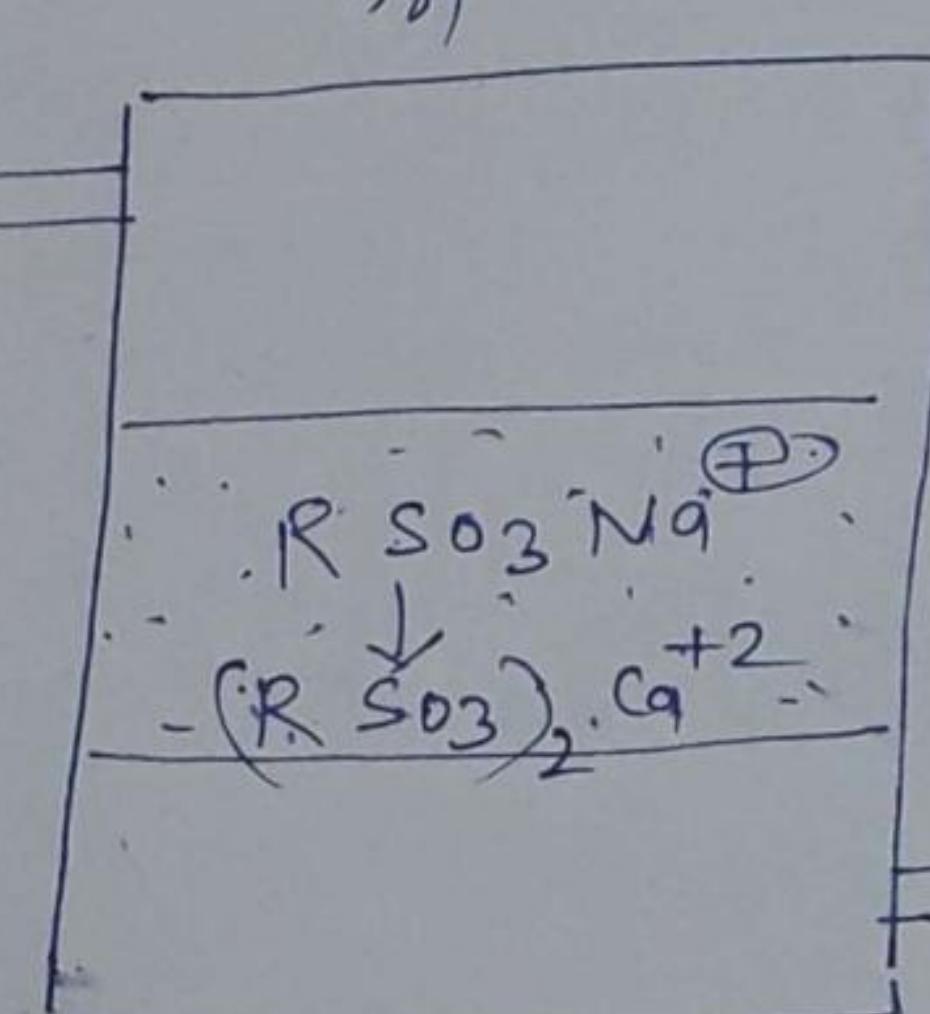


Alkyl Ammonium  
Hydroxide.

घरानीय

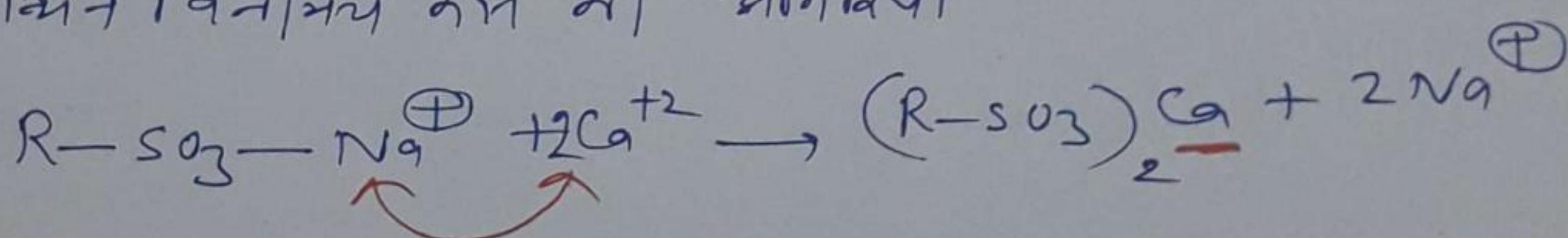
हॉट

→  
Hard  
water  
↓  
CaCl<sub>2</sub>  
or  
CaSO<sub>4</sub>

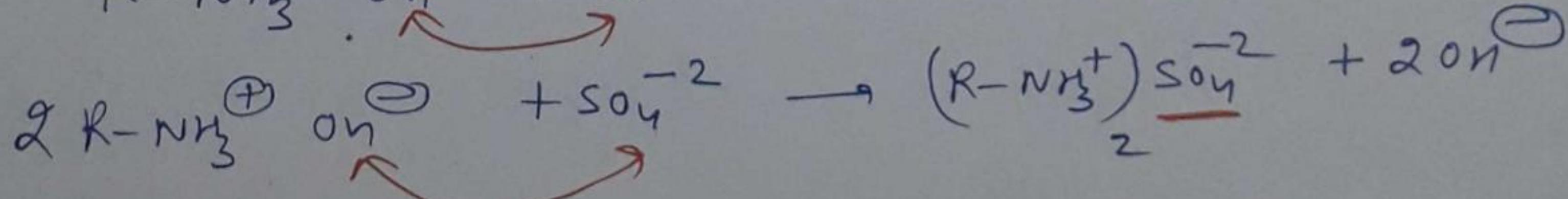
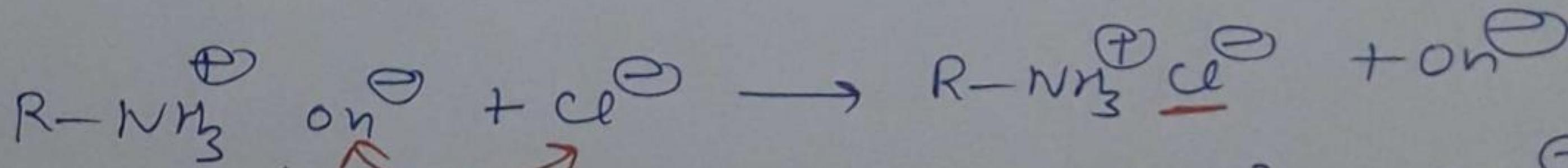


