

# UNIVERSITY SOLVED QUESTION WITH ANSWER

**Year** : 2018-2019

**Subject** : Inorganic chemistry

**Subject Code** : BP-104T

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



Registration No:

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Total Number of Pages : 02

B. Pharm.  
BP104T

1<sup>st</sup> Semester Regular / Back Examination: 2018-19  
PHARMACEUTICAL INORGANIC CHEMISTRY  
BRANCH(S) : B.PHARMA

Time : 3 Hour

Max Marks : 75

Q. Code : OF695

Answer Question No.1 (Part-1) which is compulsory, any seven from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions : (2×10)

- Why dilute nitric acid is added in the limit test for Chloride?
- What is Iugol's Solution? Mention its uses.
- What are dentifrices and anti-caries agents? Give examples.
- Write down the principle involved in limit test for Sulphate.
- Write any two effects of impurities in pharmaceutical substances.
- What is blue vitriol? Mention its uses.
- Define astringent. Give two examples.
- What is half-life of a radioactive material? Mention the units of radioactivity.
- What is achlorhydria? Mention its therapy.
- Write down the composition and uses of ORS.

Part-II

Q2 Focused-Short Answer Type Questions- (Answer Any Seven) (5×7)

- Write down the principle and procedure for the limit test of iron.
- What are the ideal characteristics of antacid? Add a note on systemic antacids.
- Write the different type of acid base theory with suitable examples.
- Define haematinics and write down the monograph of Ferrous sulphate.
- Describe the role of fluorides in dental care.
- What are cathartics? Classify cathartics basing on their mechanism of action with suitable examples. Give the monograph of Magnesium sulphate.
- Discuss various applications of radio pharmaceuticals.
- Define antidotes. Classify antidotes according to their mechanism of action. Write down the monograph of sodium thiosulphate.
- Define expectorants. Give the mechanism of action of expectorants. Write down the monograph of any one inorganic expectorant.

Part-III

Long Answer Type Questions (Answer Any Two)

- Q3 What are buffers? Explain in detail buffer action and buffer equation. Discuss the applications of buffer in pharmacy. (10)
- Q4 Explain in detail, the limit test for Arsenic along with a neat and labeled diagram. (10)

Q5 Classify antimicrobial agents with suitable examples. Mention the mechanism action of antimicrobial agents. Write down the monograph of Chlorinated lime and Hydrogen Peroxide. (10)

Q6 Discuss the different properties of  $\alpha$ ,  $\beta$  and  $\gamma$ -rays. Give a detail note on the construction and working of G-M counter. (10)

1) Why dilute nitric acid is added in the limit test for chloride?

A) Nitric acid is added in the limit test for chloride to make solution to make solution acidic and helps silver chloride precipitate to make solution turbid at the end of process.

b) What is Lugol's solution? mention its uses?  
A) Lugol's solution, also known as Lugol's iodine solution is a solution of element iodine and potassium iodide in water.

- It is primarily used as a disinfectant and antiseptic.

- It is used in medicine treatment the disease like hyperthyroidism and a supplement to prevent iodine deficiency.

c) What are dentifrices and anticaries agent? give example?

A) Dentifrice is a substance used for cleaning the teeth commonly known as tooth paste. It typically contains abrasives foaming agents, flavouring and sometimes therapeutic agents like fluoride to help prevent tooth decay and gum disease.

Ex: Colgate, Crest, Sensodyne.

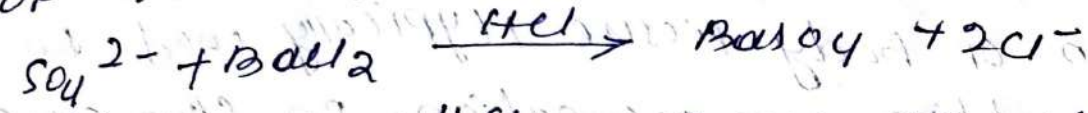
Anticaries agent is a substance that helps to prevent tooth decay.

- one common example of anticaries agent is fluoride. fluoride can be found in tooth paste, mouth washes and some community water supplies.

- It works by strengthening the tooth enamel, making teeth to more resistance to acid attacks.

d) Write down the principle of limit test for sulphates.

