TEACHER'S NOTES

I.G.C.S.E. CHEMISTRY

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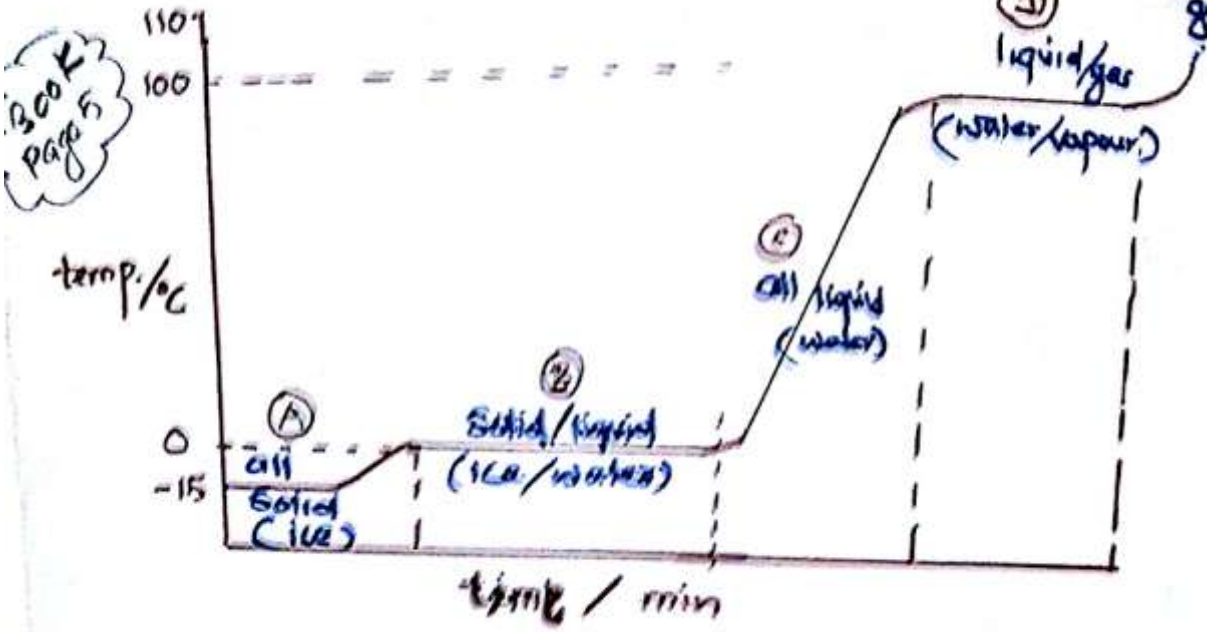
PREPARED BY:

Hakim Abbas (#66748570)
(M.Sc., B.Ed., M.C.S., CIE Certified Teacher)
https://sites.google.com/site/hakimabbas31site/

Chapter 1 Matter

Heating & cooling curves



A:- At -15°C to 0°C only ice was present. In ice the particles of water are close together and are attracted to one another.

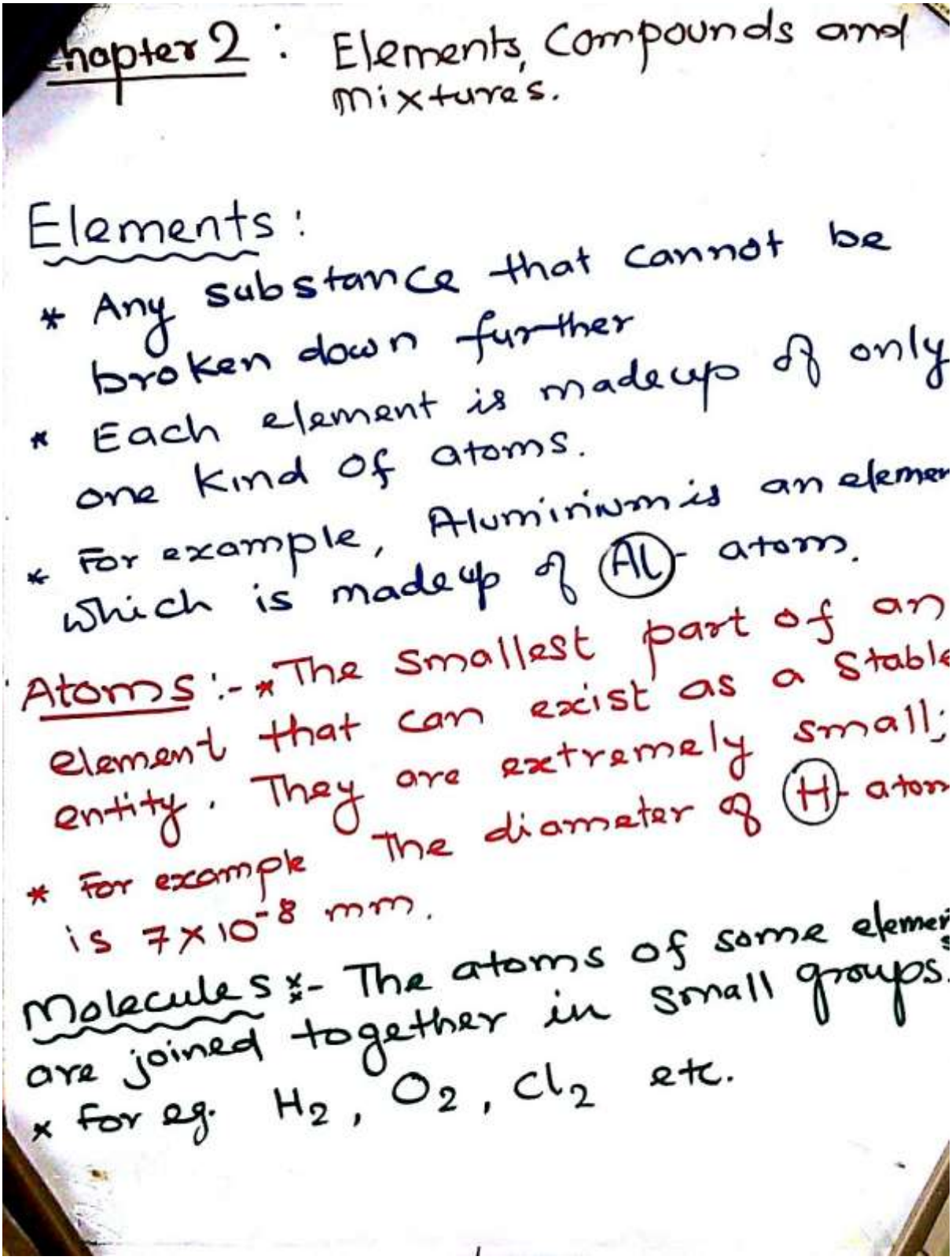
B:- At 0°C showing that even though heat energy is being put in, the temp. remains constant. The energy is used to overcome the force of attraction between the water particles.

C:- At 0°C - 100°C, the heat energy is used to allow relative movement to take place and water changes to gas.

D:- At 100°C, the boiling point of water, where heat energy is used to break down the bonds of water molecules and changes to gas.

E:- The temperature of gas increases.....

Chapter 2 Experimental techniques



Chapter 2 : Elements, Compounds and mixtures.

Elements :

* Any substance that cannot be broken down further
* Each element is made up of only one kind of atoms.
* For example, Aluminium is an element which is made up of (Al) atom.

Atoms :- * The smallest part of an element that can exist as a stable entity. They are extremely small; The diameter of (H) atom

* For example is 7×10^{-8} mm.

Molecules :- The atoms of some elements are joined together in small groups.

* for eg. H_2, O_2, Cl_2 etc.

Mixtures - Mixtures are not a pure substances, they contains more than one substance.

eg. Sea water :- Salt + water

air :- H_2, O_2, N_2 gases etc.

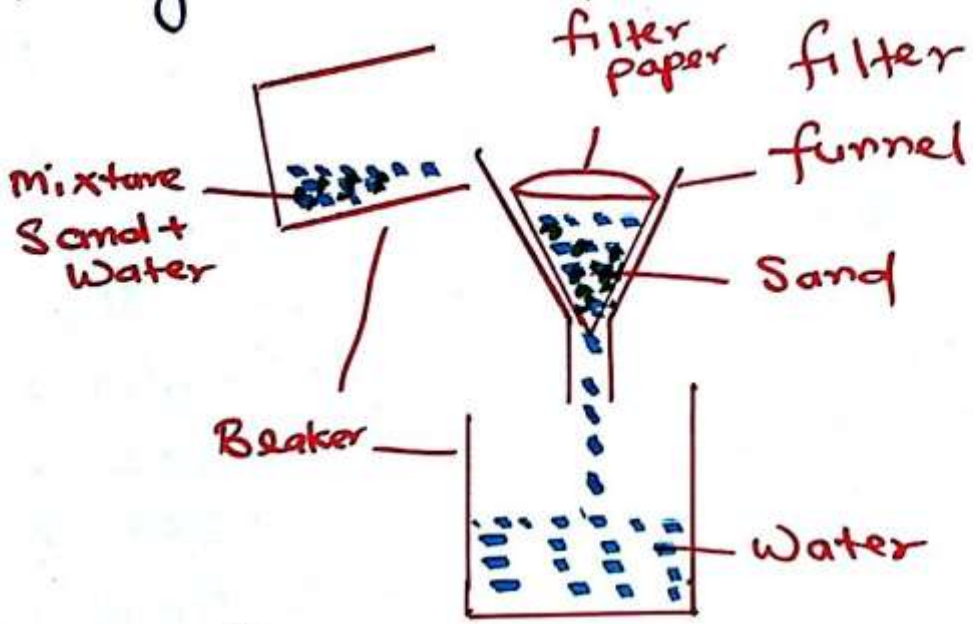
Table 2.7 : The major difference betw mix. and compounds.
(Page 18)

Mixture	Compound
• It contains 2 or more substances.	• It is a single substanc
• The composition can Vary	• Composition always Sam
• No chemical change is takes place when mix is formed.	• It involve chemical change.
• The properties are those of individual elements.	• The properties are very different to those of the component elements.
• The components may be separated quite easily by physical means.	• The components can only be separated by one or more chemical reactions.
eg. Sea water, air, Salt and sand etc	eg. H_2O, FeS, NaCl etc.

Separating Mixtures

1. Filtration:

Sand can be separated from a mixture with water by filtering through filter paper.

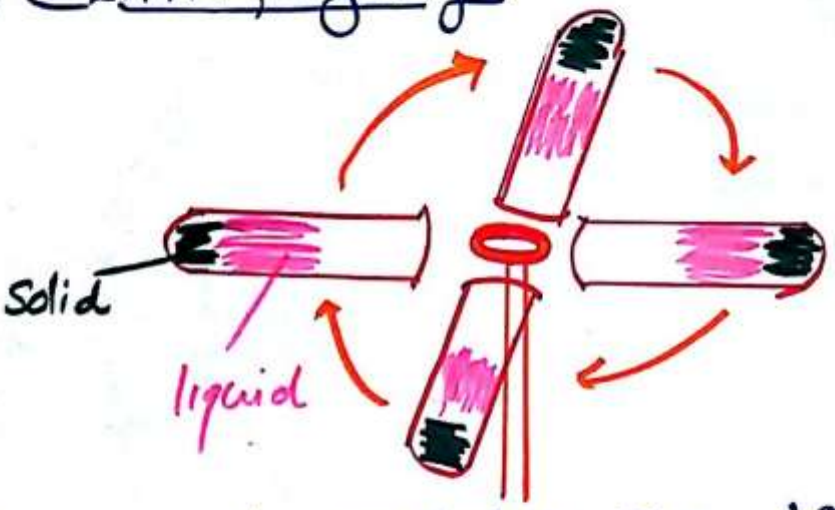


2. Decanting:

Carrot do not dissolve in water. When you have boiled some carrots it is very easy to separate from the water by pouring it off.

Separating Mixtures (2)

(3) Centrifuging :-



When solid particles are so small to filter out from liquid, this technique is used. It involves the suspension being spun round very fast in a centrifuge so that the solid gets settle to the bottom of the tube. ex. Blood cells from plasma

(4) Evaporation :-

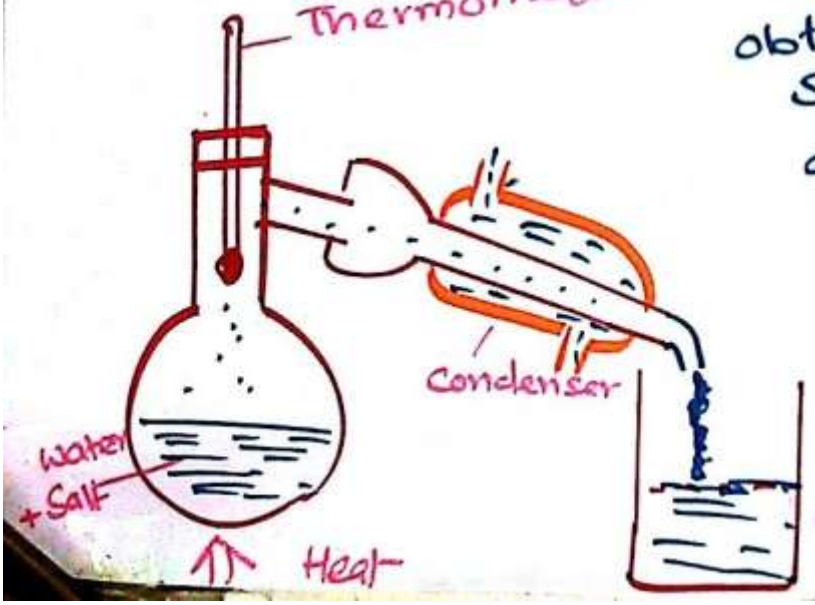
If the solid has dissolved in the liquid, the solution can be heated so that the liquid evaporates and leaves the solid behind. Ex. Salt + water

Separating Mixtures (3)

(5) Crystallisation :-

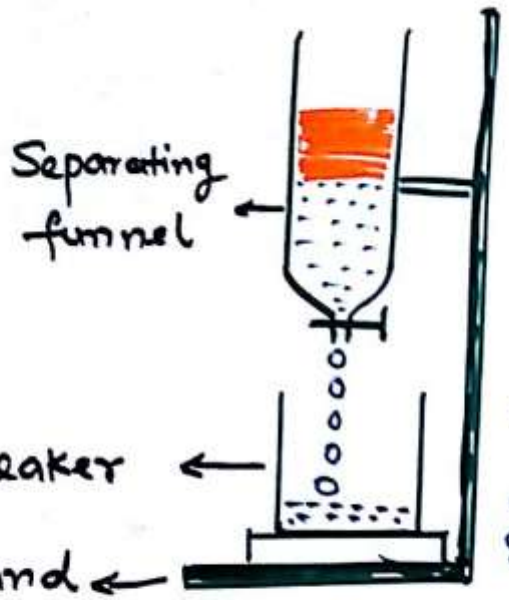
Salt is obtaine
from sea. This
is done by hea
the solution to
evaporate the water,
and Saturated solut
left for some time.
From
Saturated solution, Salt begins to
crystallise and it is removed.

(6) Simple distillation :-



water can be
obtained from
salt water by
distillation.

(7) Separating funnel

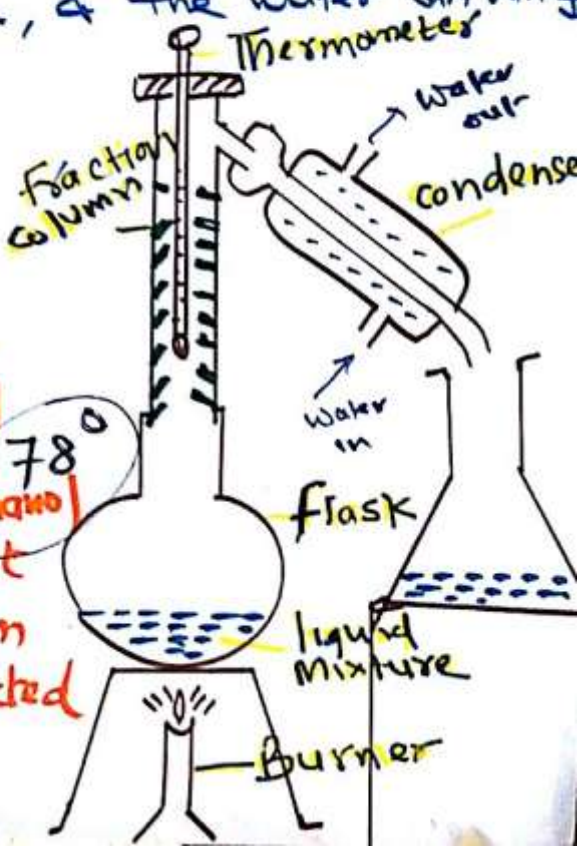


If two liquids are immiscible they can be separated using separating funnel

eg. The water is mor dense than the oil So sink to the botto of the separating funnel, & the water can run o

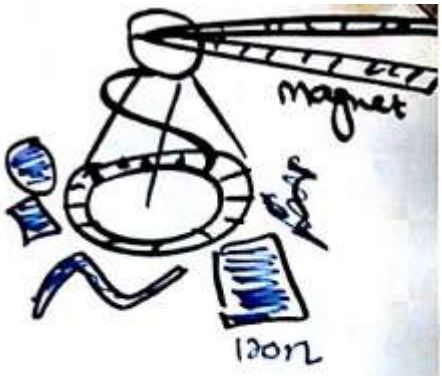
(8) Fractional distillation

Fractional distillation relies upon the liquid having different Boiling points. When the ethanol and water mixture is heated, the vapour of ethanol and water boils off at different temp. and can be condensed and collected sep-ely.



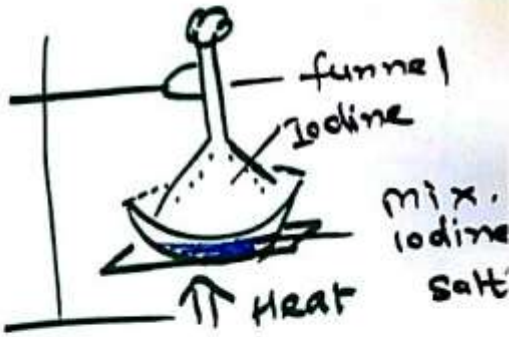
(9) Magnetic Separation

It is possible to separate Scrap iron from other Metals by using a large electromagnate.

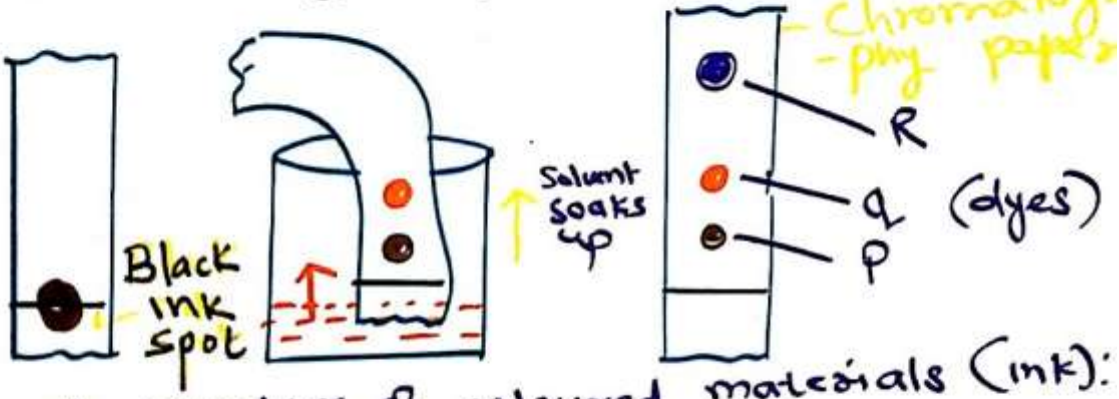


(10) Sublimation

In case of Iodine/Salt mixture the Iodine Sublime but salt doesnot.



(11) Chromatography :



Separate mixture of coloured materials (ink):

1. A spot of the ink is put on to a piece of chromatography paper.
2. This paper is then set in a suitable Solvent.
3. As the Solvent moves up the paper, the dyes are carried with it and begin to separate

Chapter 2 : Additional Questions.

2.

a. Metallic elements	Calcium, Iron Copper
b. non-metallic elements	Silicon, diamond Sulphur, nitrogen
c. Compounds	Water, Carbon monoxide Sodium chloride, ammonia
d. Mixtures	Sea water, air, brass dil. Sulphuric acid, oil

3.

a.	Solid element	Copper
b.	liquid element	Bromine
c.	Gaseous mixture	air
d.	Solid Mixture	bronze
e.	liquid compound	water
f	Solid compound	Marble

4 a. Exothermic reaction

b. Iron sulphide (FeS)

c. Iron + sulphur → Iron Sulphide

[Fe + S → FeS]

d. Mixture of iron and sulphur can be easily separated by using magnet, but from compound Iron Sulphide not.

	Mixture	Method
a	The sediment formed at the bottom of Sherry bottle	Decanting
b	Oxygen from liquid air	Fractional distillation
c	red blood cells from plasma	Centrifuging
d	petrol and kerosene from Crude oil	fractional distillation
e	Coffee grains from coffee solution	Filtration
f	pieces of Steel from engine oil	Filtration
g	amino acids from fruit juice solution	Chromatography
	ethanol and water	fractional distillation

6. a. B
b. D
c. A, C
d. A
e. B
f. −266°C
g. D

7. a. (i) 5
(ii) 5
(iii) 9
(iv) 8
(v) 45
(vi) 13
(vii) 15

b. (i) $2Zn + O_2 \rightarrow 2ZnO$
(ii) $2Fe + 3Cl_2 \rightarrow 2FeCl_3$
(iii) $4Li + O_2 \rightarrow 2Li_2O$
(iv) $2H_2 + O_2 \rightarrow 2H_2O$
(v) $2Mg + CO_2 \rightarrow 2MgO + C$

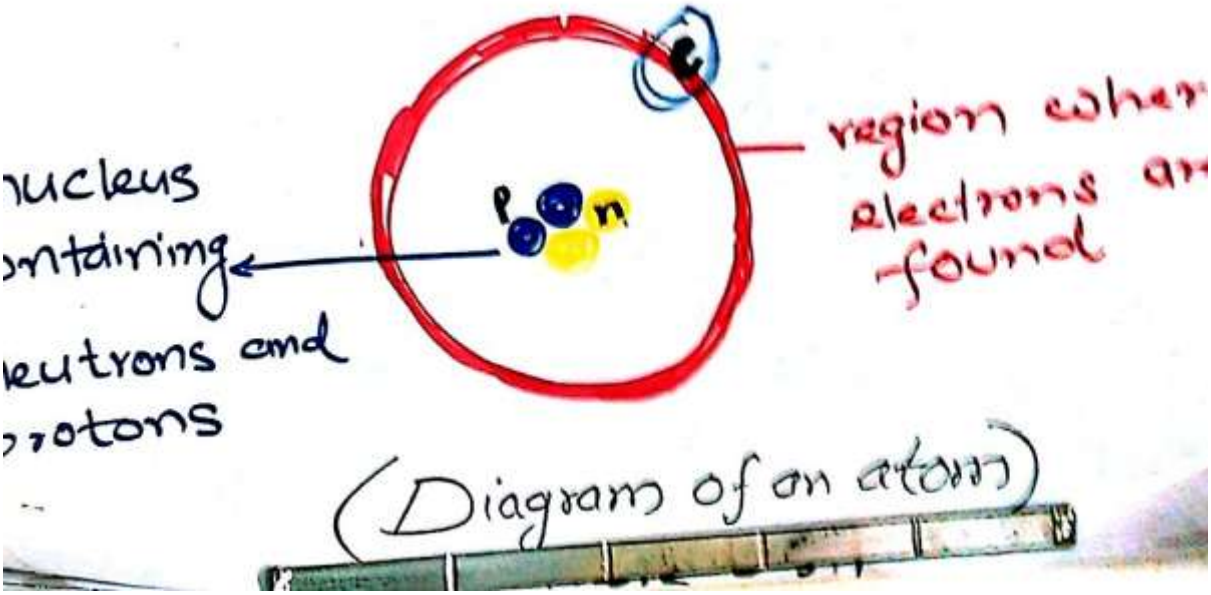
Chapter 3 Atomic Structure

Chapter 3 : Atomic Structure

nside atoms:-

here are three sub-atomic particles
re found in distinct and separate
egion.

article	Symbol	mass (amu)	charge	region
roton	P	1	+1	nucleu
eutron	n	1	0	nucleu
lectron	e	$\frac{1}{1837}$	-1	Shells



(Diagram of an atom)

Atomic number and mass numb

$$\boxed{{}^{A}_{Z}X}$$

Atomic number (Z) :-

The number of proton in the nuc
of an atom is called atomic numb

Mass number (A) :-

The total number of protons a
neutrons found in the nucleu
of an atom is called mass numbe

(n+p) mass no. (A) ← 4

$^{4}_{2}He$ ← Helium symbol of the element

(p) Atomic no. (Z) ← 2

No. of neutrons = A − Z

Ex. Calculate the no of p, n, e in the following atoms.

