

# UNIVERSITY SOLVED QUESTION WITH ANSWER

**Year** : 2019-2020

**Subject** : Inorganic chemistry

**Subject Code** : BP-104T

**Subject In-Charge** : Kiranmayee Bhatra & Adyasha Senapati



Registration No:

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Total Number of Pages : 01

B.Pharm  
BP104T

1<sup>st</sup> Semester Regular/Back Examination 2019-20

PHARMACEUTICAL INORGANIC CHEMISTRY

BRANCH : B.Pharma

Max Marks: 75

Time : 3 Hours

Q.CODE : HRB771

Answer Question No.1 (Part-A) and 02 (Part-B) which are compulsory and any TWO from Part-C.

The figures in the right hand margin indicate marks.

**Part-A**

**Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)**

- Why 20% citric acid is added in limit test for iron?
- What is blue vitriol? Write its formula and uses.
- Mention the methods used for adjusting isotonicity.
- Define anti-microbial agents with suitable examples.
- What is universal Antidote? Give its formula.
- Define haematinics. Name the official compounds of iron used as haematinics.
- What is lugol's solution? Mention its uses.
- Mention the effects of impurities in pharmaceutical substances.
- Name the techniques used for the measurement of radioactivity.
- What is half life of a radioactive material? Mention its significance.

**Part-B**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any SEVEN out of NINE) (7 x 5)**

- Discuss about the different sources of impurities found in pharmaceutical substances.
- Mention the ideal characteristics of antacids. Write down the monograph of Aluminum hydroxide gel.
- Define expectorants. Mention its mechanism of action. Write down the monograph of any one inorganic expectorant.
- Classify dental product with suitable examples. Write down the monograph of Sodium Fluoride.
- Write a note on emetics.
- Give the preparation, properties and uses of Hydrogen peroxide and Silver nitrate.
- Write the assay of Sodium chloride and Copper sulphate.
- Mention the sources, deficiency condition, and toxicity of iron in the body. Write the preparation and properties Ferrous sulphate.
- Define expectorants. Give the mechanism of action of expectorants. Write down the monograph of Ammonium chloride.

**Part-C**

**Q3 Only Long Answer Type Questions (Answer Any TWO out of FOUR)**

- Q3** Describe in detail the limit test for arsenic with a neat labeled diagram. (10)
- Q4** Define and classify astringents with examples. Mention their Mechanism of action. Write the preparation, properties of Potash Alum. (10)
- Q5** Describe the construction and working of G-M counter. Discuss important applications of radio pharmaceuticals. (10)
- Q6** Define antidotes. Classify antidotes basing upon their mechanism of actions. Explain, how cyanide poison affects the body and how it can treated? (10)

a//a/ Citric acid helps precipitation of iron by ammonia by forming a complex with it. 20% citric acid is used in limel test for iron.

b/ Copper sulfate is also known as blue vitriol.  
→ Formula of copper sulfate is -  $CuSO_4$ .

→ Copper sulfate is used as a fungicide, algacide, root killer & herbicide in both agriculture & non-agricultural settings.

c/ The tonicity of a drug sol<sup>n</sup> can be adjusted in two methods: class (i) methods, in which sodium chloride or some other substance is dissolved into the sol<sup>n</sup> to lower the freezing point and make it isotonic with body fluids. The cryoscopy method is included in this method, as well as the chloride equivalent method.

d/ An antimicrobial is an agent that kills microorganisms or stops their growth.

→ Eg: - penicillin, aminoglycosides, ofloxacin.

e/ The term 'universal antidote' historically referred to a mixture of activated charcoal, magnesium oxide, and tannic acid. It was believed to be effective against a wide range of poisons by adsorbing them, neutralizing them or precipitating them out of sol<sup>n</sup>.

¶ Hematinics are the compounds or nutrients required in the format<sup>n</sup> of blood and are used for the treatment of anemia.

→ Eg - Ferrous sulfate

g/ A sol<sup>n</sup> composed of iodine and potassium iodide which can be used as a reagent and antiseptic with potential used in cancer diagnosis.

n/ Impurity may caused the purity of the substances.

→ Impurity may bring about incompatibility with other substances.