Soft  
Water

घरानीय विनीय का मा आवृत्ति



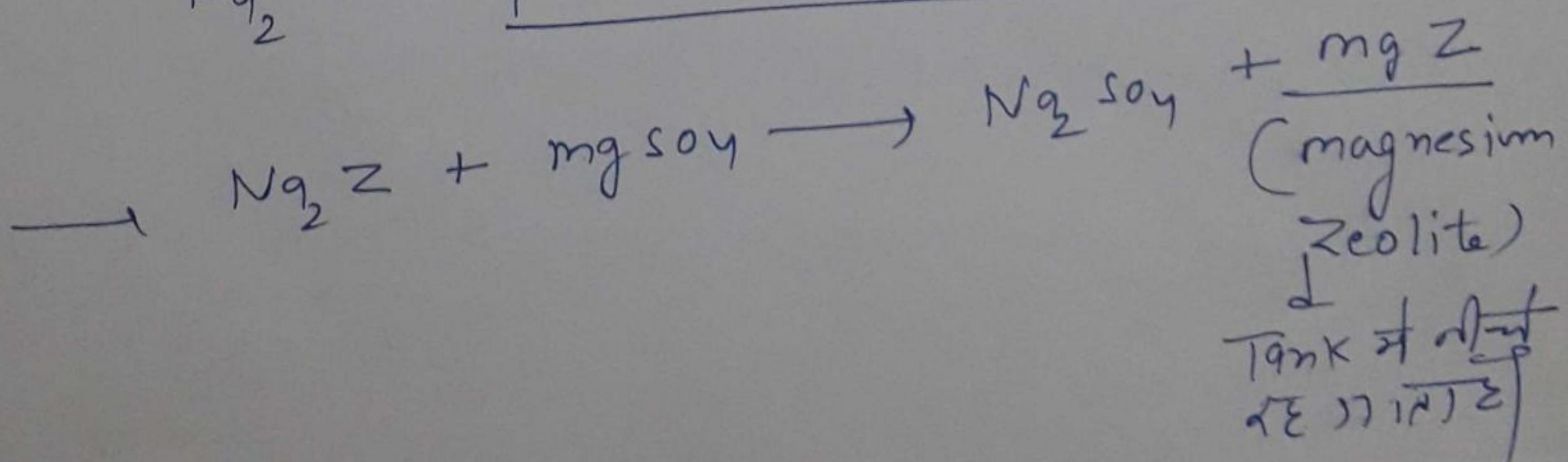
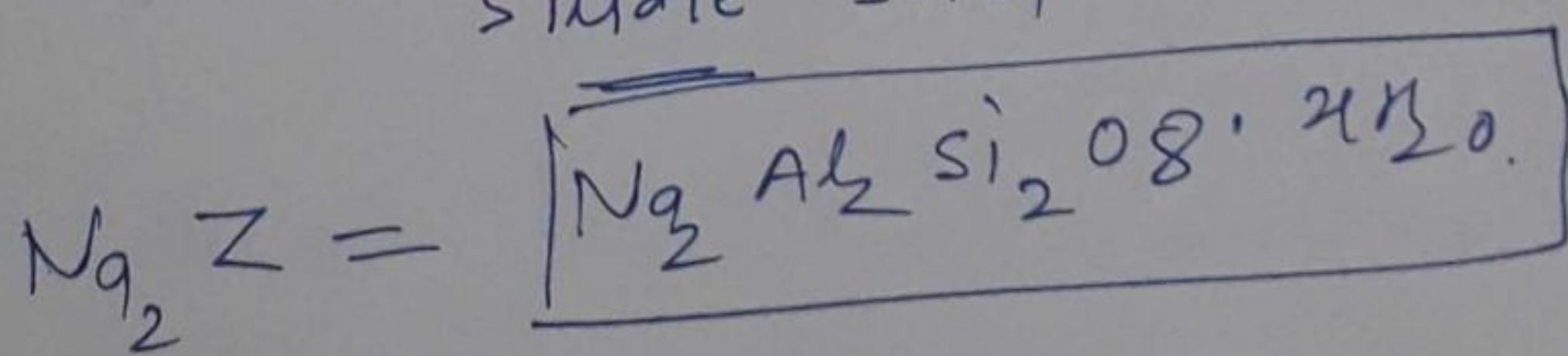
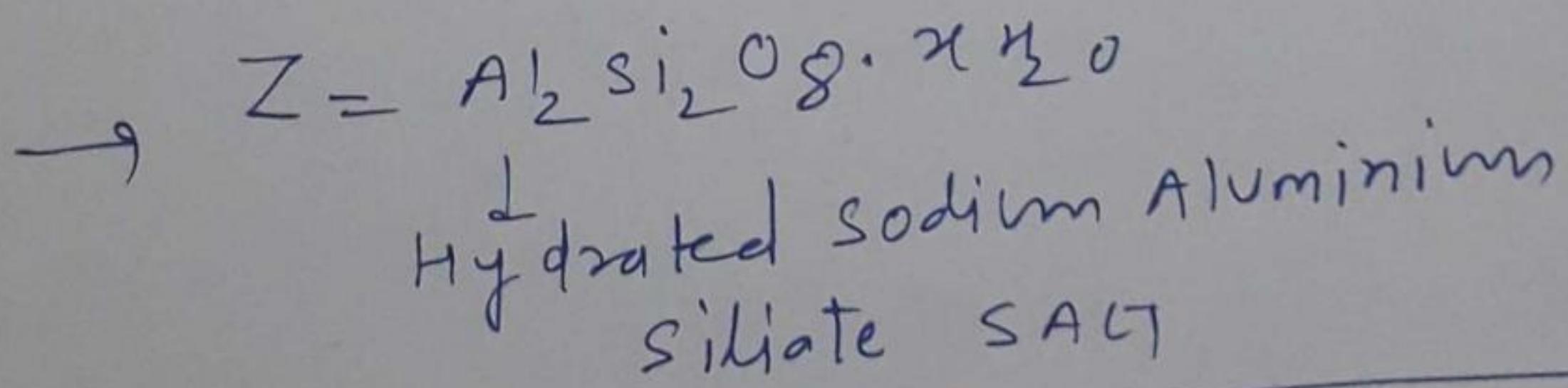
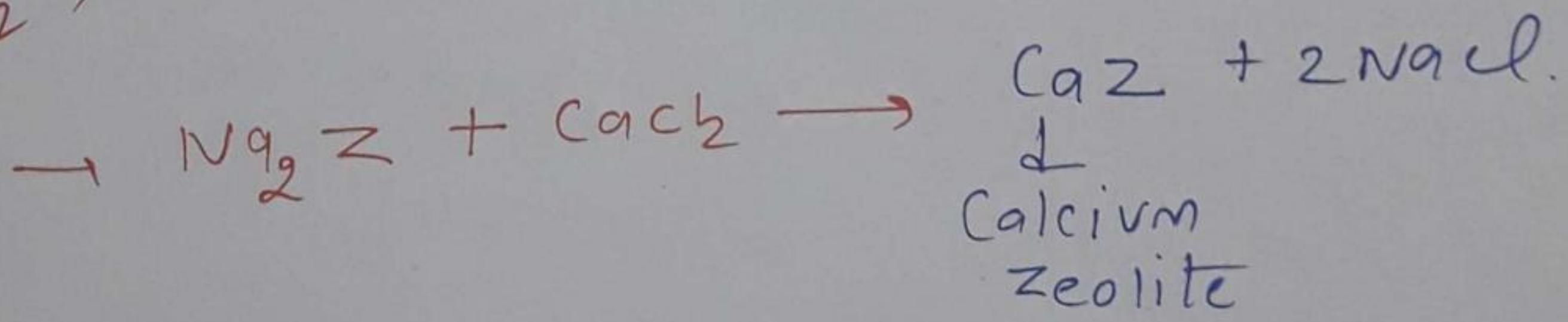
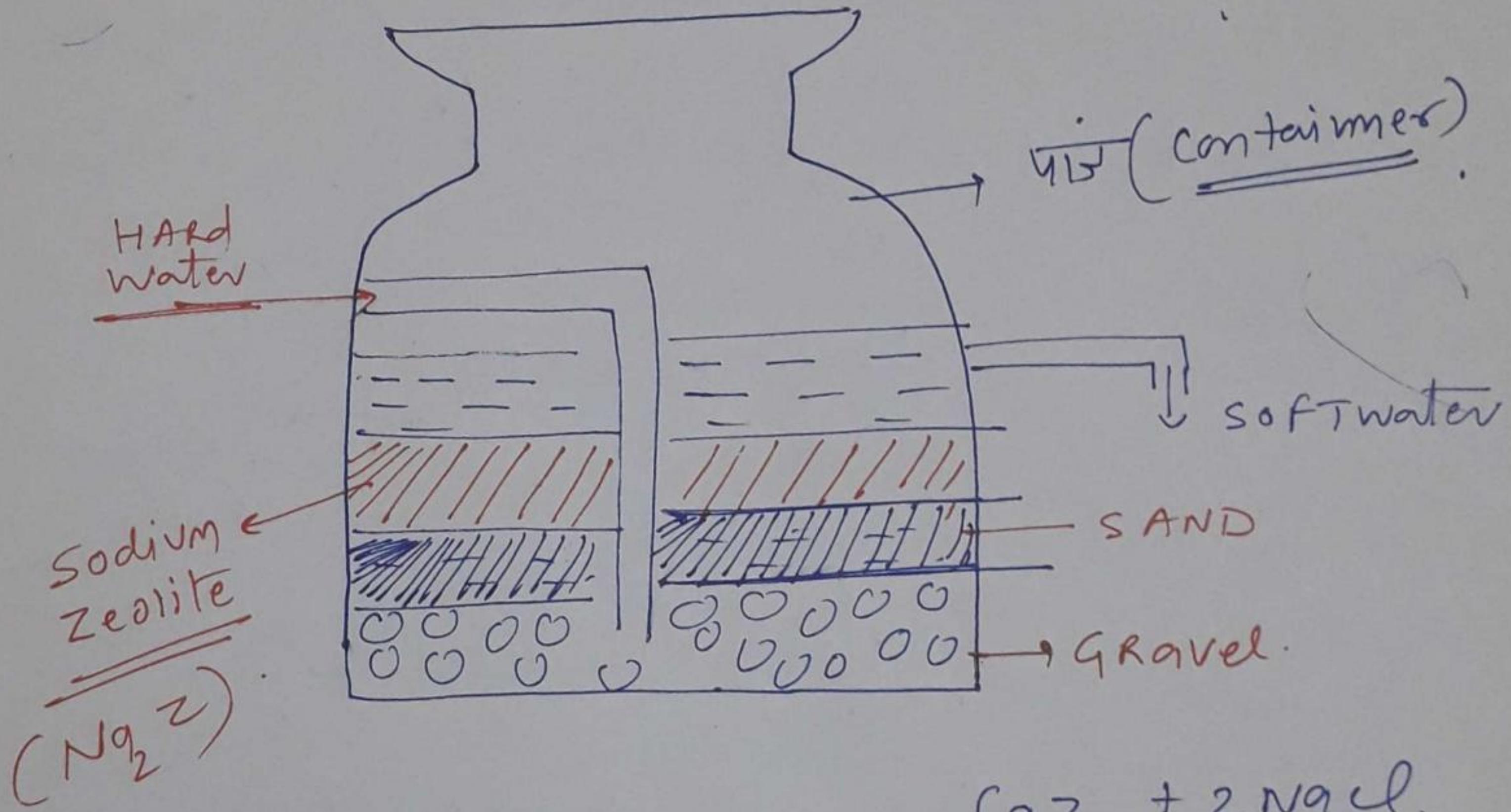
→ (घरानीय विनीय का मा आवृत्ति)



② Permutit Method (परमुटिट विधि)

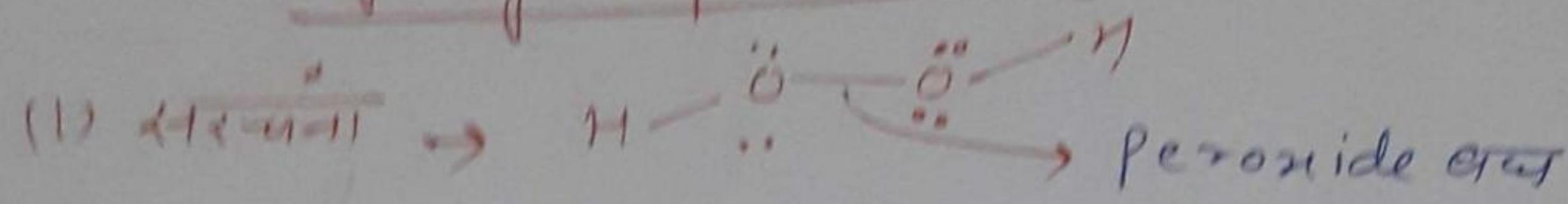
(15)

→ Sodium Zeolite Method →



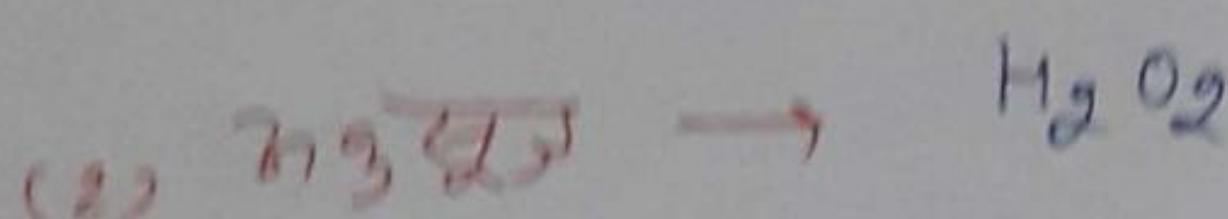
## Hydrogen peroxide (सिल्वर परोक्साइड)

(16)



$\text{O} \text{ST} 2112 \text{W} / \text{GOT} 212$

$= -1$



(3) ~~द्वितीय नियम~~  $\rightarrow$  J.J. Theneard

(4) Peroxide एवं  $\rightarrow$  one peroxide Bond

(5) ~~HNO<sub>3</sub>~~  $\rightarrow$  open book like structure  
(कृति दर्शात)

(6) ~~HNO<sub>3</sub>~~  $\rightarrow$  अधिकारी का नियम गति.