(a) $^{27}_{13}Al$ (b) $^{31}_{15}P$ (c) $^{262}_{107}Uns$ (d) $^{190}_{76}C$

Istopes :- Atoms of the same element which have different numbers of neutrons are called isotopes.

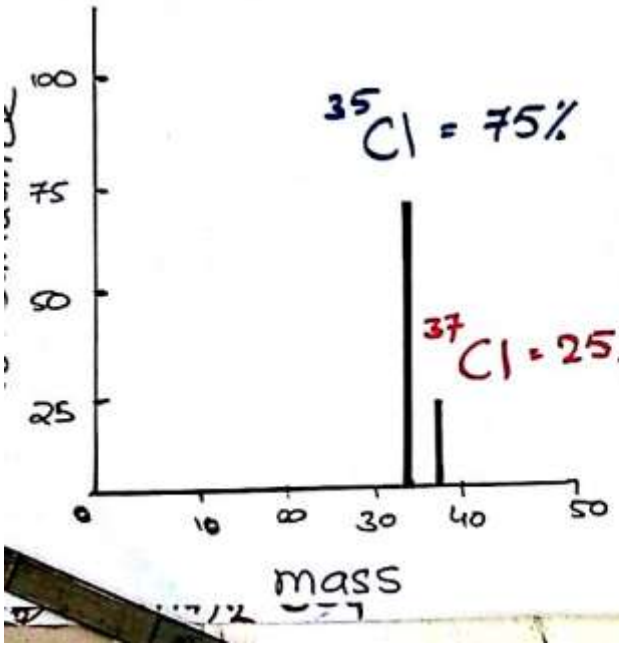
eg. two isotopes of Chlorine;

$^{35}_{17}Cl$ P=17, n = 35-17 = 18

$^{37}_{17}Cl$ P=17, n = 37-17 = 20

Activity Table 3.4

Relative atomic mass : The average mass of a large no. of atoms.



$$A_r = \frac{\text{Average mass of isotopes}}{1/12 \times \text{mass C-12}}$$

$$A_r = \frac{(35 \times 75) + (37 \times 25)}{100}$$

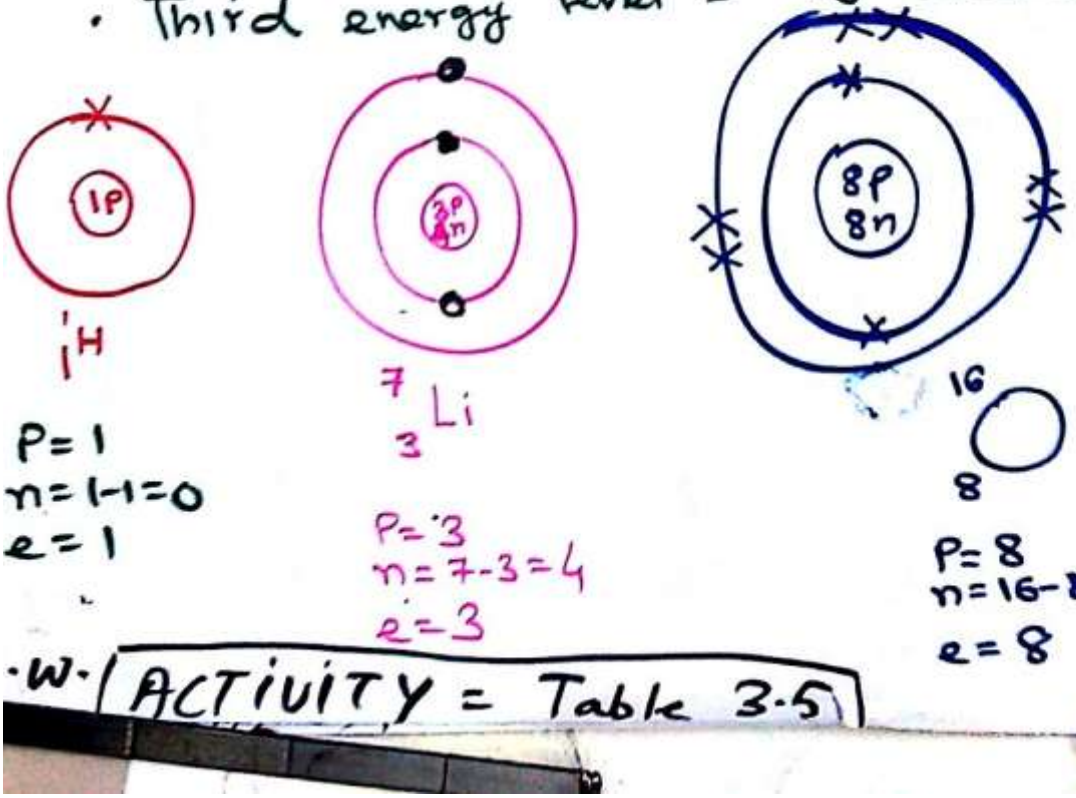
$A_r = 35.5$ amu

The arrangement of electrons in atom

The electrons move around the nucleus in a particular orbit. They move very fast, and it is not possible to give exact position of an electron in an orbit (energy level)

Each of an energy level can hold only a certain number of electrons.

- First energy level = 2 electrons
- Second energy level = 8 electrons
- Third energy level = 18 electrons.



W. ACTIVITY = Table 3.5

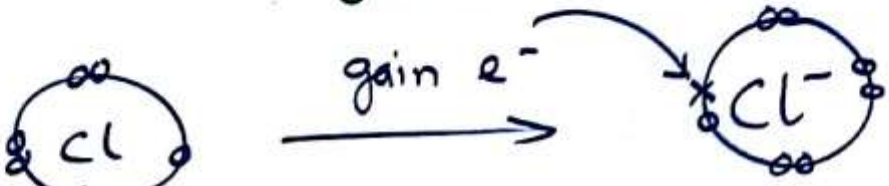
Ions :- An ion is an electrically charged particles.

- **Positive ions :-** When an atom loses one or more electrons.

+ 19 Protons
- 19 electrons
= Zero

+ 19 Protons
- 18 electrons
+ 1

- **Negative ions :-** When an atom gains One or more electrons.



+17 Protons
-17 electrons
zero

+17 Protons
-18 electrons
-1

Activity Table 3.3

Compounds:

* Compounds are pure substances which are formed when two or more elements chemically combined together. eg. Water is a simple compound formed from the elements Oxygen and hydrogen.

Oxidation: When substances combined with Oxygen;

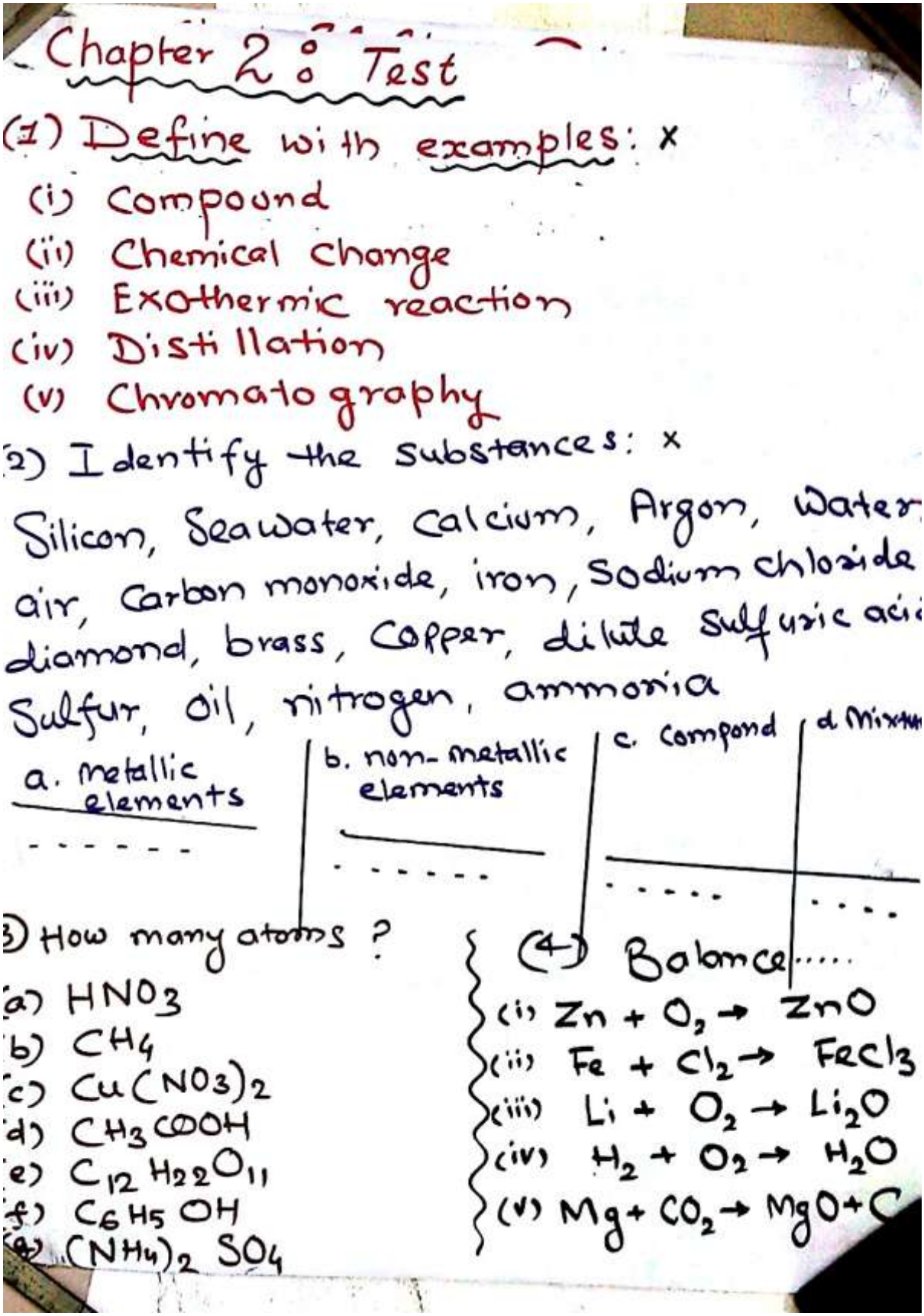
$$2Mg + O_2 \rightarrow 2MgO$$

Reduction:- When oxygen is removed from substances.

$$Fe_2O_3 + CO \rightarrow Fe + CO_2$$

Formulae: The formula of a compound is made up from the symbol of the elements present in their ratio.

eg. CO_2 ⇒ Carbon : Oxygen
1 : 2



Chapter 2 : Test

(1) Define with examples: x

(i) Compound
(ii) Chemical change
(iii) Exothermic reaction
(iv) Distillation
(v) Chromatography

(2) Identify the substances: x

Silicon, Seawater, Calcium, Argon, Water, air, Carbon monoxide, iron, Sodium chloride, diamond, brass, Copper, dilute Sulfuric acid, Sulfur, oil, nitrogen, ammonia

a. metallic elements

b. non-metallic elements

c. compond

d. Mixtu

(3) How many atoms ?

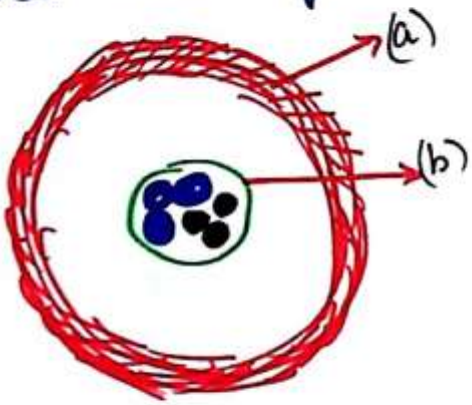
(a) HNO_3
(b) CH_4
(c) $Cu(NO_3)_2$
(d) CH_3COOH
(e) $C_{12}H_{22}O_{11}$
(f) C_6H_5OH
(g) $(NH_4)_2SO_4$

(4) Balance.....

(i) $Zn + O_2 \rightarrow ZnO$
(ii) $Fe + Cl_2 \rightarrow FeCl_3$
(iii) $Li + O_2 \rightarrow Li_2O$
(iv) $H_2 + O_2 \rightarrow H_2O$
(v) $Mg + CO_2 \rightarrow MgO + C$

Chapter 3: Class Quiz

1) Lable the diagram, and complete the table for an atom.



Particle	Symbol	Relative mass	Relative charge
Proton			
Neutron			
electron			

2) Calculate the no. of Protons, neutrons, and electrons in the following atoms.

i) $^{1}_{1}H$ (ii) $^{4}_{2}He$ (iii) $^{23}_{11}Na$ (iv) $^{262}_{107}Uns$

3) Define ions and give examples.

4) Define Isotopes and give examples.

5) $^{20}_{10}Ne = 90\%$ and $^{22}_{10}Ne = 10\%$ calculate the Ar of the Neon.

6) Show the arrangement of electrons in atoms.

(i) $^{1}_{1}H$ (ii) $^{14}_{7}N$ (iii) $^{23}_{11}Na$ (iv) $^{35}_{17}Cl$

(v) $^{40}_{20}Ca$

Chapter: 3 : Additional Questions

1. An atom X has a proton number of 19 and relative atomic mass of 39

a. How many e, p, n are there ?

b. How many electrons in outer shell?

c. Write down the symbol of ion X ?

d. Which Group of the p.t. would be X in ?

e. (i) How would you expect X to react with water?

(ii) Write a word and balanced Chemical equation.

2. The proton number of (Ba) is 56. It is in Group 2 of P.T.

a. How many electrons in outer shell?

b. How would you expect Barium to react with chlorine? Write equation.

c. How would you expect Barium to react with water? Write equation.

d. Write down the formulae

(i) * Bromide

(ii) * Sulphate of Barium.

3. Find the element Germenium (Ge)
(a) Which Group ?
(b) How many electrons in outer shell ?
(c) Is Ge, metal or non-metal ?
(d) What is the formula of Chloride ?
(e) Name and symbols of other elements in this group.

4. Three members of Halogens are

$^{35.5}_{17}Cl$ $^{80}_{35}Br$ $^{127}_{53}I$

a(i) Write electronic structure of Cl
(ii) Why relative mass of Cl is not a whole no ?
(iii) How many protons in Br ?
(iv) How many neutrons in I ?
(v) State & account the order of reactivity
b (i) When K is allowed to burn in a gas jar of chlorine, clouds of white smokes are produced
(i) Why the reaction carried out in fume cup board ?
(ii) What does the white smoke consists of
(iii) Write equations. (iv) Bromine vapour ?

Chapter 4 Periodic Table

Topic 8.2 : TYPES OF OXIDES

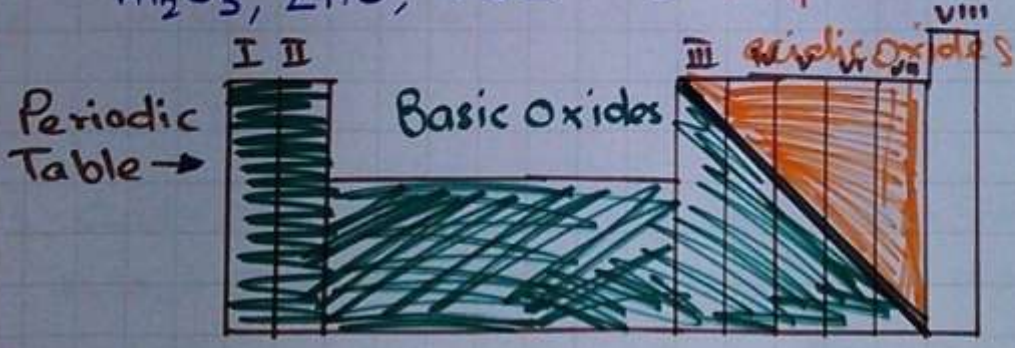
Page 1

Oxides are made by burning the elements in Oxygen.

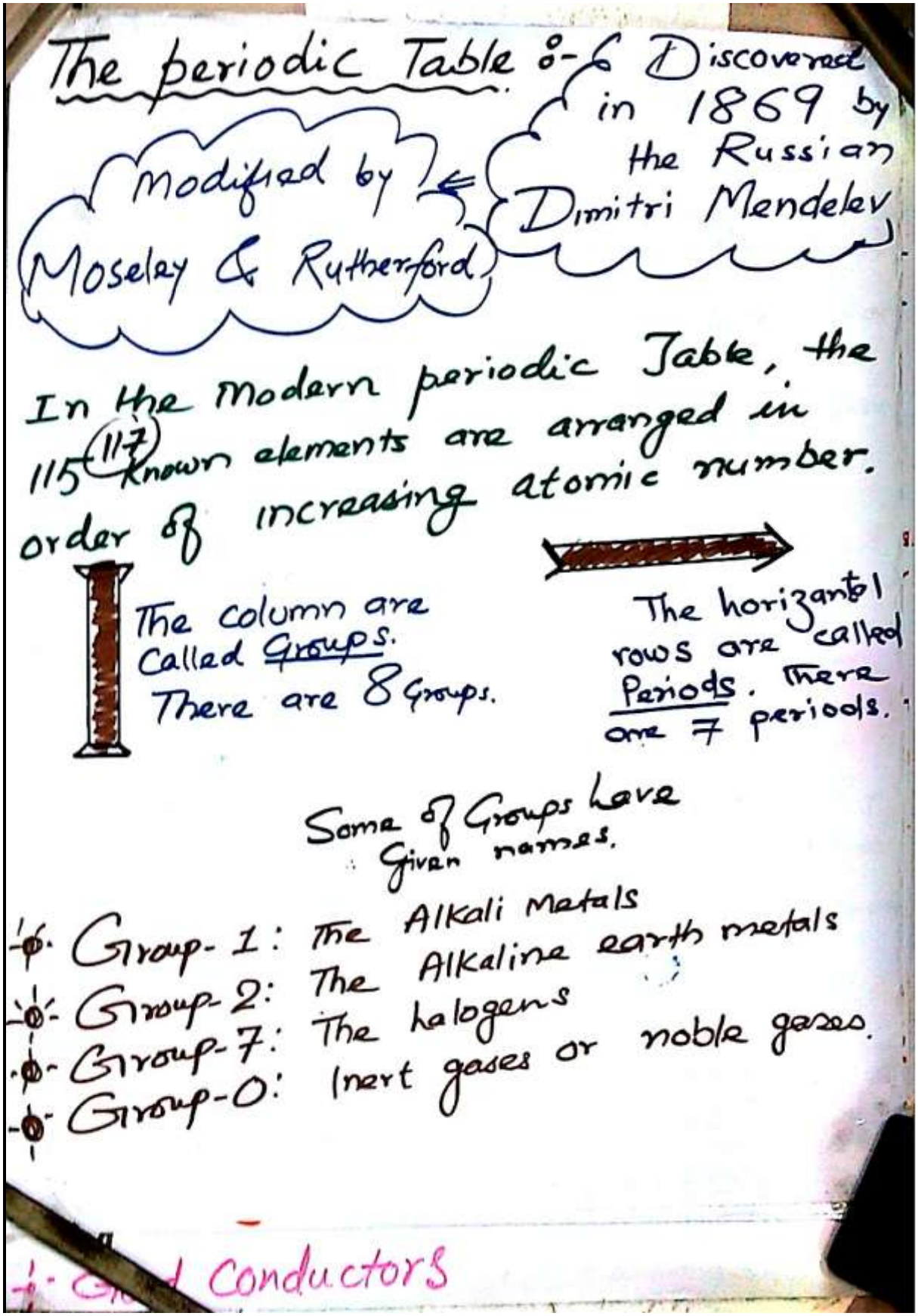
- Metal oxides are basic → dissolve in acid
- Non-metal Oxides are acidic → " Base
- Al, Zn, Pb oxides are amphoteric → " Both
- Water and CO are neutral → " do not dissolve

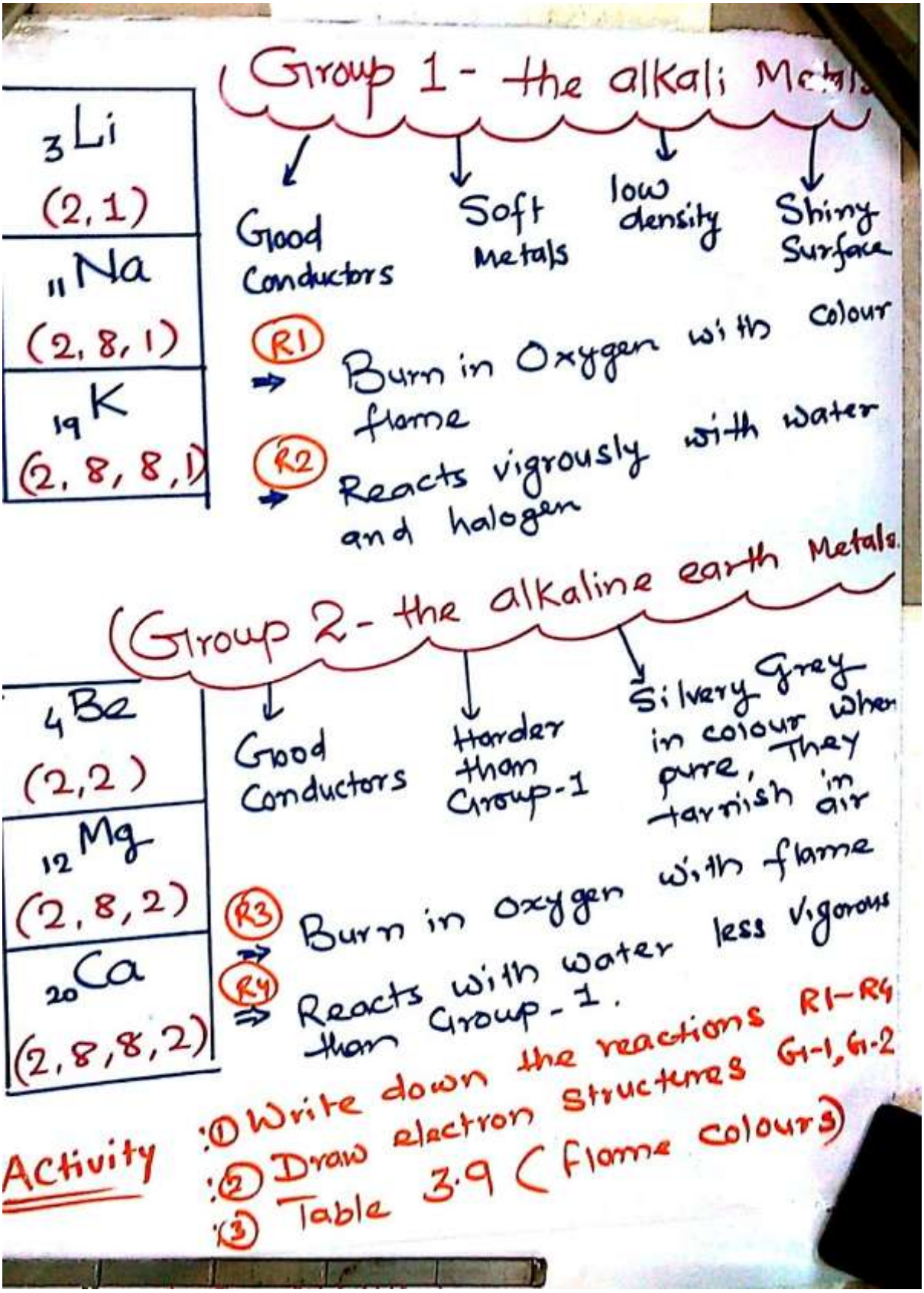
Exercise - Write down the types of oxide for -

