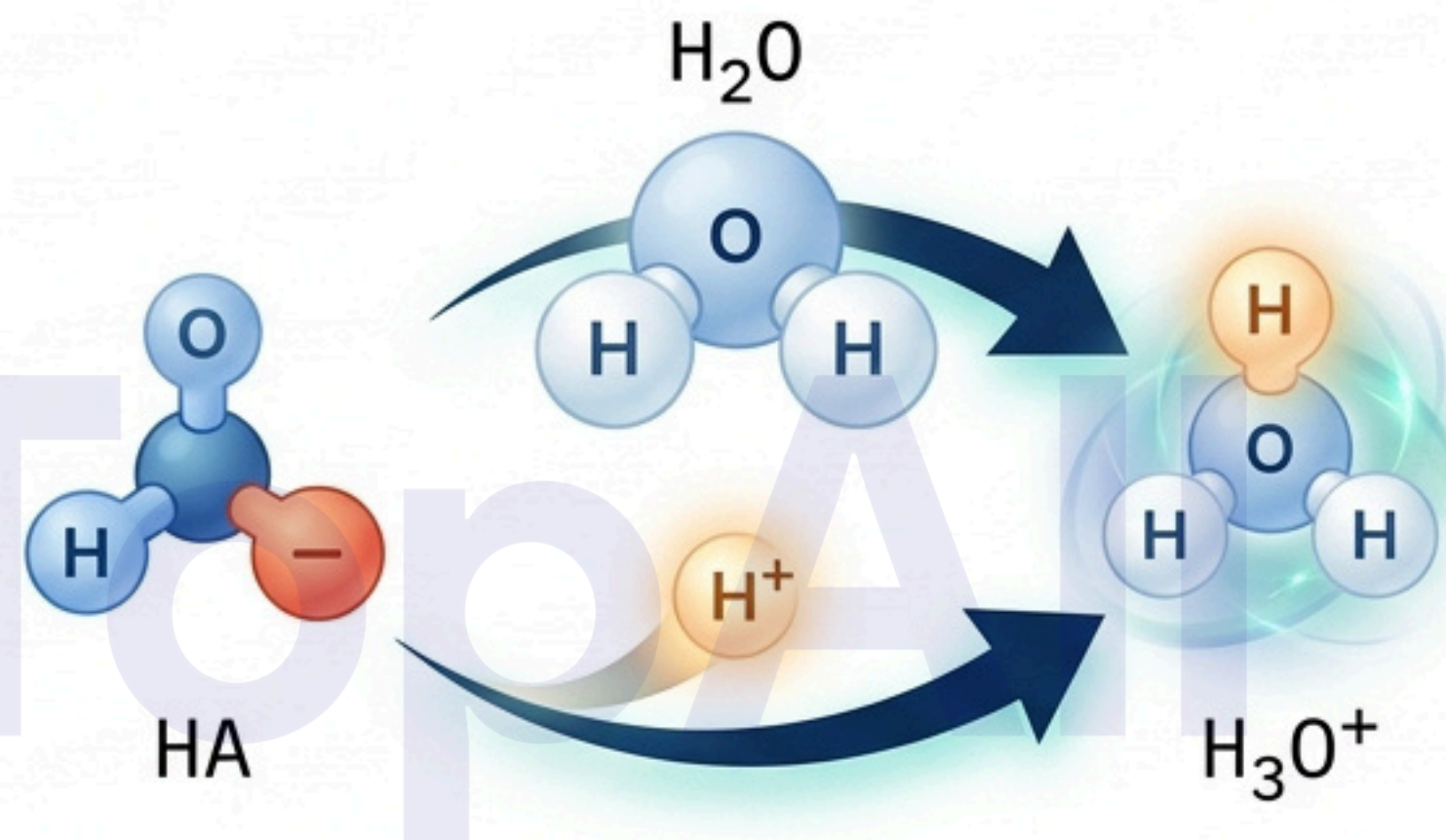


CLASS 11 CHEMISTRY • UNIT 6.11

Ionization of Acids and Bases

Understanding dissociation, dynamic equilibrium, and the logic of conjugate pairs.



Proton Transfer: Acid (HA) donates a proton (H^+) to water (H_2O), forming a hydronium ion (H_3O^+).

The One-Way Street: Strong Electrolytes

100% Yield



Donates 100% of protons.

HClO_4

HCl

HBr

HI

HNO_3

H_2SO_4

100% Yield



Yields 100% hydroxyl ions.

LiOH

NaOH

KOH

CsOH

$\text{Ba}(\text{OH})_2$



In strong acids and bases, the reaction proceeds nearly to completion.
The concentration of intact reactant molecules is negligible.

The Two-Way Street: Partial Ionization



The Mechanism

Molecules split into ions, but ions simultaneously recombine. Both opposing processes occur at the exact same rate.

The Reality

Most of the acid or base remains as intact, undissociated molecules in the solution.

