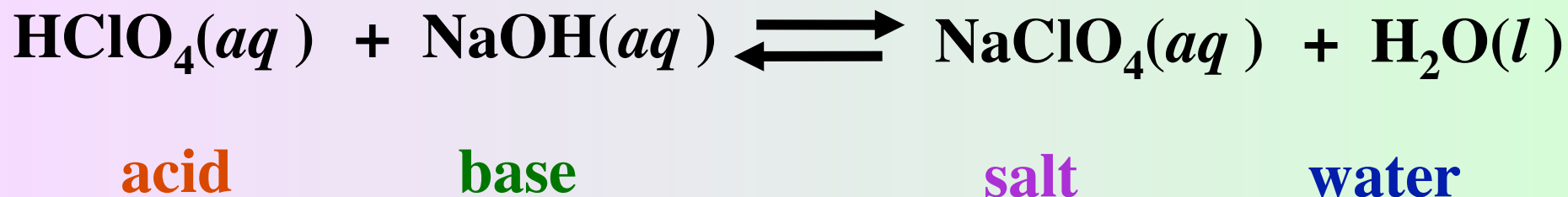


# **Some Typical Acid-Base Reactions**

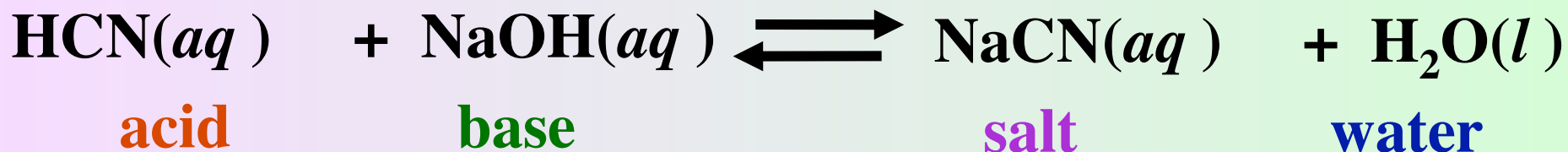
# Reactions of Strong Acids with Strong Bases



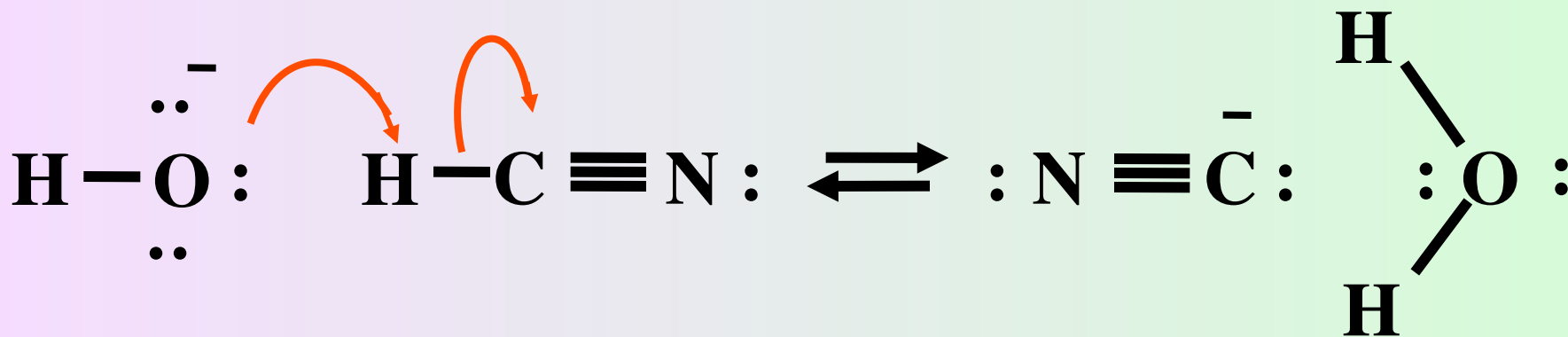
**Solution is neutral**



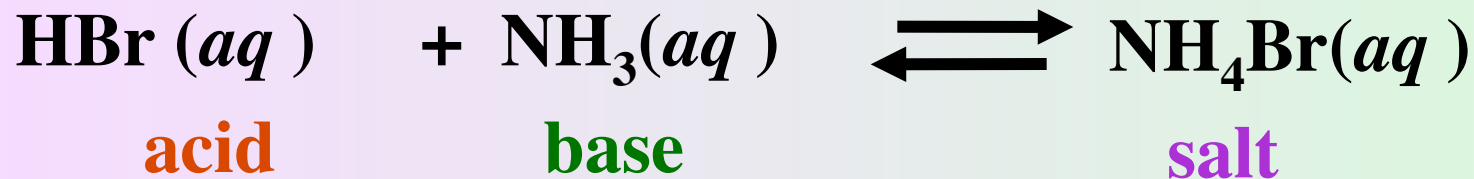
# Reactions of Weak Acids with Strong Bases



