

Acid Base & Salt

Notes:

Indicator:-

Are those substance which indicate presence of acid and base in the solution with colour change or smell

Two types:-

- 1) Natural indicator \rightarrow litmus
- 2) Artificial indicator \rightarrow Phenolphthalein
methyl orange

Indicator	Acid	Neutral	Base
Litmus	Red	Purple	Blue
Phenolphthalein	colourless	colourless	Pink
Methyl orange	Red	Orange	Yellow

1) Methyl orange \Rightarrow "MO RX" (Red in Acid)
(Yellow in base)

* Some Common mineral acid & Base

(A) Acid

- 1) hydrochloric acid (HCl)
- 2) Sulphuric acid (H_2SO_4)
- 3) Carbonic acid (H_2CO_3)
- 4) Nitric acid (HNO_3)
- 5) Phosphoric acid (H_3PO_4)

(B) Base

- 1) Sodium hydroxide (NaOH)
- 2) Calcium hydroxide (Ca(OH)_2)
- 3) Potassium hydroxide (KOH)
- 4) Ammonium hydroxide (NH_4OH)
- 5) Aluminium hydroxide (Al(OH)_3)

Activity

	Substance	Red litmus	Blue litmus	Phenolphthalein	Methylorange
1)	HCl	Red	Red	Colourless	Red
2)	H_2SO_4	Red	Red	colourless	Red
4)	HNO_3	Red	Red	colourless	Red
5)	NaOH	Blue	Blue	Pink	yellow
6)	Ca(OH)_2	Blue	Blue	Pink	yellow

Olfactory indicators:-

It is a type of indicator which determines acid and base with the help of smell.

* Preparation of Olfactory indicator with help of onion

- Cut small pieces of onion
- Take a cotton cloth, cut it into a strip
- In each strip put onion and keep it for whole night
- With the help of onion strip cloth
- put cloth strip in acid, smell will be obtained
- But if we put in base, the smell will exhaust

Understanding the acid

* Some Common acid

S.No	Natural acid	Source
1	Acetic acid (CH_3COOH)	Vinegar
2	Citric acid	Orange, lemon
3	Lactic acid	Sour milk, curd
4	Tartaric acid	Tamarind
5	Malic acid	apple

6	Oleic acid	Olive oil
7	Butyric acid	Racid butter
8	Stearic acid	Fat
9	Uric acid	Urine
10	Oxalic acid	tomato
11	Amino acid	protein
12	Formic acid	Ant sting

1)* Physical properties of acid

1) Taste: Sour in taste

2) Nature of indicators:

Litmus = Red

Phenolphthalein = colorless

Methylorange = Red

* Physical state: Acid are solid and in liquid state

Solid state: 1) Oxalic acid

2) Boric acid $H_3BO_3 \cdot H_2O$

liquid state: 1) HCl

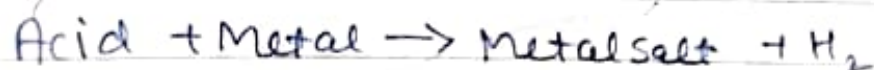
2) H_2SO_4

3) HNO_3

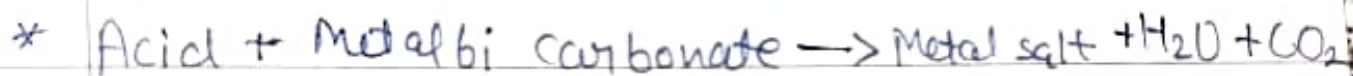
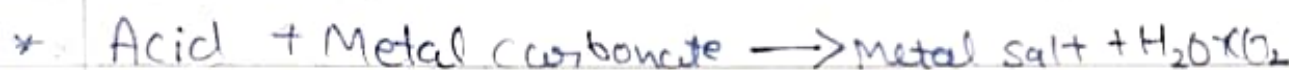
- * Electrical conductivity: Acid are good conductor of electricity