Weak Acid: CH_3COOH (Acetic Acid)

HF (Hydrofluoric Acid)

Weak Base: NH_3 (Ammonia)



You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



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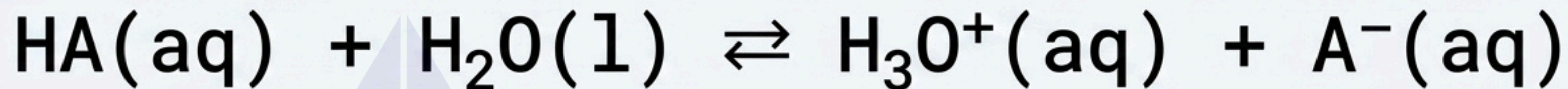
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Defining the Equilibrium Constant (K_a)



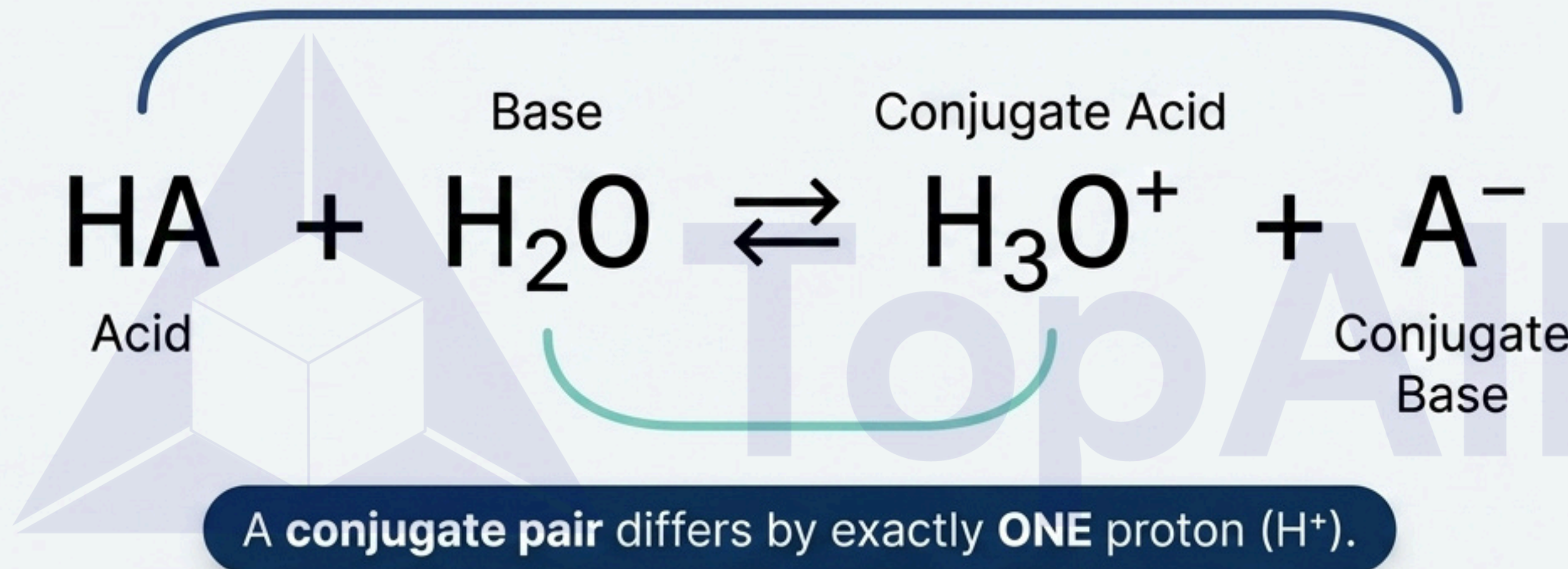

$$K_a = \frac{[\text{H}_3\text{O}^+][\text{A}^-]}{[\text{HA}]}$$

The Rule

At a given temperature, K_a measures **acid strength**.
The **larger** the K_a , the **stronger** the acid.

Note: Water (H_2O) is omitted from the denominator because it is a pure liquid and its concentration remains effectively constant.

The Conjugate Acid-Base Pairs



The Inverse Strength Law

If an acid is strong, its conjugate base is very weak (and vice-versa).

Example: Strong HCl creates the incredibly weak Cl^- base.

Which Way Will the Equilibrium Shift?



The Driving Force

- The stronger acid acts as a superior proton donor.
- It outcompetes the weaker acid, forcing the reaction to move.

Equilibrium ALWAYS shifts away from the stronger species and toward the formation of the weaker acid/base pair.

The Extent of Ionization



	Strong Electrolytes	Weak Electrolytes
Dissociation	~100% (One-way →)	< 5% (Dynamic ⇌)
K_a Value	Exceptionally High	K_a Very Low
Conjugate Pairs	Produces highly stable, weak conjugates	Produces reactive, strong conjugates
Equilibrium Shift	Pushes entirely to products	Heavily favors intact reactants



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