A) It is based upon the reaction between barium chloride ( $\text{BaCl}_2$ ) and soluble sulphate  $\text{SO}_4^{2-}$  to obtain barium sulphate in the presence of dilute hydrochloric acid.



e) Write any two effects of impurities in pharmaceutical substances.

A) Decreased efficacy - Impurities can reduce the effectiveness of pharmaceutical substance. They may interfere with the intended the pharmacological action or cause adverse effect, leading to reduced therapeutic efficacy.

Toxicity - Some impurities can be toxic posing serious health risk to consumers. Even trace amount of certain impurities can have harmful effects, ranging from mild allergic reaction to severe toxicity or carcinogenicity.

7) What is blue vitriol? mention its uses?

H) Blue vitriol, also known as copper sulphate pentahydrate, is a chemical compound with formula  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ . It is a bright blue crystalline solid and is commonly used for various purposes.

1) in agriculture to prevent fungicide and pesticides growth of algae and fungi

2) in chemistry it is used various chemical processes such as dyeing.

g) Define astringent? give two examples?

1) Astringent are the substances that causes the contraction of body tissue typically used to reduce bleeding or secretion. In skin care astringent are used to tighten the skin and pores. The two examples of astringents are

1) witch hazel - cleanses the skin and reduces inflammation

2) Alum - It is used on the wounds or minor cuts

h) What is half life of radioactive material? mention the units of radio activity?

A) The half life of a radioactive material is the time it takes for half of the atoms in a sample to decay. It is a characteristic property of each radioactive isotopes.

(10) The unit of radio active is becquerel (Bq)

i) what is achlorhydria? mention its therapy?  
A) Achlorhydria is a condition characterized by the absence or reduced production of hydrochloric acid in the stomach. This condition can lead to digestive problems as hydrochloric acid plays a crucial role in breaking down food and absorbing nutrients.

Therapies are:  
- supplemental hydrochloric acid  
- dietary changes  
- vitamin and mineral supplements  
- lifestyle modification

ii) write down the composition and uses of ORS?

A) ORS (oral rehydration solution) is a solution of electrolytes and sugar that is used for treatment of dehydration.

Each 21 gms ORS packet contains

Sodium chloride - 2.6 gm

Potassium chloride - 1.5 gm

Sodium citrate - 2.9 gm

Dextrose - 13.5 gm

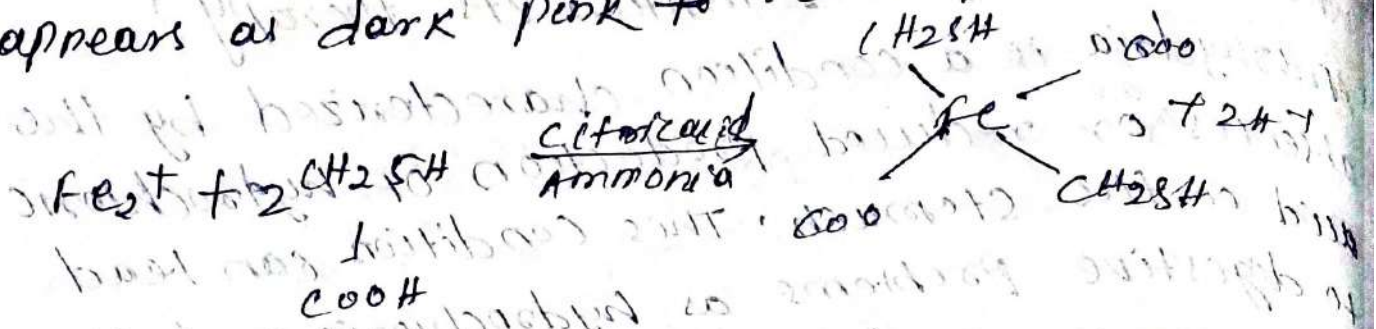
- It is used as the first line treatment for dehydration due to diarrhoea.

5 marks

2) write down the principle and procedure of limit test for iron?