$\text{H}_2\text{O}_2$  का नियम गति  
(Preparation method of  $\text{H}_2\text{O}_2$ )

(1) MERCK'S Method:  $\rightarrow$  sodium peroxide at 20%

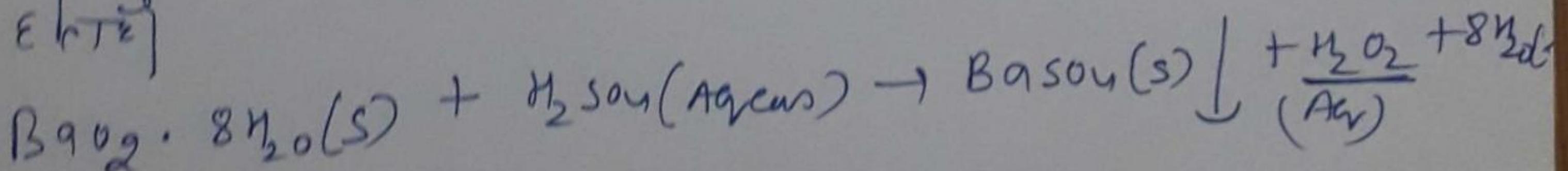
$\xrightarrow{60^\circ\text{S}}$   $\text{H}_2\text{SO}_4$  एवं अम्लाचारी नियम



(2) Barium peroxide  $\rightarrow (\text{BaO}_2) \rightarrow \left( \begin{array}{c} \text{Ba} \\ | \\ \text{O} \\ | \\ \text{O} \end{array} \right)$

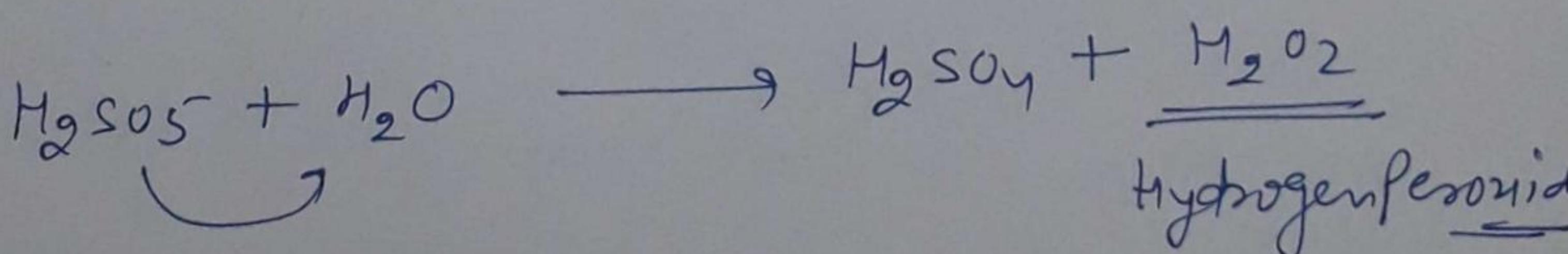
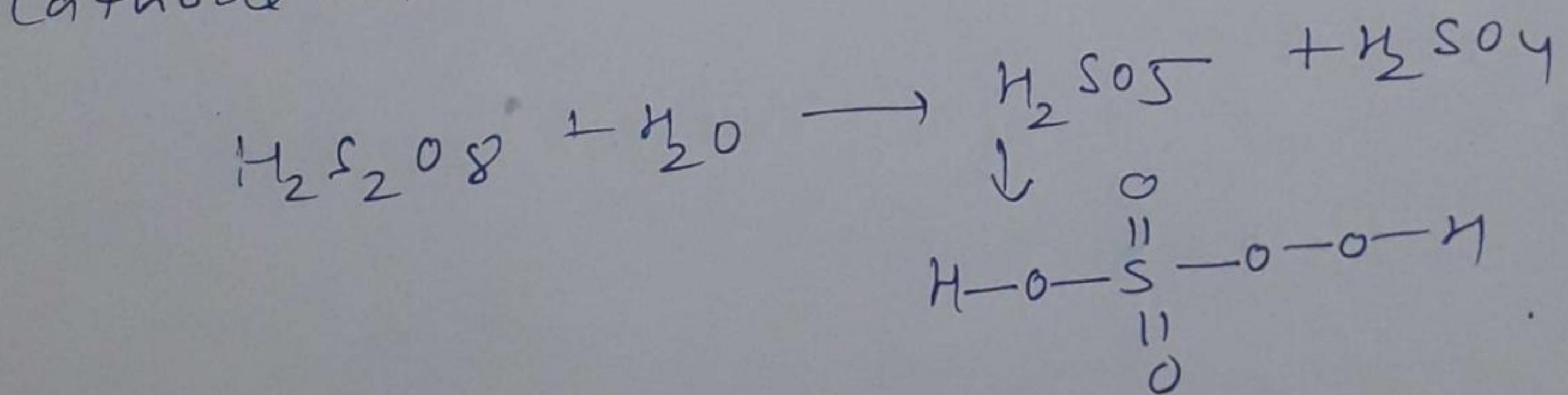
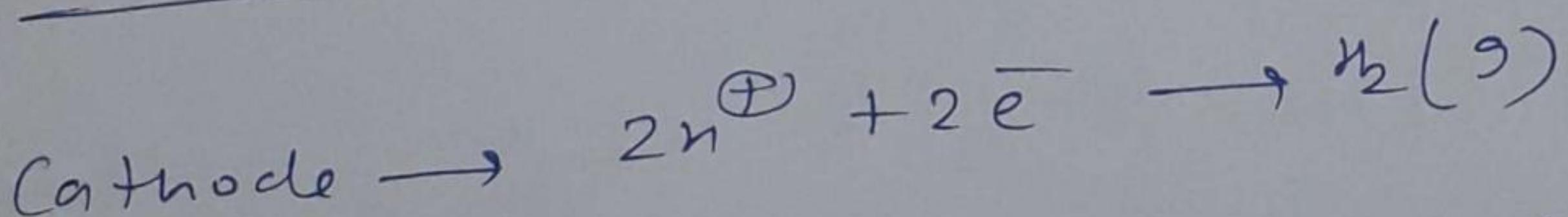
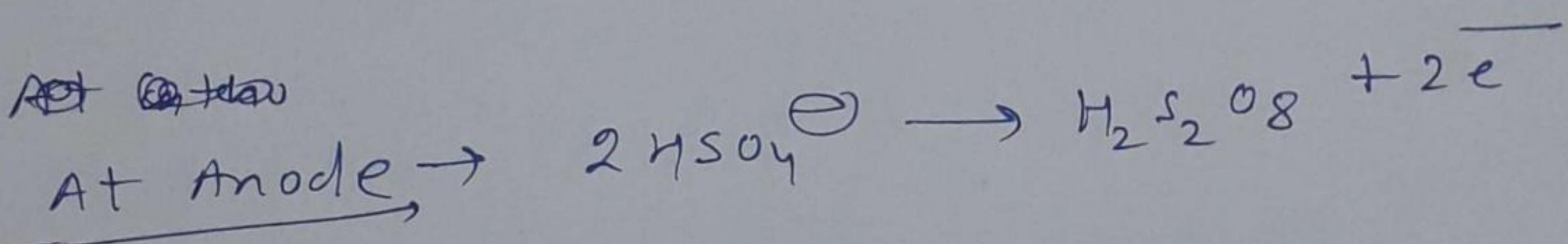
नियम बायम्परोक्साइड एवं 60° रुक्मि 3 ते 20%.

$\text{H}_2\text{SO}_4$  एवं अम्लाचारी नियम द्वारा  $\text{H}_2\text{O}_2$  एवं बायम्परोक्साइड



(3) 50% H<sub>2</sub>SO<sub>4</sub> वाले धूमधारे क्या हैं :- (17)

- 50% H<sub>2</sub>SO<sub>4</sub> वाले धूमधारे विद्युत धूमधारे हैं।  
 यहाँ पर्यावरण में धूमधारे कानूनी विद्युत धूमधारे हैं।  
 Anode पर H<sub>2</sub>O<sub>2</sub> उत्पन्न होता है।
- H<sub>2</sub>S<sub>2</sub>O<sub>8</sub> (Peroxydisulphuric acid) विद्युत धूमधारे है।  
 यह H<sub>2</sub>SO<sub>5</sub> वाले धूमधारे विद्युत धूमधारे हैं।
- H<sub>2</sub>SO<sub>5</sub> (Peroxomonosulphuric Acid) विद्युत धूमधारे है।  
 यहाँ पर्यावरण में धूमधारे है। Hydrogen peroxide है।  
 (कांडी एटरे)
- (धूमधारे अनुचित)
- $$2 \text{H}_2\text{SO}_4 \longrightarrow 2 \text{n}^{\oplus} + 2 \text{HSO}_4^-$$

