

# **STUDY MATERIAL**

**Subject: Physical Science**

**Chapter: Ammonia**

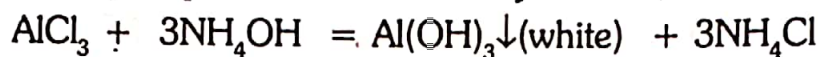
**Part: IV**

**Class: 10**

**Date: 13th April 2020**

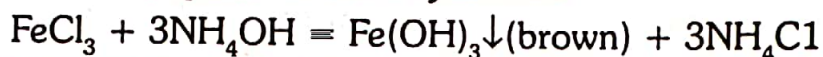
**Q.14. How does aqueous ammonia react with aluminium chloride and ferric chloride solutions ?**

**Ans.** (i) **Reaction of aqueous ammonia with aluminium chloride solution :**  
Aqueous solution of ammonia ( $\text{NH}_4\text{OH}$ ) reacts with aluminium chloride forming white gelatinous precipitate of aluminium hydroxide.



(ii) **Reaction of aqueous ammonia with ferric chloride solution :**

Aqueous solution of ammonia ( $\text{NH}_4\text{OH}$ ) reacts with ferric chloride solution forming brown precipitate of ferric hydroxide.



**Q.15. State with reasons two precautions taken during preparation of ammonia in laboratory.**

**Ans. Precautions taken during preparation of ammonia in laboratory :**

- The components ammonium chloride ( $\text{NH}_4\text{Cl}$ ) and calcium hydroxide [ $\text{Ca}(\text{OH})_2$ ] should be dry to avoid evolution of ammonia while mixing the two.
- The mixture of the components should fill about half the flask to leave enough space for easy passage of the evolved gas.

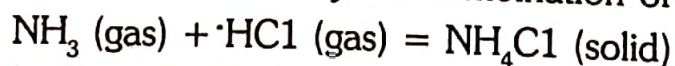
**Q.16. State some uses of ammonia.**

**Ans. Uses of ammonia :**

- It is used for the industrial preparation of nitric acid and sodium carbonate.
- Large quantities of ammonia are used in the manufacture of fertilizers, such as urea, ammonium phosphate etc.
- Ammonia is used as solvent.
- Liquid ammonia is used as a refrigerant in ice making.
- Ammonia is used as laboratory reagent.
- It is also used in pharmaceutical industries and also in the preparation of smelling salt.

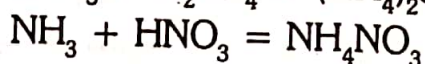
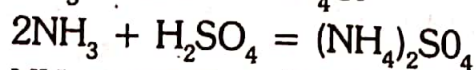
**Q.17. Give an example of formation of a solid by combination of two gases.**

**Ans. Formation of a solid by combination of two gases :** Ammonia gas reacts with hydrogen chloride gas forming a solid ammonium chloride. This is an example of formation of a solid by the combination of two gases.

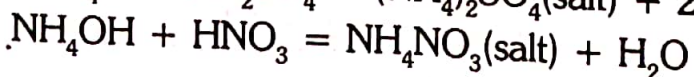
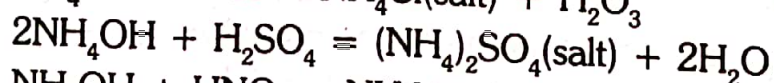
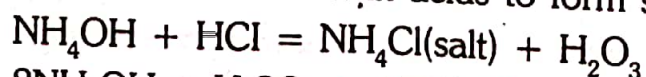


**Q.18. State how does ammonia react with HCl,  $\text{H}_2\text{SO}_4$ ,  $\text{HNO}_3$  acids.**

**Ans. Reaction of ammonia with acids :** Ammonia is a base, it readily reacts with an acid to form salt.



Aqueous solution of ammonia reacts with acids to form salt and water.



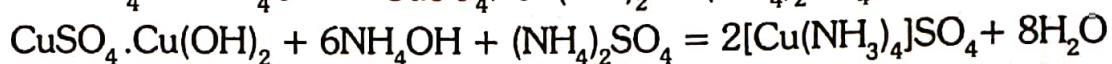


**Q.19. How is urea obtained from ammonia?**

**Ans.** Preparation of urea from ammonia : Ammonia reacts with carbon dioxide at 200°C and 150 atm pressure to form urea.