A) It is based upon the reaction between thioglycolic acid in the presence of citric acid on an ammonium medium to form a chelate known as ferrous thioglycolate.

appears as dark pink to reddish purple colour



Test solution

- sample + 40ml of water

↓  
- 2ml of 20% w/v (Citric acid)

↓  
- 2 drops of thioglycolic acid

↓  
- make the solution alkaline and with adding ammonia

↓  
- volume upto 50ml

↓  
- observed the colour

Standard solution

- 2ml of standard solution

↓  
- 40ml of  $H_2O$  + 2ml of 20% w/v citric acid

↓  
- 2 drops of thioglycolic acid

↓  
- make the solution alkaline with adding ammonia

↓  
- volume upto 50ml

↓  
- observed the colour

observation ÷ If the colour produced by the test solution is less than standard solution then the limit test for iron is passed.

b) Write the ideal characteristics of antacid  
Add a note on systemic antacid?

A) Ideal Characteristics of antacid =

- It should be insoluble in water and has fine particle form.

- It should not cause metabolic alkalosis

- It must have its effects over a long period of time.

- It should not cause constipation.
- It should not cause any side effect.
- It should be stable and readily available.
- It should ~~be~~ not be too expensive.

Antacids are mainly divided into 2 types

- systemic antacids
- non systemic antacids

### systemic antacids

- Antacids which absorb in the systemic circulation (blood circulation) are called as systemic antacid.
- They are not very suitable antacid they can cause metabolic alkalosis (Disturbance in acid-base balance).
- A systematic antacid is a type of medication that is taken orally to neutralize stomach acid and relieve symptoms of acid, indigestion and heart burn or upset stomach.

c) Write the different type of acid base theory with suitable example?

A) There are mainly 3 types of acid bases theory

- 1) Arrhenius theory
- 2) Bronsted-Lowry theory
- 3) Lewis theory

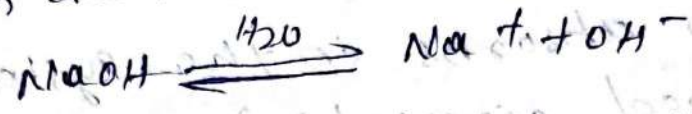


### Arrhenius's theory

Acids - According to Arrhenius theory acids are these substance which gives hydrogen ions  $(H^+)$  when dissolved in water.



Bases - According to Arrhenius theory, bases are these substance which gives hydroxide ions  $(OH^-)$  when dissolved in water.



### Bronsted - Lowry theory

Acids - According to the Bronsted Lowry theory acids are the substance which are capable to donate the proton  $H^+$  to any other substance hence acid act as a proton donor.

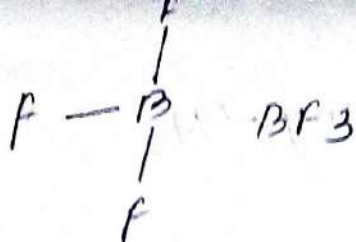


Bases - According to Bronsted Lowry theory bases are those substance which have the tendency to accept the proton  $(H^+)$  from any other substance. hence act as a proton acceptor.

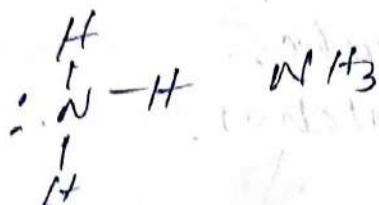


### Lewis theory

Acids - According to Lewis theory, acids are those substance which have the tendency to accept the lone pair electron.



Bases + According to Lewis theory, bases are those ~~substances~~ tendency to donate a lone pair of electron.



- d) Define haematinics and write the down the monograph of ferrous sulphate?
- A) Haematinics are the substance that are required in the information of blood and mainly used in the treatment of anaemias.
- ii) These drugs increase the number of red blood cells and amount of haemoglobin when they are below in normal level.
- iii) Anaemia occurs when the balance between production and destruction of red blood cells get disturbed.

### monograph of ferrous sulphate

molecular formula -  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$

molecular weight - 278 g/mol

synonyms - green vitriol

### method of preparation

- when iron is treated with dilute  $\text{H}_2\text{SO}_4$ , iron dissolves and form ferrous sulphate and

Hydrogen get liberated



### Properties

- It occurs as transparent green crystal and pale bluish green crystalline powder
- It is odourless
- It having metallic taste
- It is soluble in water
- It is insoluble in alcohol.