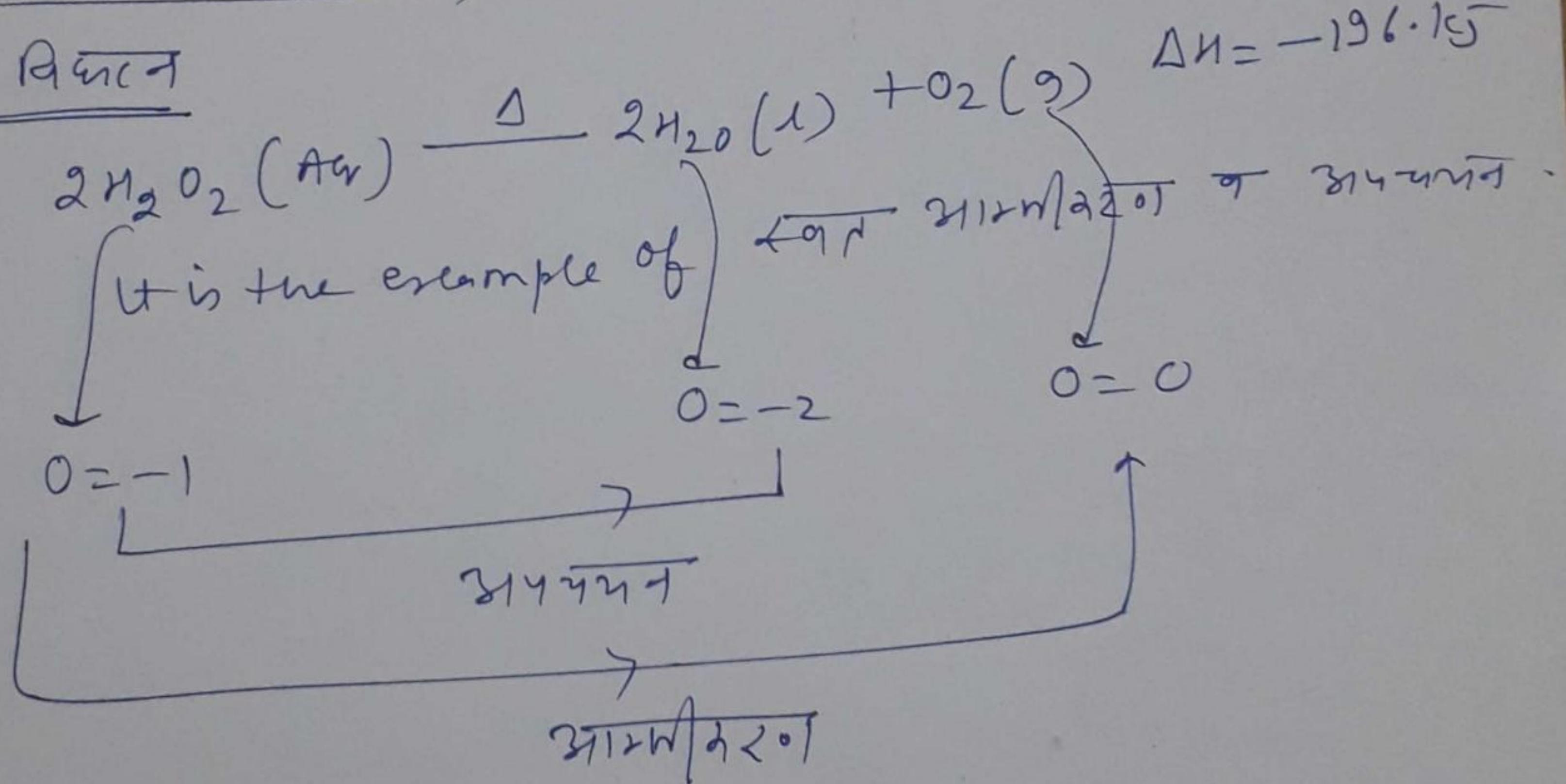


## → Physical properties of $H_2O_2$

- pure  $H_2O_2$  अतः colour pale blue
- तापमात्रा  $\approx 92.2^\circ C$
- density  $1.44 \text{ g/cm}^3$
- नम्रता  $2717\text{cm}^{-1}$  विकास  
कारण Hydrogen Bond
- m.p. =  $272.4^\circ K$ .
- तापमात्रा ( $B.P.$ ) =  $423^\circ K$ .
- धूग्रता मात्रा of  $H_2O_2 > H_2O$

## → इन सभी गुणों का क्या अर्थ है? (Chemical Reactions)

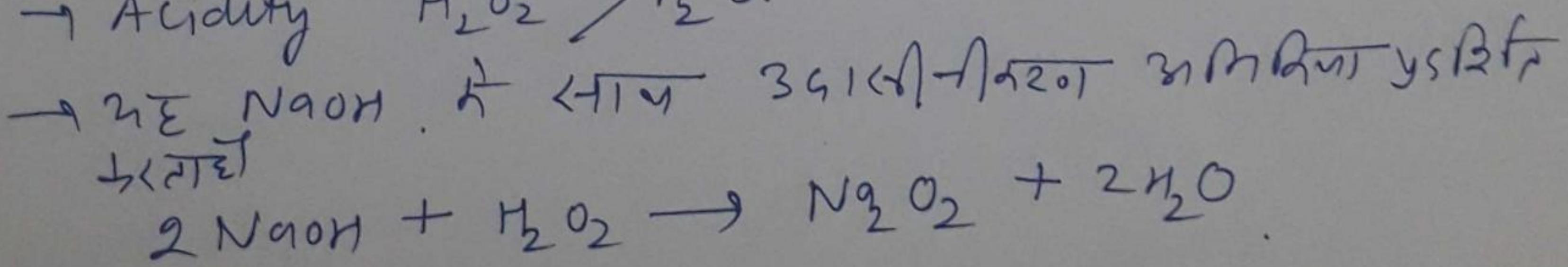
### ① Reactions



### ② → $H_2O_2$ के कुछ अवयव

→ एक अमील घृणन वाला और अमील अवधारणा.

→ Acidity  $H_2O_2 > H_2O$ .

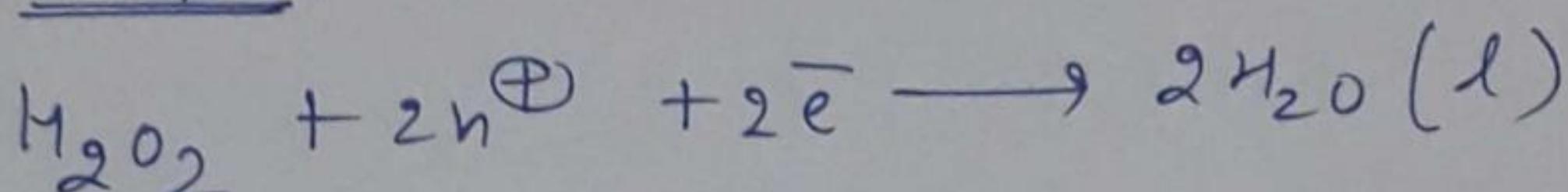


③ Oxidising and Reducing Behavior  
 (आंतरिक व अप्यान्तर सम्बन्ध (चैप्टर)) 19

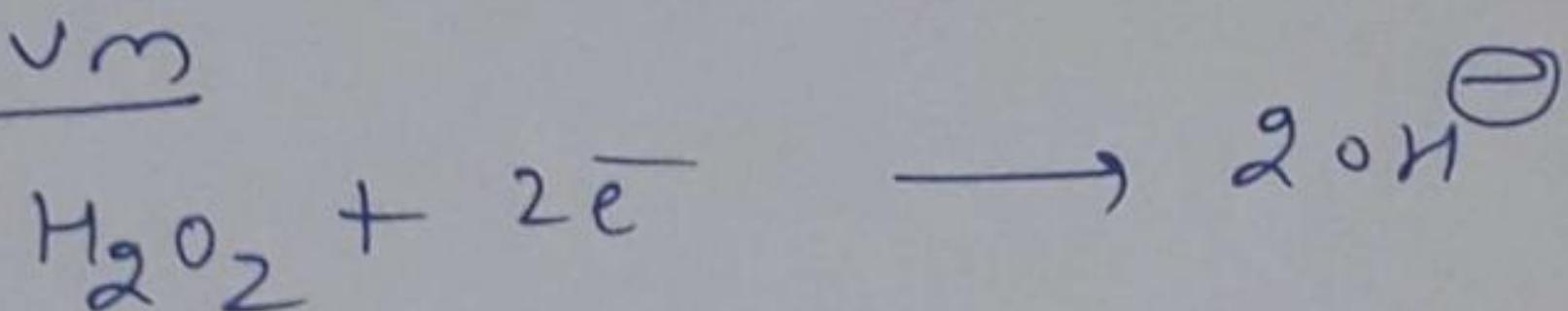
→  $H_2O_2$  आंतरिक व अप्यान्तर द्वारा भित्ति  
 केवल नहीं होता है

आंतरिक दृष्टि →  $H_2O_2$  आंतरिक व भित्ति द्वारा  
 भित्ति व आंतरिक दृष्टि उत्पन्न होती है।