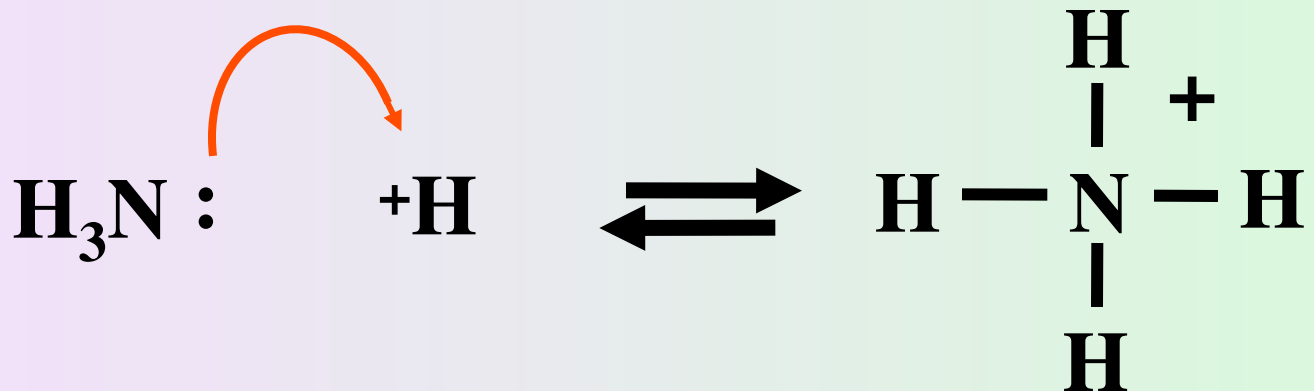
**Solution is basic**



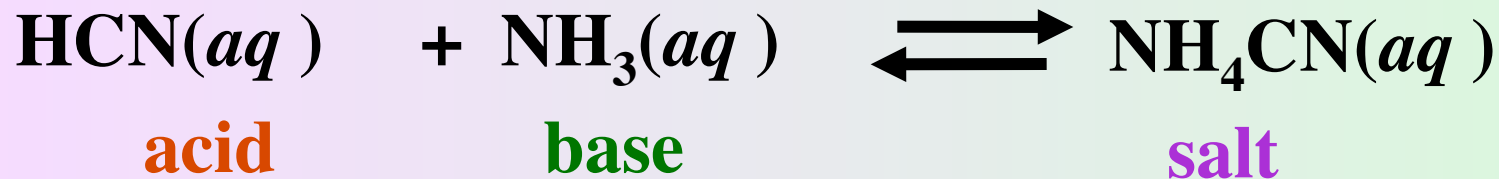
# Reactions of Strong Acids with weak Bases