→ Impurity may lower the shelf life of the substances.

→ Sometime impurities changes the physical & chemical properties of the substances & may it produce toxic effect.

Def of Impurity in any material that affect the purity of material of interest

- presence of impurity may produce toxic effect.
- It may lower the strength of pharmaceutical substance.
- common impurities include lead, arsenic, iron, chloride etc.

Types:-

→ They are of basically 3 types.

(1) organic Impurities.

(2) Inorganic Impurities.

(3) Residual solvents.

(1) organic Impurities:-

→ organic impurities basically arise during synthesis purification and storage of drug substances.

→ They may be identified or non-identified.

→ They basically include starting material, by product, synthesis intermediate, reagents, ligands catalyst.

(2) Inorganic Impurities:-

→ They often derived during manufacturing process.

→ They are generally identified.

→ They are basically include reagent, heavy metals inorganic salt.

(3) Residual solvents:-

→ They arise during manufacturing process.

→ These are the impurities that are basically present in solvent using pharmaceutical manufacturing.

## Source of Impurities:

- Raw material: Impurities from raw material may be carried out through manufacturing process and contaminate the final product.
- Reagent used if the reagent use in manufacturing are not completely removed by washing, then it may entry in the final product.
- method & process: These are various method used for manufacturing of pharmaceutical products. In certain drugs, multiple step synthesis process is used, which produces intermediate compound.
- solvent: most of the pharmaceutical product manufacturer using water are product.
- Now generally we used distill or demineralised water but some time for reducing cost we use softened water that contain  $Na^+$   $Cl^-$  impurity. That can contaminated the final product.
- Atmospheric contamination: In industrial area atmosphere is contaminated with dust particle & harmful gases. During manufacturing product react with product react with them contaminated.
- packing error: product of similar appearance such as tablet of same shape, size & colour some time placed in similar container lead to potential sources of danger.

## 6/1/ Expectorants :-

- It is the drugs that are used to help to remove of sputum in the respiratory track or we can simple say they are used in the treatment of cough is protective physiological reflex, that helps to clean the respiratory track.
- It is classified into 2 type.

(1) expectorant

(2) stimulant

## → Mechanism of Expectorants :-

(1) Increase fluidity

(2) Reducing viscosity.

(3) Increase vol<sup>m</sup> of sputum.

→ Ex :- KI, NH<sub>4</sub>Cl

## Potassium Iodide :-

properties

chemical formula - KI

molecular weight - 166 gm/mol.

- It is colourless & transparent crystal & white granular powder.