→ Audic Medium

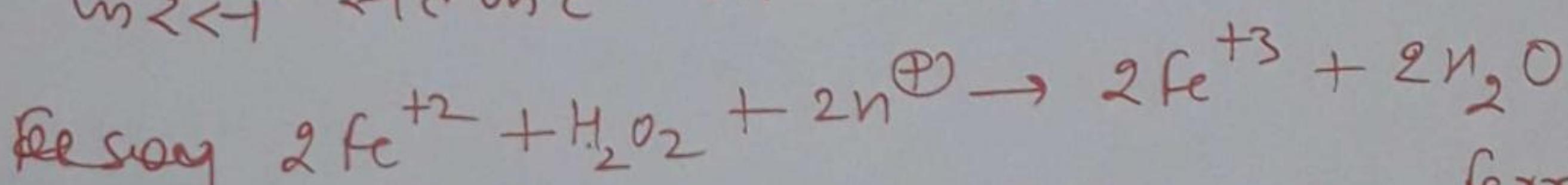


→ Basic medium

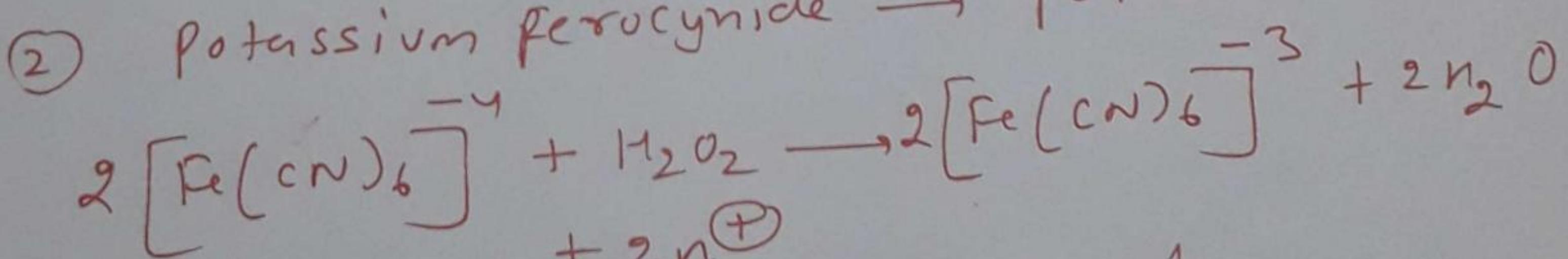


→ Oxidising action in Audic Medium:-

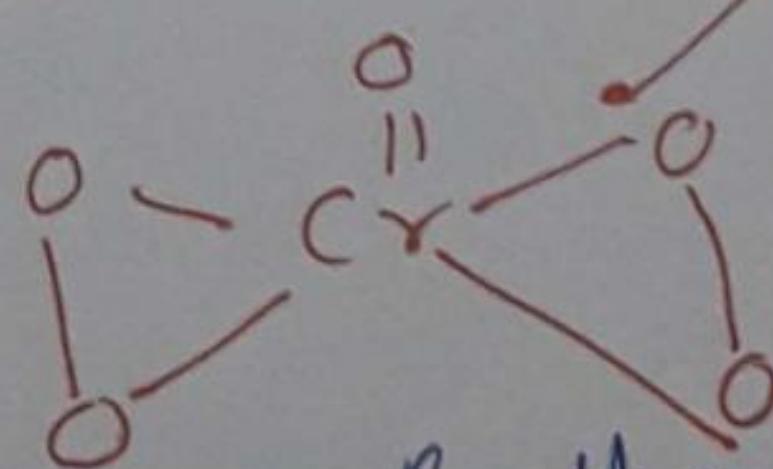
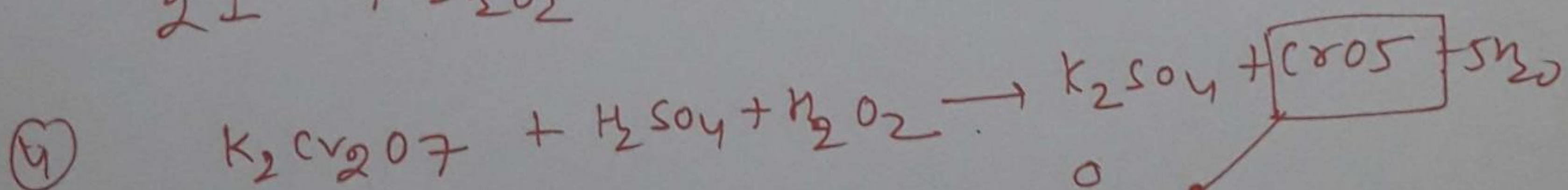
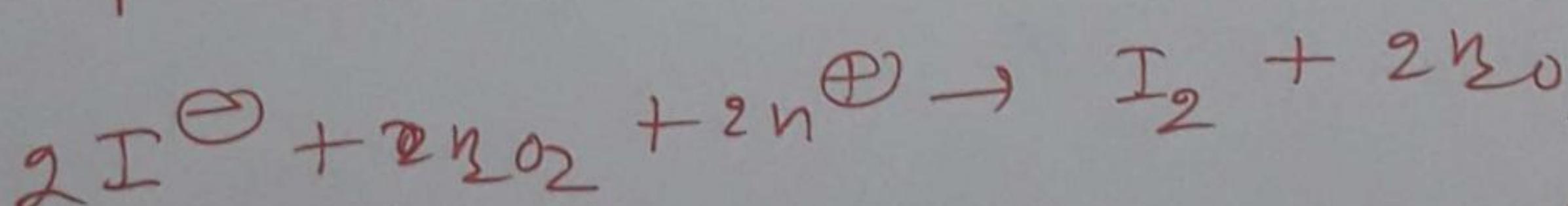
① दिरक्ष लिंगम् व दिरक्ष लिंगम्



लिंगम्  $2Fe^{+2} + H_2O_2 + 2n^{\oplus} \rightarrow 2Fe^{+3} + 2H_2O$  ferricyanide

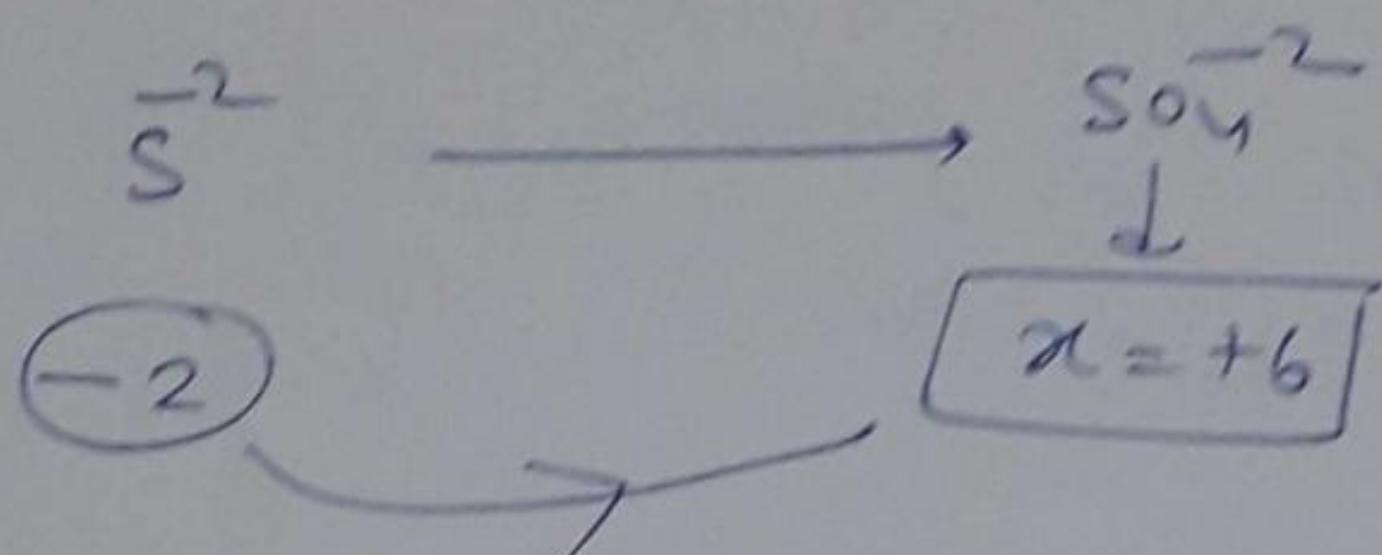
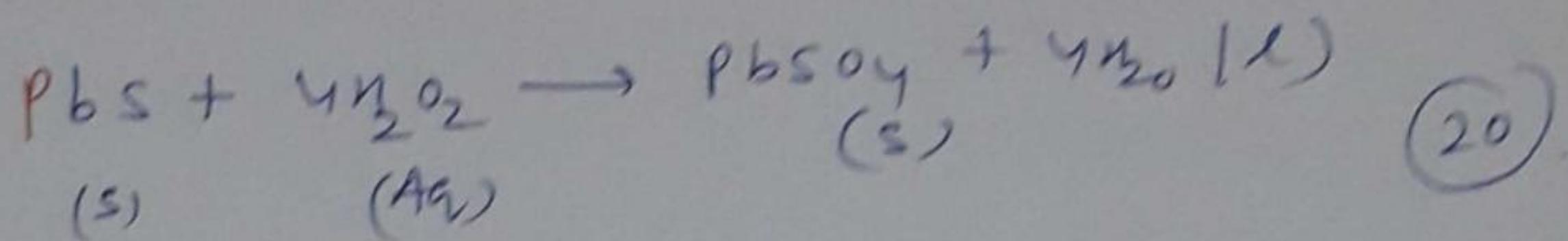