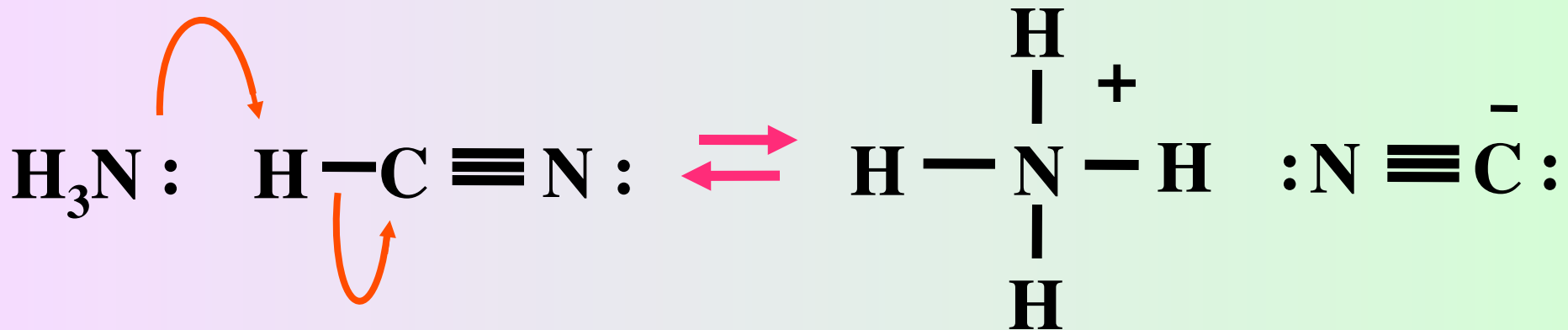
**Solution is acidic**



# Reactions of Weak Acids with Weak Bases



pH depends on the relative acid strengths of  $\text{NH}_4^+$  and  $\text{HCN}$



# **Acid-Base Properties of Oxides and Hydroxides**

# Acidic, Basic, and Amphoteric Oxides

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**Metallic oxides give basic solutions in water**

**react with acids**

**Oxides of nonmetals give acidic solutions in water**

**react with bases**

**Amphoteric oxides**

**react with both acids and bases**

# Acidic, Basic, and Amphoteric Oxides

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**Metallic oxides give basic solutions in water**



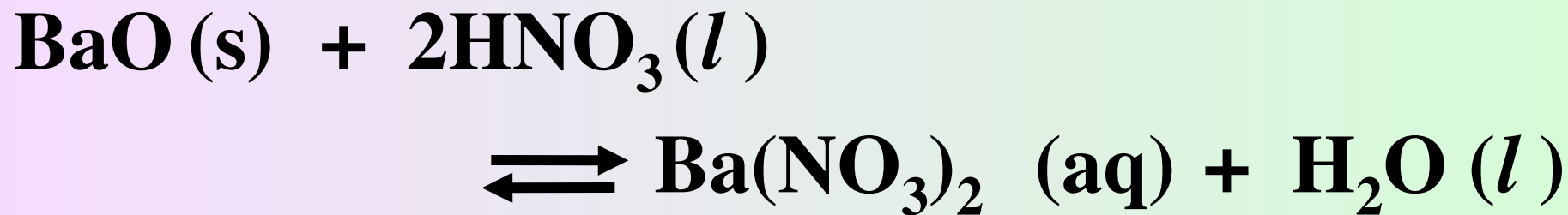


# Acidic, Basic, and Amphoteric Oxides

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**Metallic oxides give basic solutions in water**

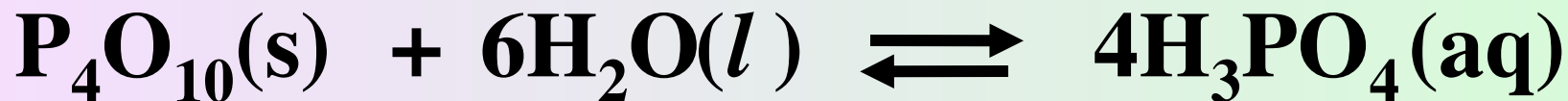
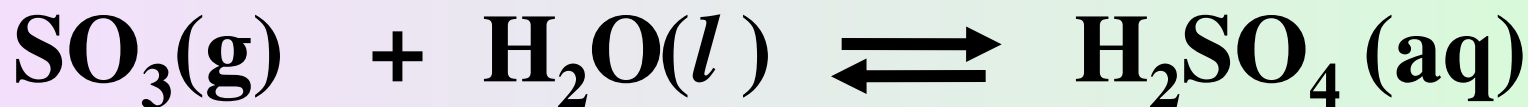
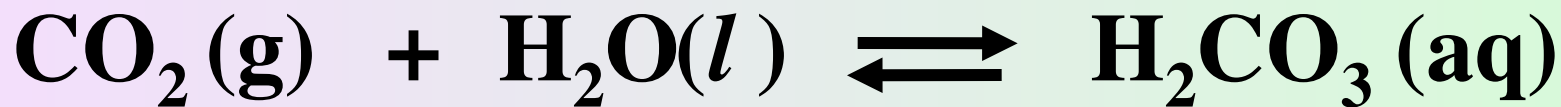
**react with acids**



# Acidic, Basic, and Amphoteric Oxides

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**Oxides of nonmetals give acidic solutions in water**