### Uses

- It is used as hematinics.
- It can also be used as disinfectant.
- e) Describe the role of fluoride in dental care?
  - fluoride is most commonly used anticaries agent.
  - fluoride occurs naturally in our body and also found in small amount in a variety of foods.
  - When a fluoride having salt or solution is taken internally, it is readily absorbed, transported and deposited in the bone or the developing of the teeth, and remain get excreted by kidney.
  - The deposited fluoride on the surface of teeth prevent the action of acids and enzyme in producing cavities.

- A small quantity of (1ppm) of fluoride thus becomes necessary to prevent dental caries
- However more than 2-3 ppm is ingested then it carried to bones and teeth and cause dental fluoridosis.

### Administration of Fluoride

- Fluoride can be administered by both internally and topically prevention the dental caries.
- Orally it can given in drinking water or Juice about 1ppm/day.
- Sodium fluoride tablets in a dose of 2.2gm per day are also used.
- For topical application 2% solution is generally used on teeth.

Q) What are cathartics? classify on its mechanism monograph of magnesium sulphate?

A) Cathartics are the drugs that are used to get relief from constipation.

- These are the drugs that accelerated defecation.
- cathartics act by increasing fluid content of faeces, making them softer and easier to pass.
- cathartics increase the mobility of intestine

Classification (on its mechanism)

- ① Stimulant cathartics - They act by producing local irritation on intestinal tract.
- ② Lubricants - provide lubricant effect so that stool easily pass through rectum also known as stool softener.
- ③ Bulk forming - These agents increase the amount of stool production.
- ④ Saline cathartics - They increase the osmotic load in gut, consumed with large amount of water.

magnesium sulphate

Chemical formula -  $MgSO_4 \cdot 7H_2O$

molecular weight - 246.47 g/mol

Synonyms - Epsoms salt.

method of preparation

It is obtained by the action of dil sulphuric acid and magnesium carbonate ( $MgCO_3$ )



Properties

- It occurs as the ~~white~~ white crystals
- It is odourless.
- It is having cool, saline bitter taste.
- It is soluble in water sparingly in alcohol in alcohol.

- uses
- It is used as cathartic.
  - It is used as agriculture.
  - It is used to control seizures in pregnancy.

g) write the various application of radio pharmaceuticals

h) Define antidotes according to their mechanism classify it? write the monograph of sodium thio sulphate?

A) Antidotes are the substance which reacts ~~of~~ <sup>oppositely</sup> with the ingested poison and overcome its effect.

- They are used to neutralize the effect of poison in the body.

- on the basis their mechanism, antidote classified into the following three categories.

### physiological antidotes

- They are called antagonised
- They produce effect just opposite to the poison.
- eg - sodium nitrite.

### Chemical antidotes

- They are act by combining with poisoning and changing its chemical structure or converting them into inactive or harmless compounds. Ex: sodium thiosulphate

### g) mechanical antidotes

- They act by preventing absorption of poison into the body.

## monograph of sodium thio sulphate

molecular formula -  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$

weight - 248.2 g/mol

synonyms - sodium hyposulphate

### preparation

It can be prepared by boiling sulphite with sulphur.



### properties

- It occurs as large colourless crystals.
- It odourless and having alkaline test.
- It soluble in water.
- It insoluble in alcohol.

### uses

- It is used in the treatment of cyanide poisoning.
- It is also used to skin disease.

(i) What is expectorants? write its mechanism and one example of monograph?

A) Expectorants are the drugs that are used to help the removal of sputum from respiratory tract or we can simply say that they are used in the treatment of cough.

- The cough is a protective physiological reflex that helps to clear the respiratory tract.

- cough can be divided into 2 types

1 - dry cough

2 - productive cough.

### Classification of expectorants

Expectorants are ~~not~~ act two mechanisms

1) Either increasing the fluidity or increase the volume of sputum.

2) now on the basis of mechanism it can be divided into two categories

① sedative expectorant

② stimulant expectorant

### Potassium iodide

molecular formula - KI

weight - 166 g/mol

synonym - Kali iodium.

### method of preparation

~~It is odourless.~~

It is

When hydrogen iodide treated with potassium bicarbonate it results of potassium iodide.