2) Chemical properties of acid

1) Acid react with Metal

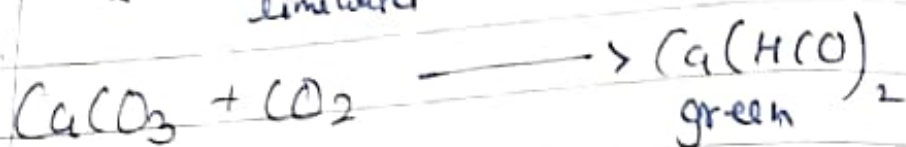
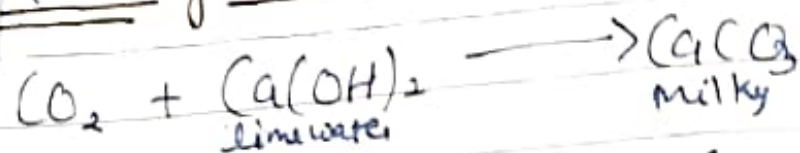


* Reaction of acid with Metal Carbonate and Metal hydrogen carbonate

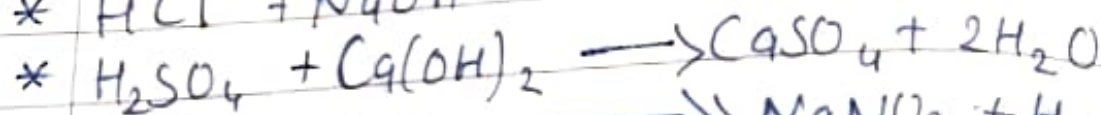
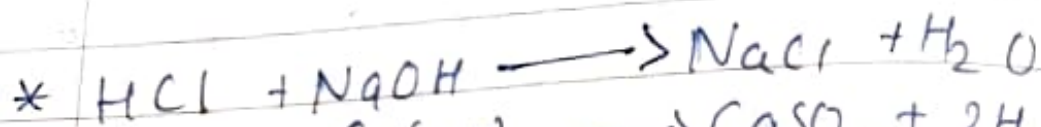


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Test of CO_2



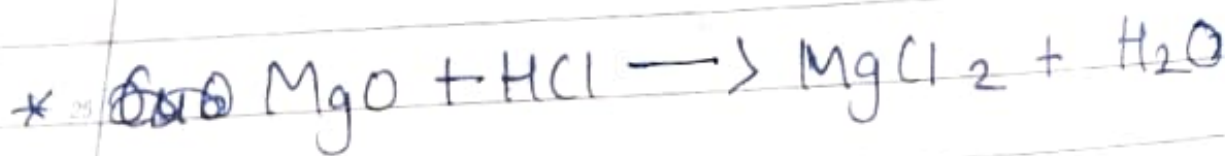
Reaction Acid + Base (Neutralization reaction)



Reaction of Acid with metallic oxide

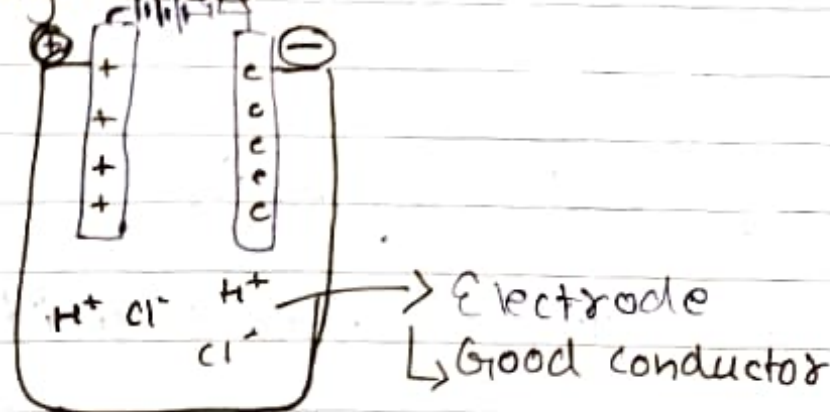


* Basic in nature



- * Acid show good conductivity of electricity

→ Electrolytic cell



- * All the acid consist of hydrogen

Role of water in Acid



Arrhenius Concept of Acid

- When acid are dissolve in water, it forms H^+ or hydronium (H_3O^+)
- * Acid are classified as strong acid or weak acid
- * Strong acid are those acid which give high concentration of H^+ eg - HCl , H_2SO_4 , HNO_3