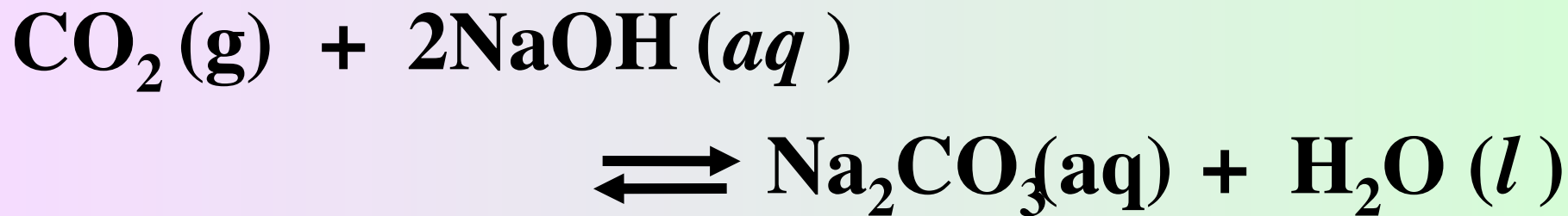


# Acidic, Basic, and Amphoteric Oxides

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Oxides of nonmetals give acidic solutions in water

react with bases

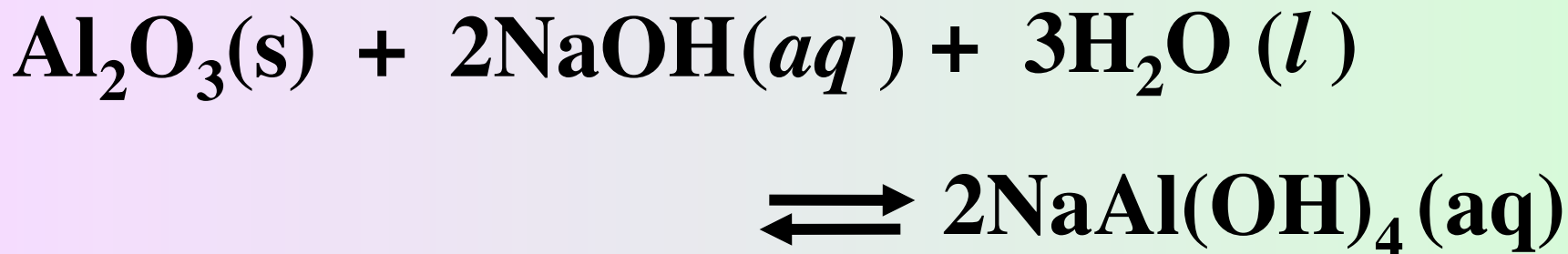
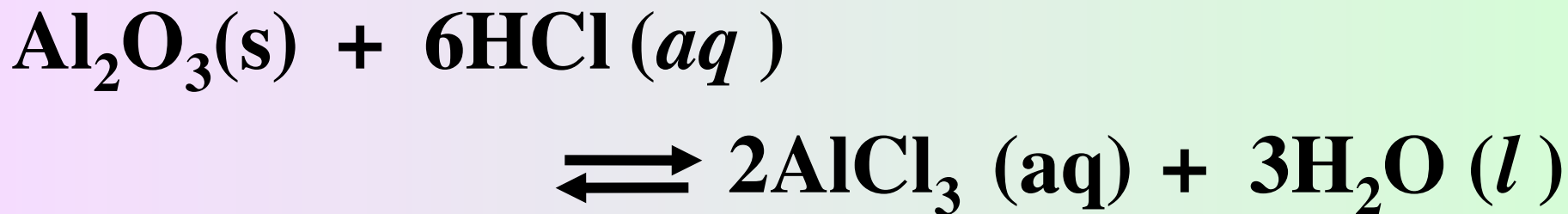