### Properties

- It is odourless
- It is better in taste
- It is hygroscopic in nature
- It is soluble in both water and alcohol



## uses

- It is used as expectorant
- It is used as antifungal agent
- It is used as Iodine supplement
- It is also used as saline cathartic

## part-III 10 marks

1) What are buffers? buffer action and buffer equation. Discuss about the application in pharmacy?

A) Buffers are solution that resist changes in their pH when a small amount of acid or base added in it.

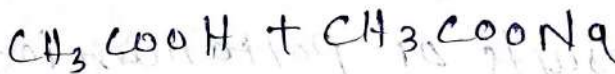
- They can neutralize small amount of acid or base.

### Type of buffers

- Acidic buffers
- Basic buffers

### Acidic Buffer

- An acidic buffer is a combination of weak acid and its salt with strong base.



### Basic Buffer

- A basic buffer is a combination of weak base and its salt with strong acid.



## Buffer action

- Buffer action basically describes the mechanism of action of buffers means how buffers actually works to resist changes in their pH if we add small amount of acid or base here we have to see.

① mechanism of action of acid buffers

② mechanism of action of basic buffers

### mechanism of action of acid buffers

- Let consider a acidic buffer system of  $\text{CH}_3\text{COOH}$  and  $\text{CH}_3\text{COONa}$ .
- Now these  $\text{CH}_3\text{COOH}$  and  $\text{CH}_3\text{COONa}$  will dissociate like this



### mechanism of basic buffers

- Let consider a basic buffer system of  $\text{NH}_4\text{OH}$  and  $\text{NH}_4\text{Cl}$  now they will dissociate like this



### Buffer equation

- Buffer equation is also known as Henderson equation.
- It is mainly used to calculate the pH of a buffer solution
- Let calculate the equation of acidic buffer

## Application of buffer in Pharma.

1. Stabilizing pH
2. Pharmaceutical compounding
3. Analytical techniques
1. Drug delivery systems
5. Biological applications

Overall buffers play a critical role in pharmacy by ensuring the stability, effectiveness and compatibility of pharmaceutical product or process.