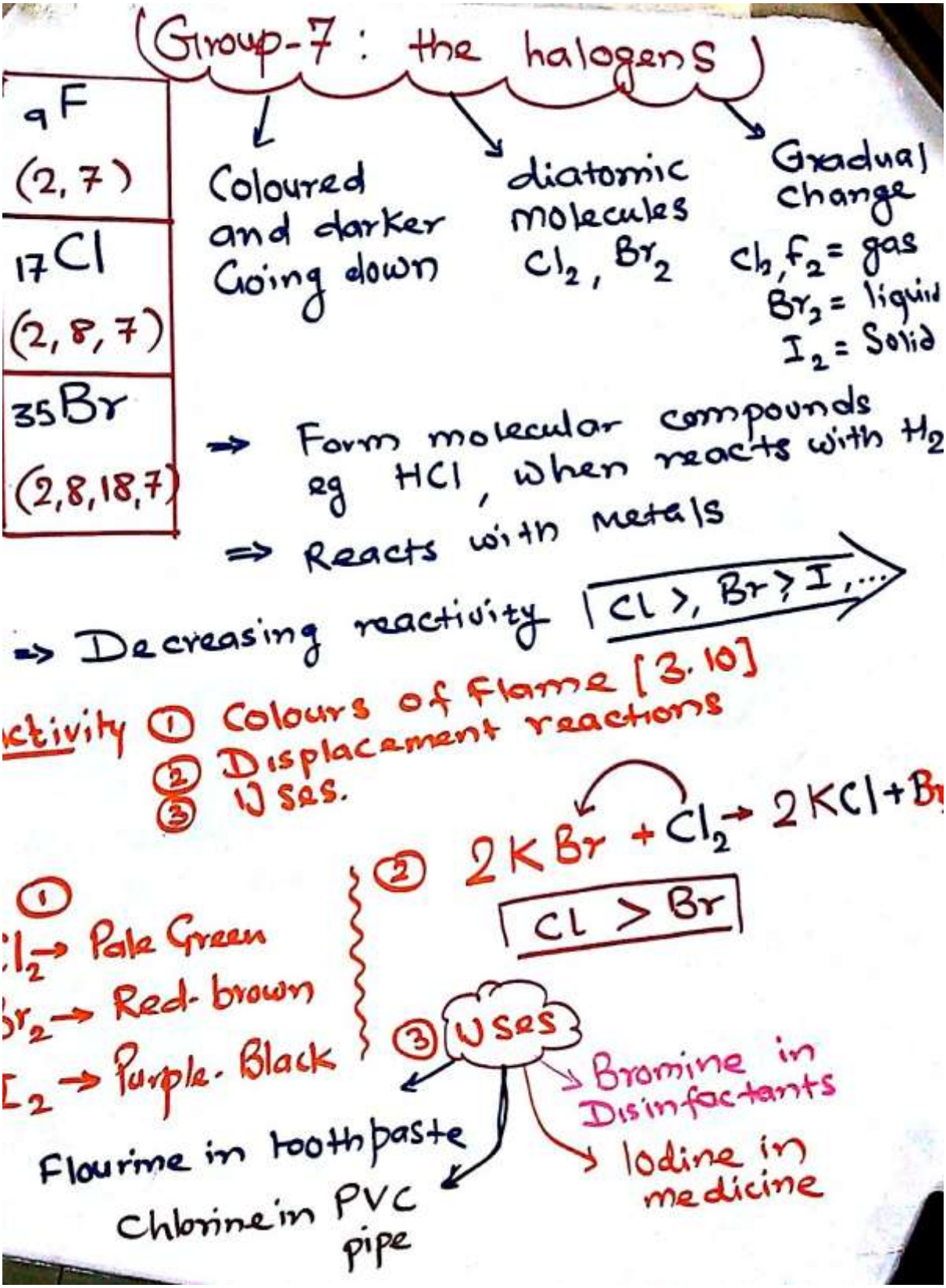
Iron Oxide, Copper(II) oxide, Calcium oxide → Basic
Sulpher dioxide, Carbon dioxide → Acidic
water, Carbon mono oxide → neutral
Al_2O_3, ZnO, PbO → Amphoteric

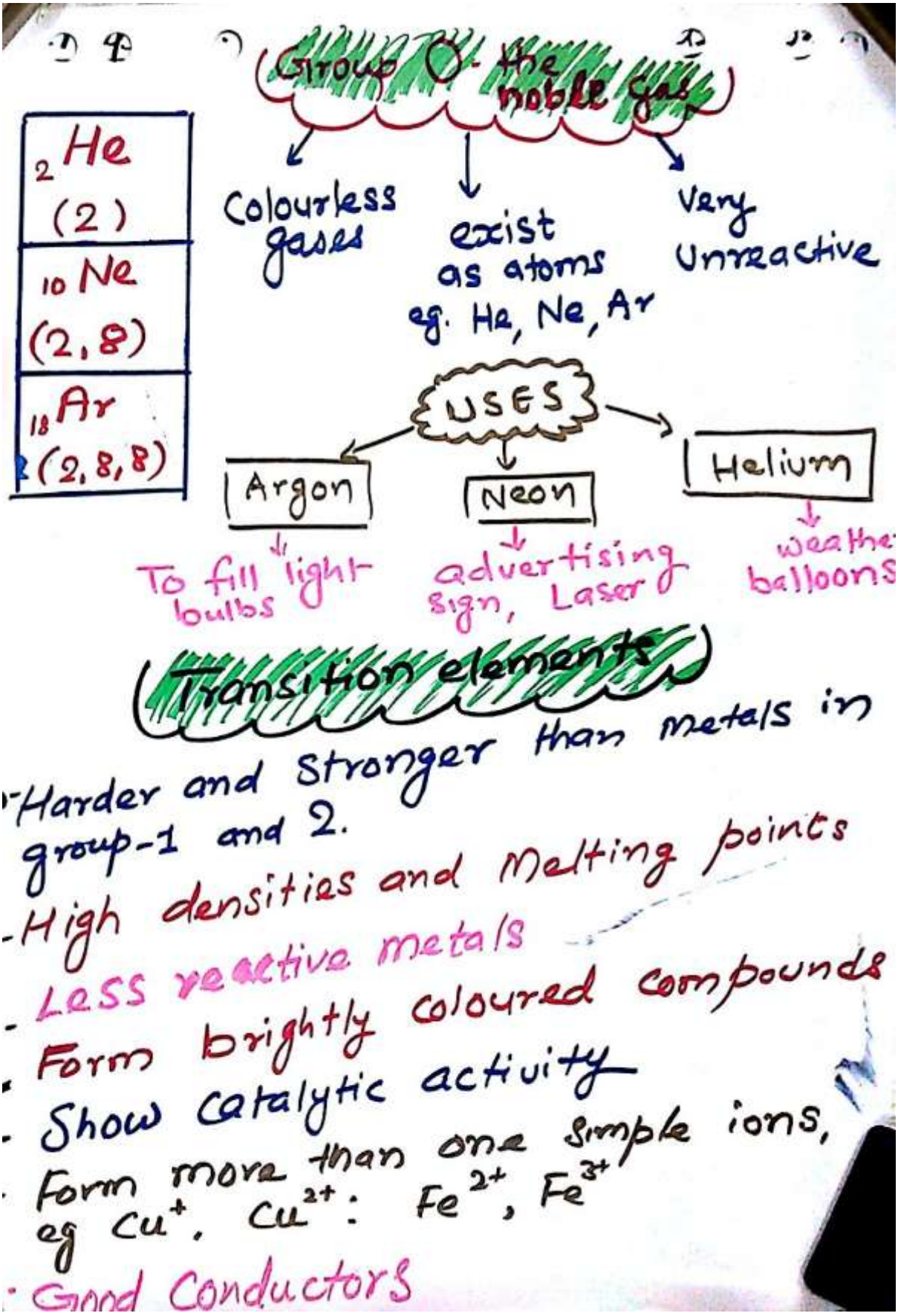


- How could you distinguish between SiO_2 / MgO
  MgO = Basic oxide, SiO_2 = acidic oxide
- Name a substance will reacts with ZnO but not CuO.
  ~~Dilute hydrochloric acid~~ (NaOH)
- How to remove impurities of Fe_2O_3 (iron(III) oxide) from Al_2O_3 (Aluminium oxide).
  Dissolve in Sodium hydroxide (NaOH)
  Al_2O_3 = amphoteric Fe_2O_3 = Basic oxide





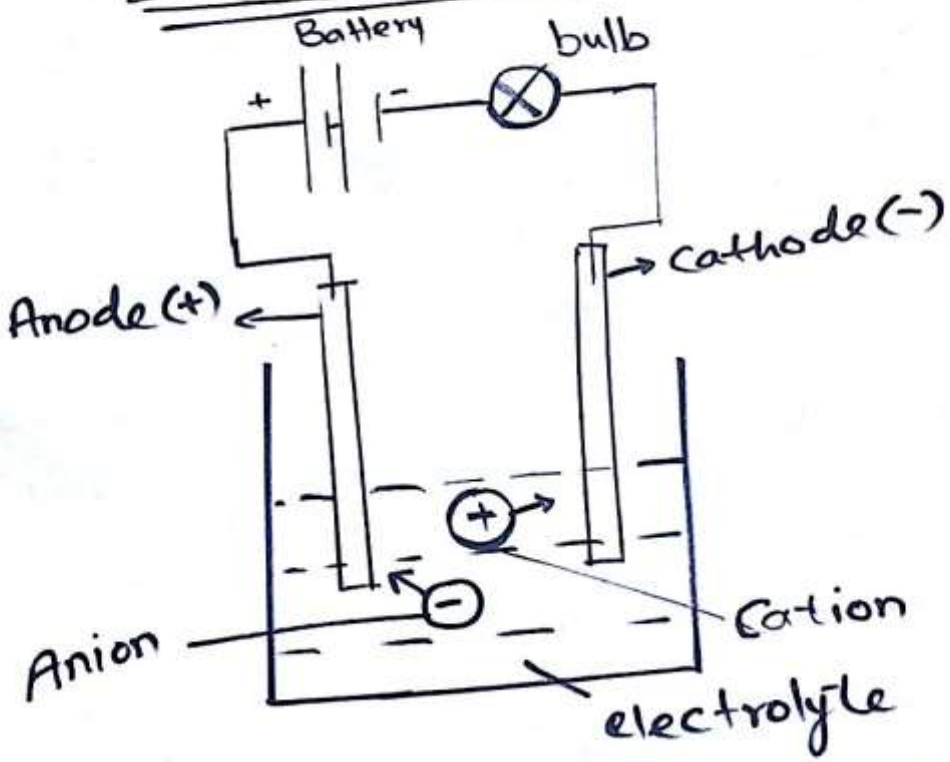




Chapter 5 Electrolysis

Topic 5 : Electricity & chemistry (2)

Electrolytic Cell



Anode :- A positively charged electrode.

Anion :- A negetively charged ion

Cathode :- A negatively charged electrode

Cation :- A positively charged ion

Topic 5: Electricity & chemistry ①

Electrolysis - The decomposition of an electrolyte using electricity

eg. $NaCl_{(aq)} \rightleftharpoons Na^{+}_{(aq)} + Cl^{-}_{(aq)}$

Electrolyte - A substance which when molten or dissolved in solution conducts electricity

eg. Molten Salt - molten sodium chloride

aqueous Salt - copper sulphate

acidic solution - Sulfuric acid

alkaline solution - Sodium hydroxide

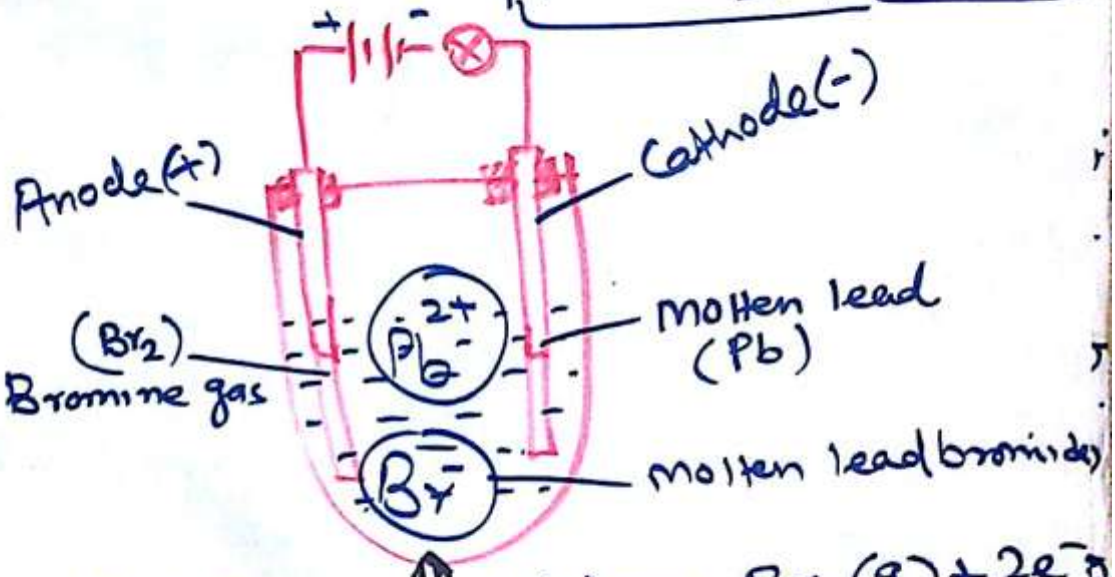
Electrolytic cell :- Converts electrical energy into chemical energy and consists of
- two electrodes
- power supply
- External circuit
- electrolyte

Predicting the products of molten Salts — (3)

molten electrolyte → Cathode (−) = metals

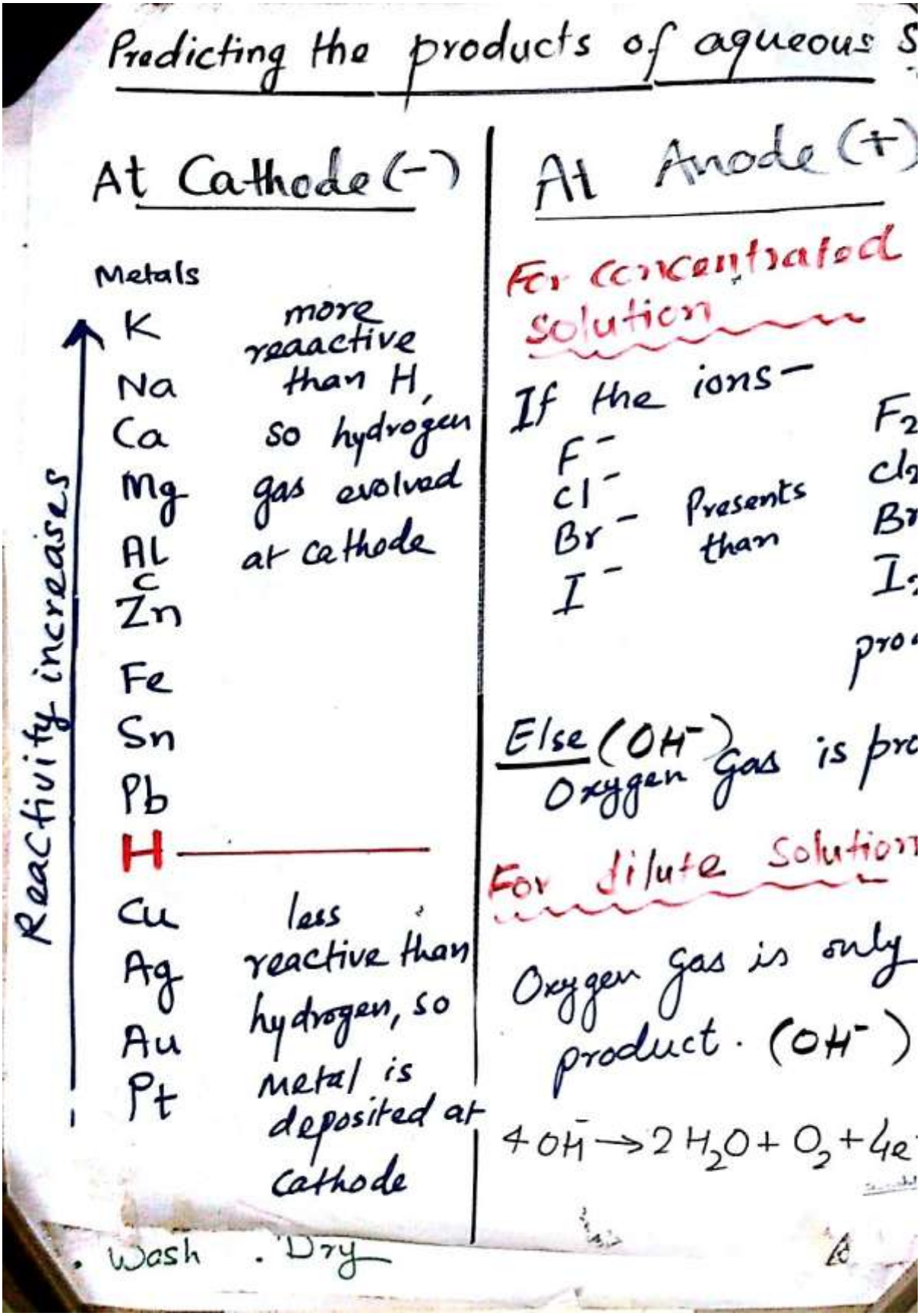
molten electrolyte → Anode (+) = non-metals

Ex. 1 Electrolysis of molten $PbBr_2$ | lead(II) Bromide



At Anode(+) :- $2Br^-(l) \rightarrow Br_2(g) + 2e^-$

At Cathode(−) :- $Pb^{2+}(l) + 2e^- \rightarrow Pb(l)$
lead



Predicting the products of aqueous S

At Cathode (−)

Metals

Reactivity increases

- K
- Na
- Ca
- Mg
- Al
- Zn
- Fe
- Sn
- Pb
- H
- Cu
- Ag
- Au
- Pt

more reaactive than H, so hydrogen gas evolved at cathode

less reactive than hydrogen, so metal is deposited at cathode

. Wash . Dry

At Anode (+)

For concentrated solution

If the ions −

F⁻
Cl⁻
Br⁻
I⁻

Presents than

F_2
Cl_2
Br
I
pro

Else (OH^-) Oxygen gas is pro

For dilute Solution

Oxygen gas is only product. (OH^-)

$4OH^- \rightarrow 2H_2O + O_2 + 4e$

Ex1 Electrolysis of Copper (II) Sulfate Solution

1. Write the ions presents in the solution -

Cu^{2+}, H^+, SO_4^{2-}, OH^-

Cu^{2+}, H^+ : cations

SO_4^{2-}, OH^- : anions

2. ions attracted to the Cathode-

Cu^{2+}, H^+

* Predicted product

$$Cu^{2+} + 2e^- \rightarrow Cu$$

3. ions attracted to the anode-

SO_4^{2-}, OH^-

* predicted product -

$$4OH^- \rightarrow O_2 + 2H_2O + 4e^-$$

4. Solution left

$$2H^+ + SO_4^{2-} \rightarrow H_2SO_4$$

Sulfuric ac

Electrolysis of aqueous Solutions

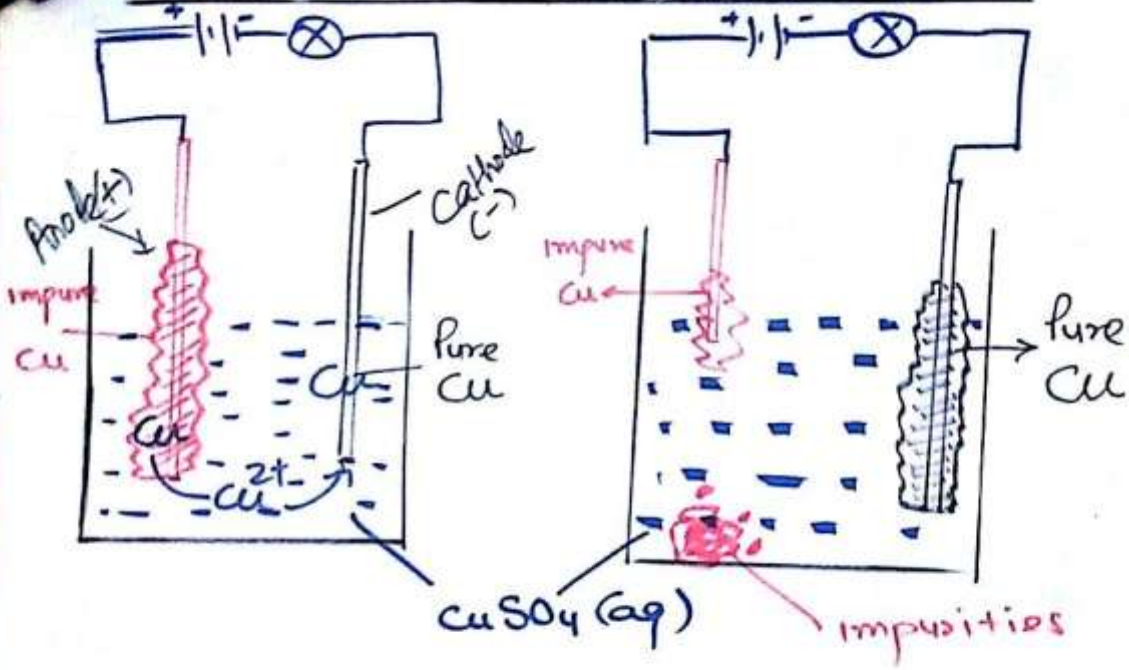
(P 68)

Electrolyte	Cathode product	Anode product	Solution formed
① Concentrated copper (II) Chloride	$Cu^{2+} + 2e^- \rightarrow Cu$	$2Cl^- \rightarrow Cl_2 + 2e^-$	H_2O
② dilute copper (II) Chloride	$Cu^{2+} + 2e^- \rightarrow Cu$	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$	HCl (aq)
③ Conc. Potassium bromide	$2H^+ + 2e^- \rightarrow H_2$	$2Br^- \rightarrow Br_2 + 2e^-$	KOH (aq)
④ dilute Potassium bromide	$2H^+ + 2e^- \rightarrow H_2$	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$	KBr (aq)
⑤ Conc. Potassium sulfate	$2H^+ + 2e^- \rightarrow H_2$	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$	K_2SO_4 (aq)
⑥ Silver Nitrate Solution	$Ag^+ + e^- \rightarrow Ag$	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$	HNO_3 (aq)

Exercise: Predict Products

Electrolyte	At cathode (−)	Anode (+)	Solution
1. molten sodium chloride NaCl (l)			-
2. molten Iron (III) chloride $FeCl_3$ (l)			-
3. molten Aluminium chloride $AlCl_3$			-
4. molten copper (II) chloride $CuCl_2$			-
5 concentrate copper (II) chloride			
6. dilute copper (II) chloride			
7. Conc. Potassium Sulfate			

PURIFICATION OF COPPER



Anode:
1. Impure Cu- plates
2. Oxidised (lose e^-)
3. decrease in mass/size

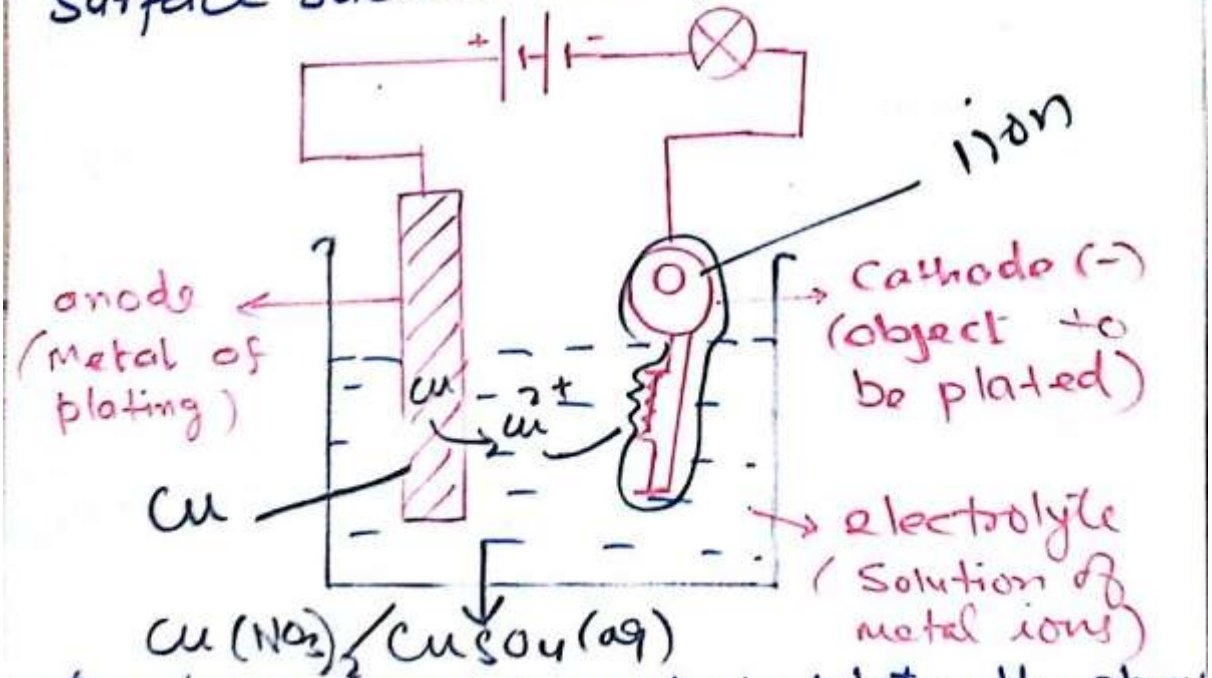
$$Cu(s) \rightarrow Cu^{2+}(aq) + 2e^-$$

Cathode:
1. Pure Cu- plates
2. Reduced (gain e^-)
3. Increase in mass/size

$$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$$

Question: Why do purification of Copper?
Answer: Copper is used to make electrical Cables.

Electroplating : the process of depositing metals from solution in the form of a layer on the other surface such as metal / plastic.



