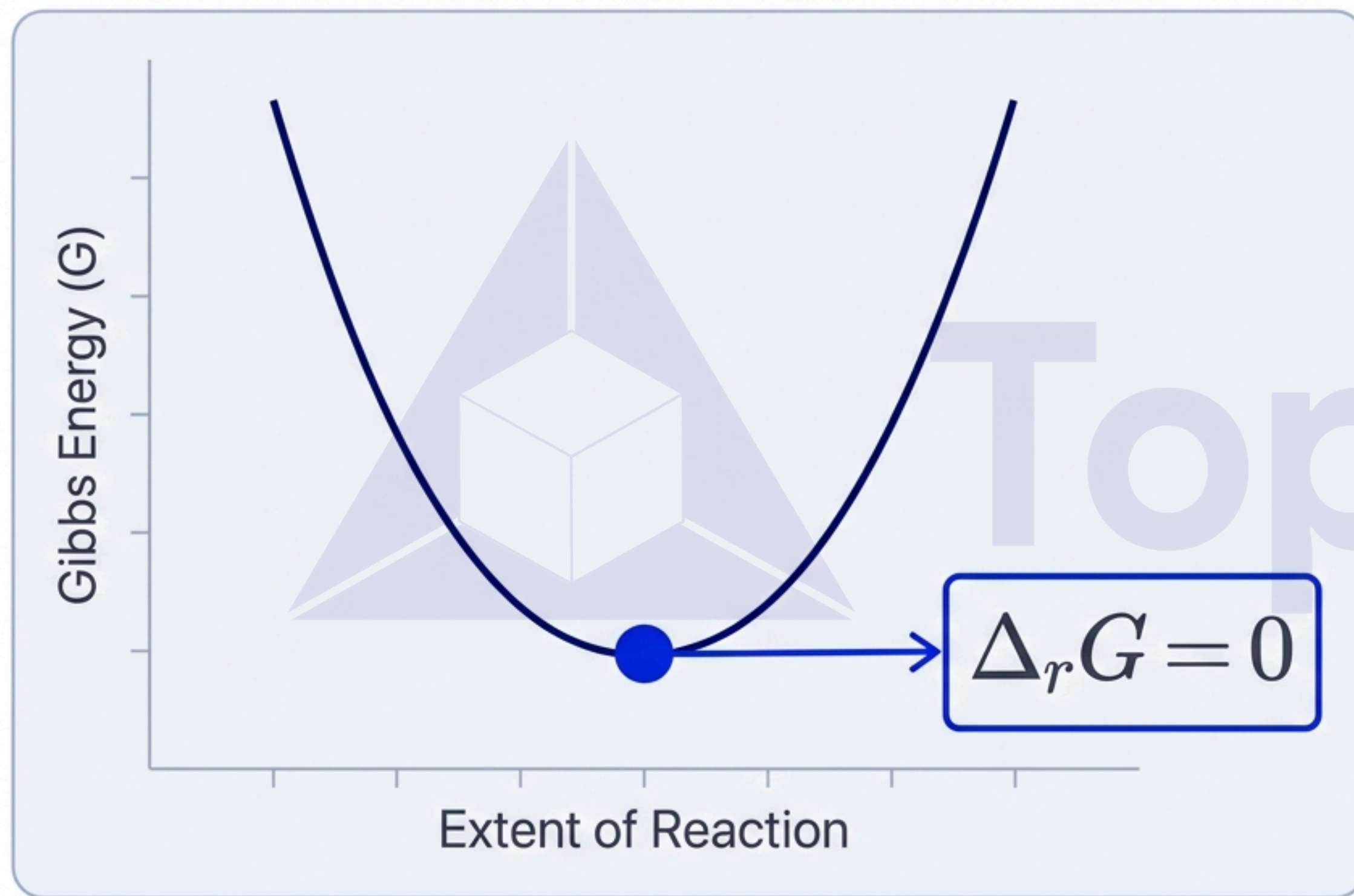


**WHERE DOES A SPONTANEOUS
REACTION STOP?**



Equilibrium: Reaching the Minimum



Gibbs-energy curve moves toward minimum. At equilibrium, the system can extract no further useful work.

Standard Gibbs Energy

Start (At equilibrium, $\Delta_r G = 0$)

$$0 = \Delta_r G^\circ + RT \ln K$$

Rearrange (The Natural Log form)

$$\Delta_r G^\circ = -RT \ln K$$

Base-10 (The Calculation form)

$$\Delta_r G^\circ = -2.303RT \log K$$



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

$$E=mc^2$$



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Read K Without Calculation

$$K > 1$$

$$\Delta G^\circ < 0$$

Products favoured
(Exothermic tendency)

$$K = 1$$

$$\Delta G^\circ = 0$$

Perfect baseline
equilibrium

$$K < 1$$

$$\Delta G^\circ > 0$$

Reactants favoured
(Endothermic tendency)

High-Frequency Exam Errors

JEE TRAP ALERT



Assuming $\Delta G^\circ = 0$ for every equilibrium situation.



At equilibrium, $\Delta G = 0$.
Do not confuse the two.

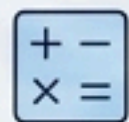
Calculation Vigilance Check



Temperature **MUST** be in Kelvin.



$R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ — convert ΔG° between J vs kJ.



Did you use **ln** (use **R**) or **log** (use **2.303R**)?

Final Chapter Revision: The Formula Stack



$$\Delta U = q + w$$

$$H = U + pV$$

$$\Delta H = \Delta U + \Delta n_g RT$$

$$\Delta S = \frac{q_{rev}}{T}$$

$$\Delta G = \Delta H - T\Delta S$$

$$\Delta S = P \vee q$$

$$\Delta G^\circ = -RT \ln K$$



You've Learned the Theory.

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