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CONCEPT OF ACID AND BASE

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ACID

1. ARRHENIUS CONCEPT- an acid is ‘a substance which yields hydrogen ion (H⁺) in an aqueous medium’; and that of a base is ‘a substance which yields hydroxyl ions (OH⁻) in an aqueous medium’.
2. LOWRY AND BRONSTED’S THEORY

According to Lowry and Bronsted’s theory—‘an acid is a substance capable of yielding a proton (hydrogen ion), while a base is a substance capable of accepting a proton’. Thus, a complementary relationship exists between an acid and a base that may be expressed in a generalized fashion as below :





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CONJUGATE ACID-BASE PAIR- The pair of substances which by virtue of their mutual ability either gain or lose a proton is called a conjugate acid-base pair.

Examples are,

Acid	Base
HNO ₃	H ⁺ + NO ₃ ⁻
HCl	H ⁺ + Cl ⁻
CH ₃ COOH	H ⁺ + CH ₃ COO ⁻
NH ₄ ⁺	H ⁺ + NH ₃

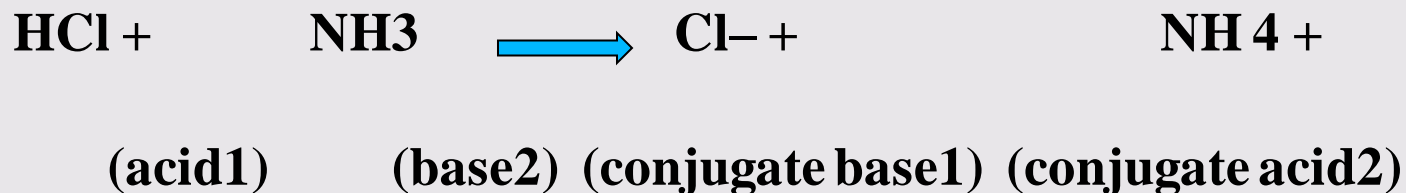
in a situation where actual acid-base behaviour exists then an interaction should involve two sets of conjugate acid-base pairs, represented as :





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The species which essentially differ from each other by one proton only, are known as conjugate base and acid respectively.

Demerits of Lowry- Bronsted Theory- It does not hold good for non protonic solvents, for instance : BF_3 , POCl_3 and SO_2 .

3. LEWIS'S THEORY –

According to Lewis—‘an acid is an electron pair acceptor, whereas a base is an electron pair donor’.

Eg- Boron trifluoride(acid) and Ammonia (base)



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4. USANOVICH THEORY- Usanovich (1934) modified the Lewis concept of acid and base According to him :

Acid : It is a chemical species that reacts with a base thereby giving up cations or accepting anions or electrons.

Base : It is a chemical species that reacts with an acid thereby giving up anions or electrons or combines with cations.

e.g, in the Cerous (III)—Ceric (IV) system, the ceric ion (IV) behaves as an oxidizing agent and acts as an acid ; while the cerous ion (III) behaves as a reducing agents and acts as a base.



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5. LUX-FLOOD CONCEPT –

- **The concept of acid-base reactions with respect to the oxide ion was first introduced by Lux (1929) and supported by Flood (1947).**
- **According to the Lux-Flood concept—‘an acid is the oxide-ion acceptor while a base is the oxide donor’. Examples : $\text{MgO} + \text{SiO}_2 \rightarrow \text{MgSiO}_3$ $\text{CaO} + \text{SO}_3 \rightarrow \text{CaSO}_4$**
- **In the above reactions both MgO and CaO are the oxide ion donor and hence act as bases, whereas SiO₂ and SO₃ are the oxide-ion acceptor and hence act as acids.**



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