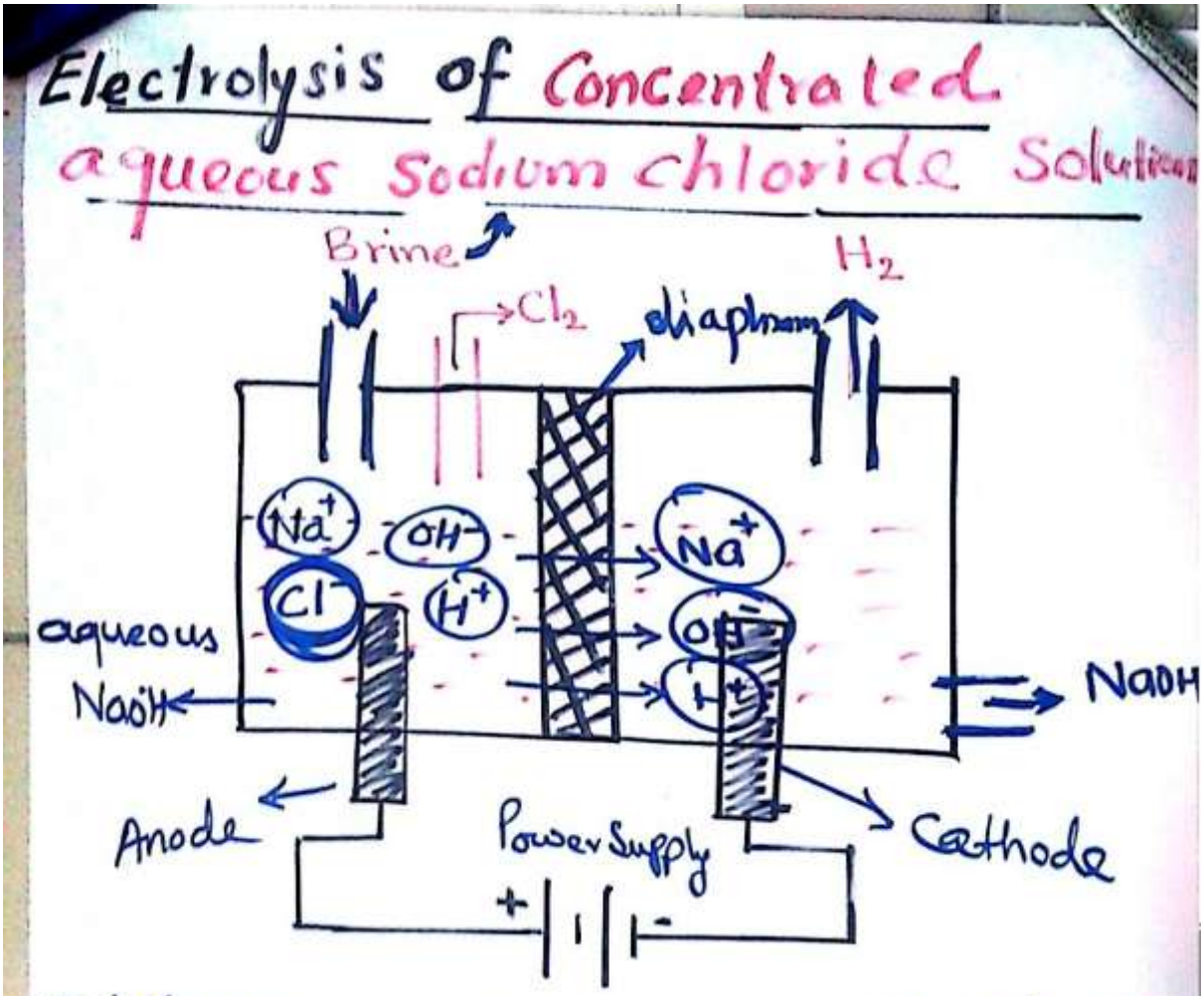
Anode :-
1. metal used to plate the object
2. Oxidised (lose e^-)
3. decrease in size/mass

eg. $Cu(s) \rightarrow Cu^{2+}(aq) + 2e^-$

Cathode :-
1. Object to be plated
2. Reduced (gain e^-)
3. increase in size/mass

eg. $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$

Electrolysis of Concentrated aqueous Sodium chloride Solution



Diaphram :- Used to prevent the Cl_2 gas from reacting with the NaOH

Anode :- $2Cl^-(aq) \rightarrow Cl_2(g) + 2e^-$

Cathode :- $2H^+(aq) + 2e^- \rightarrow H_2(g)$

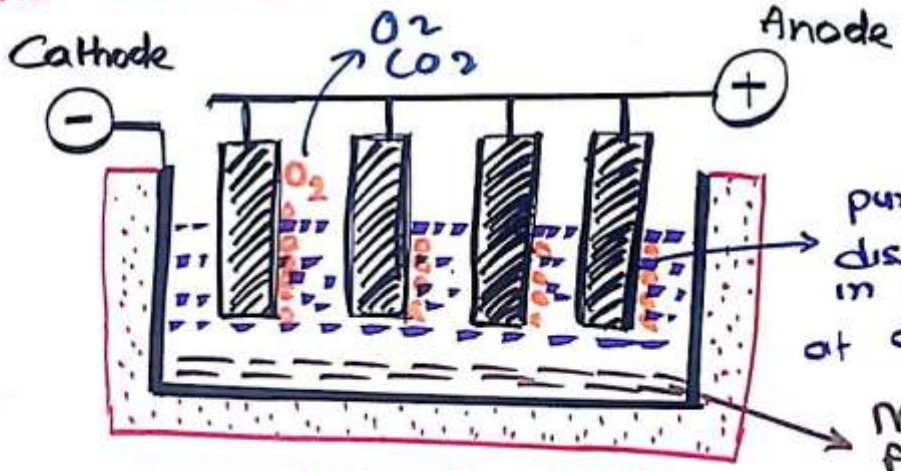
Solution :- $Na^+(aq) + OH^-(aq) \rightarrow NaOH(aq)$

Extraction of Aluminium By Electrolysis

Al is more reactive than C so it can't extracted like Iron or Zinc

Ore of Al Bauxite Al_2O_3

Al_2O_3 is amphoteric



Hall-Heroult Cell

Cathode :- $Al^{3+} + 3e^- \rightarrow Al$

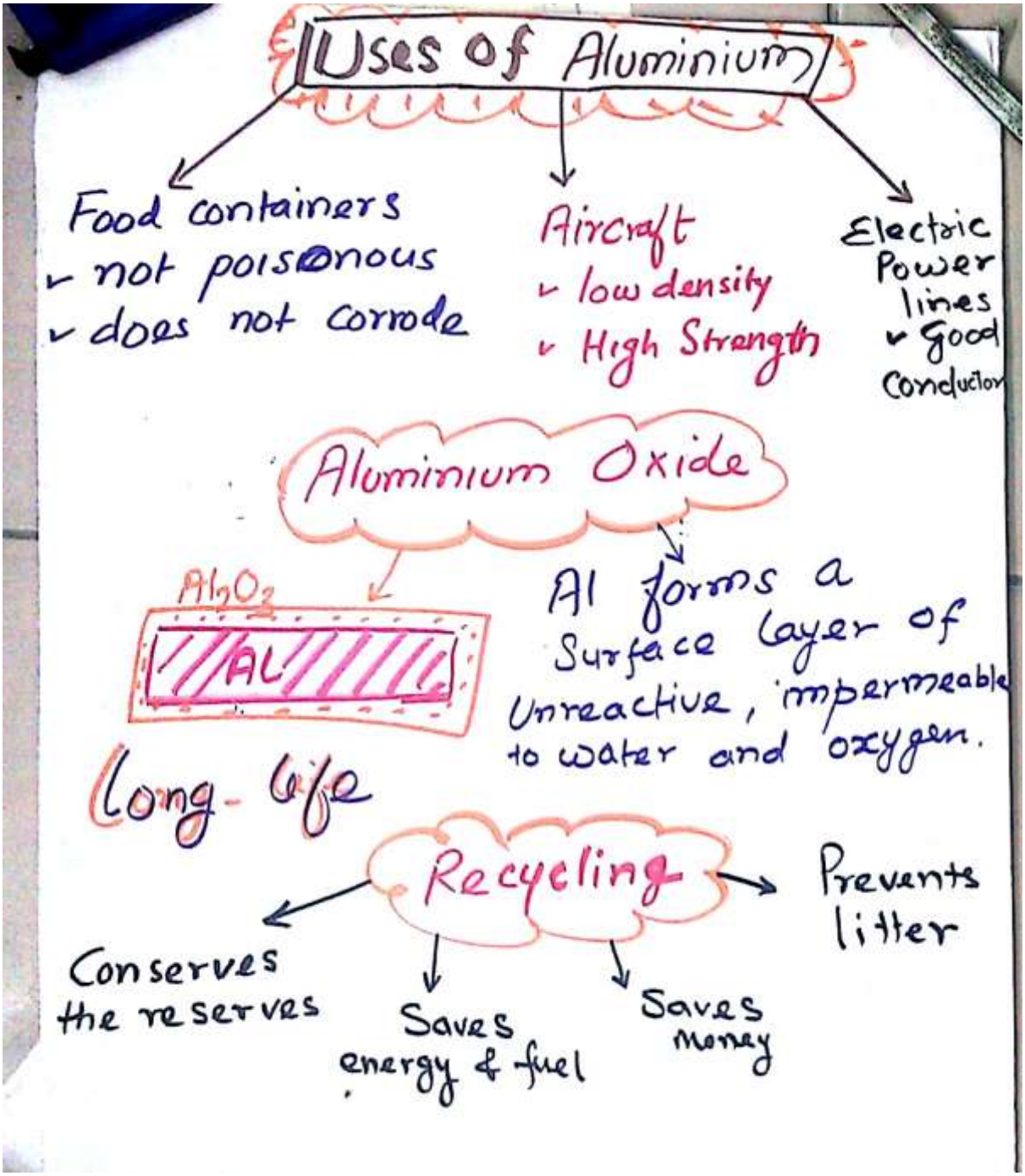
Anode :- $2O^{2-} - 4e^- \rightarrow O_2(g)$

$C + O_2 \rightarrow CO_2(g)$

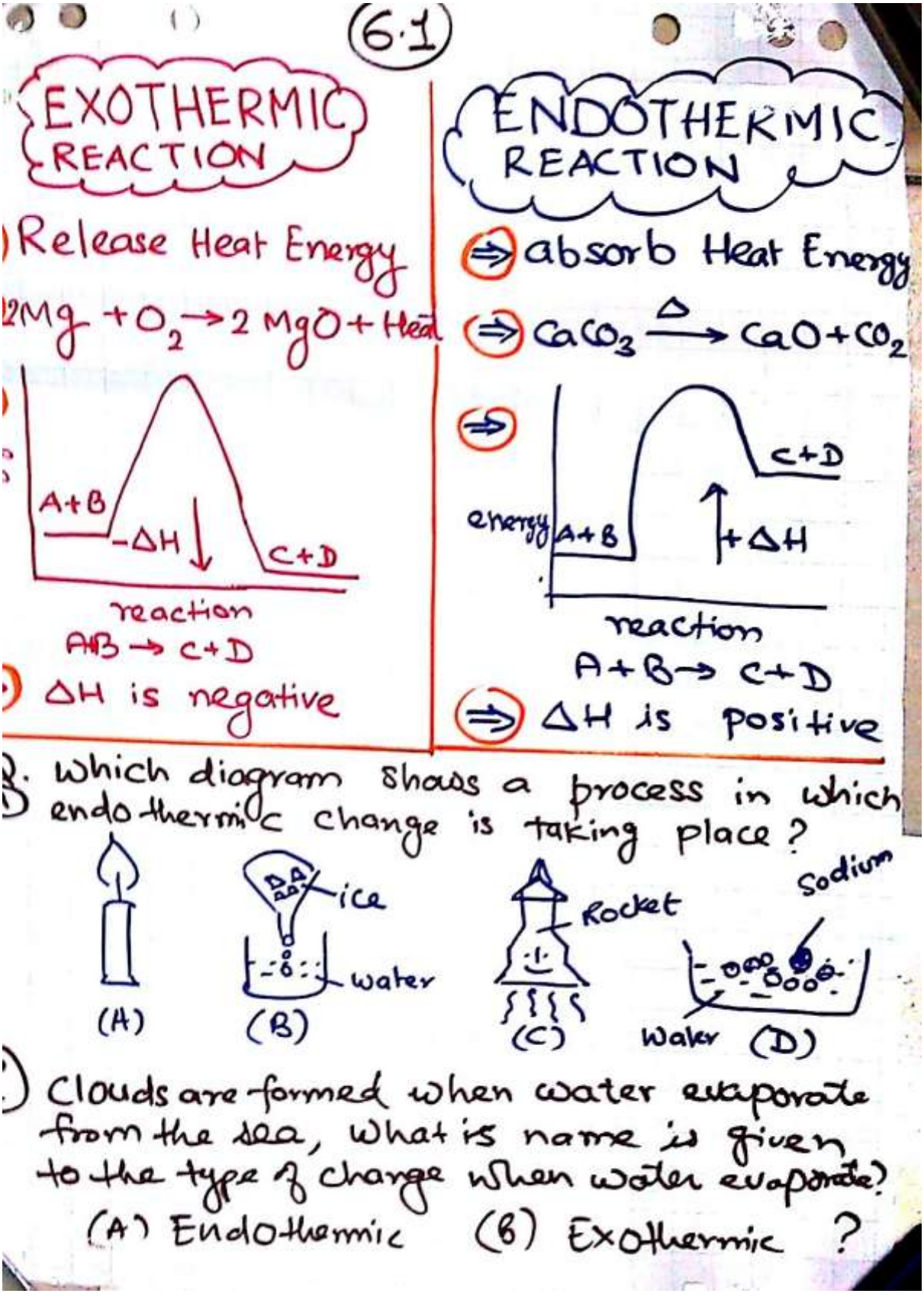
} Anode decrease in mass

NaOH is used to remove impurities like Iron (III) oxide

Cryolite lowers the working temperature from 2050°C to 900°C



Chapter 6 Chemical Change



6.2

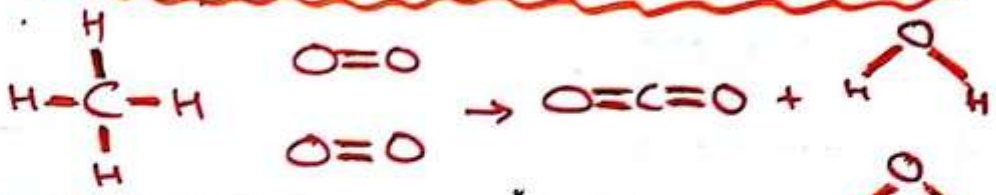
Energy change when Bond Break/form

To Break a Bond → Energy required
= Endothermic process

To Form a bond → energy is released
= Exothermic process

Example

$$CH_4 + 2O_2 \Rightarrow CO_2 + 2H_2O$$

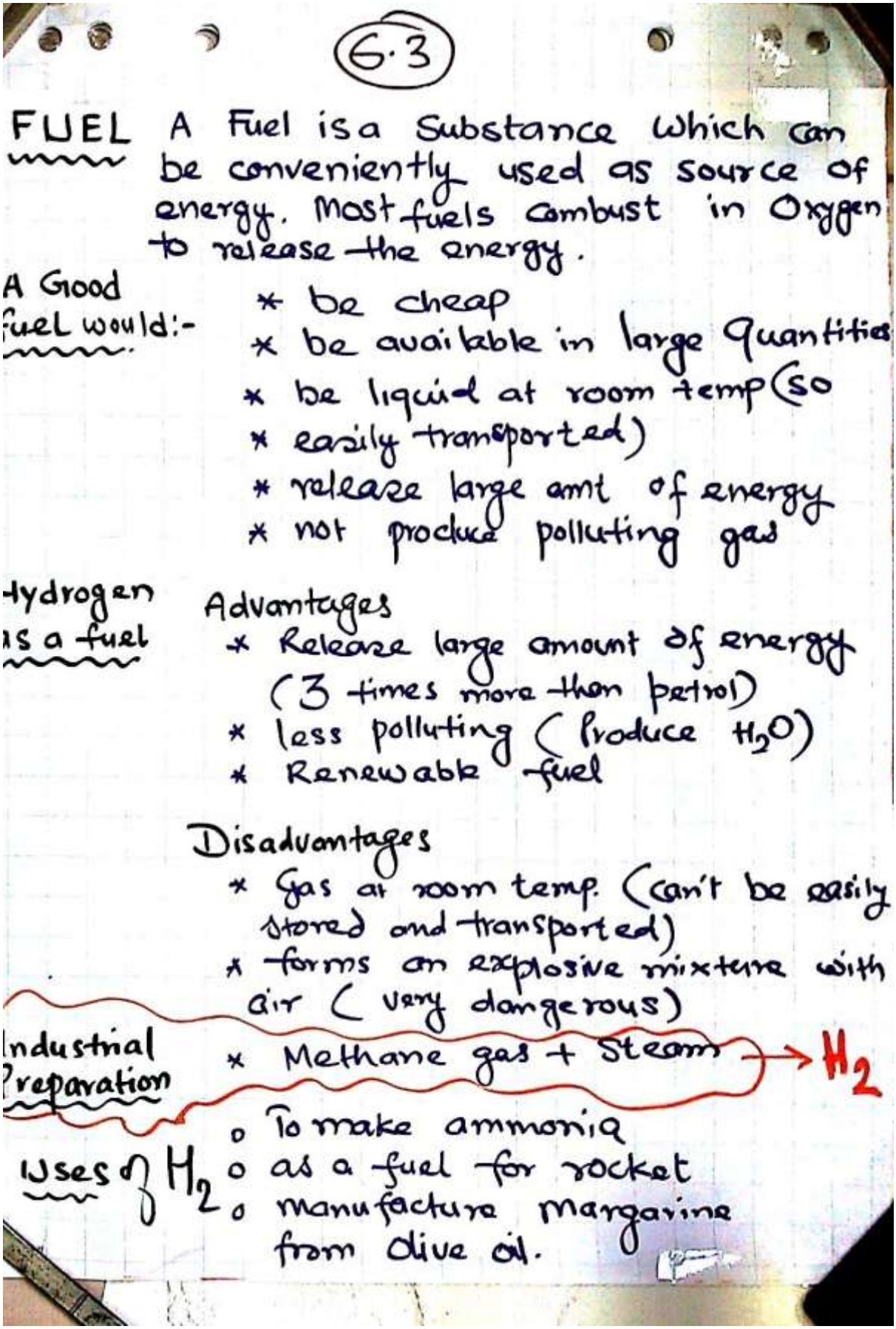


BOND BROKEN (ENDOTHERMIC)		Bond formed (EXOthermic)	
Type of Bond	Heat energy KJ/mol	Type of Bond	Heat KJ/mol
C–H ×4	+413×4	C=O×2	−740×2
O=O ×2	+497×2	O–H×4	−463×4
Total amount of energy needed	+2646	Total heat energy released	−3332

Overall heat energy change

$\Delta H = +2646 - 3332 = -686$ kJ/mol

Therefore the reaction is EXOTHERMIC



6.3

FUEL A Fuel is a Substance which can be conveniently used as source of energy. Most fuels combust in Oxygen to release the energy.

A Good fuel would:-

* be cheap
* be available in large quantities
* be liquid at room temp (so
* easily transported)
* release large amt of energy
* not produce polluting gas

Hydrogen is a fuel

Advantages

* Release large amount of energy (3 times more than petrol)
* less polluting (Produce H_2O)
* Renewable fuel

Disadvantages

* Gas at room temp. (can't be easily stored and transported)
* forms an explosive mixture with air (very dangerous)

Industrial Preparation

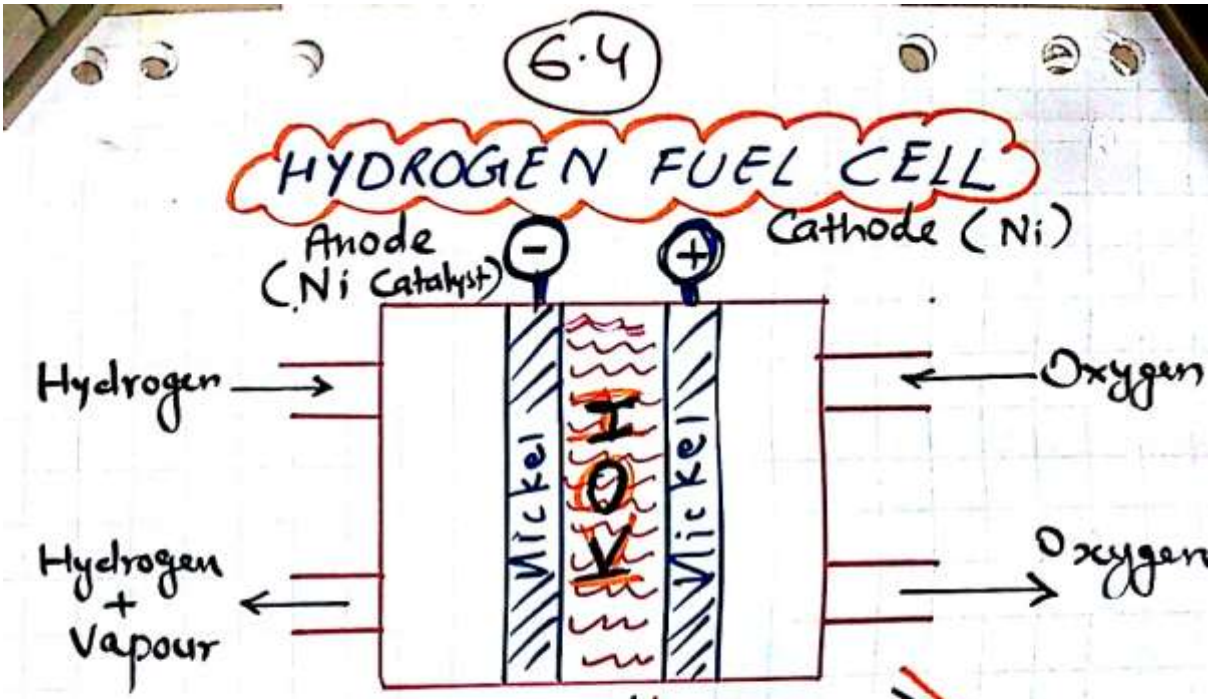
* Methane gas + Steam → H_2

Uses of H_2

- To make ammonia
- as a fuel for rocket
- manufacture margarine from olive oil.

6.4

HYDROGEN FUEL CELL



Produces electricity from H_2, O_2 and gives water

Composed of Ni Catalyst, anode Cathode & Electrolyte KOH.

e^- produ... at anode

Anode: $H_2(g) + 2OH^-(aq) \rightarrow 2H_2O(l) + 2e^-$

Cathode: $O_2(g) + 2H_2O(l) + 4e^- \rightarrow 4OH^-(aq)$

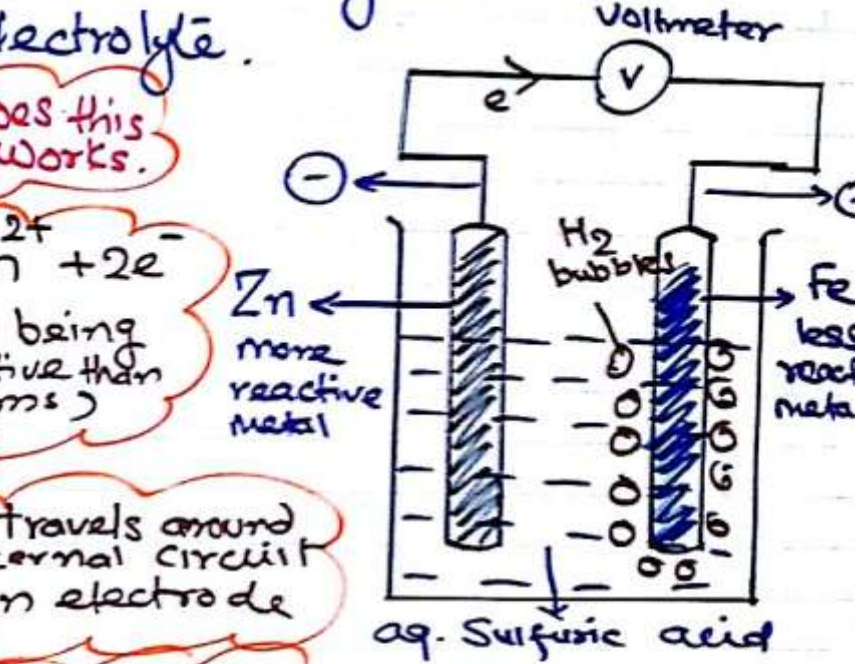
Overall: $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$

6.5

PRODUCTION OF ELECTRICITY From SIMPLE CELL

A cell is a device which converts chemic energy into electrical energy.

It is composed of two metals of differe reactivity connected by an external circ and an electrolyte.



How does this cell works.

$Zn \rightarrow Zn^{2+} + 2e^-$

(Zinc atoms being more reactive than iron atoms)

Electrons travels around the external circuit to the iron electrode

Hydrogen ions in the electrolyte remove the e^- from iron electrode

$2H^+ + 2e^- \rightarrow H_2$

Zinc anode decrease in mass

The bigger th difference in reactivity betw een the two metals, the higher th voltage, or brighter the Bulb !!!