## 2) Limit test of Arsenic with labelled diagnosis

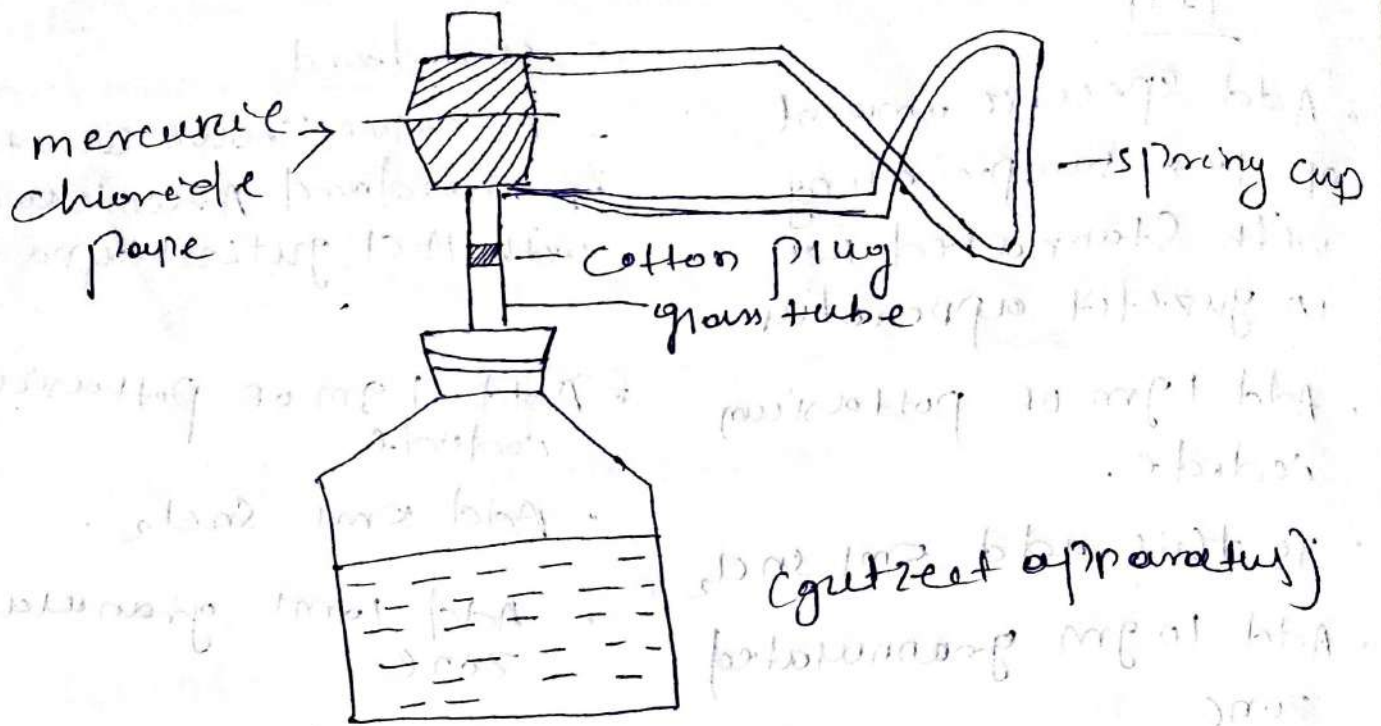
### A) Principle =

The principle of limit test for Arsenic is based upon the fact that arsenic in the arsenious form easily get reduced into arsine gas which reacts with mercuric chloride gives yellow stain.



### Apparatus Required

- gutzeit apparatus
- glass rod
- stand



### Chemicals required

- Standard arsenic solution
- potassium iodide
- Zinc
- Stannous chloride
- Lead acetate

### Role of Reagents

- $Zn/KI/SnCl_2$ : As reducing agent
- $HCl$ : To make solution acidic
- Lead acetate: To trap any hydrogen sulphide if presents

# Procedure

## Test

Add specific amount of test sample along with Stannated HCl in guzelet apparatus

- Add 1 gm of potassium iodide.
- To this add 5 ml  $\text{SnCl}_2$
- Add 10 gm granulated zinc
- Keep the solution aside for 40 min.

## Standard

- Dissolve known quantity of standard Arsenic chloride with HCl guzelet apparatus

• Add 1 gm of potassium iodide

• Add 5 ml  $\text{SnCl}_2$

• Add 10 ml granulated zinc

• Keep the solution aside 40 min

## Observation

- If stain produced by test is less than stain produced by standard sample pass the test

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

Q) classify antimicrobial agents with suitable exams  
write down the monograph of chlorinated lime  
and Hydrogen peroxide?

1) Antimicrobial agents are those chemical ~~proper~~  
~~traz~~ compounds or drugs that inhibits or  
destroy the growth of micro organism.

• The ether kill or prevent the bacterial

### Classification of antimicrobial

① Antiseptic

② Disinfectants

③ germicides

④ Bacteriocides

⑤ sanitizers

⑥ Sterilization

### Mechanism of action of antimicrobials

• micro organism mainly contains proteins  
to survive.

• Antimicrobials act by changing their protein  
structure which results in death of micro-  
organism

• Antimicrobials act by 3 mechanism

① Oxidation

② Halogenation

③ precipitation

oxidation - The MOA shows by oxygen releasing compounds

Halogenation - This MOA shows by halogen releasing compounds

precipitation - The MOA shows by metal

~~containing~~ containing compounds

## Hydrogen peroxide

Chemical formula:  $H_2O_2$

molecular weight = 34.01 g/mol

synonyms - Hydrogen oxide

### Preparation

It can be prepared by the reaction of sodium peroxide with dilute sulphuric acid.



### Properties

- It is clear ~~and~~ colourless fluid.
- It is odourless
- It having bitter taste
- It is miscible with water.

### uses

- It is used as antimicrobial agent
- It is used as antiseptic
- It is used as bleaching agent

## Chlorinated lime

Chemical formula -  $\text{CaOCl}_2$

molecular weight - 136.98 g/mol

Synonym - bleaching powder

### Preparation

It is prepared by reacting chlorine with calcium hydroxide



### Properties

- It is white grey powder.
- It has odour of chlorine.
- It is partially soluble in water and alcohol.

### Uses

- It is used as microbial agent.
- It is used as powerful bleaching agent.