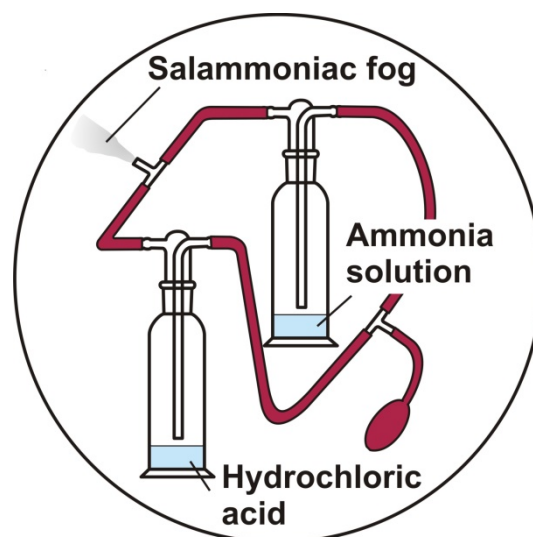


# Formation of “Salammoniac Fog” from Vapors of Hydrochloric Acid and Ammonia

## Equipment:

2 gas washing bottles  
2 hose connectors made of glass  
(Y- or T-shape)  
rubber bulb air blower  
rubber hoses  
ring stand, clamp holders, clamps



## Chemicals:

concentrated hydrochloric acid ( $12 \text{ kmol m}^{-3}$ )  
concentrated ammonia solution ( $13 \text{ kmol m}^{-3}$ )

## Safety:

concentrated hydrochloric acid (HCl):



H290, H314, H335

P280, P303 + P361 + P353, P304 + P340, P305 + P351 + P338, P310

concentrated ammonia solution ( $\text{NH}_3$ ):



H290, H314, H335, H400

P273, P280, P303 + P361 + P353, P305 + P351 + P338, P310

The gaseous hydrogen chloride released into the environment by the concentrated hydrochloric acid can cause severe irritation and burns to the skin as well as serious damage to the eyes. Concentrated ammonia solution gives a pungent smell because of gaseous ammonia, which particularly attacks the respiratory organs and the eyes. Due to the hazardous nature of both gases, the experiment has to be carried out in a fume hood. Suitable protective gloves and safety goggles must also be worn.

## Procedure:

Preparation: Both gas washing bottles are attached to the ring stand with clamps in order to ensure that the experiment can be carried out safely. One of the hose connectors is connected with the help of short rubber hoses to the inlet tubes of the washing bottles; the rubber bulb air blower is attached to the free leg of this hose connector. Subsequently, the second hose connector is connected to the outlet tubes of the washing bottles, while the free leg is attached in this case horizontally to the ring stand for safety. It should also be taken into account that the inlet tubes end about 1 cm above the bottom of each washing bottle.

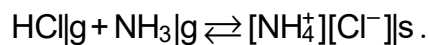
Procedure: 5 mL of concentrated hydrochloric acid are poured in one of the gas washing bottles and 5 mL of concentrated ammonia solution are poured in the other one; it should be kept in mind that the inlet tubes are not allowed to immerse in the solutions. Subsequently, the rubber bulb air blower is pressed.

**Observation:**

Clearly visible mist emerges from the tube.

**Explanation:**

By pressing the rubber bulb air blower, both gases (HCl and NH<sub>3</sub>) are unified producing “salammmoniac fog,” a mist of finely distributed ammonium chloride crystals:



This is an example of an acid-base reaction. In this case, the proton transfer takes place even without the presence of a solvent.

**Disposal:**

The residues from the washing bottles are carefully diluted with water, combined for neutralization and the mixture is poured into the sink.