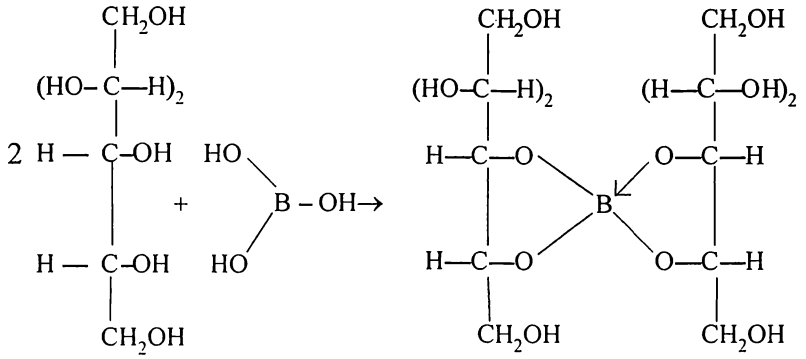
Polyhydric alcohols such as glycols and mannitol produce a similar result:



Mannitol Mannityl boric acid

Medicinal or Pharmaceutical Use: Pharmaceutical aid and local anti- infective.

2. HYDROCHLORIC ACID, HCl

Hydrochloric acid is prepared by dissolving hydrogen chloride gas in water.

Preparation of Hydrogen Chloride.

1. Hydrogen chloride may be made by reacting sodium chloride (common salt) with sulphuric acid. The reaction takes place in two steps.

$$NaCl + H_2SO_4 \longrightarrow \underset{\text{Sodium bisulphate}}{NaHSO_4} + HCl$$

$$NaHSO_4 + NaCl \longrightarrow \underset{\substack{\text{Sodium sulphate} \\ \text{(salt cake)}}}{Na_2SO_4} + HCl$$

The hydrogen chloride in the first step above known as the 'pan acid' is comparatively more pure whereas the hydrogen chloride obtained in the second step along with the salt cake is less pure and is known as 'muriatic acid' of commerce. Muriatic acid is a yellow liquid.

$$Ag^{+} + 2NH_3 \rightleftarrows [Ag(NH_3)_2]^{+}$$

$$Cu^{2+} + 4NH_3 \rightleftarrows [Cu(NH_3)_4]^{2+}$$

The copper molecular complex, that is the ammoniacal solution of cupric hydroxide known as cuoxam is used as reagent for cellulose, that is for cotton which contains almost pure cellulose. Cellulose is soluble in cuoxam.

Strong Ammonia Solution is official in B.P. '88 and also in I.P.'66 as Ammonia Solution Strong.

Tests for Identity

Official

1. Dilute freely with water. The solution produced is strongly alkaline (which may be tested with red litmus or any other suitable indicator).
2. Dip a glass rod in hydrochloric acid and keep it near the surface of the solution. Dense white fumes are produced (this is due to the formation of ammonium chloride).

Non-official

When Nessler's regeant (alkaline potassium mercuri-iodide solution) is added to Ammonia Solution Strong, a yellow to brown colour or precipitate is formed.

Standard: Contains not less than 27 per cent w/w and not more than 30 per cent w/w of NH_3.

Storage Condition: Since ammonia volatilises from solution at room temperature, Strong Ammonia Solution should be stored in a well-closed container at a temperature not exceeding 20°C.

Chemical Incompatibility

As ammonia is a base, it is incompatible with acids. It is also incompatible with salts of metals such as iron, zinc and copper precipitating their hydroxides. Alkaloidal salts like quinine hydrochloride or strychnine hydrochloride are decomposed by the

contains about 1.7 g of calcium hydroxide in 1 litre of water, that is solubility is 0.17% w/v and the solubility is reduced when the solution is heated. The solubility can be increased to 26 g per litre or 2.6 per cent if the calcium hydroxie is dissolved in 10 per cent sucrose solution. The increased solubility is due to the formation of calcium sucrosate. Calcium hydroxide is insoluble in alcohol. Aqueous solution of calcium hydroxide is alkaline to phenolphthalein and other common indicators.