6.6

Used in nuclear Power Stations to produce Electricity

U-235 is bombarded with neutrons resulting in a lot of heat energy

Radioactive Uranium-235 $^{235}_{92}U$

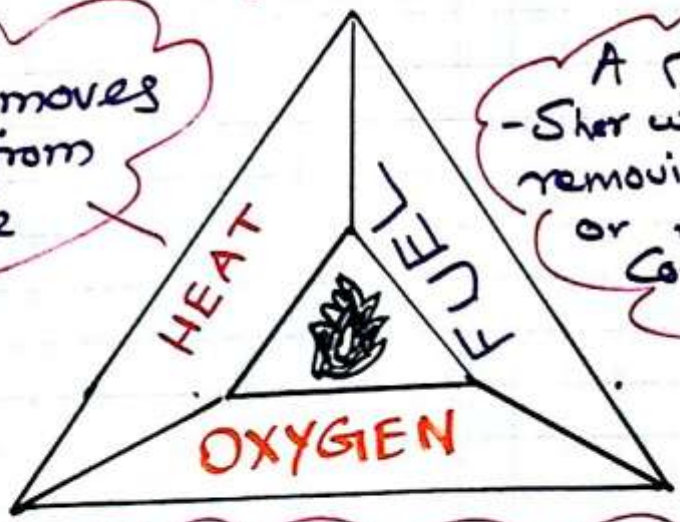
U-235 used rod is radioactive and very difficult to dispose off

Unlike the fossil fuels (coal, oil, gas) U-235 does not need a supply of Oxygen

The fire Triangle

Water removes heat from a fire

A fire extinguisher works by removing one or more of the components



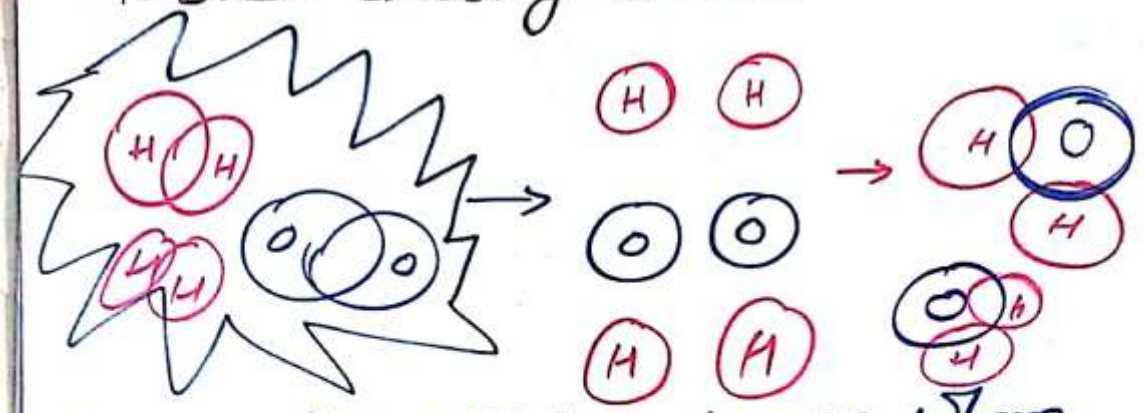
A Carbon dioxide extinguisher puts the fire off by preventing Oxygen getting to the fire

Chapter 7 Chemical Change

7.1/①

Topic 7.1 Rates of Reaction

For a Substances to react, Particles
(1) Must Collide
(2) Must Collide with enough energy to break existing bonds.



Successful collision is one where reactants reacts and products are formed

Activation energy is the mimimal amt of energy a collision need to be Successful.

Rate of a chemical reaction is the Conc. of reactant used up, or product made in a Given time.

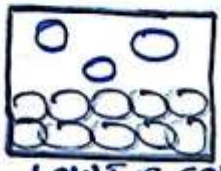
Unit of rate is $mol/dm^3\ s^{-1}$

7.1 / ②

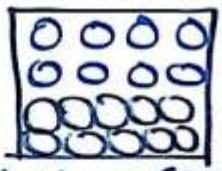
FACTORS AFFECTING RATE

1. Concentration

Increasing conc. of reactants increases the rate of reaction.



More Particles Per Unit Volume → Collision rate increase → Successful Collision rate Increases



2. Temperature

Increasing temp Increases the rate of reaction

Averge K.E. of Particles increases → Energy greater than Activation E. → Successful Collision increases

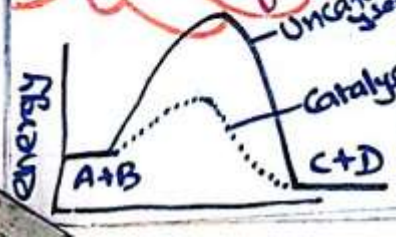
3. Particle Size

Decreasing Particle size or Increasing Surface Area → More Reactant Particle exposed → Collision increases

4. Pressure

Increasing Pressure → more particles / per unit Volume → Collision rate Increases

5. Catalyst



A catalyst is a subs. which Speed up chemical reaction, but remains chemically unchanged

⇒ Alternate pathway with a lower activation energy

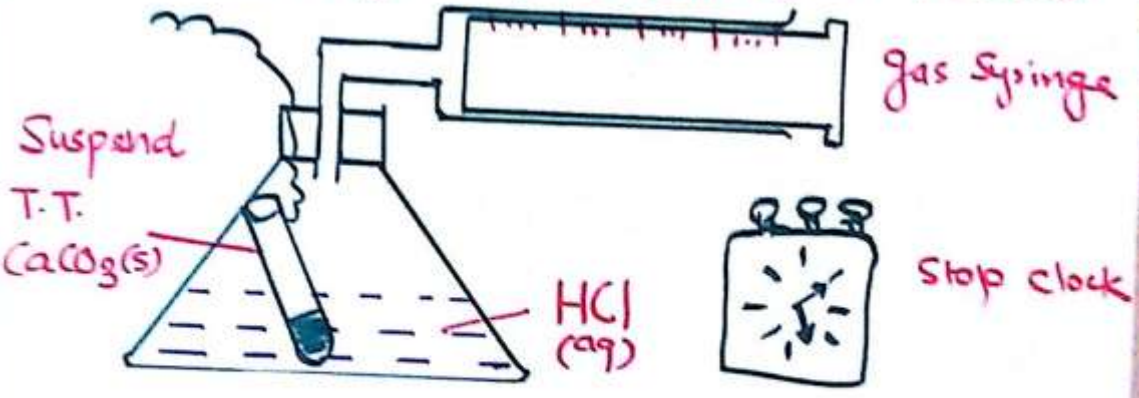
Measuring rate of Reaction

1. Measure the Volume of gas produce / time

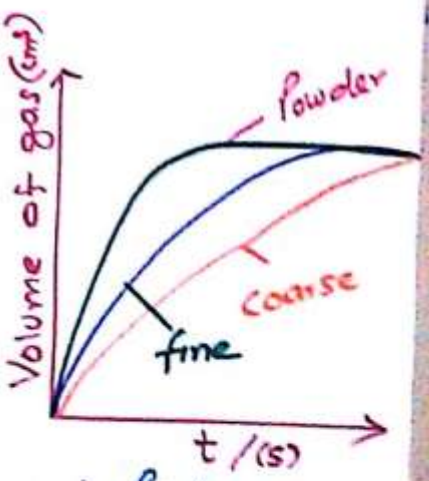
$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2 + H_2O + CO_2(g)$$

Calcium Carbonate available in 3 sizes :-

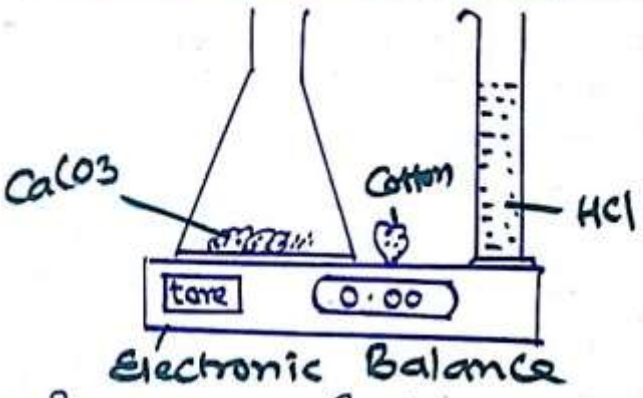
- Coarse (big)
- fine (small)
- Powder

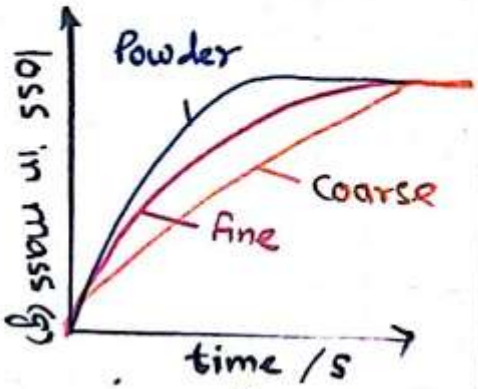


- weight m gm $CaCO_3$ Powder
- Add x ml HCl to Conical flask
- Sat Gas Syring to Zero
- place the bung in Conical flask
- Shake the conical flask and Start the Stop watch
- Record the Volume of gas Produced every 10 seconds Untill 5 min.
- repeat the Experiment with fine and Powder
- Plot the graph Volume / time
- Result



(2) Mass loss Experiment





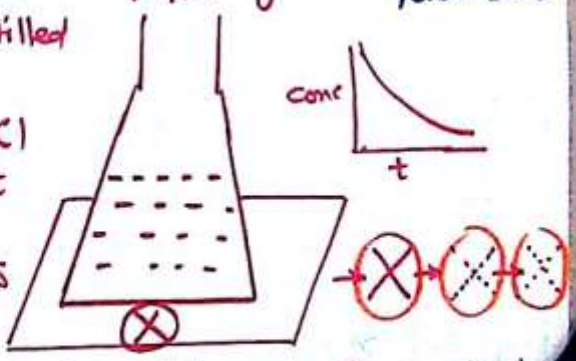
- Place m gm Powder $CaCO_3$ in conical flask and place on the electronic balance
- Measure x .ml HCl, and Place on Electronic Ba
- Press tare to set Zero reading
- Add HCl to the $CaCO_3$ and Insert the cotton
- Record the mass every 10 Sec.
- Repeat with fine and coarse
- Result

(3) Disappearing Cross experiment

$$Na_2S_2O_3(aq) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2O(l) + SO_2(g) + S(s)$$

Yellow Solid

- Place x ml of Sodium thiosulfate and and distilled Water into Conical flask
- Add required Volum of HCl
- Swirl the flask and Start Stop clock
- Place On paper with Cross
- Stop the clock when ⊗ disappears
- repeat with different Concentratio



7.1 / (5)

Photochemical reaction is one where light causes a reaction to occur.

Photographic Film

$2AgBr \rightarrow 2Ag_{(s)} + Br_{2(g)}$

$[Ag^+ + e^- \rightarrow Ag]$

$[2Br^- - 2e^- \rightarrow Br_2]$

Where light hits the AgBr (cream) on the film, Silver ion (Ag^+) gains e^- and changed to Ag atom (dark area)

An Area On the photographic film where the light intensity is high will produce a very dark area due to higher Ag atoms are formed, and where the intensity of light is low, will produce a lighter area.

Photosynthesis

$6CO_2 + 6H_2O \xrightarrow{\text{sun light}} C_6H_{12}O_6 + 6O_2$

(Chloro phyll)

Sky at night

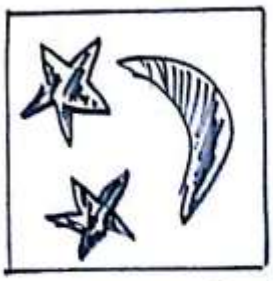


Image on film

7.2 Reversible Reaction

A reversible reaction is a reaction in which reactants reacts and form products, and products can then reacts to form reactants.

$$A + B \rightleftharpoons C + D$$

reactants — Products

Example-1

$$CuSO_4 \cdot 5H_2O \rightleftharpoons CuSO_4 + 5H_2O$$

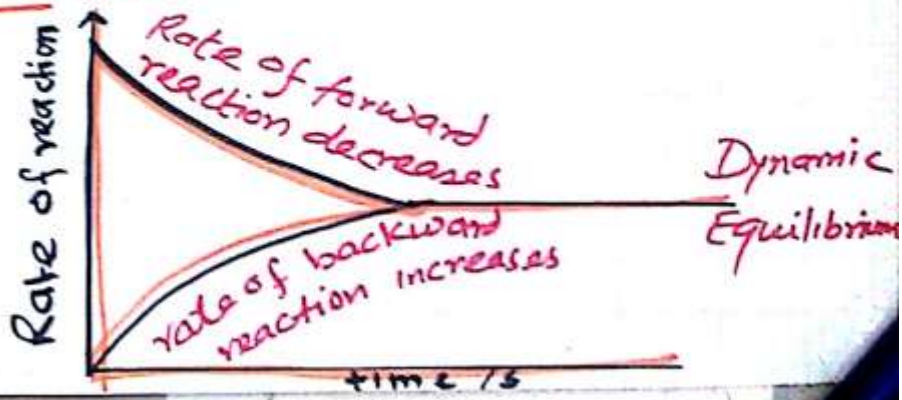
(hydrated copper sulfate) (anhydrous $CuSO_4$)

Blue ⇌ White

Example-2

Red litmus $\underset{HCl}{\overset{NaOH}{\rightleftharpoons}}$ Blue litmus

Dynamic Equilibrium : When the rate of forward reaction and the rate of the backward reaction are equal and the concentration of reactants and products remain Constant.



Law of Equilibrium

$$A + B \rightleftharpoons C + D$$

(50%) ⇌ (50%)

LAW

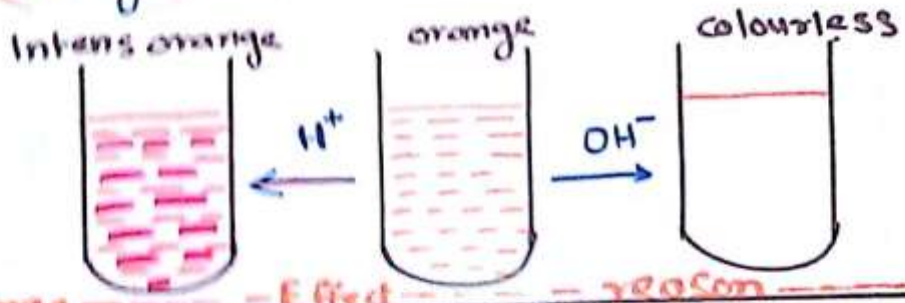
IF you increase or decrease the conc. of reactants or product, the equilibrium position shifts in such a way as to try to cancel what you doing.

Example - 1 Bromine water Experiment.

$$Br_2(aq) + H_2O(l) \rightleftharpoons Br^-_{(aq)} + 2H^+_{(aq)} + OBr^-_{(aq)}$$

Br_2 (aq) → Orange

$2H^+$ (aq) → colourless



Change	Effect	reason
Increase H^+ ion conc. by adding dil Hydrochloric acid	Shift from Right to left Intense Orange	Try to decrease the conc. of H^+ ions.
decrease H^+ ion by adding dil. Sodium hydroxide	Shift from Right to left Colourless	Try to increase the conc. of H^+ ions.

Endothermic

Ex.2 HABER PROCESS = Ammonia

nitrogen + hydrogen ⇌ ammonia

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

$(\Delta H = -92$ kcal/mol)

Exothermic

Change	Effect on Equilibrium	Reason
Increase the conc. of Reactants	Forward	Try to decrease the conc. of reactants by moving left to right
decrease the conc. of reactant	Backward	Try to increase the conc. of reactants by moving R→L
Increase the Temp. of system	Backwood	Try to decrease the temp. by moving in the endothermic direction.
decrease the temp. of System	forward	Try to increase the temp. by moving in the exothermic direction
Increase the Pressure	Forward	Try to decrease the Pressure by moving from more no. of moles to less no. of moles
decrease the Pressure	Backward	Try to increase the Pressure by moving from less no. of moles to more no. of moles

7.3 Redox (1)

A redox reaction is one which one species has been oxidised and another reduced.

Oxidation

- LOSS OF electrons

$Mg \rightarrow Mg^{2+} + 2e^-$

- Gain of Oxygen

$C + O_2 \rightarrow CO_2$

- ~~Gain~~ Loss of Hydrogen
- Oxidation no. increase

Reduction

- Gain of electrons

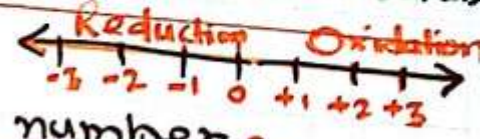
$Cu^{2+} + 2e^- \rightarrow Cu$

- Loss of Oxygen

$CuO + H_2 \rightarrow Cu + H_2O$

- Gain of Hydrogen
- Oxidation no. decrease

OIL RIG



Working out Oxidation number :-

Rules –

1. Oxidation no. of H = +1
2. " " of O = -2
3. " " of F = -1
4. " " Elements = 0 eg $Cl_2 = 0$
5. " " Ions = charge eg $Mg^{+2} = +2$

Examples –

CO_2

$x + (2x-2) = 0$

$x = +4$

NO_3^-

$x + (3x-2) = -1$

$x = +5$

$Cr_2O_7^{2-}$

$2x + (7x-2) = -2$

$2x = +12$

$x = +6$

(2)

Redox Reaction-

1) Magnesium ribbon is placed in Copper (II) nitrate solution

$$Mg(s) + Cu(NO_3)_2(aq) \rightarrow Mg(NO_3)_2(aq) + Cu$$

(2) Split into ions-

$$Mg + Cu^{2+} + 2NO_3^- \rightarrow Mg^{2+} + 2NO_3^- + Cu$$

(3) Full Ionic Equation-

$$Mg + Cu^{2+} \rightarrow Mg^{2+} + Cu$$

(4) O.N.

$$\overset{0}{Mg} + \overset{+2}{Cu^{2+}} \rightarrow \overset{+2}{Mg^{2+}} + \overset{0}{Cu}$$

R.A. oxidation — Reduction O.A.

(5) Oxidation - Reduction

Species	Change in O.N.	gain/loss of e^-	Oxidation Reduction
Mg	0 to +2	loss $2e^-$	Oxidation
Cu^{2+}	+2 to 0	gain $2e^-$	Reduction

Reducing agent (R.A.)

- Which can be easily Oxidised by losing Valence e^-
- More reactive metals are Stronger red. agent

K > Na > Ca > Mg > Al

Oxidising agent (O.A.)

which can be readily Reduced by gain e^-

- more reactive non-metals are Stronger O

F > Cl > Br > I

test for Oxidising agent

1. Add the suspected O·A to the KI(aq)

Colourless → Dark Brown or Black

2. Add to freshly prepared acidified Iron(II) sulfate solution.

Pale green (Fe^{2+}) → Reddish Brown (Fe^{3+})

test for reducing agent

1. Add suspected R·A to acidified Potassium manganate(VII) Solu

Purple → Colourles

2. Add to acidified Potassium dichromate solution.

Orange → Green

Exercise: Identify Oxidation / Reduction

1. $3Mg + Fe_2(SO_4)_3 \rightarrow 3MgSO_4 + 2Fe$
2. $Cl_2 + 2KI \rightarrow 2KCl + I_2$
3. $Sc + Sn^{2+} \rightarrow Sc^{3+} + Sn$
4. $CuO + H_2 \rightarrow Cu + H_2O$
5. MnO_4^- (Purple) → Mn^{2+} (colourless)
6. $Cr_2O_7^{2-}$ (orange) → $2Cr^{3+}$ (green)
7. $Cl_2 + 2I^-$ (colourless) → $2Cl^- + I_2$ (Black

Chapter 8 Acids, Bases and Salts

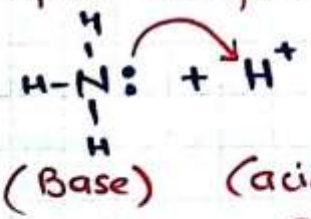
Topic 8.1 Acids & Bases (1)

ACIDS

- Produce hydrogen ions (H^+) when dissolved in water

$HCl(aq) \rightarrow H^+(aq) + Cl^-(aq)$

- Proton donar (H^+)
- electron pair acceptor



(Base) (acid)

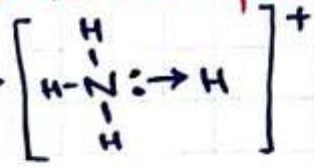
- Turn blue litmus → Red
- pH (0 – 6)

Bases → Insoluble
Alkali → Soluble

- Produce (OH^-) hydroxide ions.

$NaOH(aq) \rightarrow Na^+(aq) + OH$

- Proton acceptor (H^+
- electron pair donar



- Turn Red litmus → Blu
- pH (8 – 14)

REACTIONS

1. Acid + Metal → Salt + H_2

   $H_2SO_4 + Mg \rightarrow MgSO_4 + H_2$

2. acid + Base → Salt + H_2O

   $H_2SO_4 + MgO \rightarrow MgSO_4 + H_2O$

3. acid + Alkali → Salt + H_2O

   $H_2SO_4 + NaOH \rightarrow Na_2SO_4 + H_2O$

4. acid + Metal Carbonate → Salt + H_2O + CO_2

   $H_2SO_4 + MgCO_3 \rightarrow MgSO_4 + H_2O + CO_2$

1. Base + Acid → Salt + Wo

   $NaOH + HCl \rightarrow NaCl + H$

2. Base + Ammonium Salt → Salt + Ammonia + H_2

   $NaOH + NH_4Cl \rightarrow NaCl + NH_3 + H_2$

Predict the Observations !!!

Topic 8.1 / Page (2)

Concentration of acids

The no. of moles of acid molecules Per unit volume. eg A 1 M HCl contains 1 mole of HCl in 1 litre.

