

# **SHREE H. N. SHUKLA INSTITUTE OF PHARMACEUTICAL EDUCATION AND RESEARCH**



**B.PHARM**  
(SEMESTER –I)

**SUBJECT NAME: PHARMACEUTICAL INORGANIC  
CHEMISTRY**

**SUBJECT CODE: BP103TP**

**UNIT 3(b): ANTACID**

## Content

**Antacid:** Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate\*, Aluminum hydroxide gel, Magnesium hydroxide mixture.

### Antacid

Antacids are the drugs which are alkaline substance used for neutralizing excess gastric acid associated with ulceration, gastritis and peptic ulcer etc. These drugs give relief from pain caused due to hyperchlorhydria or hyperacidity.

The hyperacidity can cause the following GIT disorders .

1.) **Gastritis** : A general inflammation of gastric mucosa

2.) **Peptic ulcer**: It is a non-cancerous sore in the wall of stomach or those region that are bathed by digestive juices secreted by stomach and contains hydrochloric acid and pepsin. Hence the name is peptic ulcer.

3.) **Gastric and duodenal ulcer**: Sore on inside lining of stomach is called as And the sore on upper part of small intestine is called as gastric and duodenal ulcer. ' Antacids are usually weak alkaline. It act by raising the pH of the stomach.

#### **Criteria for Ideal Antacids:**

- 1 It should not be absorbable or cause systemic alkalosis.
2. It should not liberate carbon dioxide and cause rebound hyperacidity.
- 3 It should not interfere with absorption of food.
4. It should not be a laxative or cause constipation.
5. It should be quick acting and exert its effect over long period of time.
6. It should buffer in the pH range 4-6.
7. It should probably inhibit pepsin. 8. It should be palatable and inexpensive.

#### **Classification of Antacids Antacids are classified as:**

1.) **Systemic antacids**: Systemic antacids are water soluble. It acts instantaneously, but the duration of action is short. It is a potent neutralizer, it may rise the pH above 7. This class of antacids easily absorbed in to systemic circulation and are capable of changing blood pH. It may cause systemic alkalosis. Antacid belonging to this category is Sodium bicarbonate.

In general, the bicarbonate antacids preferably used when short term antacid treatment is required .

2.) **Non-systemic antacids** : This class of antacids are insoluble in water. They have poor absorption capacity. It has no direct effect on acid base equilibrium. They do not produce systemic alkalosis.

Non-systemic acid can be further, classified as

1. Aluminium compound as antacids : (a) Aluminium hydroxide gel. (b) Dried Aluminium hydroxide gel. (c) Dried Aluminium hydroxide table.
2. Calcium compound as antacids: (a) Calcium carbonate (b) Tribasic calcium phosphate.
3. Magnesium compound as antacids. (a) Magnesium carbonate heavy and light. (b) Magnesium hydroxide mixture.

### 1.) SODIUM BICARBONATE

**Chemical formula**  $\text{NaHCO}_3$

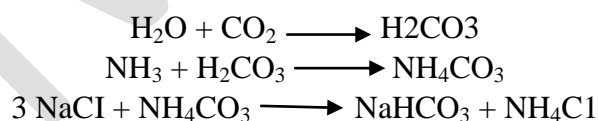
**Molecular weight** 84.007 g/mol

**Category** Systemic antacids, Electrolyte replenishes

**Synonyms** Baking soda, Sodium hydrogen carbonate.

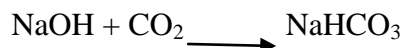
**Preparation from Industrial method :**

- **Solvay process/ammonia soda process:** In this method of preparation, sodium chloride (Brine solution) is saturated with ammonia to render it free from traces of impurities such as Mg and Fe.
- The solution is then filtered and the temperature of the solution is increased by heating to  $30^\circ\text{C}$ . The hot solution is allowed to interact with a current of  $\text{CO}_2$  present in carbonating tower. The carbonating tower is cooled immediately for the precipitation of sodium bicarbonate.
- The precipitation of sodium bicarbonate occurs at a temperature below  $15^\circ\text{C}$ . The preprecipitate is filtered and dried.



**Laboratory method or small scale method:**

Sodium bicarbonate is prepared by the passing  $\text{CO}_2$  through the solution of  $\text{NaOH}$ , the solution is concentrated and form Sodium bicarbonate.



**Properties**

- 1 It occurs as white crystalline or amorphous powder having a saline taste
2. It is freely soluble in water but practically insoluble in alcohol.
- 3 It gives effervescence with acids.

4. When it is heated to 100°C. it converted in to sesquicarbonate ( $\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3 \cdot 2\text{H}_2\text{O}$ ).

5 Its solution is alkaline in nature.

### Identification Test :

It gives the reaction of sodium and bicarbonate

### Assay :

The assay of sodium bicarbonate is based upon acidimetric titration. Accurately weighed 1 g of sodium bicarbonate is transferred in conical flask and dissolved in 20 ml of carbon dioxide free water. It is then titrated with 0.5N sulphuric acid using methyl orange as an indicator.