* Weak acid :- Are those acid which gives less concentration of H^+ or H_3O^+

eg- CH_3COOH , H_2CO_3 , H_3BO_4

Dilution of Acid

* Acid is put in water

Base

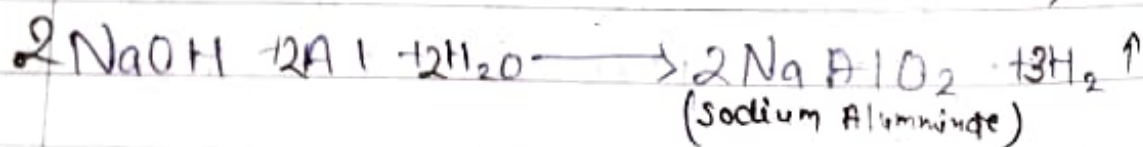
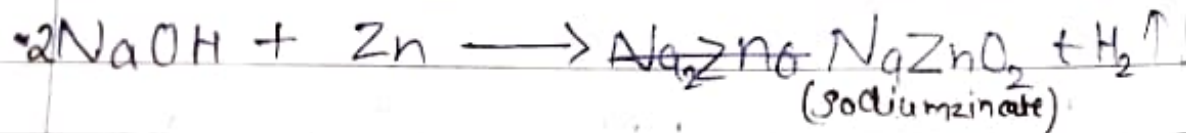
* Physical properties

- Taste: Bitter
- Litmus: Red to Blue
- Electrical conductivity: Good conductor
- State: Solid

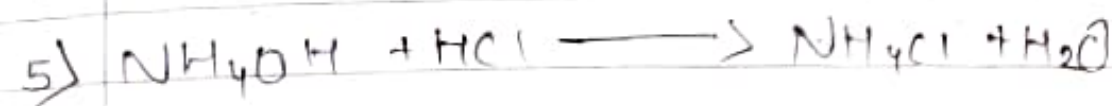
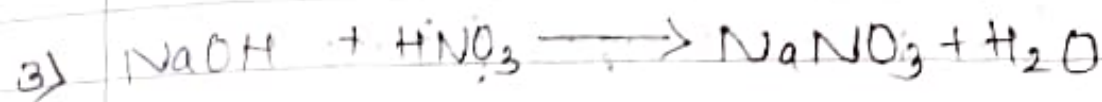
* Chemical properties * Amphoteric metal
↳ Zn & Al

* Reaction of Bases with Metal

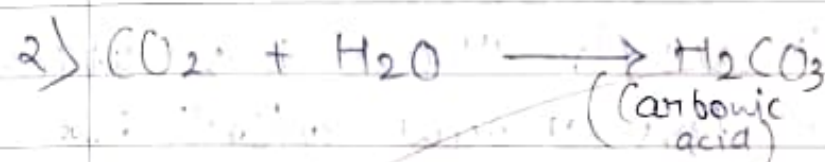
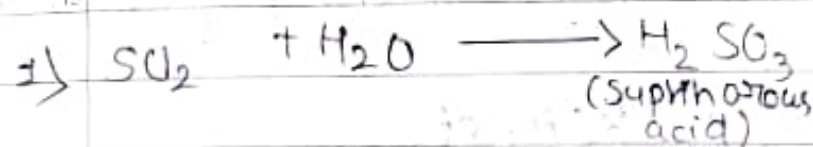
Base + Metal \longrightarrow Metal salt + gas



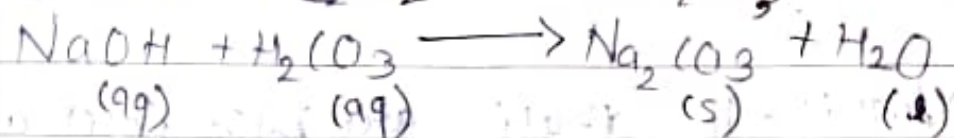
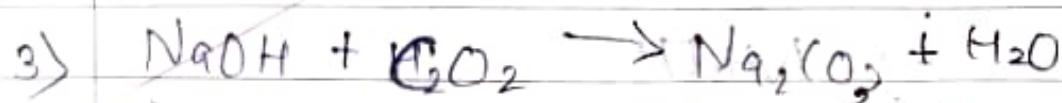
2) Reaction of Base with Acid