# Acidic, Basic, and Amphoteric Oxides

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## Amphoteric oxides

react with both acids and bases

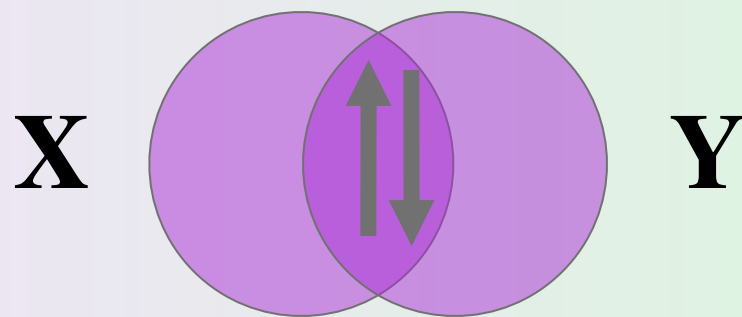
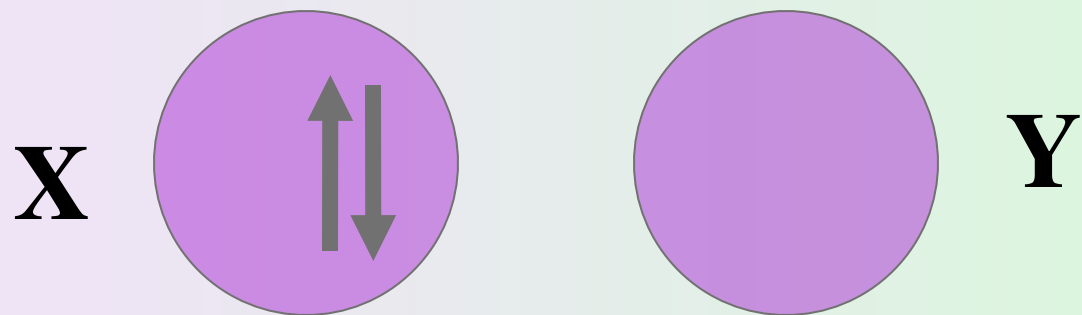


# **Lewis Acids and Bases**

# **Lewis definitions**

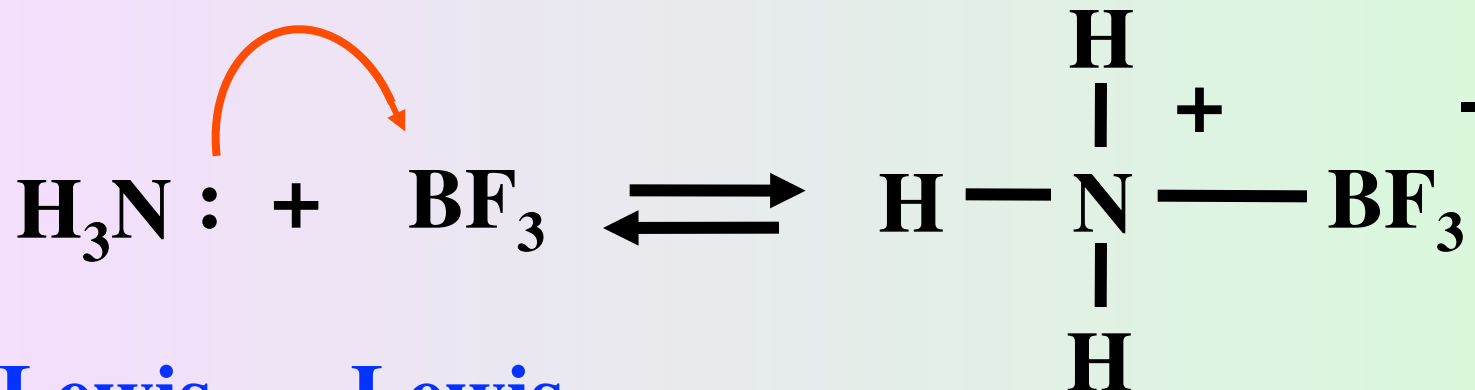
**an acid is an electron-pair acceptor**

