

## Acids and Bases

121. (a) Aluminium ion

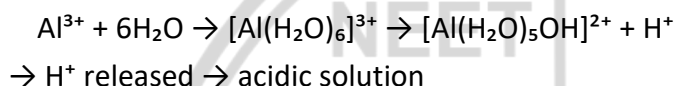
Explanation:

When  $\text{AlCl}_3$  dissolves in water: $\text{Al}^{3+}$  ion has a high positive charge.It attracts water molecules and polarizes them, causing release of  $\text{H}^+$  ions.

This makes the solution acidic.

Chloride ion ( $\text{Cl}^-$ ) does not hydrolyze — it is the conjugate base of a strong acid ( $\text{HCl}$ ), so it does not affect pH.

Hydrolysis (Word-Friendly Equation):



122. (d) Because it is a weak electrolyte.

123. (b) Adsorption indicator

Explanation:

In precipitation titrations, certain dyes (like eosin) get adsorbed on the precipitate near the endpoint  $\rightarrow$  colour change occurs  $\rightarrow$  called adsorption indicators

124. (a) Starch

Explanation:

Starch forms a deep blue complex with iodine  $\rightarrow$  used to detect the endpoint in iodometric titrations.125. (b)  $\text{H}_2\text{C}_2\text{O}_4$  and  $\text{KMnO}_4$ 

Explanation:

This titration is redox titration, not acid-base.



$\text{KMnO}_4$  is self-indicator  $\rightarrow$  purple colour disappears at endpoint.

Hence phenolphthalein is not needed and not suitable.

126. (c)  $\text{AlCl}_3$  and  $\text{SO}_2$  both are example of Lewis theory.

127. (c)  $\text{Na}_2\text{CO}_3 + 2\text{H}_2\text{O} \rightleftharpoons 2\text{NaOH} + \text{H}_2\text{CO}_3$ . It is a strong base and weak acid so it is a basic.

128. (d) Conjugate acid of the base

Explanation (Word-friendly):

When a base accepts a proton ( $\text{H}^+$ ), it becomes its conjugate acid.

This is based on the Brønsted–Lowry acid-base theory, which states:

Acid  $\rightarrow$  proton donor

Base  $\rightarrow$  proton acceptor

After accepting a proton, base  $\rightarrow$  conjugate acid

After donating a proton, acid  $\rightarrow$  conjugate base

129. (c)  $\text{H}_2\text{O} + \text{NH}_3 \rightleftharpoons \text{NH}_4^+ + \text{OH}^-$ .  
Acid base

In this reaction  $\text{H}_2\text{O}$  acts as acid because it donate a proton.

130. (b)  $\text{H}_2\text{SO}_4 + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{HSO}_4^-$   
Coniugate acid and base pair

131. (b)  $\text{Al}_2(\text{SO}_4)_3 \rightleftharpoons 2\text{Al}^{3+} + 3\text{SO}_4^{2-}$

$\text{Al}(\text{OH})_3 + \text{H}_2\text{SO}_4$   
Weakbase Strongacid

132. (c)  $\text{NaOH} + \text{HCl} \xrightleftharpoons[\text{Reaction}]{\text{Neutralization}} \text{NaCl} + \text{H}_2\text{O}$   
Salt



133. (a) Conjugate acid is obtained from the base by gain of  $H^+$ .

134. (c)  $KCl$  is a ionic compound .

135. (a)  $H_3BO_3 + H_2O \rightleftharpoons [B(OH)_4]^- + H^+$

$H_3BO_3$  is a weak monobasic acid if does not act as a  $H^+$  donor but behaves as a Lewis acid.

136. (c) Because it is not accept the proton.

137. (c)  $NH_4Cl$  is a salt of weak base ( $NH_4OH$ ) and strong acid ( $HCl$ ).

138. (b) Because it accept electron pair from the  $PH_3$

139. (b)  $NH_4^+ \rightleftharpoons NH_3 + H^+$

140. (d)  $NF_3$

Explanation (Word-Friendly):

Basicity of nitrogen halides depends on the availability of the lone pair on nitrogen. Fluorine is highly electronegative, so in  $NF_3$ , it pulls electron density away from nitrogen. This makes the lone pair on nitrogen less available for donation, reducing basicity. Therefore,  $NF_3$  is the least basic nitrogen halide.

Order of basicity:

$NBr_3 > NCl_3 > NI_3 > NF_3$  (least basic)