3) Reaction of Base with Non-metallic oxide



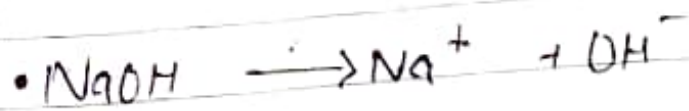
Acid rain



4)

Electrical conductivity of Base

→ Good conductor of electricity



Arrhenius concept of Base

Those substance which give (OH^-) or hydroxide ion in water are termed to be base

Strong Base: Are those base which produce high amount of (OH^-) ion

eg- NaOH , KOH , etc

Weak Base: Are those base which produce less amount of (OH^-) ion

eg: NH_4OH

Note: All alkali are base, but all bases are not alkali

Alkaline Base: Are those base which gives OH^- ions in water

eg- NaOH , KOH

Normal Base: They do not give OH^- ions in water

eg:- PbO , Al_2CO_3

* pH Scale, Universal indicator and pH
useful in every day life

* Dilution and decrease in concentration of H^+ or OH^- ions in solution

* The universal indicator shows different colours at different concentration of hydrogen ions in a solution

* A scale for measuring hydrogen ion concentration in a solution called pH scale.

* Measure pH generally from 0 (very acidic) to 14 (very alkaline)

Salt

When Acid and Base react it forms salt and water this reaction is said to be neutralization reaction.

Example

Acid		Base	Salt
HCl	+	NaOH \rightarrow	NaCl
H ₂ SO ₄	+	NaOH \rightarrow	Na ₂ SO ₄
HNO ₃	+	NaOH \rightarrow	NaNO ₃
HCl	+	KOH \rightarrow	KCl
H ₂ SO ₄	+	KOH \rightarrow	K ₂ SO ₄
HNO ₃	+	KOH \rightarrow	KNO ₃
HCl	+	Ca(OH) ₂ \rightarrow	CaCl ₂
H ₂ SO ₄	+	Ca(OH) ₂ \rightarrow	Ca ₂ SO ₄
HNO ₃	+	Ca(OH) ₂ \rightarrow	CaNO ₃

Types of Salt

- 1) Acidic salt: NaHSO_4
- 2) Basic salt: $\text{Cu(OH)Cl} \rightarrow$ Copper hydroxy chloride
- 3) Mixed salt: $\text{CaOCl}_2 \rightarrow$ Calcium oxychloride

4) Double salt: $\bullet K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$
(potasalum)

$\bullet FeSO_4 \cdot (NH_4)_2 SO_4 \cdot 6H_2O$
(mohor salt)

5) Common Salt

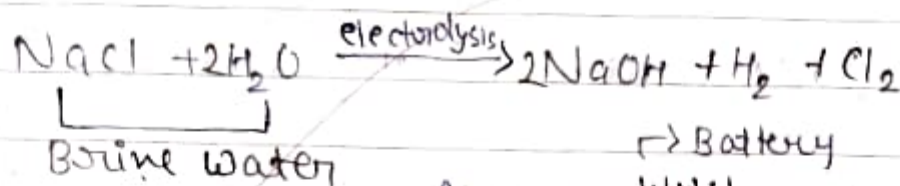
1) NaCl ———— Sea
————— Rock

Uses of NaCl

1) $NaOH \rightarrow$ Sodium hydroxide or (caustic soda)

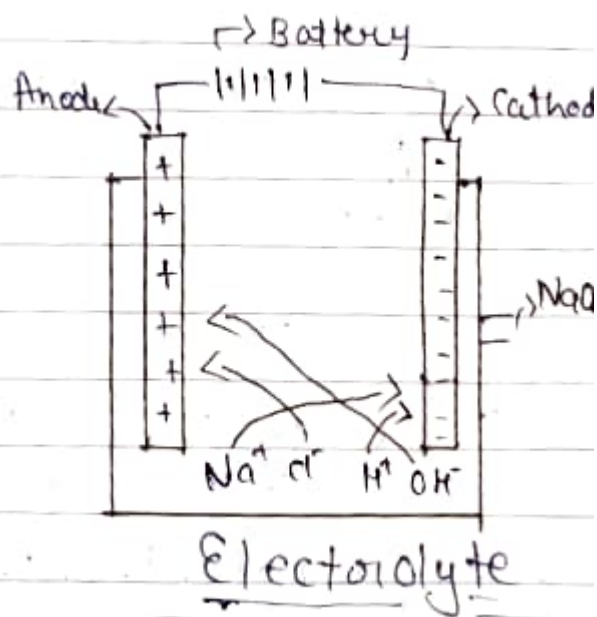
Preparation:

• By electrolysis process



* Anode = Cl

* Cathode = H_2



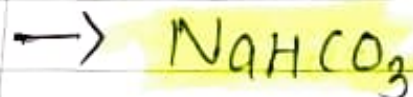
Uses of NaOH

- 1) • Manufacturing of soap
- Detergent, paper
- Artificial silk and other chemicals
- 2) • In petroleum refining^{ein}
- 3) • purification of bauxite
- 4) • In textile industry for mangle^{essing} fabrics

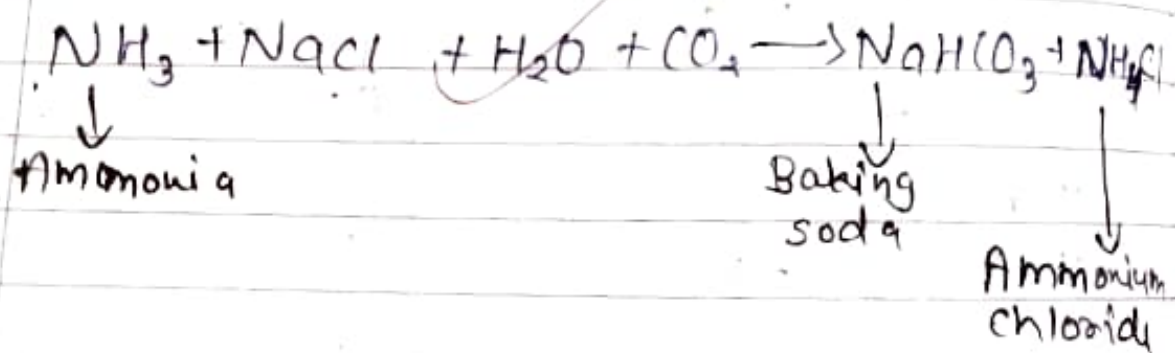
2) Sodium bi-carbonate or

Sodium hydrogen carbonate
or

Baking soda



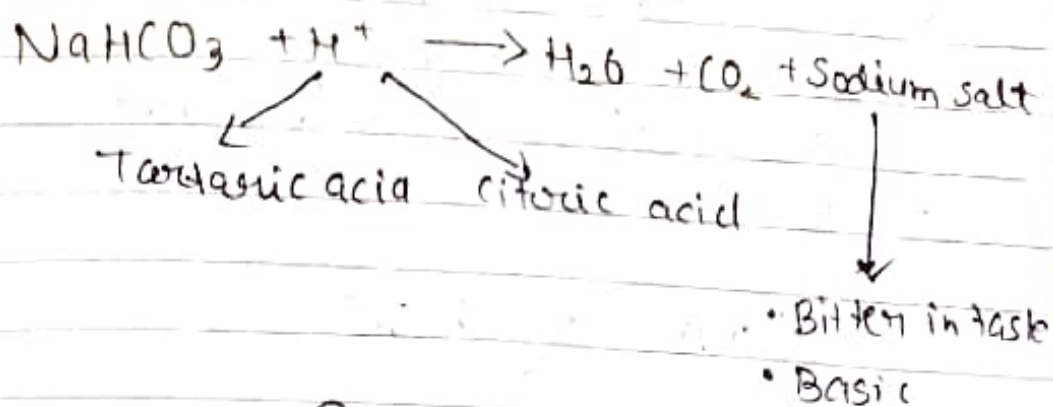
Preparation (Solvay process)



* By passing CO_2 through cold solution of sodium chloride saturated with ammonia