**a base is an electron-pair donor**



**X — Y**

# Example

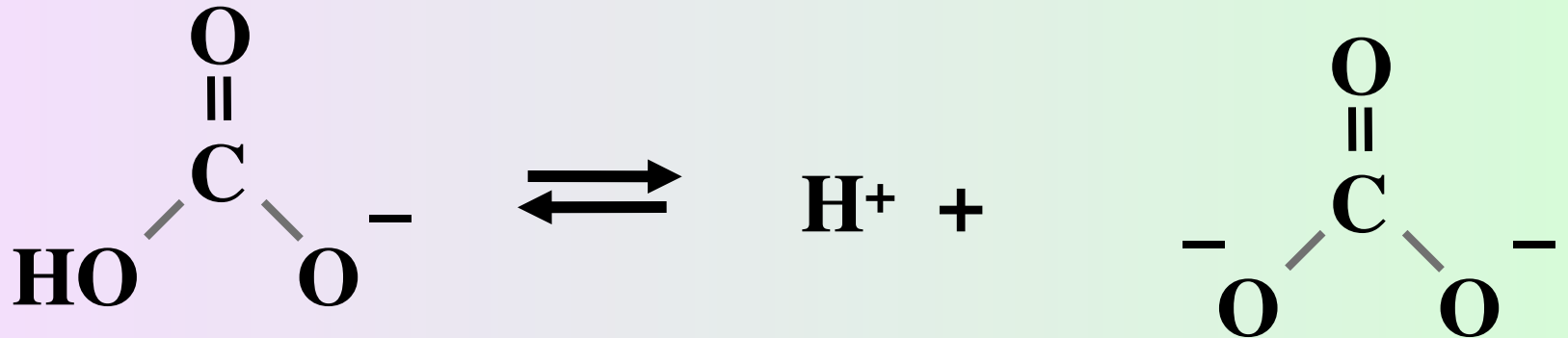
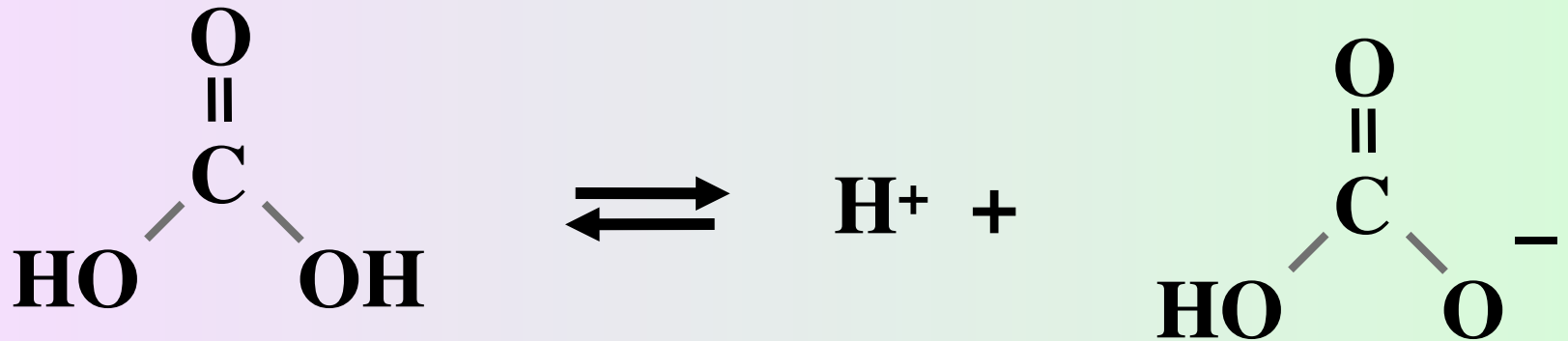
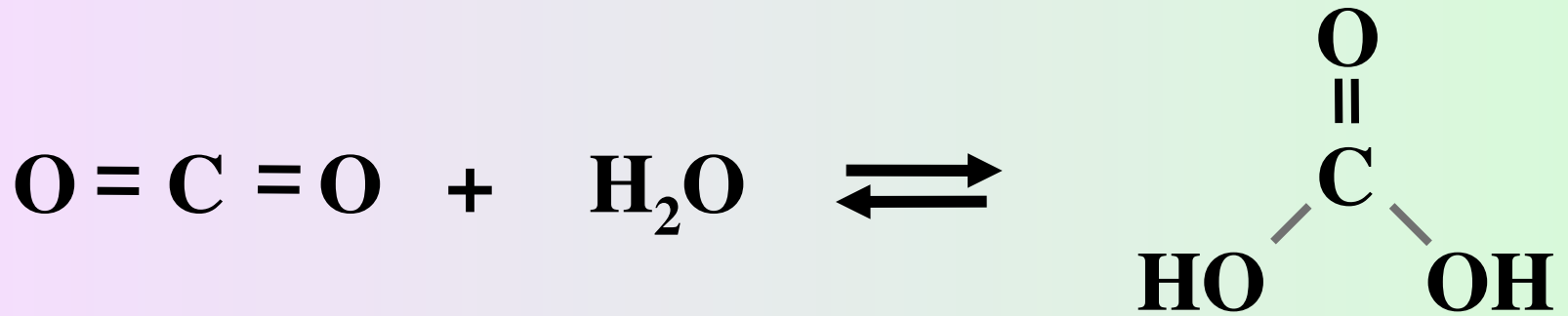


Lewis  
base

Lewis  
acid



# Carbonic acid



# Lewis Acid-Lewis Base