## Method of preparation -

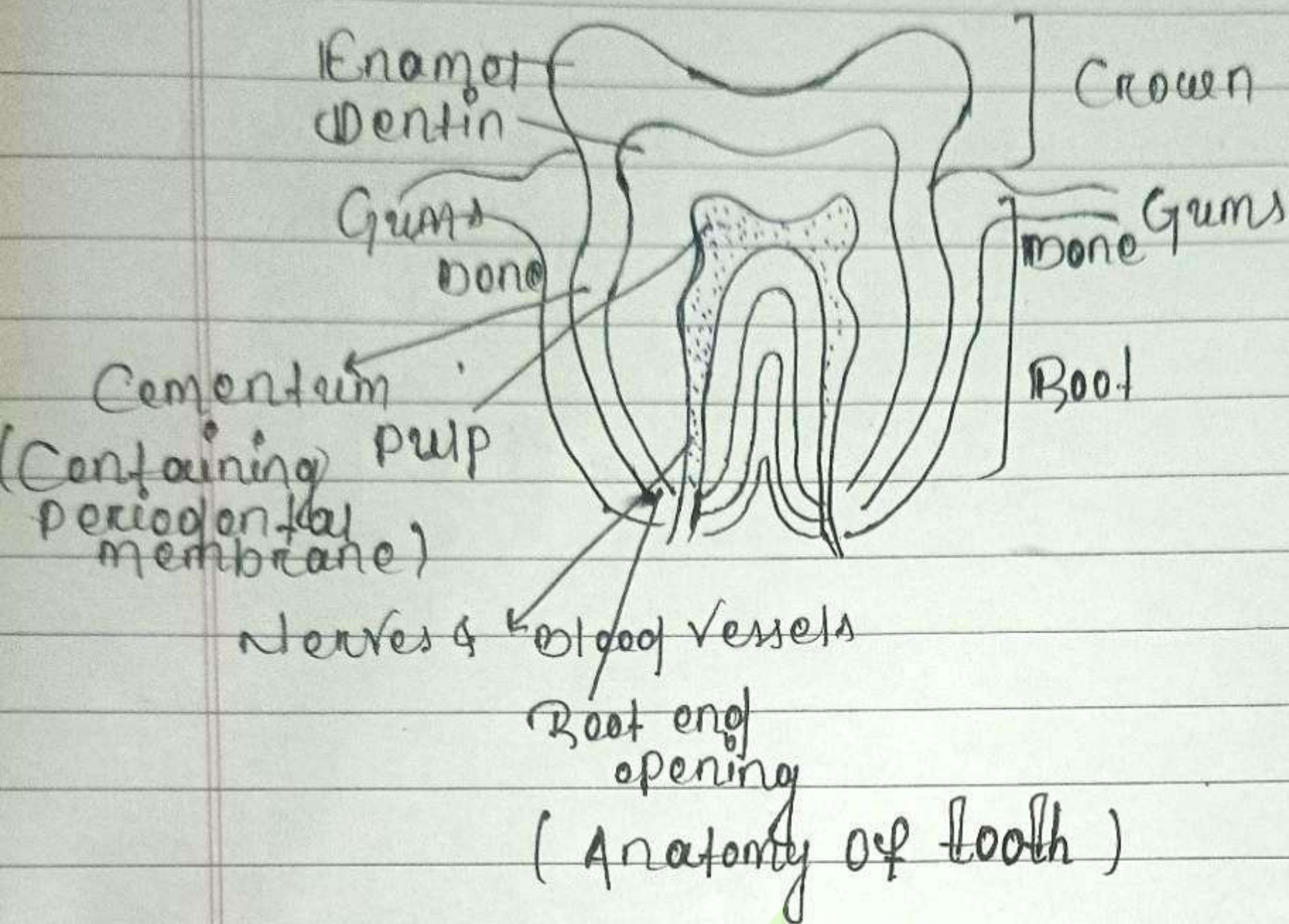
when potassium hydroxide reacted with iodine then potassium iodide, potassium iodate & water is obtained



Further KIO<sub>3</sub> is reduced with excess charcoal powder.



# of Dental products:



→ The basic components of tooth anatomy includes Enamel, Dentin, Cementum, pulp & pellicle.

## Enamel:-

- It contains about 96% of minerals part or rest 4% of water & organic matter material.
- Due to the presence of mineral part in such a high concentration Enamel becomes the hardest tissue of body.

10

## Dentin

- It contains the bulk 70% of mineral <sup>like</sup> light Ca & Phosphorus the rest is Collagen & water.
- It has a rich nerve supply



## Cementum :-

- It is the calcified tissue that helps the teeth for proper implantation in the socket.
- It may be further classified into 4 types Incisors, Canines, premolars, molars.
- This is the part which is actually <sup>involved</sup> in chewing, stabbing, cutting & grinding of food.

## Pulp

- This soft tissue occupies the cavity of the tooth consisting of nerves, blood vessel, lymph & fibrous tissue.
- It is a site that quickly response to injuries.

## pellicle :-

- It is a thin <sup>film</sup> ~~thin~~ <sup>salivary</sup> ~~film~~ <sup>film</sup> formed on the surface of the tooth due to the selective binding of <sup>salivary</sup> glycoprotein.
- It protects the tooth from the action of acid produced by oral microbial flora on carbohydrate.

## Dental products :-

- Dental product used to maintain the dental hygiene & to prevent to the decay of teeth & to give freshness & cleanliness to the teeth & mouth.
- There is a wide range of dental product available in the market.