Strength of acids / Bases

The presence of H^+ ions in a Soluti

Strong acid

Completely ionise in water producing, H^+ ions more

$$HCl \xrightarrow{water} H^+_{(aq)} + Cl^-_{(aq)}$$

100%

weak acid

Partially ionise in water, and produce less H^+ ions.

$$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$$

2-3% only

Strong Base

Completely ionise in water and produce more OH^- ions

$$NaOH \xrightarrow{water} Na^+ + OH^-$$

100%

weak Base

Partially ionise in wate and produce less OH^- ions.

$$NH_4OH \rightleftharpoons NH_4^+ + OH^-$$

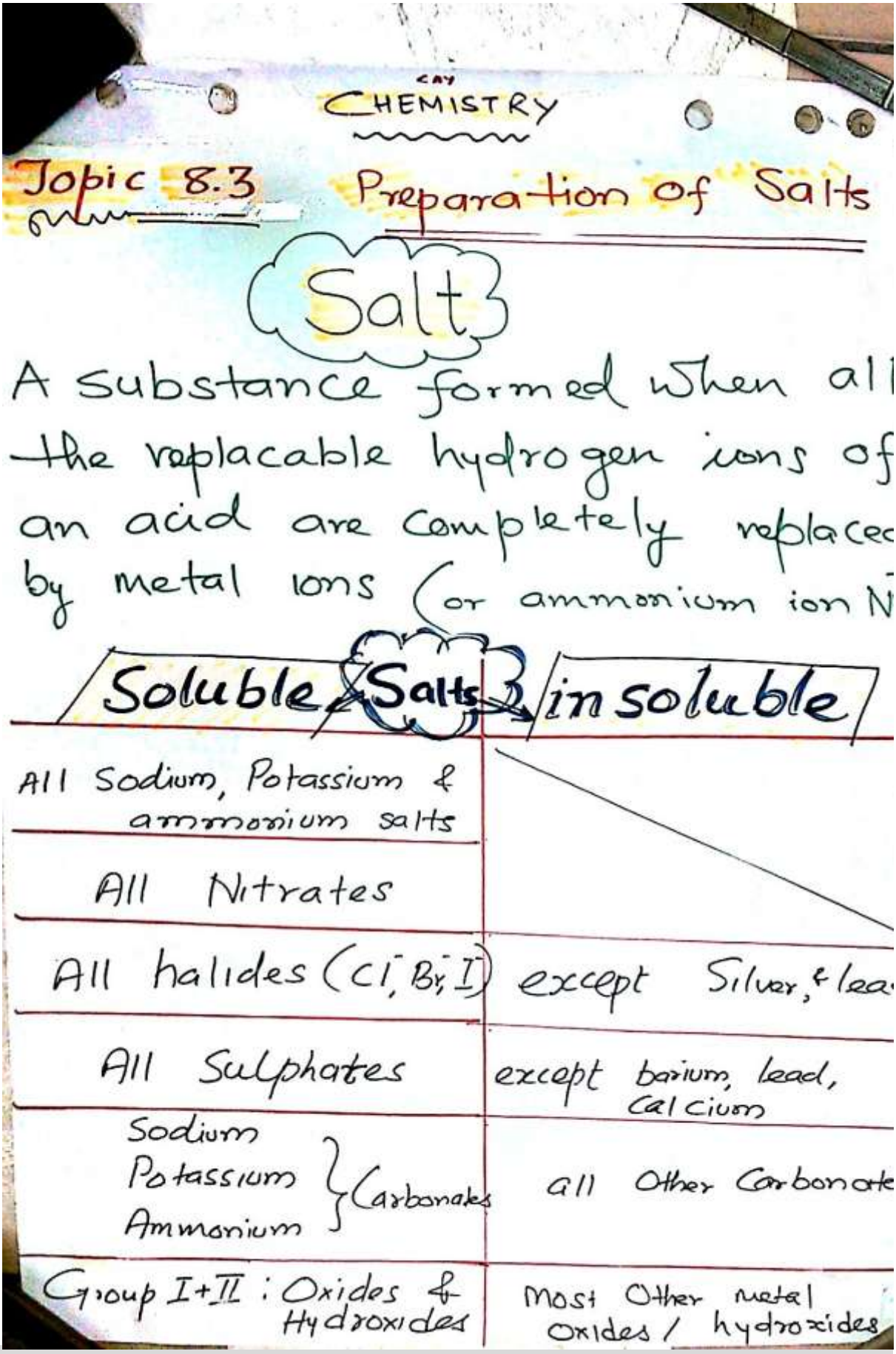
2 % only

Monoprotic acid:- $HCl \rightarrow H^+ + Cl^-$

One mole H^+ ions produces per mole acid

Diprotic acid:- $H_2SO_4 \rightarrow 2H^+ + SO_4^{2-}$

two moles of H^+ ions produce per mole aci



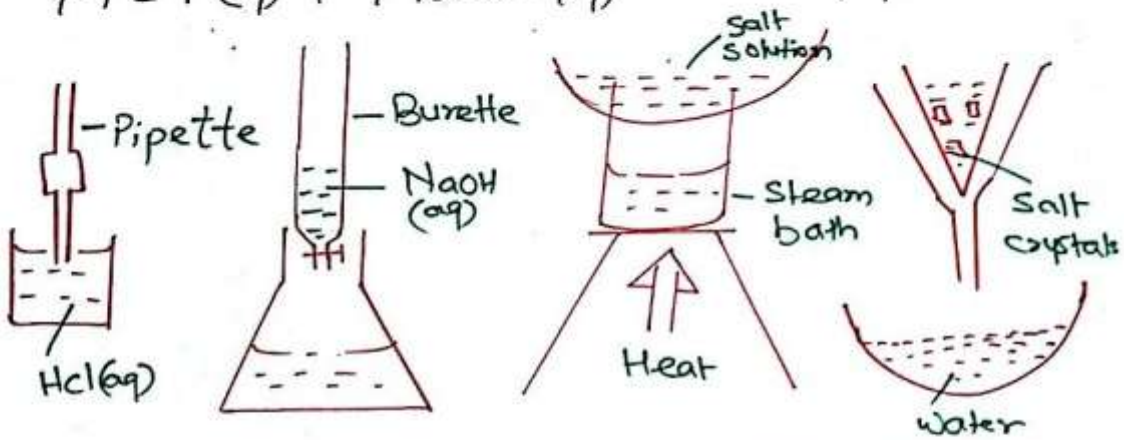
CHEMISTRY

TOPIC 8:3 Preparation of Salts.

1. ACID + SOLUBLE BASE (Alkali) → Soluble Salt + Water

TITRATION

eg. $HCl_{(aq)} + NaOH_{(aq)} \rightarrow NaCl_{(aq)} + H_2O$



- Pipette 25 cm^3 of HCl into Conical flask
- Add 3 drops of Indicator (phenolphthalein)
- Add NaOH dropwise from burette until colourless, to pink
- Record volume of NaOH (aq)
- Evaporate . Cool to crystallise
- Wash . Dry

VA7

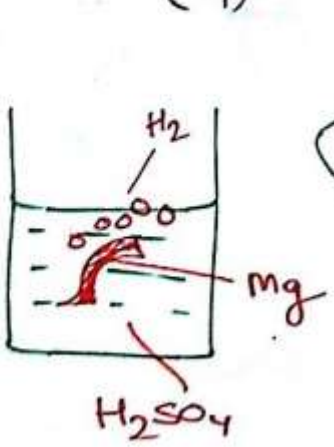
CHEMISTRY

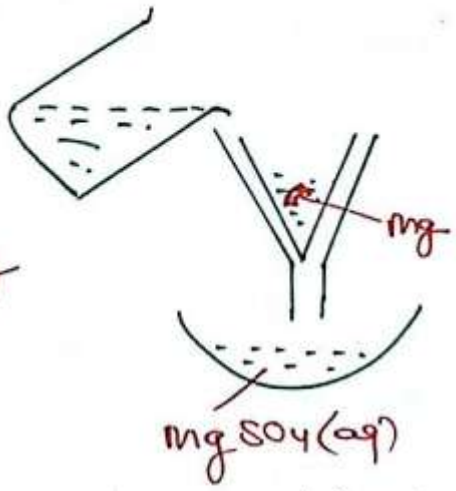
8.3 Salt preparation

2) Excess relatively reactive material.

acid + Metal → Soluble Salt + hydrogen gas.

eg. $H_2SO_{4(aq)} + Mg_{(s)} \rightarrow MgSO_{4(aq)} + H_{2(g)}$





- Measure 25 cm^3 of sulphuric acid H_2SO_4
- Add Mg ribbon, untill no more effervescence
- Filter to remove the excess Mg ribbon
- Evaporate the filtrate
- Cool to crystallise
- Filter • wash • Dry

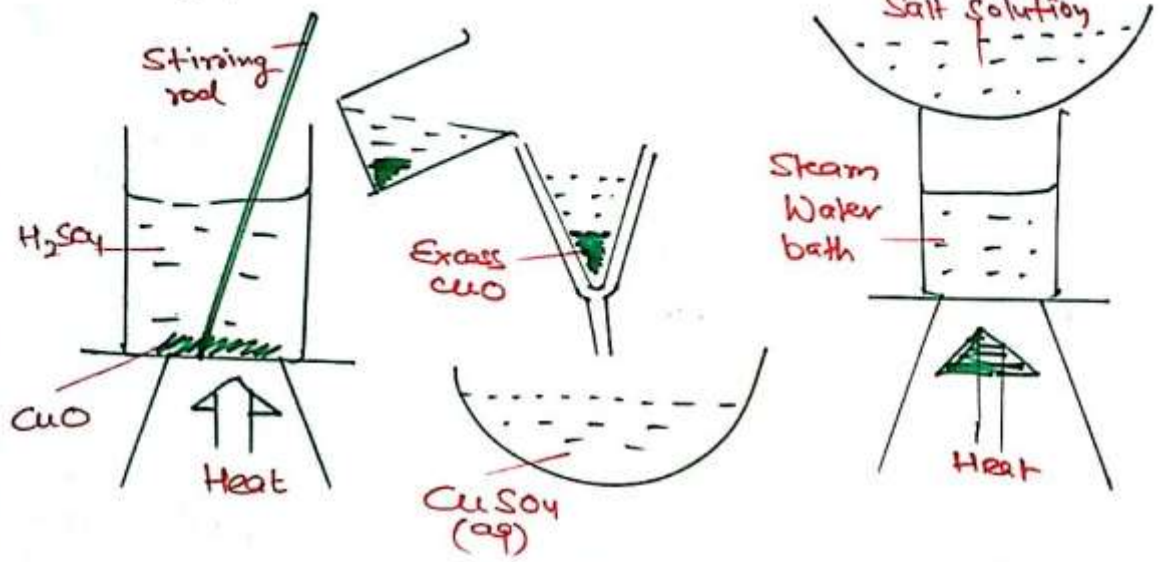
Chemistry

Topic 8.3 : Salt

3 Excess insoluble metal Oxide

acid + base → Soluble Salt + Wate

eg. H_2SO_4 (aq) + CuO (s) → $CuSO_4$ (aq) + H_2O (l)



- Measure 25 cm^3 of sulfuric acid
- Add CuO one spatula at a time
- add CuO, until excess CuO
- Filter to remove excess CuO
- Evaporate
- cool
- filter • wash • dry

Chemistry

8.3 Preparation of Salts

(3) Excess Insoluble Metal Carbonate

acid + Metal Carbonate → Soluble Salt + CO_2 + H_2O

eg. $H_2SO_4 + CuCO_3 \rightarrow CuSO_4 + CO_2 + H_2O$

- measure 25 cm^3 of sulfuric acid into beaker
- Add $CuCO_3$ excess
- Stirr until no effervescence
- filter to remove excess $CuCO_3$
- Evaporate
- Cool
- filter . wash . dry

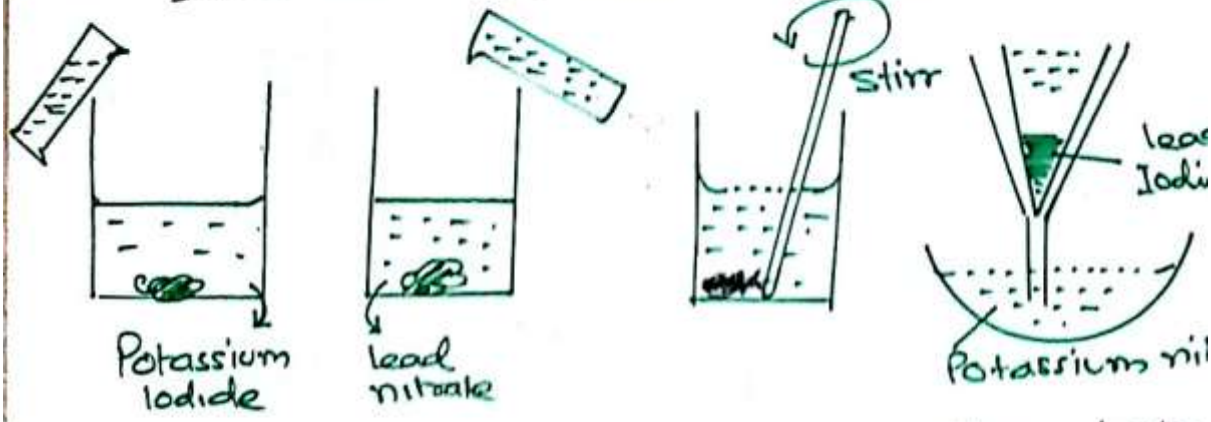
Chemistry

Topic 8.3 preparation of Salts

(5) Precipitation

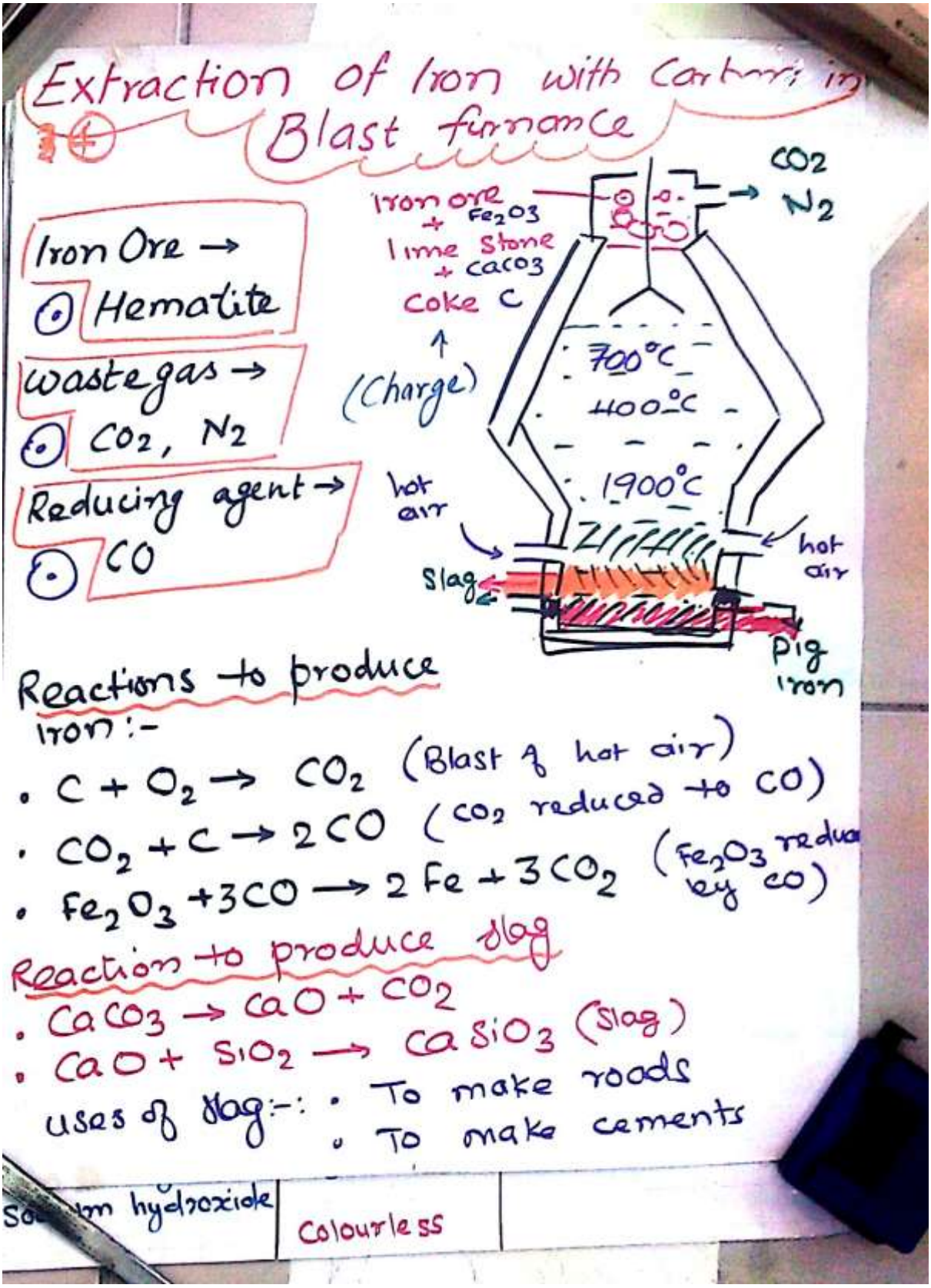
Mixing two Salt solution → Insoluble Salt (ppt)

eg. Potassium Iodide (aq) + Lead nitrate (aq) → Lead Iodide (s) + Potassi nitrat (aq)



- Pour a slight excess of water into each beaker containing soluble solids
- Stirr
- Mix
- Filter
- Wash
- Dry

Chapter 9 Metals

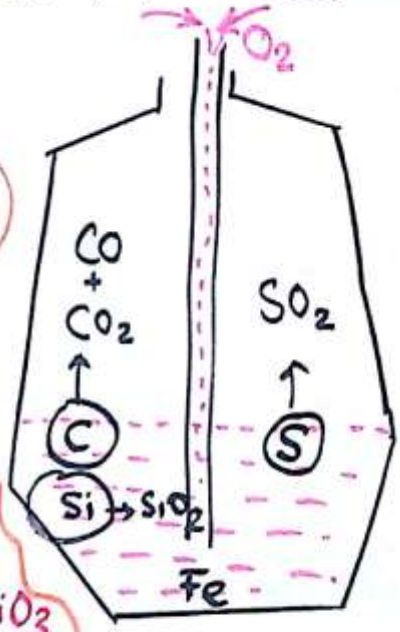


Converting PIG IRON into Steel in Basic Oxygen furnace

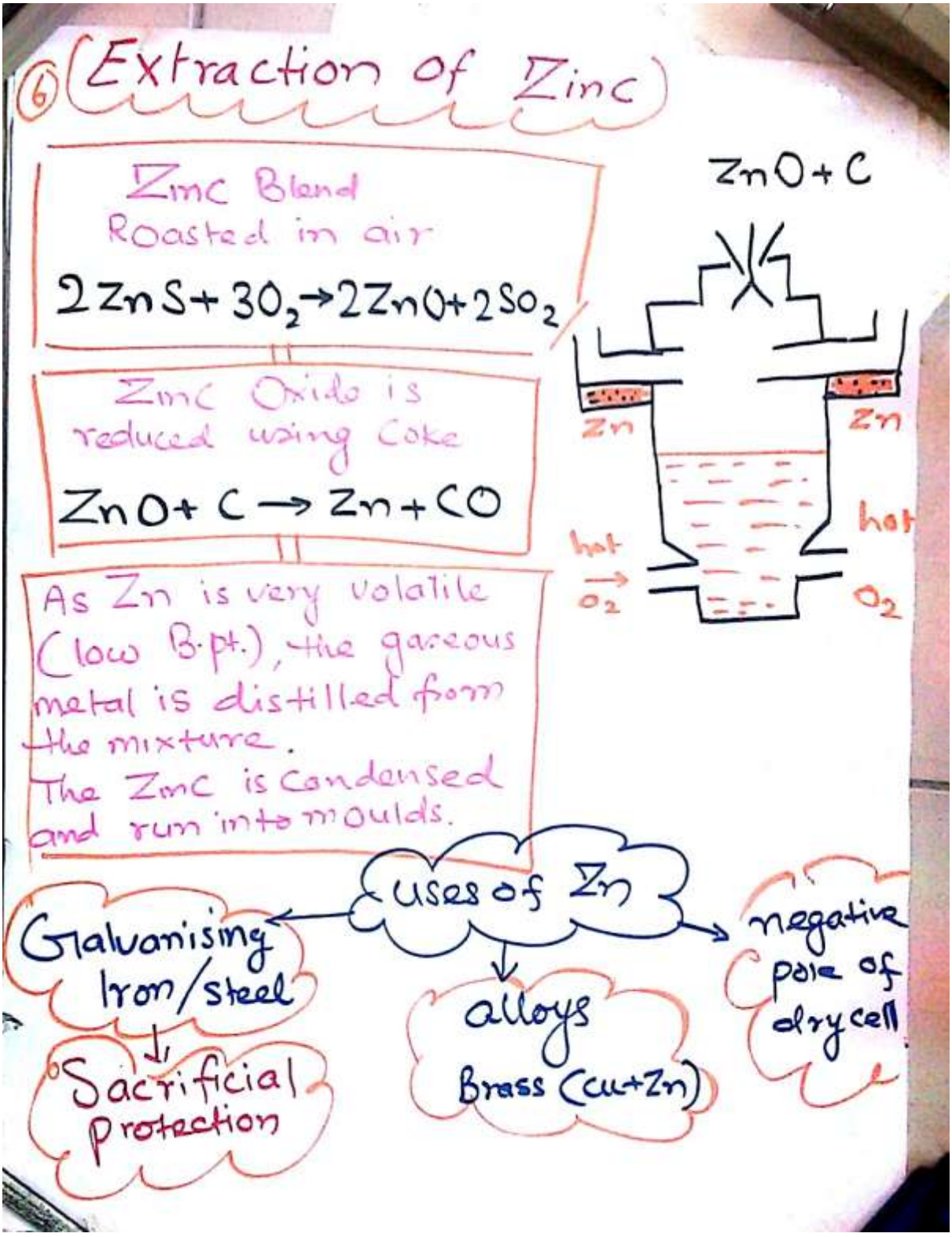
(5)

Oxygen Gas is blown onto the Pig iron

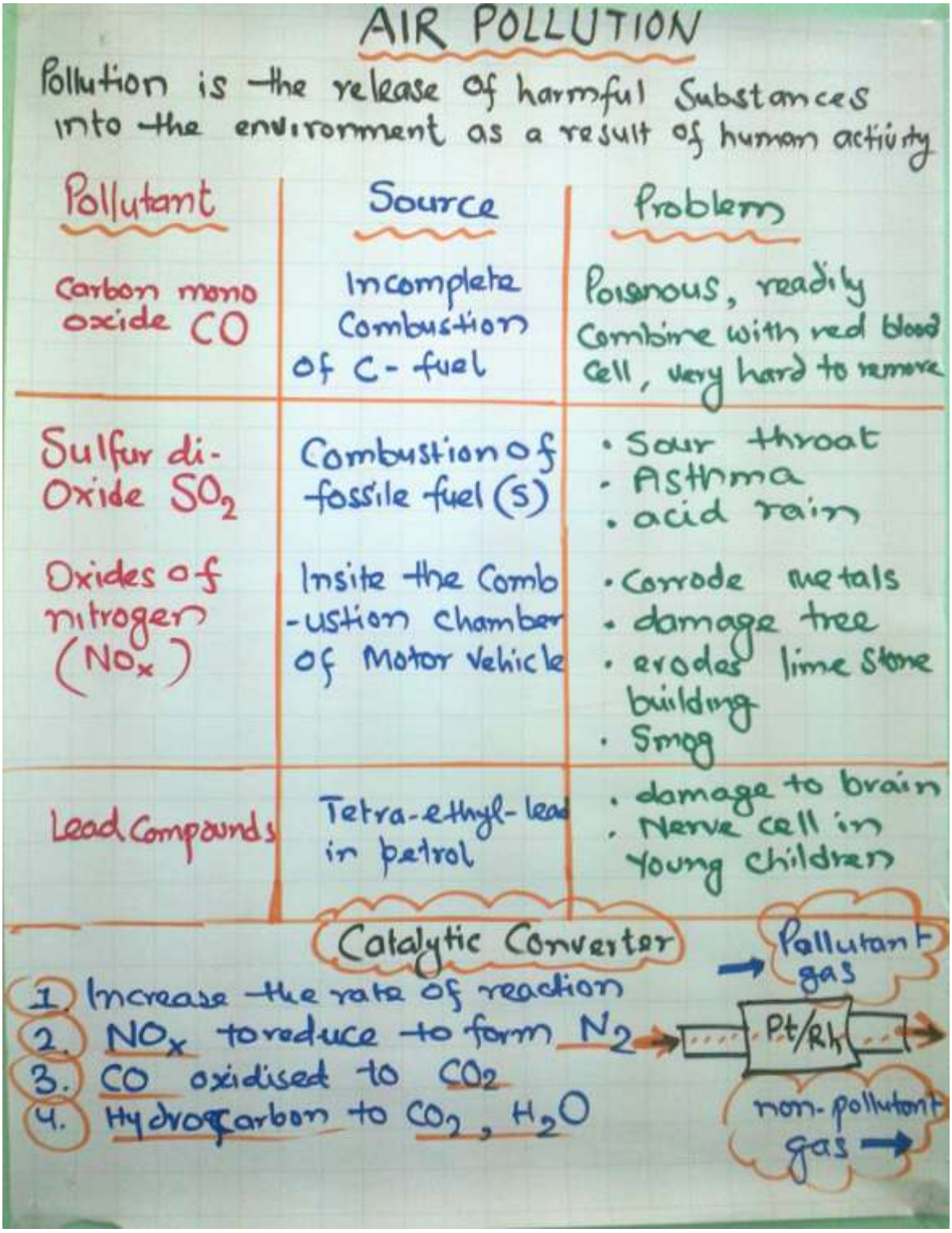
- Carbon oxidised to CO, CO_2
- Sulphur → SO_2
- Si → SiO_2 → $SiO_2 + CaO$ → Slag/$CaSiO_3$



Steel	Stainless - steel What is added	Possible uses
Cast iron/Pig iron	4% Carbon	engine blocks drain covers
Mild Steel	less than 0.3% C	Carbodies Machinery
Medium Carbon	0.3-0.7 % C	railway lines
high Carbon	0.7-1.5 % C	knives razor blades
Sodium hydroxide	Colourless	



Chapter 10 Air and Water



Nitrates For Plants

- All plants needs N_2 to make Proteins, in the form of nitrates, which are soluble in water and so can be taken up by the roots.
- There are two main process to convert N_2 → nitrate

(1) During lighting storms

$N_2 + O_2 \rightarrow NO_x$

NO_x + water → NO_3^-

(2) Legumes

Bacteria on roots

Fertilisers

Plants require 3 essential elements to grow

N	P	K
nitrogen	phosphorus	potassium
Taller	healthier	higher Crop yield

eg. ammonium nitrate, potassium phosphate, ammonium sulfate, potassium sulfate

Controlling Soil acidity

✓ Calcium Carbonate
- Cannot be washed away
- pH cannot rise above 7

✗ calcium oxide
- could be washed away
- pH rise above 7
- Cause NH_3 to be displaced from fertilisers

The Haber Process (Manufacture of NH_3)

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ ($\Delta H = -92$ kJ/mol)

Conditions = 450°C | 200 atm | Iron catalyst

Manufacture of Hydrogen gas

CH_4 (Methane) + H_2O (Steam) $\rightarrow CO + 3H_2$ (Hydrogen)

Manufacture of nitrogen gas

N_2 gas produced by the fractional distillation of clean liquid air

Justification of the conditions –

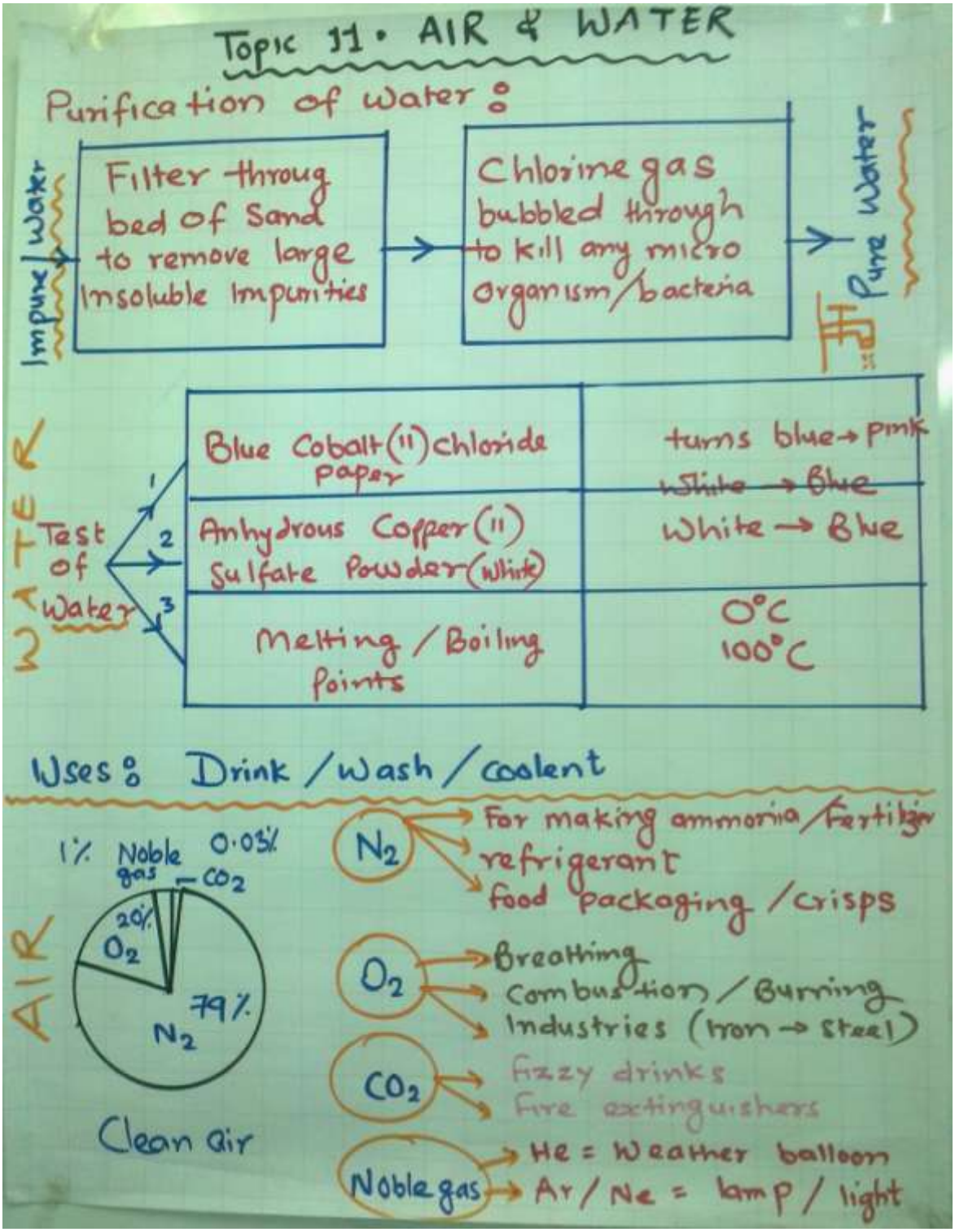
1. Lowering the temp. decrease the rate of reaction but increase the yield of NH_3, because forward reaction is Exothermic
2. Increasing the pressure, increase the rate of reaction and increase the yield of NH_3, because no. of moles of product is less than reactants.