**Q.20. How does aqueous ammonia react with copper sulphate solution?**

**Ans.** Reaction of aqueous ammonia with copper sulphate solution : When aqueous ammonia i.e. ammonium hydroxide is slowly added to a copper sulphate solution, a pale blue precipitate of basic copper sulphate is first formed. On adding excess of ammonium hydroxide, the precipitate dissolves forming a deep solution of the complex compound called copper tetramine sulphate.

**C. Broad Answer Type Questions****Marks for each 3****Q.1. How ammonia is prepared in laboratory?**

**Ans.** Laboratory preparation of Ammonia :

(a) **Chemicals required** : Ammonium chloride ( $\text{NH}_4\text{Cl}$ ) and quick lime ( $\text{CaO}$ ) or dry slaked lime [ $\text{Ca}(\text{OH})_2$ ].

(b) **Condition** : Normally ammonia gas is obtained in the laboratory by heating a mixture of ammonium chloride with slaked lime. Instead of using slaked lime quick lime may also be used.

$\text{NH}_4\text{Cl}$ ,  $\text{Ca}(\text{OH})_2$  or  $\text{CaO}$  should be in powdered form and dry. The round bottomed flask should be half filled with the mixture of the two for easy escape of ammonia gas formed.

(c) **Collection** : Ammonia is lighter than air, it may be collected by the downward displacement of air.

Ammonia is not collected through the downward displacement of water because, it is highly soluble in water.

(d) **Equations of the reaction** :



(e) **Precautions** : The ingredients, the test-tube, the delivery pipes and the gas-jar should be absolutely dry. All the connections in the apparatus should be leak-proof.

(f) **Drying of ammonia** : As ammonia is a basic substance, it cannot be dried by acidic drying agents like conc.  $\text{H}_2\text{SO}_4$  or  $\text{P}_2\text{O}_5$ . The gas is absorbed by fused  $\text{CaCl}_2$  with the formation of an addition compound  $\text{CaCl}_2 \cdot 8\text{NH}_3$ . So, fused  $\text{CaCl}_2$  cannot be used to dry ammonia. It is best dried with the basic drying agent, quick lime ( $\text{CaO}$ ).

**Q.2. Prove by experiment that ammonia is dissolved in water and produces alkaline solution.**

**Ans.** Fountain experiment :

**Arrangement of the experiment** : A flask is filled with dry ammonia gas and its mouth is corked. The flask is kept in inverted position and is clamped



to a stand. Through a hole in the cork one end of a glass tube is introduced inside the flask. This end of the tube inside the flask is shaped into a jet. The other end of the tube dips in some red litmus solution taken in a beaker.

**Operation** : Now ice or ether is poured upon the flask.

**Observation** : A blue fountain produces inside the flask.

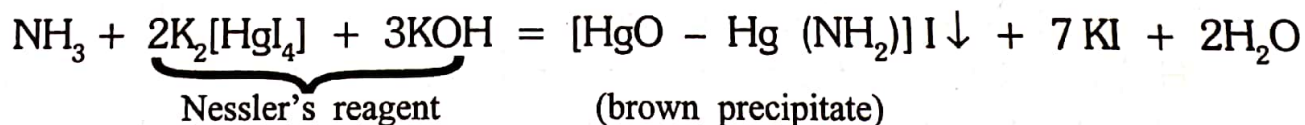
**Explanation** : Due to evaporation of ether the flask is cooled. Ammonia gas inside the flask contracts, as a result there is a partial vacuum inside the flask. At this stage if stopcock is opened the red litmus solution rushes inside the flask and ammonia is dissolved in it. Due to vacuum created inside there is a formation of fountain and the solution becomes blue.

**Conclusion** : This experiment proves that ammonia is highly soluble in water and the aqueous solution is alkaline.

### Q.3. How is ammonia identified ?

**Ans. Identification of ammonia :**

- (i) Ammonia is easily detected by its pungent smell.
- (ii) A glass rod dipped in into hydrochloric acid is then held into ammonia a white fumes is observed due to formation of ammonium chloride.  
$$\text{NH}_3 + \text{HCl} = \text{NH}_4\text{Cl} \text{ (white fumes)}$$
- (iii) Ammonia turns moist red litmus paper into blue.
- (iv) Ammonia produces brown colouration or precipitate in Nessler's reagent.



- (v) A strip of filter paper, soaked in mercurous nitrate solution, when exposed to ammonia gas, turns black.