③ Potassium Iodide व  $I_2$  व

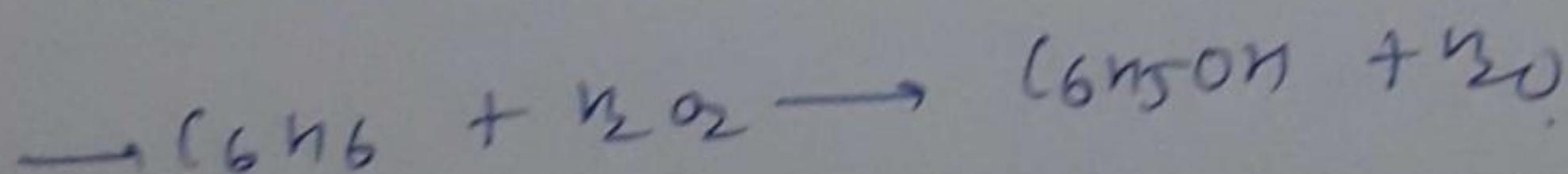
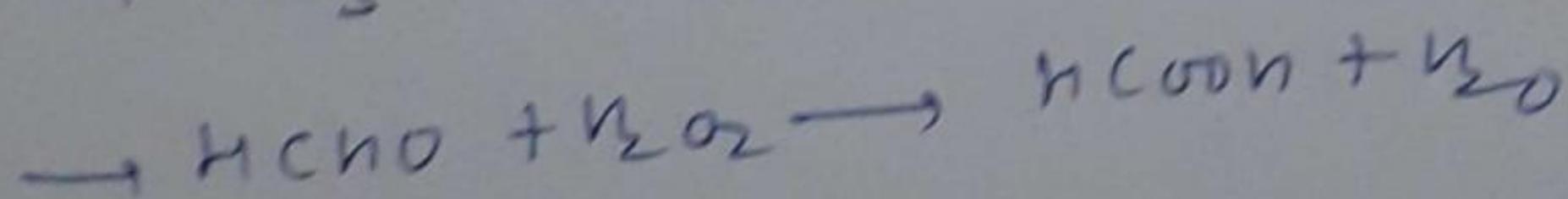
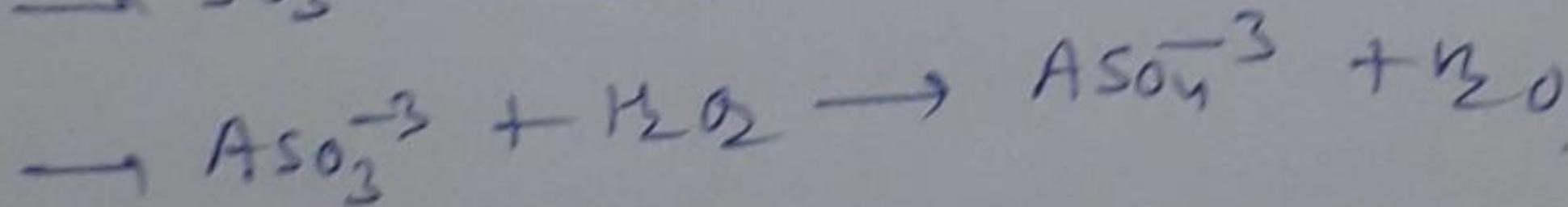
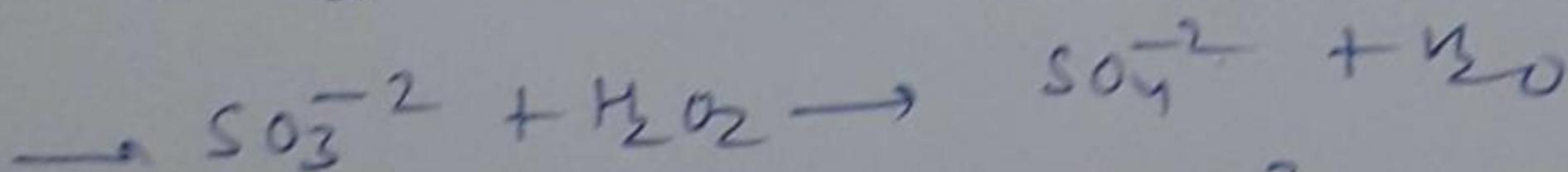
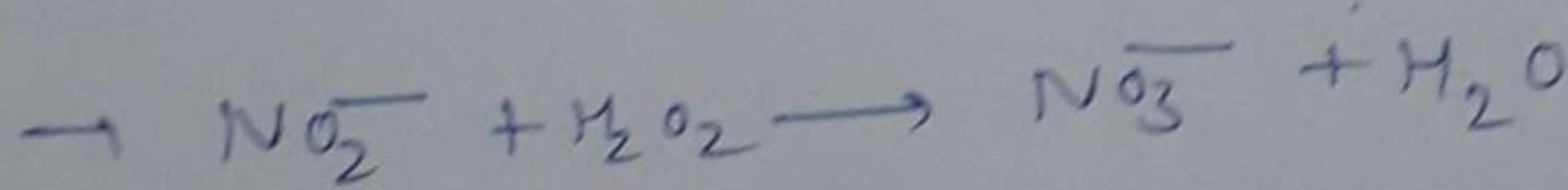
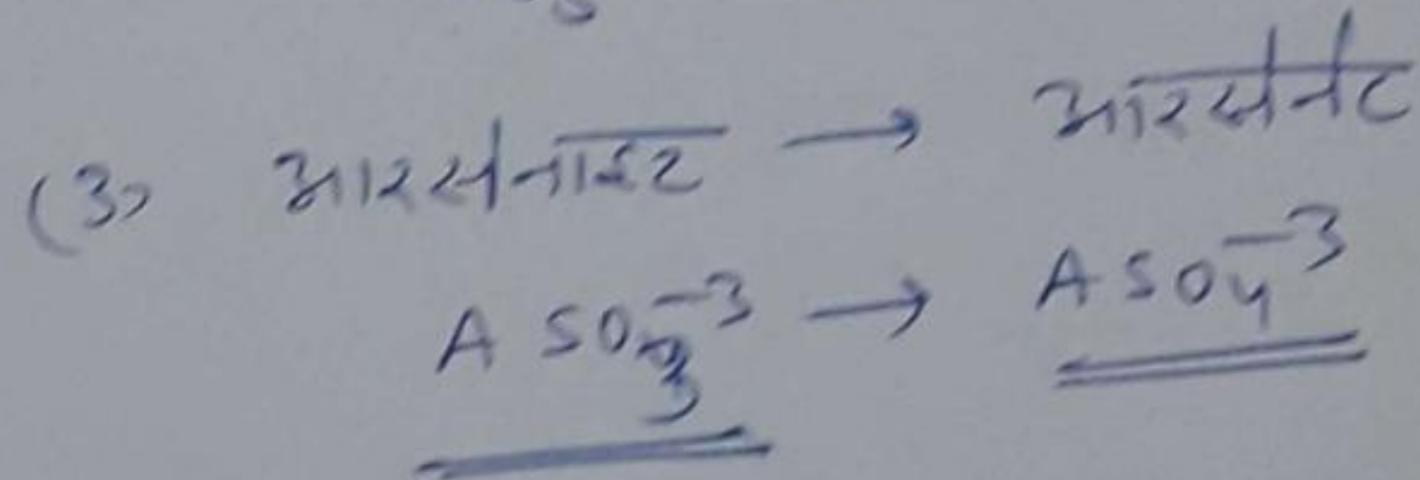
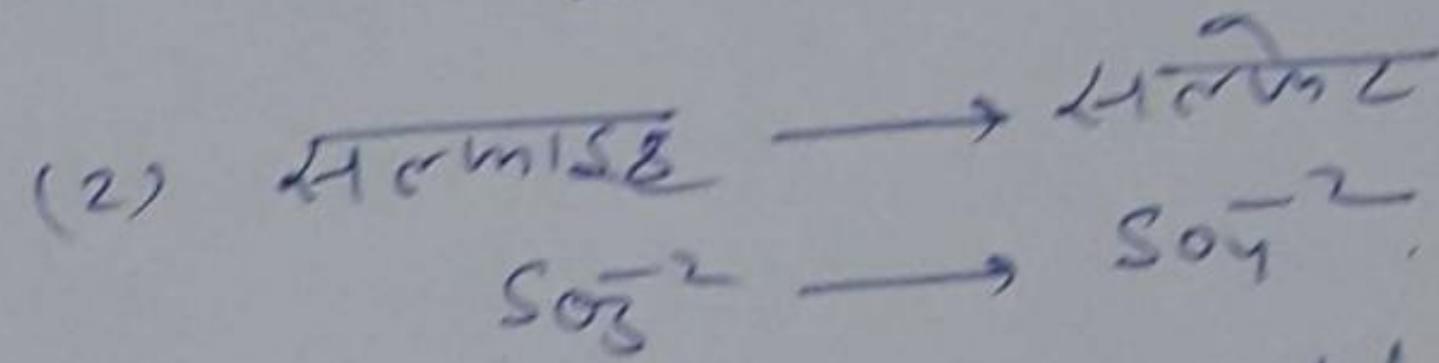
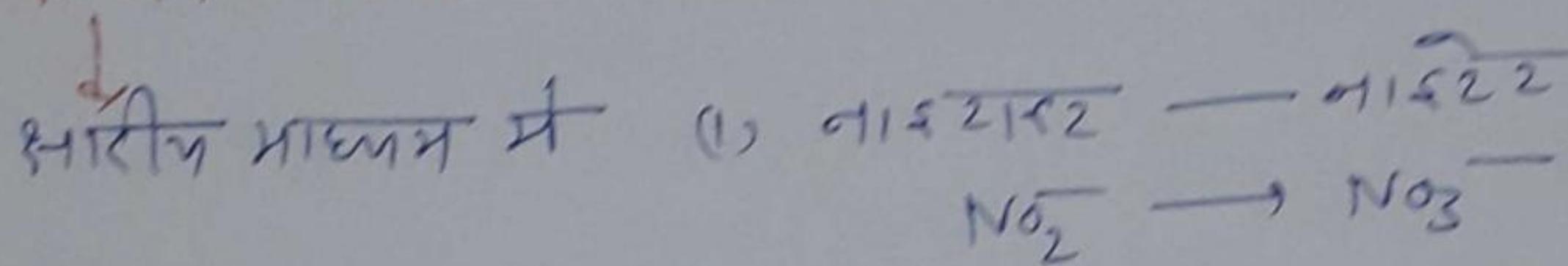