Commercial uses of NH_3

Manufacture of nitric acid | Manufacture of artificial fertilizers | explosives

LAB Preparation of ammonia

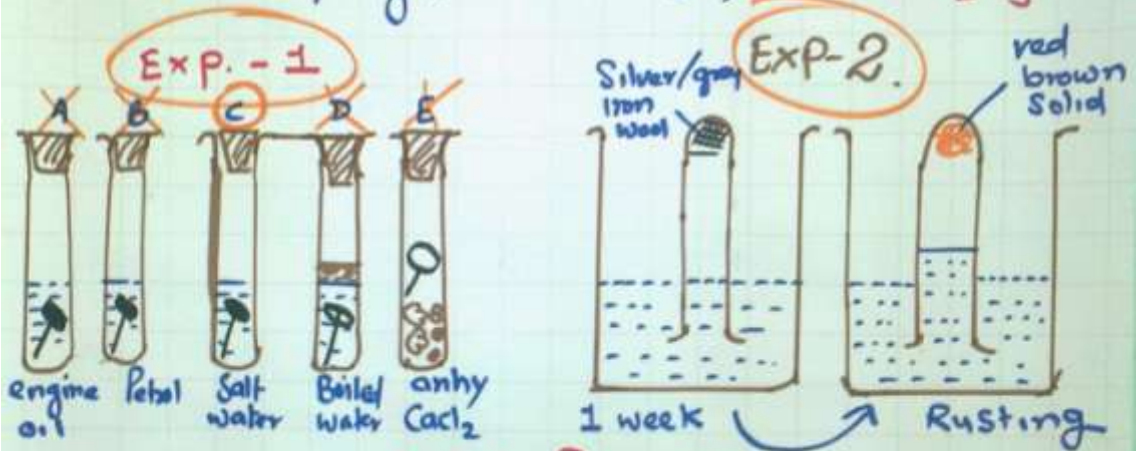
$2NH_4Cl + Ca(OH)_2 \rightarrow CaCl_2 + 2NH_3 + 2H_2O$



Corrosion & Its Prevention

Corrosion: When metals/alloys are chemically attacked by Oxygen and water

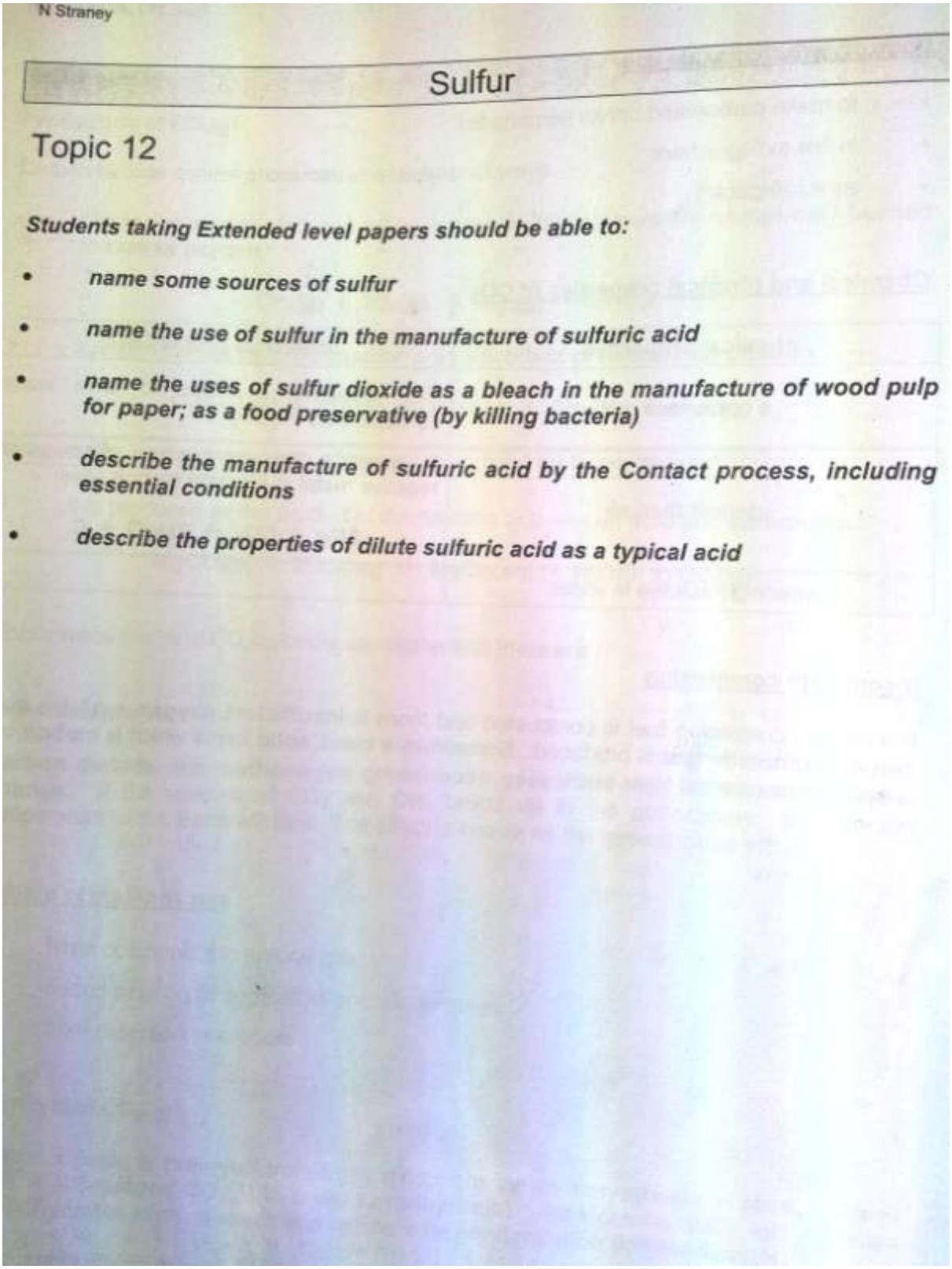
Rusting: Corrosion of Iron to form powder of hydrated Iron(III) oxide $Fe_2O_3 \cdot xH_2O$



Rust Prevention

Method		
✓Paint	Car bodies, Bridge	If the Paint is Scratched the iron Starts to rust
✓Oil/grease	Moving Parts & Machinery	Prevent water getting to the iron
✓Galvanising	Steel Girders bridges/build	Steel is coated with Zn to Protect Iron
✓Sacrificial protection	Ships/oil rigs underground pipe	Bars of Zn attached. Zn corrods in preference to Fe
✓Coating with tin / plastic	tin Food Freezers	not poisonous long lasting

Chapter 11 Sulfur



N Straney

Sulfur

Topic 12

Students taking Extended level papers should be able to:

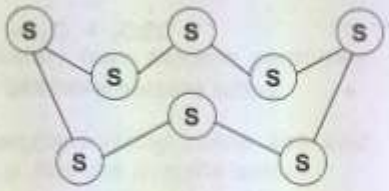
- *name some sources of sulfur*
- *name the use of sulfur in the manufacture of sulfuric acid*
- *name the uses of sulfur dioxide as a bleach in the manufacture of wood pulp for paper; as a food preservative (by killing bacteria)*
- *describe the manufacture of sulfuric acid by the Contact process, including essential conditions*
- *describe the properties of dilute sulfuric acid as a typical acid*

Sulfur is a **bright yellow solid**.

Sources of sulfur

- an elemental source is **underground deposits** in the **USA, Poland** and **Japan**
- compounds of sulfur (Zinc blende ZnS)

Sulfur exists as a molecule usually containing **8 atoms (S_8)**. It is described as being **crown shaped**.



Action of heat on sulfur

Sulfur melts at 112 °C, and boils at 444 °C. When combusted in oxygen it burns with a **blue flame** to form **sulfur dioxide gas**. Solid or liquid sulfur does not conduct electricity and is insoluble in water.

Uses of sulfur

- manufacture of sulfuric acid
- vulcanisation of rubber to make it harder
- in the manufacture of drugs
- producing fungicide for vines and hops

Sulfur dioxide

Sulfur dioxide is produced when sulfur is burned in oxygen. It dissolves in water to form the weak acid **sulfurous acid** (H_2SO_3).

Uses of sulfur dioxide gas

- to bleach wood pulp in the paper industry
- as a food preservative by killing bacteria
- in the manufacture of sulfuric acid

Test for SO_2

Bubble SO_2 (reducing agent) through the following acidified oxidising agents and note the colour change.

solution	colour at start	colour at end
acidified potassium manganate(VII)	purple	colourless
acidified potassium dichromate(VI)	orange	green

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N Straney

Manufacture of sulfuric acid (Contact process)

Sulfur dioxide is made by burning sulfur in air or from the roasting of zinc blende in air.

- **Sulfur dioxide** is then reacted with **more oxygen** using **vanadium(V) oxide catalyst** at **450°C** and a **pressure of 3 atmospheres** to form **sulfur trioxide**.

$$2SO_2 + O_2 \rightleftharpoons 2SO_3 \quad (\Delta H = -197kJ/mol) \text{ (exothermic)}$$

- **Sulfur trioxide** is reacted with **concentrated sulfuric acid** to produce **oleum**

$$SO_3 + H_2SO_{4(concentrated)} \rightarrow H_2S_2O_7$$

- **Oleum** is now diluted with the right amount of **water** to make **concentrated sulfuric acid**.

$$H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$$

In the second step the sulfur trioxide is not dissolved in water ($SO_3 + H_2O \rightarrow H_2SO_4$) because it is a very exothermic reaction producing a thick mist of sulfuric acid. This is difficult to deal with, which is why sulfur trioxide is added to concentrated sulfuric acid, which is a less violent reaction

Properties of dilute sulfuric acid as a typical acid

- acid + metal → salt + hydrogen

  $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

- acid + carbonate → salt + water + carbon dioxide gas

  $H_2SO_4 + MgCO_3 \rightarrow MgSO_4 + H_2O + CO_2$

Uses of sulfuric acid

Concentrated sulfuric acid is a powerful **dehydrating agent** and a **drying agent**.
It reacts as a **dehydrating agent** when added to sugar, the atoms of hydrogen and oxygen are removed leaving **carbon solid**.

$$C_{12}H_{22}O_{11}(s) \rightarrow 12C(s) + 11H_2O(g)$$
white powder — black solid

Concentrated sulfuric acid can be used to **dry acidic** or **neutral gases** in chemistry such as CO_2, SO_2, H_2S, H_2 and O_2.

Uses of sulfuric acid

- to make soapless detergents
- to make fertilisers for plants

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Chapter 12 Carbonates

Carbonates

Topic 13

All students should be able to:

- *describe the manufacture of lime (calcium oxide) from calcium carbonate (limestone) in terms of the chemical reactions involved.*
- *name some uses of lime and slaked lime as in treating acidic soil and neutralising acidic industrial waste products e.g. flue gas desulfurisation*
- *name the uses of calcium carbonate in the manufacture of iron and of cement*

Calcium carbonate/limestone ($CaCO_3$)

This is found as chalk, limestone and marble. It is insoluble in pure water but it dissolves slowly in the presence of carbon dioxide, giving calcium hydrogen carbonate.

Properties of carbonates

- generally insoluble in water except sodium, potassium and ammonium carbonate.
- react with acids to produce salt, water and carbon dioxide gas.

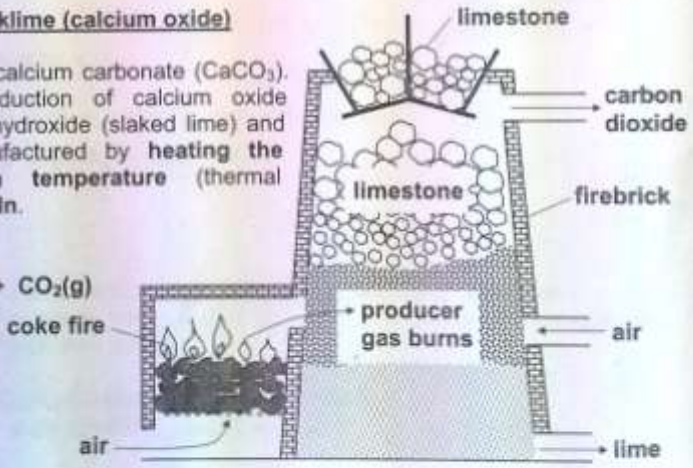
Uses of calcium carbonate (limestone)

- Used in the **manufacture** of **iron** and **steel**. Limestone is added to the blast furnace, where it is **thermally decomposed** to CaO (basic oxide), which removes acidic impurities such as silicon(IV) oxide as calcium silicate (a slag).
- Used in the **manufacture** of **cement**. This is made by grinding a mixture of limestone and clay. The powder is then strongly heated in a huge kiln. The product is cooled and crushed to an extremely fine powder(cement). The cement reacts with water and sand to form synthetic rock.
- Used to **neutralise** excess **acidity** in **lakes** and **soil**

Manufacture of lime/quicklime (calcium oxide)

Limestone rock is mostly calcium carbonate ($CaCO_3$). It is used for the production of calcium oxide (lime/quicklime), calcium hydroxide (slaked lime) and cement. Lime is manufactured by **heating the limestone to a high temperature** (thermal decomposition) in a **limekiln**.

$$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$$



Producer gas is carbon monoxide gas.

Uses of lime/quicklime

- **to neutralise soil acidity**
- **neutralising acidic industrial waste products e.g. flue gas desulfurisation**
- **to remove acidic impurities in the basic oxygen furnace**

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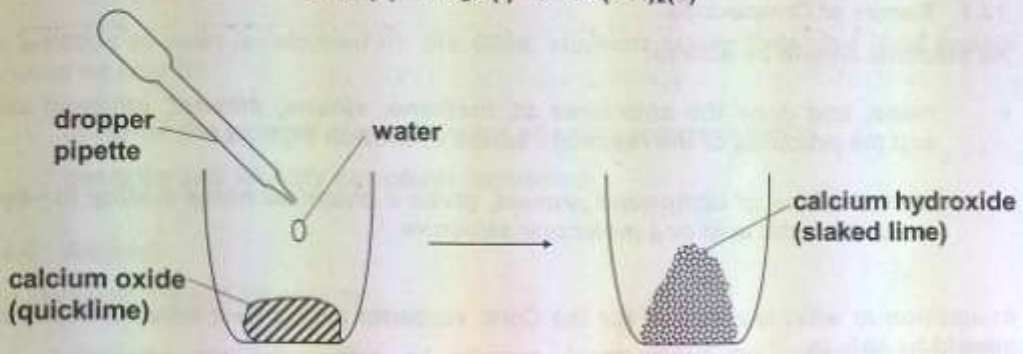
- **Calcium hydroxide (slaked lime)**

When water is added to calcium oxide, a highly exothermic reaction occurs as the oxide is slaked to calcium hydroxide solid.

$$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(s)$$



Uses of calcium hydroxide/slaked lime

- **to neutralise acidic soil**
- **water purification**
- **glass manufacture**
- **neutralising acidic industrial waste products**

Action of carbon dioxide gas on lime water (calcium hydroxide solution $Ca(OH)_2$)

The colourless limewater turns milky due to the formation of insoluble **calcium carbonate**.

$$Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$$

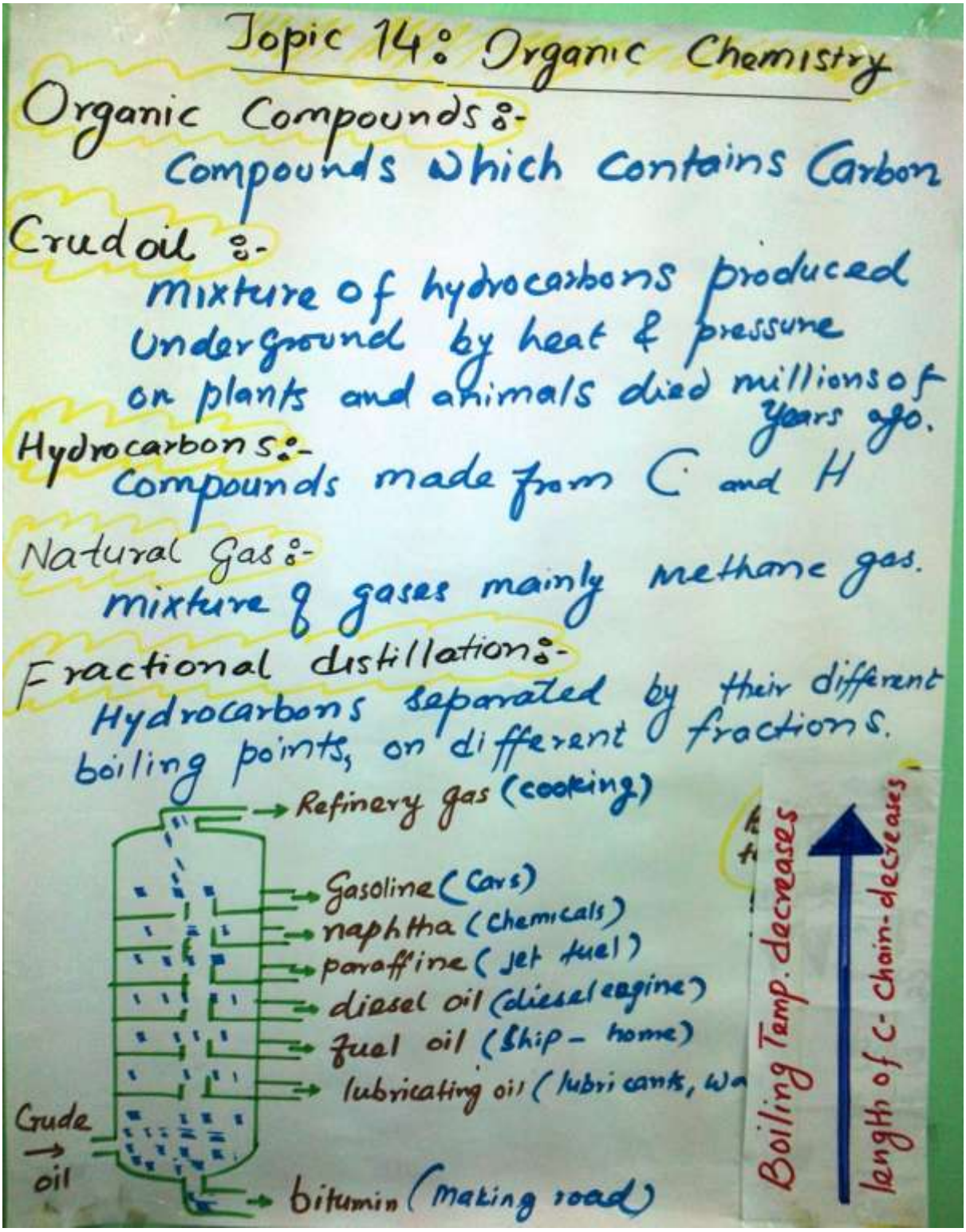
If more carbon dioxide is blown through the solution, the soluble calcium hydrogen carbonate forms.