Calcium hydroxide solution neutralizes acids forming the corresponding calcium salts.

$$Ca(OH)_2 + 2HCl \longrightarrow CaCl_2 + 2H_2O$$

Calcium hydroxide solution (lime water) absorbs carbon dioxide and forms calcium carbonate.

$$Ca(OH)_2 + CO_2 + H_2O \longrightarrow CaCO_3 + 2H_2O$$

This is the reaction in which lime water is turned milky by the passing of carbon dioxide. This is a test for carbonates and bicarbonates.

When calcium hydroxide is strongly heated, calcium oxide is formed.

$$Ca(OH)_2 \xrightarrow{\Delta} CaO + H_2O$$

It is official in I.P.

Official Tests for Identity

A solution of the sample in acetic acid gives the reactions of calcium (see Chapter 13).

Standard: It contains not less than 90% of $Ca(OH)_2$.

Storage Condition: Since it absorbs carbon dioxide from the atmosphere and is converted into calcium carbonate, it must be stored in tightly closed containers.

Chemical Incompatibility: Since it is a weak base, it will react with acids. However this is turned into an advantage in the preparation of zinc cream. In this the calcium hydroxide solution is reacted with oleic acid to form calcium oleate which, being a divalent soap, produces a water in oil emulsion of the arachis oil and water.

$$Zn + 2H_3PO_2 \longrightarrow Zn(H_2PO_2)_2 + H_2\uparrow$$
$$H_3PO_2 + Na_2CO_3 \longrightarrow 2NaH_2PO_2 + H_2O + CO_2\uparrow$$

It is a powerful reducing agent.

When it is treated with copper sulphate solution and heated to 60°C, a reddish precipitate of cuprous hydride is formed.

$$2CuSO_4 + 2H_3PO_2 + 4H_2O \longrightarrow 2H_3PO_4 + \underset{\text{Cuprous hydride}}{Cu_2H_2}\downarrow + 2H_2SO_4 + H_2\uparrow$$

When the solution is boiled, the cuprous hydride decomposes to metallic copper and hydrogen.

When it is mixed with acidified potassium permanganate solution, it reduces the permanganate and the pink colour is discharged.

$$5H_3PO_2 + 4KMnO_4 + 6H_2SO_4 \longrightarrow 2K_2SO_4 + 4MnSO_4 + 5H_3PO_4 + 6H_2O.$$

Mercuric chloride mixed with hypophosphorus acid is reduced first to white mercurous chloride and finally to mercury.

On strong heating, it decomposes to phosphorous acid and phosphine.

$$3H_3PO_2 \xrightarrow{\Delta} \underset{\text{Phosphine}}{PH_3}\uparrow + \underset{\text{Phosphorous acid.}}{2H_3PO_3}.$$

Storage Condition: Since it is a powerful reducing agent, it will react with oxygen of the atmosphere and get oxidised. So it must be kept in tightly closed containers.

Chemical Incompatibility: As a strong acid, it will react with all bases and alkalis. Secondly it is a reducing agent and will reduce any substance prone to reduction and also all oxidizing agents.

Medicinal or Pharmaceutical Use: Its use in pharmacy is only as a reducing agent. Thus it is used in Syrup of Ferrous Iodide preparation. Here all the ferric iodide present is reduced to ferrous iodide by the hypophosphorous acid so that the preparation contains only ferrous iodide.

CONTENTS

SECTION B - PRACTICAL

SOLUBILITY DESCRIPTIONS

The solubility descriptions in this book denote the following ranges :

Description	**Approximate quantities of solvent by volume required to dissolve 1 part of solute by weight.**
Very soluble	Less than 1 part
Freely soluble	From 1 to 10 parts
Soluble	From 10 to 30 parts
Sparingly soluble	From 30 to 100 parts
Slightly soluble	From 100 to 1,000 parts
Very slightly soluble	From 1,000 to 10,000 parts
Practically insoluble	More than 10,000 parts