

Comparing Conductivity in Acids, Bases, and Salts

- Acids start with “H”
- Salts: usually a Metal + a Polyatomic Ion or Metal + a Nonmetal - except ammonium salts, which start with NH_4
- Bases end in “OH”

Acids

- Strong acids are 100% ionized and are always Good Conductors
- Weak Molecular acids (Made of molecules with no charge) are less than 100% ionized so they are Poor Conductors (eg. H_2SO_3 , HNO_2 , HF , CH_3COOH etc.)
- Weak Molecular acids decrease in degree of ionization and decrease in conductivity as you move DOWN the table.
- Salts of Weak Acids (eg. NH_4NO_3 , NH_4Cl , NaHSO_4 etc.) are all Good Conductors because they are Soluble.

Bases

- Check solubility first (use Solubility Table, then K_{sp} Table if necessary),
- Soluble Hydroxides are Good Conductors.
- For Low Solubility hydroxides, Conductivity decreases when Molar Solubility decreases, (compare K_{sp} values: AB comp: $s = \sqrt{K_{\text{sp}}}$ AB₂ comp: $s = \sqrt[3]{\frac{K_{\text{sp}}}{4}}$)
- Hydroxides of Alkali Metals are always Soluble, Strong Bases, and Good Conductors (eg. NaOH , KOH , CsOH etc.).
- The Molecular Weak Base NH_3 is a Poor Conductor.
- $\text{Sr}(\text{OH})_2$ is Soluble so it is a Strong Base and a Good Conductor
- $\text{Sr}(\text{OH})_2$ dissociates to form 3 ions, whereas NaOH etc. dissociate to form 2 ions. So if concentrations are equal, $\text{Sr}(\text{OH})_2$ would be a Better Conductor.
- Low Solubility Bases like $\text{Mg}(\text{OH})_2$ are Poor Conductors.

Salts

- Check Solubility first (use Solubility Table, then K_{sp} Table if necessary).
- Soluble Salts are always Good Conductors. Salts with Low Solubility are Poor Conductors.
- In comparing a number of Soluble Salts (eg. NaCl, CaCl₂, FeCl₃), the more ions it dissociates into, the Better the Conductivity.
- In comparing a number of Salts with Low Solubility, the lower the Molar Solubility (s), the Lower the Conductivity. Use K_{sp} table: (compare K_{sp} values: AB comp: $s = \sqrt{K_{sp}}$ AB₂ comp: $s = \sqrt[3]{\frac{K_{sp}}{4}}$).
- Soluble salts of Ionic Weak acids are always Good Conductors, regardless of how weak or strong the ionic acid is.
For example: HSO₃⁻ and HCO₃⁻ are both weak acids on the table. HCO₃⁻ is weaker than HSO₃⁻. But it doesn't matter!
NaHSO₃ and NaHCO₃ are both soluble salts and dissociate to form ions, so NaHSO₃ and NaHCO₃ are both Good Conductors!
The acid NH₄⁺ is lower than H₂S on the table, but NH₄Cl is a Soluble Salt while H₂S is a Molecular Weak Acid. So NH₄Cl dissociates completely to form NH₄⁺ and Cl⁻ ions, but H₂S only ionizes partially, so NH₄Cl is a Good Conductor while H₂S is a Poor Conductor.