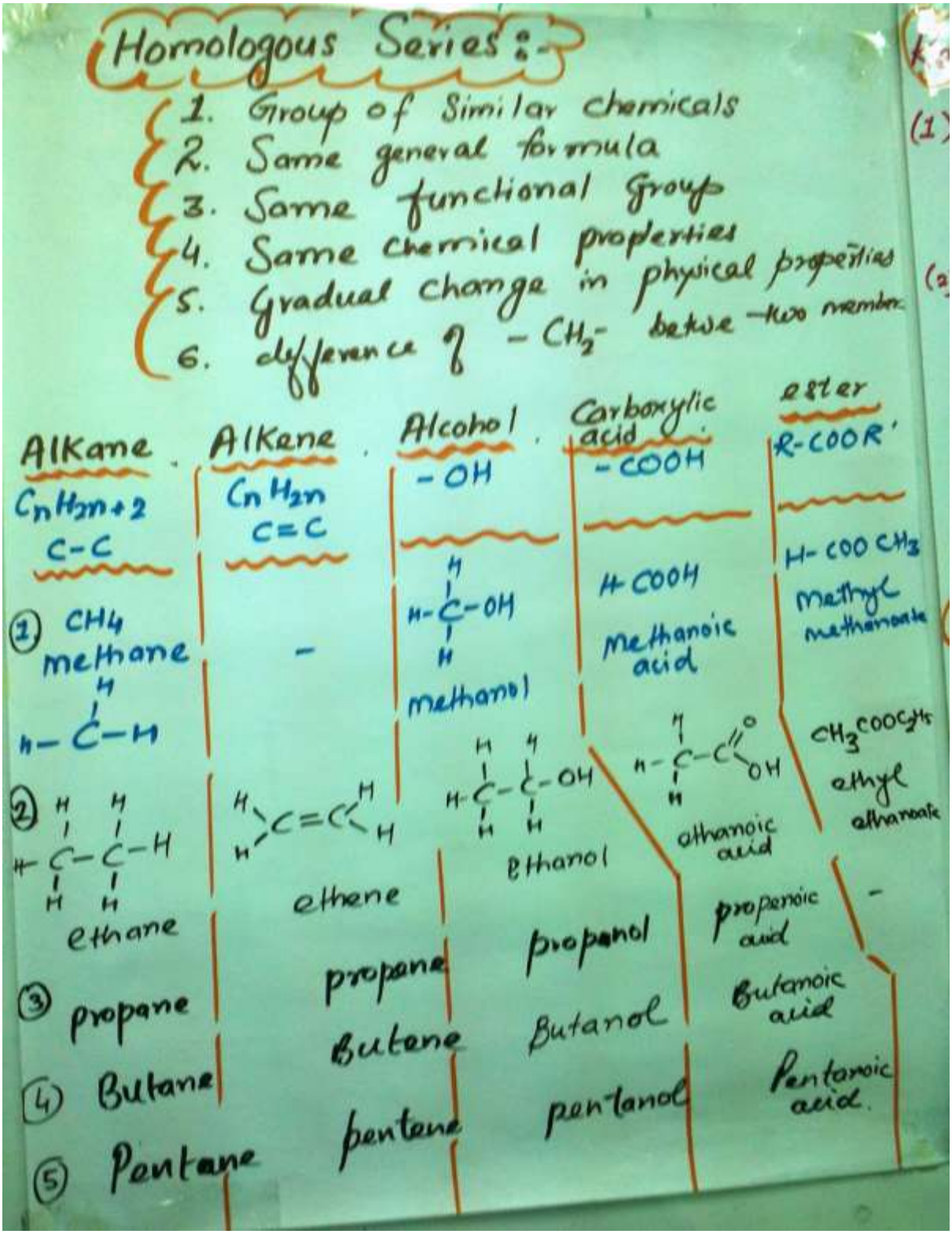
$$CaCO_3(s) + CO_2(g) + H_2O(l) \rightarrow Ca(HCO_3)_2(aq)$$

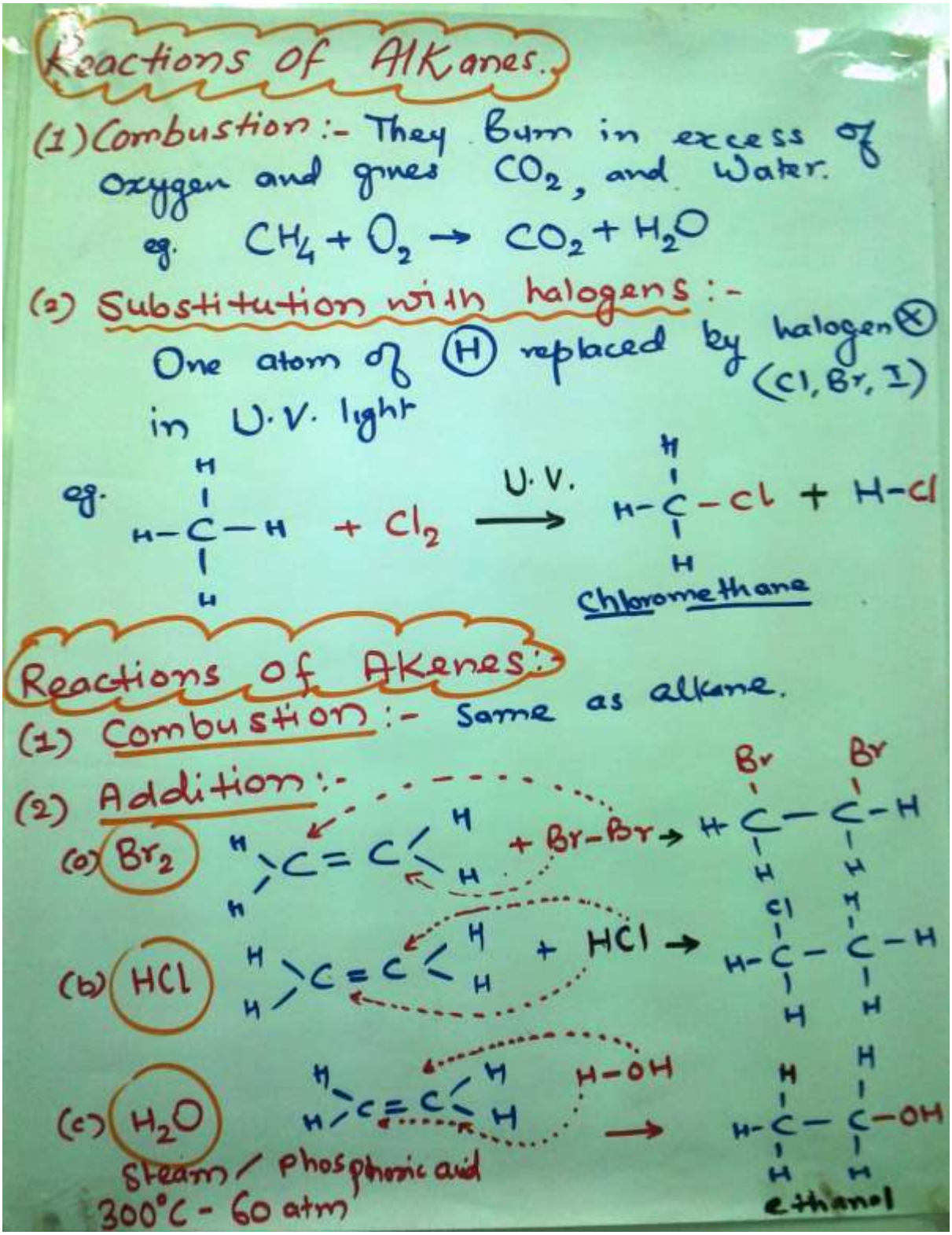
If the solution is now boiled, then the calcium hydrogen carbonate decomposes back to insoluble calcium carbonate.

$$Ca(HCO_3)_2(aq) \rightarrow CaCO_3(s) + H_2O(l) + CO_2(g)$$

Chapter 13 Organic Chemistry







Manufacture of Alkenes by Catalytic Cracking :

The decomposition of higher alkanes into lower alkanes, alkenes and hydrogen using catalyst Al_2O_3 and temp. of 500°C.

$$C_{10}H_{22} \rightarrow C_8H_{18} + C_2H_4$$

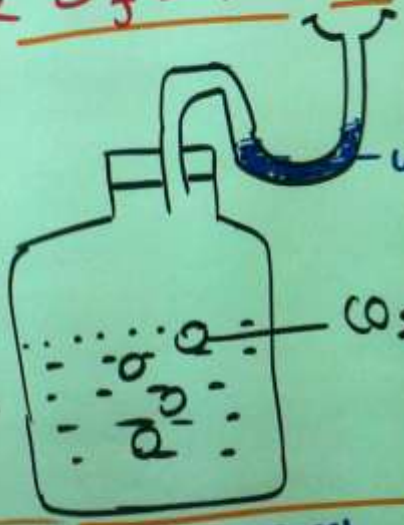
Decane — octane — ethene

Manufacture of ethanol :

Fermentation

1) Glucose
2) water
3) yeast

at 37°C

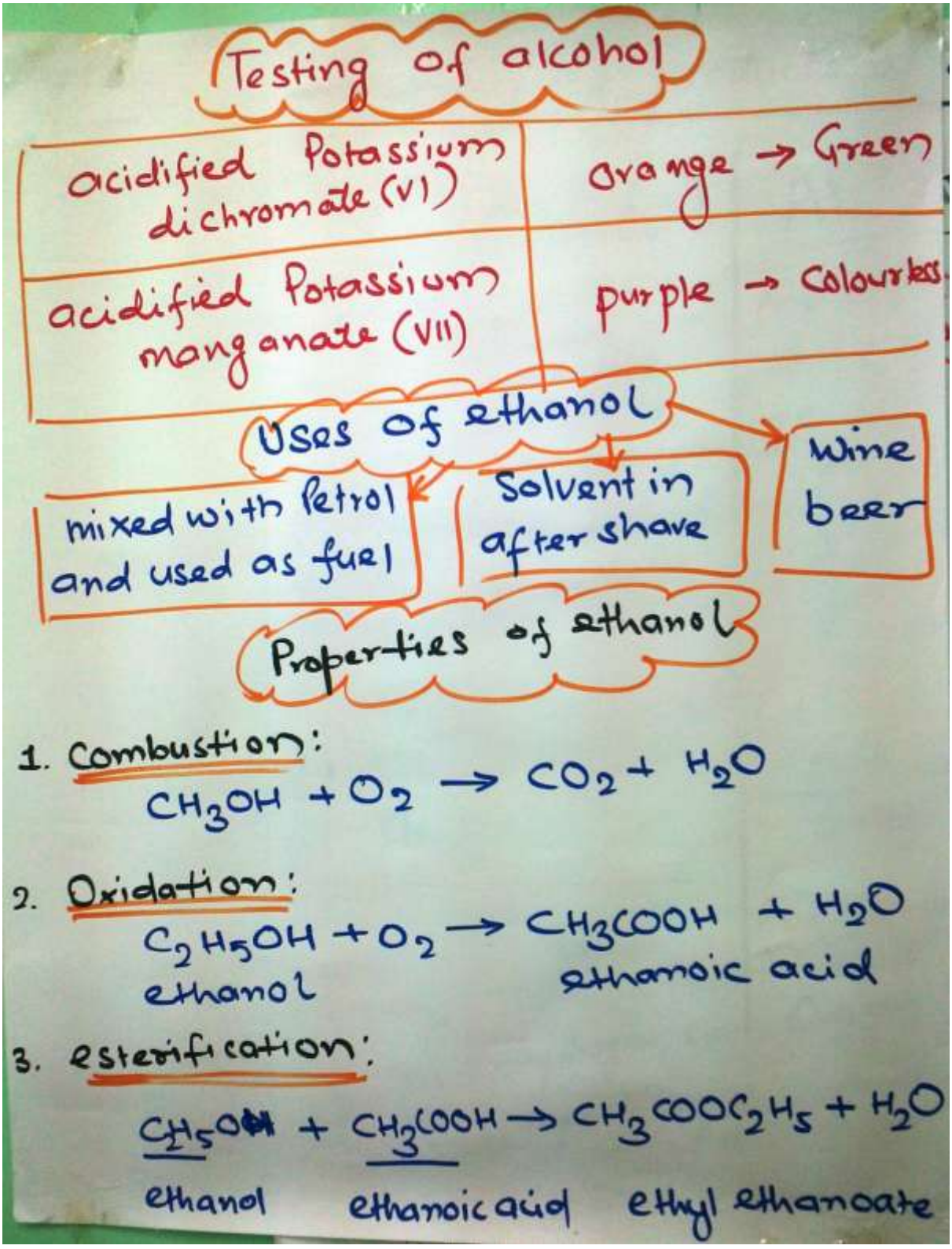


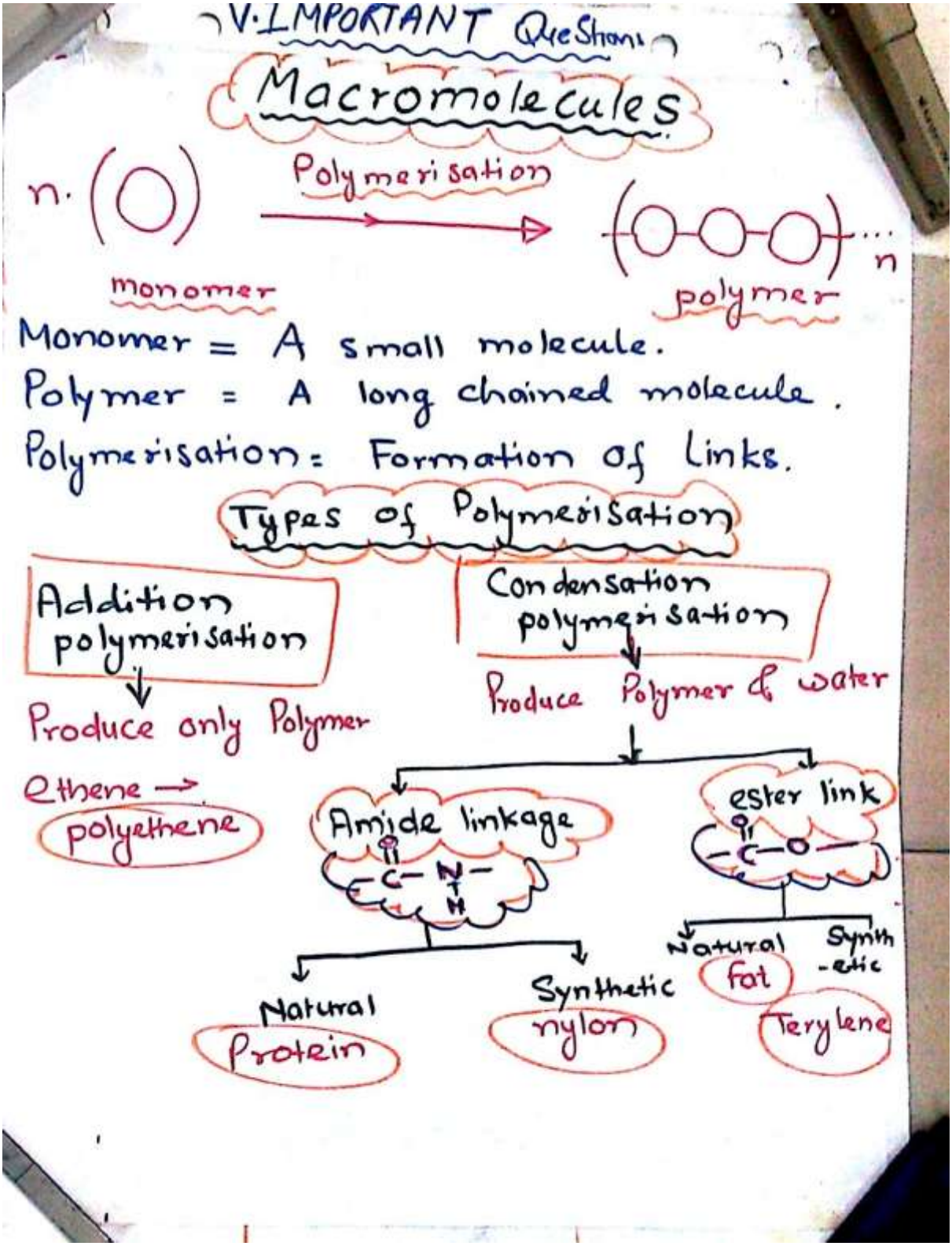
anaerobic respiration

$$C_6H_{12}O_6\,(aq) \xrightarrow[37°C]{\text{yeast}} 2CO_2 + 2C_2H_5OH$$

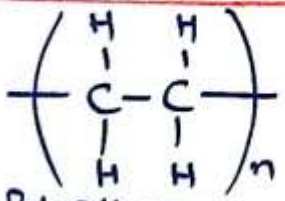
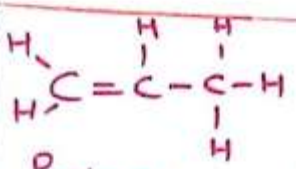
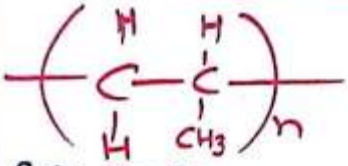
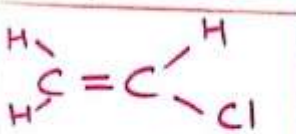
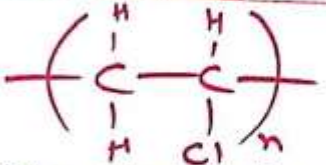
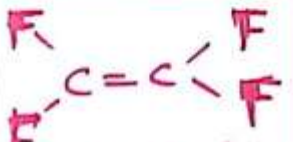
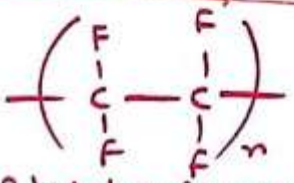
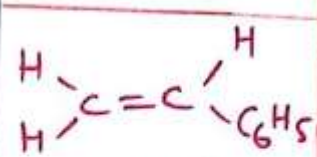
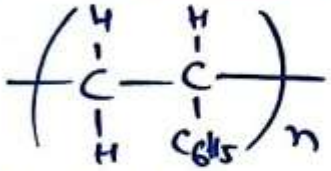
Glucose — ethanol

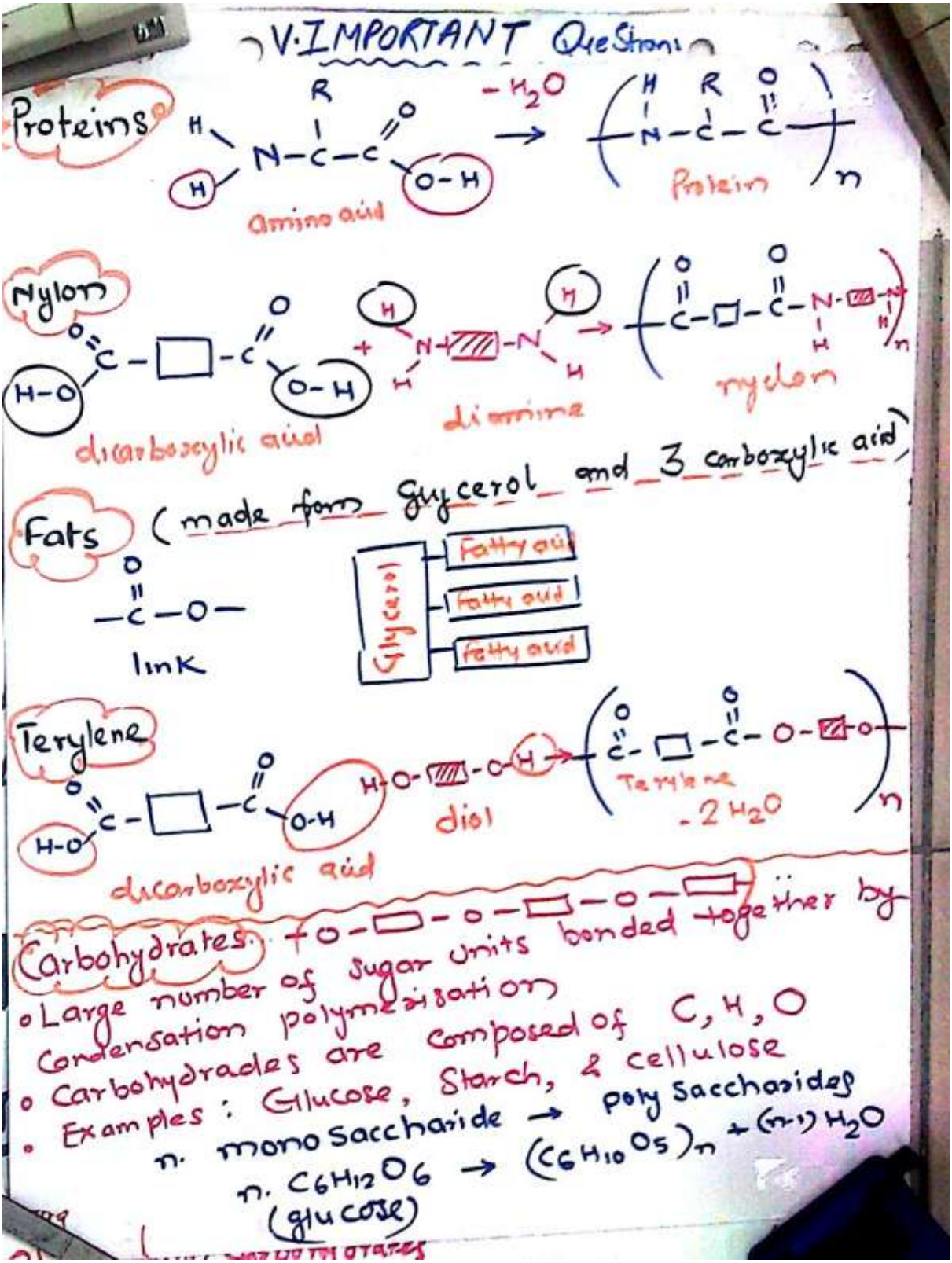
$$C_2H_5OH + O_2 \rightarrow CH_3COOH + H_2O$$

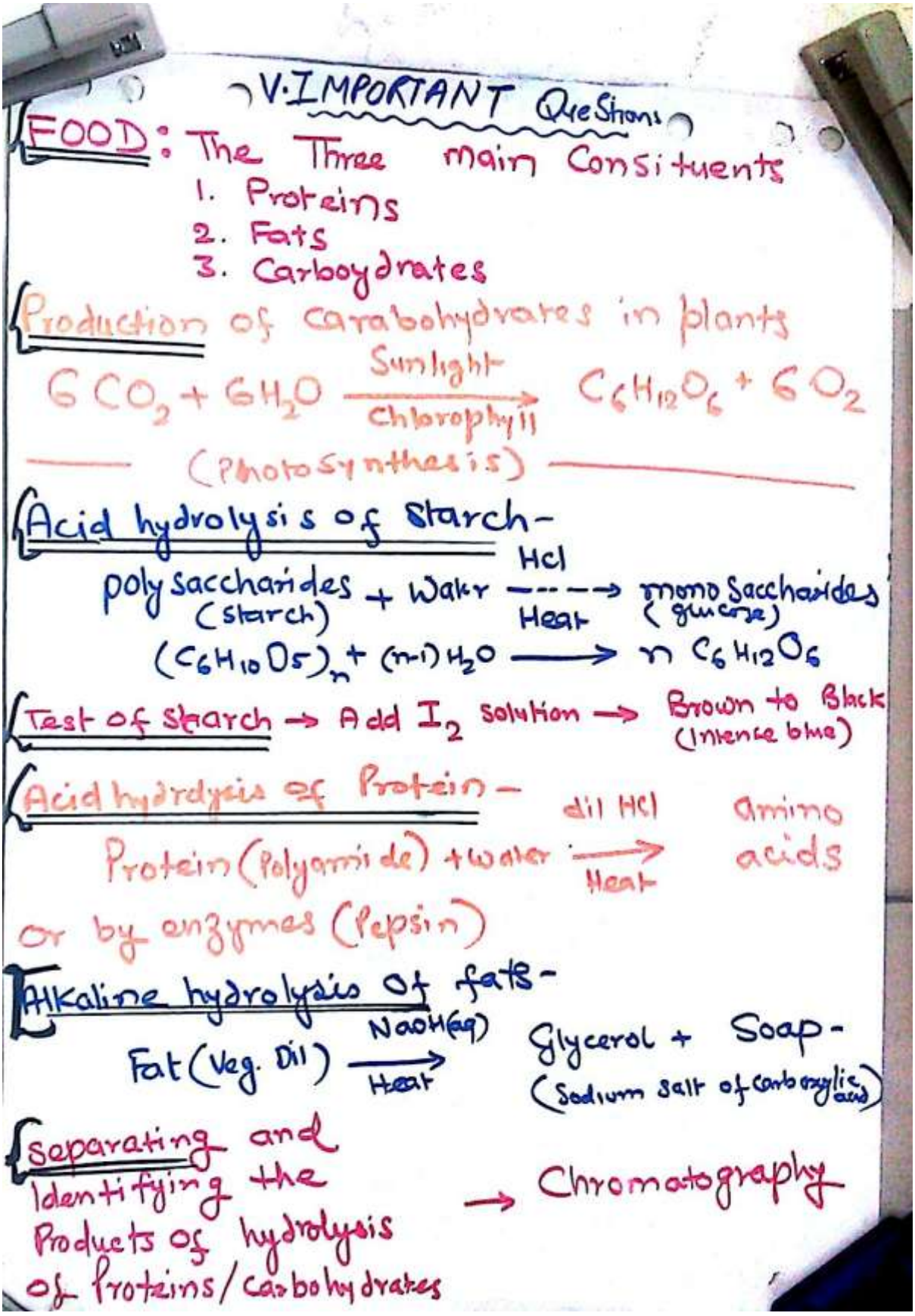




Addition Polymers

Monomer	Polymer	Uses.
 ethene	 Polyethene	Plastic bags, bowl, Buckets * tough, Durable
 Propene	 Poly propene	• ropes • Packaging • tough / durable
 Chloro ethene	 Poly chloro ethene	- guttering - electrical- • insulation
 Tetra fluoro ethene	 Poly tetra fluoro ethene	• non- Stick frying pans • Withstand High temperatu-
 phenyl ethene	 Poly phenyl ethene	• Insulation • Packaging





V.IMPORTANT Questions

FOOD: The Three main Consituents
1. Proteins
2. Fats
3. Carboydrates

Production of carabohydrates in plants

$$6CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 + 6O_2$$

(Photosynthesis)

Acid hydrolysis of Starch-

$$\text{polysaccharides (starch)} + \text{Water} \xrightarrow[\text{Heat}]{\text{HCl}} \text{monosaccharides (glucose)}$$

$$(C_6H_{10}O_5)_n + (n-1)H_2O \longrightarrow n\,C_6H_{12}O_6$$

Test of starch → Add I_2 solution → Brown to Black (Intence blue)

Acid hydrdysis of Protein-

Protein (Polyamide) + water $\xrightarrow[\text{Heat}]{\text{dil HCl}}$ amino acids

or by enzymes (Pepsin)

Alkaline hydrolysis of fats-

Fat (Veg. Oil) $\xrightarrow[\text{Heat}]{NaOH(aq)}$ Glycerol + Soap-
(Sodium salt of carboxylic acid)

Separating and Identifying the Products of hydrolysis of Proteins/Carbohydrates → Chromatography