Butterfly structure -

## ⑤ Sulphide & Sulphate



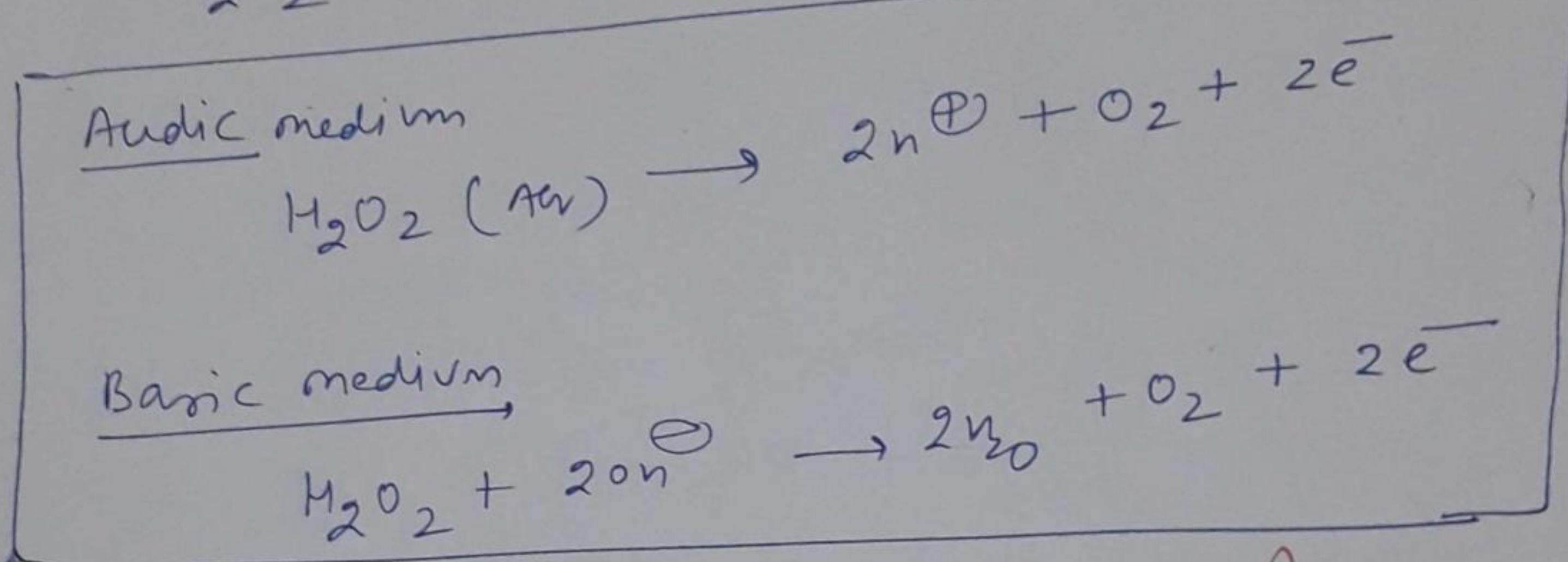
$\rightarrow$  द्वितीय नायन एवं त्रितीय नायन



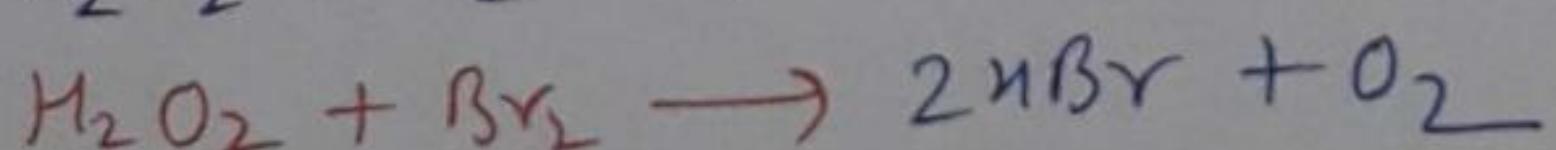
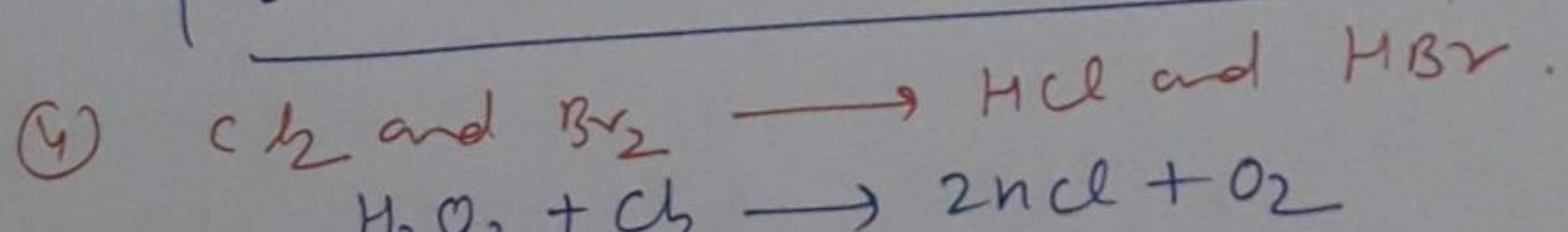
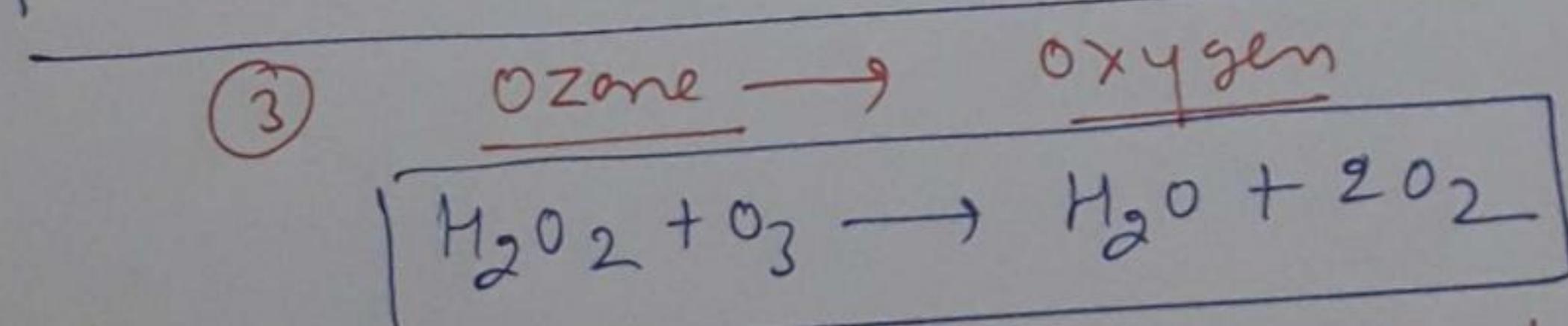
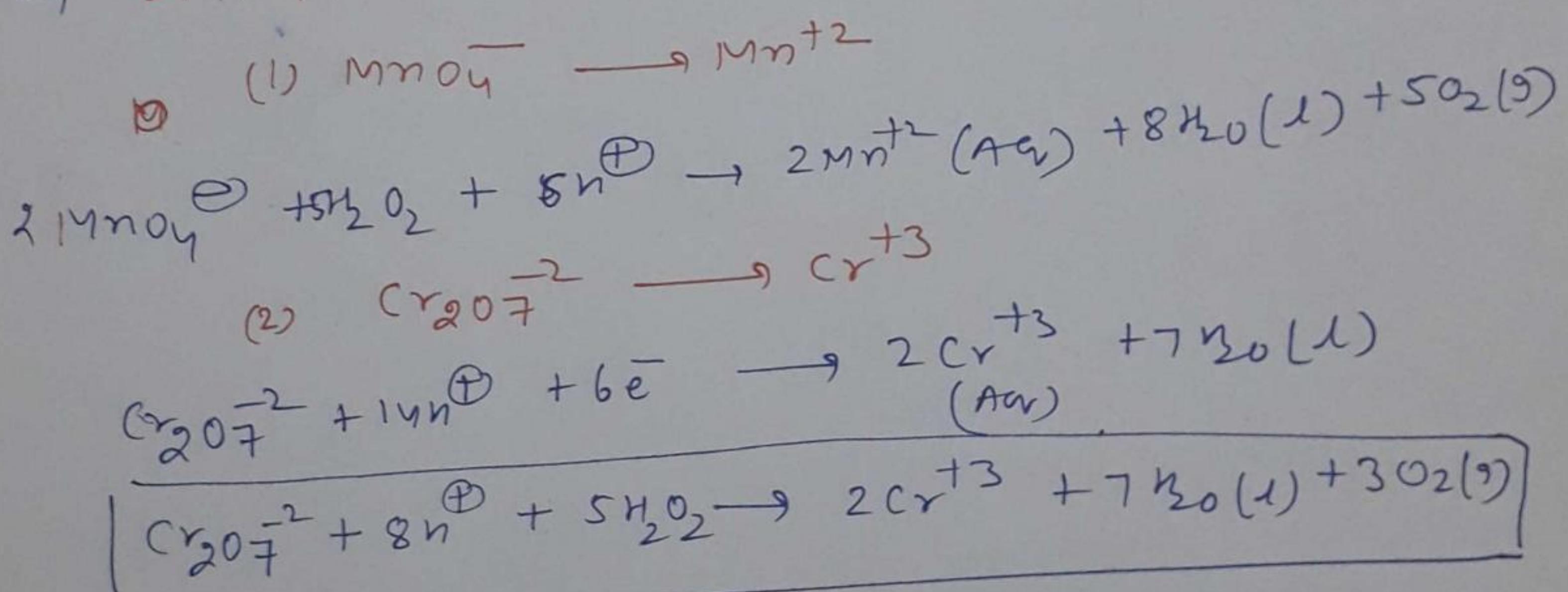
→ अपचारक गैस (Reducing Behaviour). (21)