Uses

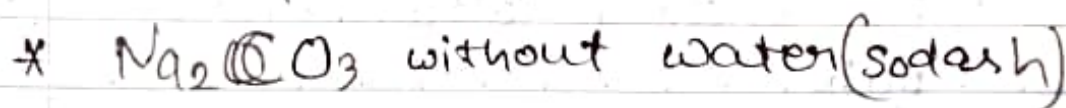
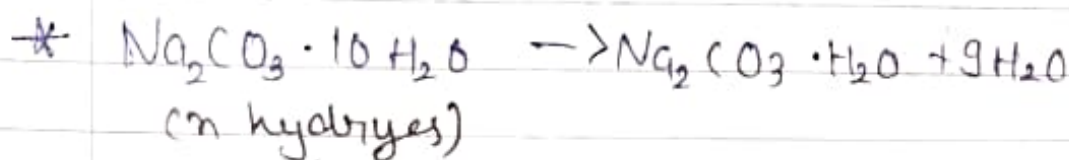
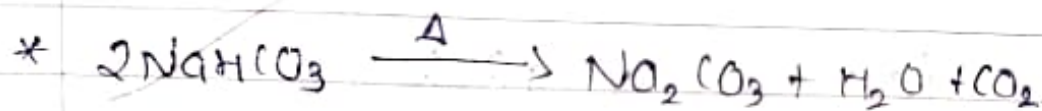
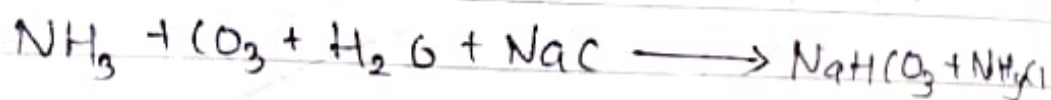
(i) In the presence of Baking powder



3) Sodium Carbonate ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$)

↳ Washing soda
↳ ($\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$)

Preparation



Uses

- for washing purpose in laundry
- for softening hard water
- In manufacturing of soap
- As a laboratory reagent
- to

4) Calcium oxychloride

↳ Bleaching powder
↳ CaOCl_2

Preparation



- By passing Chlorine gas in slaked lime

Reaction of CaOCl_2

- 1) $\text{CaOCl}_2 + \text{HCl} \longrightarrow \text{CaCl}_2 + \text{H}_2\text{O}$
- 2) $\text{CaOCl}_2 + \text{H}_2\text{SO}_4 \longrightarrow \text{CaSO}_4 + \text{H}_2\text{O} + \text{Cl}_2$
- 3) $\text{CaOCl}_2 + \text{CO}_2 \longrightarrow \text{CaCO}_3 + \text{Cl}_2$

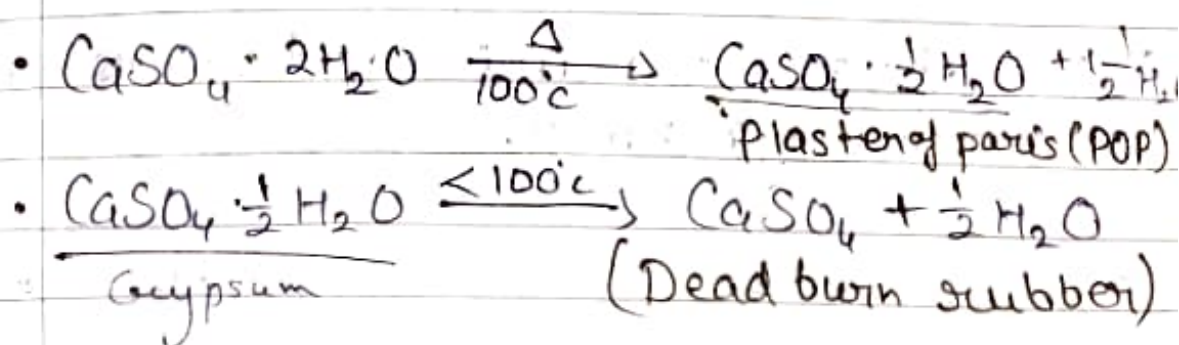
Uses

- for bleaching cotton, linen and good pulp

- For sterilization of drinking water
- In manufacture of chloroform
- for making wool unshrinkable

* Plaster of Paris

→ Calcium sulphate hemihydrate
 → $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$
 → made with help of Gypsum.



Uses

- For making moulds
- for pottery, ceramic
- For making statue

Water of Crystallisation Compound

A compound which consist of water molecule and determine the property of compound like colour, nature are said to be water crystallisation compound