## Classification of dental products :-

There are 4 types of dental product

- (i) Anticaries agent
- (ii) Dentifrices
- (iii) Desensitizing agent
- (iv) Cement & fillers

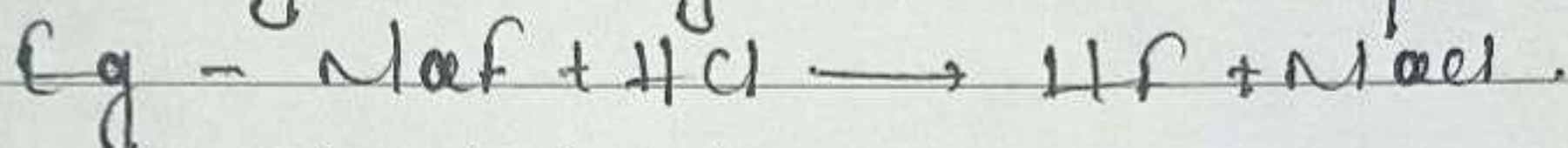
Method of preparation of NaF -

- It is prepared by double decomposition of  $\text{CaF}_2$  with  $\text{Na}_2\text{CO}_3$ .



properties -

- It is a white powder  
 → It is colourless & odourless  
 → It is soluble in  $\text{H}_2\text{O}$  & insoluble in alcohol upon acidification it gives Hydrofluoric acid.



- Brand or Market Names:  
 Optifresh, D Flour, Vinaflour

use -

- To prevent dental caries.  
 → usual dose of 2.2 mg (equivalent to 1 mg of fluoride ion).

Application -

- 1.5 to 3 ppm in drinking water. Topically 2% aq<sup>n</sup> to the teeth

Stannous fluoride :- ( $\text{SnF}_2$ )

- Molecular weight - 156.7

properties -

- It is a white crystalline powder having unpleasant odour. It is soluble in  $\text{H}_2\text{O}$  but insoluble in alcohol & organic solvent.  
 → aq. sol<sup>n</sup> of stannous fluoride deteriorates rapidly on standing because of stannous cation to stannin form. It is causing turbidity.

## Emetics :-

The word Emetics derived from a greek word 'Emesis' which means vomit.

It is a agent which when administered orally or by injection to induced to vomiting.

→ vomiting occur due to stimulation of emetic center situated in the medulla oblongata.

→ Emesis is a vomiting it is characterised by forcefully elimination of gastric content through the mucos.

→ That region is called "Area of postrema"

→ In the area of postrema chemoreceptor trigger zone & nucleus tractus solitarius is also present.

→ Emetics are used as mechanical Antidote which gives before absorption of poison in to intestine.

→ It have 2 mechanism :-

(1) stimulating of chemoreceptor trigger zone

(2) by reflexly producing irritation on GI track.

→ Ex: —→ salt in high dose act as Emetics by delays water, Znsoy etc.

## 44 Hydrogen peroxide.

chemical formula :-  $H_2O_2$

molecular weight :- 34.01 g/mol

synonyms :- hydrogen oxide, peroxide.

preparation -

it can be prepared by the react<sup>n</sup> of sodium peroxide with dil. sulphuric acid.



properties -

→ it is clear colourless liquid.

→ it is odourless.

→ it having a bitter taste.

→ it is miscible with water.

sodium hydroxide -

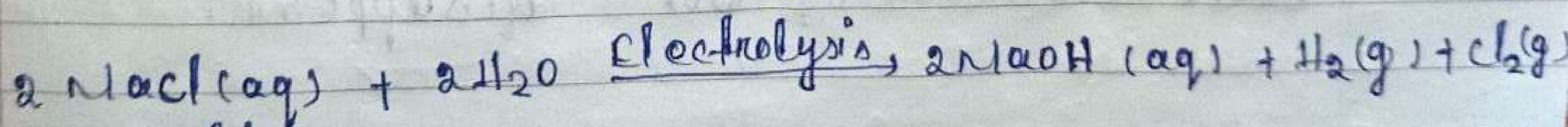
chemical formula -  $NaOH$

molecular weight - 40 g/mol.

synonyms - caustic soda.

preparation -

when  $NaCl$  is added in the  $H_2O$  in the process of electrolysis then  $NaOH$  is obtained.



properties -

→ boiling point -  $1388^\circ C$

→ melting point -  $318^\circ C$

→ odourless, white crystalline powder.