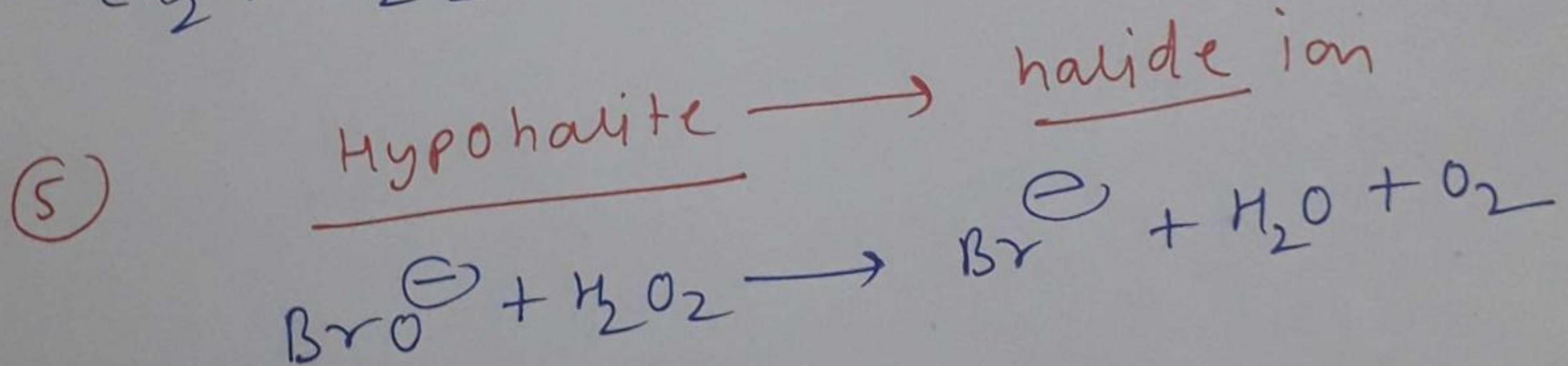
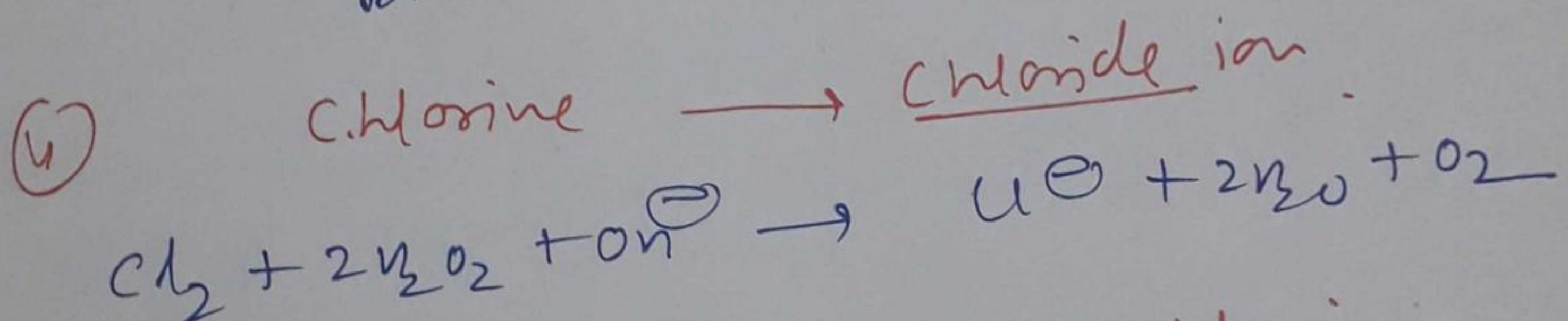
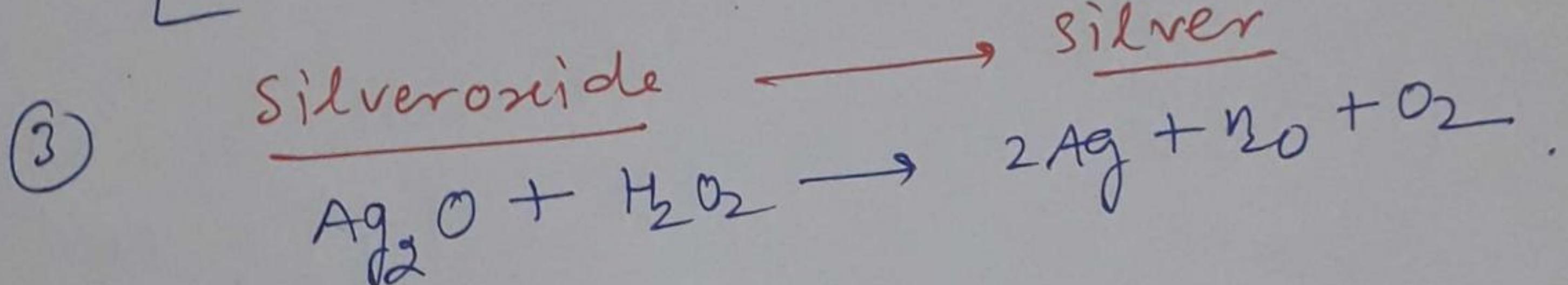
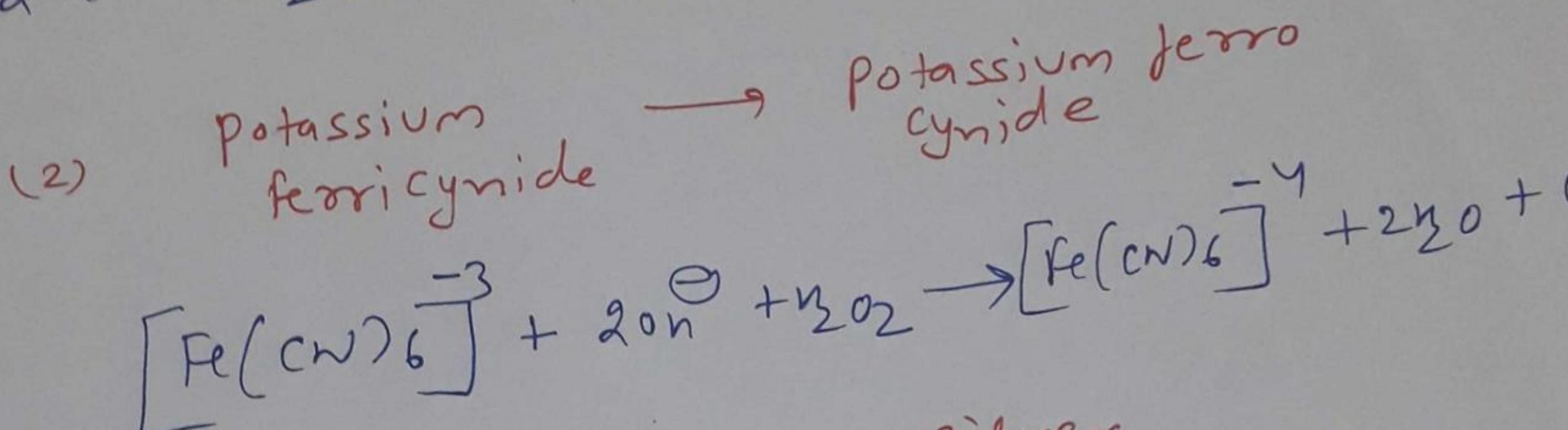
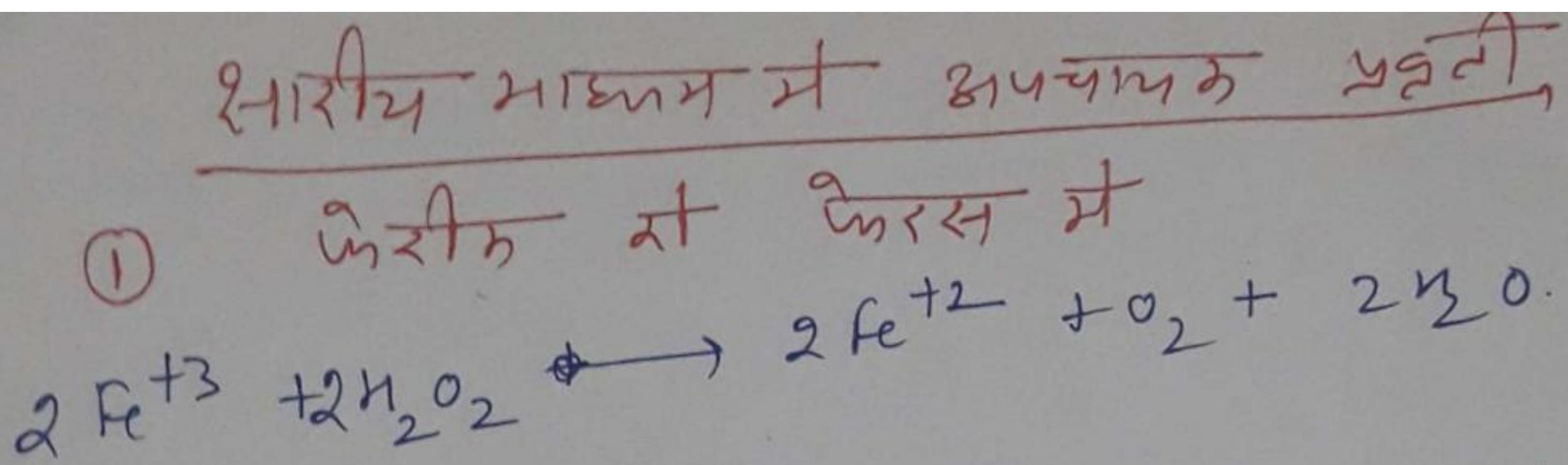
→  $H_2O_2$  अल्लिया व खाली अत मासम से अपचारक यही यस्ता यस्ता उत्पन्न होता है। इसी प्रकार जल की अपचारकता है।

जानीका oxygen ( $O_2$ ) द्वारा  $H_2O_2 + O_2 \rightarrow H_2O + O_2$



→ ଆଜିମୁଖ ମାଣସ + ଶ୍ରୀଚନ୍ଦ୍ରମାତ୍ର ପ୍ରକଳ୍ପ





blue colour with starch solution.

### 9.9.8 Strength of Hydrogen Peroxide solution

The strength of an aqueous solution of hydrogen peroxide is usually expressed in the following two ways:

- (a) **Percentage strength.** It expresses the amount of  $\text{H}_2\text{O}_2$  by weight present in 100 mL of the solution. For example, a 40% aqueous solution (w/v) of  $\text{H}_2\text{O}_2$  implies that 40 grams of  $\text{H}_2\text{O}_2$  present in 100 mL of the solution.
- (b) **Volume strength**

The most common method of expressing the strength of an aqueous solution of hydrogen peroxide is in *terms of the volume (in mL) of oxygen liberated at N.T.P. by the decomposition of 1 mL of that sample of hydrogen peroxide.*

Thus, the aqueous solutions of hydrogen peroxide sold in the market are labelled as *10 volume, 20 volume, 30 volume, 100 volume, etc.* A solution of hydrogen peroxide labelled as 10 volume actually means that 1

## Some Important formulae used

1. The strength of  $x$  volume  $\text{H}_2\text{O}_2$  solution

$$= \frac{68}{22.4} \times x(\text{volume})$$

2. The strength of  $x$  volume  $\text{H}_2\text{O}_2$  solution

$$= \text{Normality} \times 17$$

3. Normality =  $\frac{\text{Strength of } x \text{ volume } \text{H}_2\text{O}_2 \text{ sol}}{17}$

4. Volume strength =  $5.6 \times \text{Normality}$

$$= 5.6 \times \frac{\text{Strength gm/l}}{17}$$

5. Volume strength =  $11.2 \times \text{molarity}$