**Storage :** It is stored on tightly closed containers.

### Uses

1. It acts as an antacid because of its acid neutralizing properties.
2. It is used to treat dyspepsia and metabolic acidosis.
3. It is widely used as an electrolyte replenisher.

## 2.) ALUMINIUM HYDROXIDE GEL

**Chemical formula :**  $\text{Al}(\text{OH})_3$

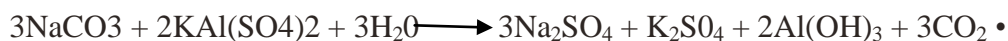
**Molecular weight:** 78 g/mol

**Category:** Antacid •

**Synonyms:** Aluminium hydroxide suspension. Aluminium hydroxide mixture

### Preparation of aluminium hydroxide from potash alum:

It is prepared by the adding hot solution of potash alum slowly with constant stirring to hot solution of sodium carbonate and not vice versa. After complete removal of carbon dioxide the precipitated aluminium hydroxide is filtered. It is washed thoroughly with hot water it is free from sulphate. .



### Properties :

1. It is white viscous suspension. A clear liquid separated when it is kept standing for sometime.
2. Aluminium hydroxide gives astringent aluminium chloride when it reacts gastric acid (HCl).  
This results in vomiting, nausea and constipation.

**Assay:**

The assay of aluminium hydroxide is performed by complexometric titration. In this titration sodium edetate allowed to complex aluminium under conditions in which metals, such as calcium and magnesium do not interfere. The excess of sodium edetate is added left after complexation with aluminium is over, is back titrated with 0.005 M lead nitrate. Hexamine is added to raise the pH to the alkaline side to facilitate the titration of the excess of EDTA with 0.05M lead nitrate.

**Procedure :**

5 gm of substance accurately weighed and taken in a flask. To this 3 ml hydrochloric acid is added. The solution is warmed on a water bath. After cooling, this is filtered to a 100 ml volumetric flask and the volume is made up to 100 ml. 20 ml of solution is taken from volumetric flask into a conical flask and 40 ml of 0.05M disodium edetate added to it followed by 80 ml of water and a few drops of methyl red solution.

To this 1N Sodium hydroxide is added to neutralise this solution. This can be indicated by change of colour from red to yellow. Now the flask is warmed on a water bath for 30 minutes. To this 3 g hexamine is added and 0.5 ml of xylenol orange solution is added to it as an indicator. This mixture is titrated with 0.05M lead nitrate until a violet colour appears at the end point due to the formation of lead xylenol orange complex.

**Storage :** Store in tightly closed containers and should not be allowed to freeze. Uses 1 It is a very effective slow acting antacid. 2. It is able to neutralise gastric hydrochloric acid and causes absorption of toxins, and gases.

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**3.) MAGNESIUM HYDROXIDE MIXTURE**

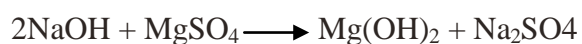
**Chemical formula :**  $\text{Mg}(\text{OH})_2$

**Molecular weight :** 58 32 g/mole

**Category :** Antacid. laxative Synonyms Milk of magnesia, Magnesium hydroxide oral suspension

**Preparation :**

It can be prepared from sodium hydroxide and magnesium sulphate In this method; sodium hydroxide is mixed with light magnesium oxide (MgO) and the suspension obtained is diluted with water. It is then slowly added to magnesium sulphate with constant stirring. The resulting solution is left undisturbed so that the precipitate settles at the bottom The upper clear liquid is separated and residue is collected on a calico filter which is then washed with water until it is free from sulphates. The precipitate is the finally mixed with sufficient quantity of distill water.



White and creamy magnesium hydroxide is obtained due to the addition of light magnesium oxide otherwise it would have been gelatinous translucent aqueous suspension.

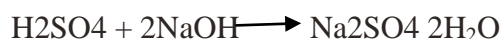
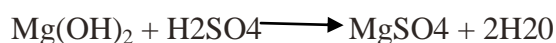
**Properties :**

1. It is white fine amorphous powder.
2. It is almost insoluble in water and it yields a solution which is slightly alkaline.
3. It dissolves in dilute mineral acids..

**Assay :**

It is carried out by acid base back titration method using methyl red as an indicator. Initially, magnesium hydroxide mixture is made to react with sulphuric acid. The excess of sulphuric acid is back titrated with 1N sodium hydroxide.

**Procedure :** An accurately weighed amount of sample is taken in a flask (5 ml). To it 25 ml of 1N sulphuric acid is added. The excess of sulphuric acid is back titrated with 1N sodium hydroxide using methyl red as an indicator.



**Storage:**

Stored in tightly closed container.

**Uses**

- 1.) It is used as an antacid and osmotic laxative.
- 2.) It is used as an alkaline mouth wash.