→ highly soluble in water & insoluble in ether.

## 94 Assay of NaCl -

Its assay is based on the Argentometric titration.

### procedure -

- weight 1 gm of sample & dissolved it in 50 ml water.
- Now add 50 ml of 0.1 M silver nitrate.
- To this add 5 ml of 2 M nitric acid & 2 ml concentrated  $KMnO_4$ .
- Now shake this properly and titrate with 0.1 M ammonium thiocyanate using 2 ml ferric ammonium sulphate as indicator.
- Titrat<sup>n</sup> continues until reddish brown colour appears.

## Assay of CuSO<sub>4</sub> -

Its assay is based on the Iodometric titration procedure

- accurate amount of CuSO<sub>4</sub> is weighed & dissolved in water.
- To this add excess amount of KI &  $CH_3COOH$
- Now liberated iodine is titrated with 0.1 M of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> using starch as an indicator titration continued until blue colour of sol<sup>n</sup> disappear.

ii/ Miscellaneous compound -  
Expectorants -

It is the drug's that are used to help to have removal of sputum in the respiratory track or we say they are used in the treatment of cough is protective physiological reflex that helps to clean the respiratory track.

→ Ex - KI, NH<sub>4</sub>Cl

Monograph of NH<sub>4</sub>Cl :-

weight - 53.49 gm/mol

chemical formula - NH<sub>4</sub>Cl

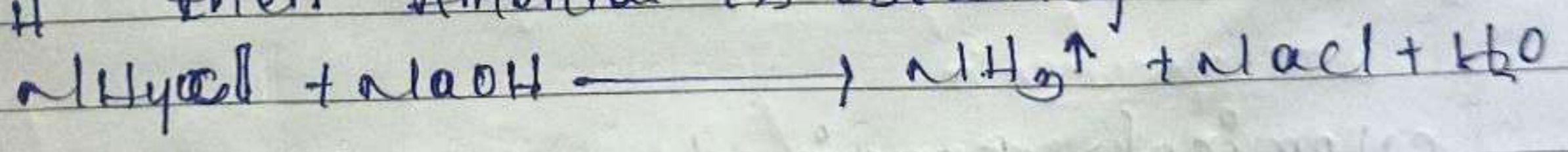
synonym - Ammon chlor / Sal ammoniac.

properties -

- crystalline powder.
- odorless.
- cool saline taste
- hygroscopic in nature.

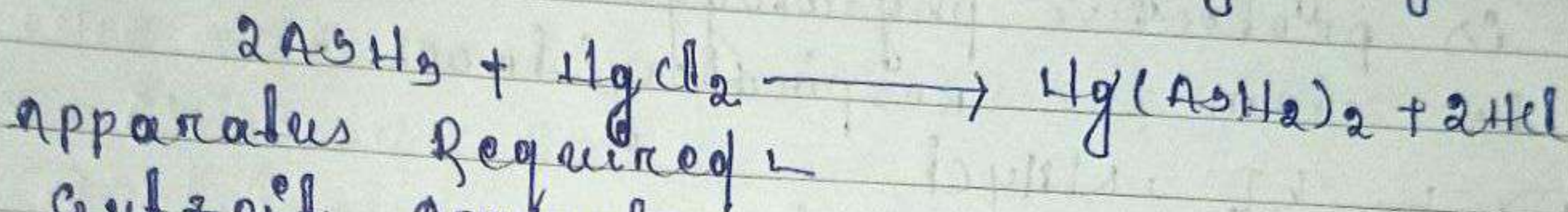
chemical properties -

→ ammonium chloride react with strong base like NaOH then ammonia is obtained



## Q.2/ a/ ARSENIC:

The principle of limit test of arsenic is based on the fact that arsenic in the arsenious state easily get reduced into arsine gas which on reaction with mercuric chloride gives yellow stain.



apparatus Required:-

- Gutzeit apparatus.
- glass rod.
- stand.

→ structure:-



chemicals Required:-

- standard arsenic solution.
- potassium Iodide.
- zinc.
- stannous chloride.
- stannated HCl & lead acetate.

## procedure

### Test

→ Add specific amount of test sample along with stannated HCl in gutzeit apparatus.

→ Add 1 gm of KI

→ To this add 5 ml  $\text{SnCl}_2$

→ Add 10 gm granulated "Zn"

→ keep the sol<sup>n</sup> aside for 40 min.

### observation -

→ If stain produced by test is less than stain produced by standard, sample passed the limit test.

→ If the stain produced by test is greater than stain produced by standard sample fails the limit test.

### Standard

→ Dissolve known quantity of standard Arsenic sol<sup>n</sup> with HCl in gutzeit apparatus.

→ Add 1 gm of KI

→ Add 5 ml  $\text{SnCl}_2$

→ Add 10 gm of granulated "Zn"

→ keep the sol<sup>n</sup> aside for 40 min.



## Q4/ Astringents?

Ans:-

→ These are those substances which cause protein precipitation

→ These agents are applied topically on damaged skin, mouth and mucous membrane of gastrointestinal tract which forms a protective layer.

Mechanism:-

- Astringents forms the protective layer which:-
- protects against bacteria and infection.
- prevent capillary leakage when applied to bleeding areas.
- Reduces local oedema, exudation, inflammation and mucus secretion.

They also reduce the cell permeability because of their capability of precipitating proteins.

Examples:-

zinc sulphate, potash Alum etc.

POTASH ALUM:-

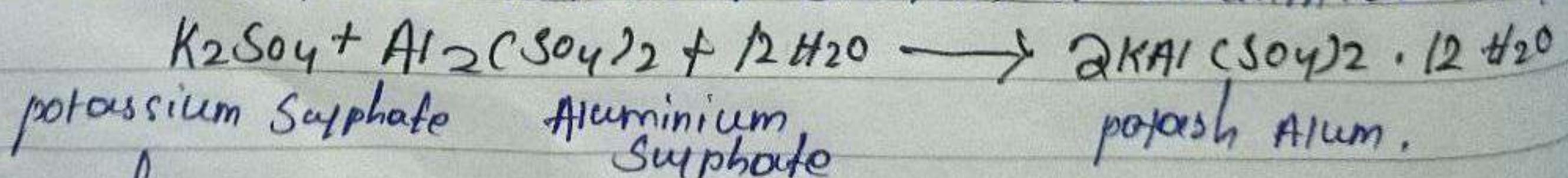
It is also known as potassium aluminium sulphate

→ molecular formula:  $KAl(SO_4)_2 \cdot 12H_2O$

→ molecular weight: 474.4 g/mol.

Preparation:-

It is prepared by mixing a concentrated solution of potassium sulphate with hot solution of aluminium sulphate.



Properties:-

- It exists as colorless, transparent or granular.
- Sweet astringent taste.
- Soluble in water and insoluble in alcohol.

Medicinal uses:- used topically as astringents.

→ also used as antiseptic, also used as pharmaceutical aid.

## Q5/ Antidotes?

→ These are those agent or substance substances which are used to neutralized the effect of poison.

→ These substance are mainly used in the treatment of poisoning.

classification / type:-

on the basis of mechanism of action, classified into three categories:-

(i) mechanical Antidotes.

(ii) physiological Antidotes.

(iii) chemical Antidotes.

(1) Mechanical Antidotes:-

These are those antidotes which prevent the poison from getting absorbed into the body.

eg- activated charcoal.

(2) Physiological Antidotes:-

These are those antidotes which produce the opposite effect of poison.

eg- Sodium Nitrite.

(3) Chemical Antidotes:-

These are those antidotes which alter the chemical nature of poison, which convert the poison into inactive or harmless compound.

eg- Sodium trisulphate

Mechanism:-

eg- cyanide poisoning.

• Normally, during cellular respiration, cells take  $O_2$  from blood with the help of enzyme cytochrome oxidase.

• with the help of  $O_2$ , cells ~~from general ATP enzyme~~ generate ATP, Energy.

Cyanide poisoning:-

-> cyanide binds to iron, present in cytochrome c oxidase (Cyt c oxidase) of the electron transport chain (ETC) hampering  $O_2$ .

