

Competition Corner: Model Selection Across Topics

Optional Extension | g10_u09_w33

Use only the fictional cards: $\text{H}_2 = 0.50$ mol, $\text{O}_2 = 0.30$ mol for $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$; $\Delta H = +50$ kJ; $Q = 0.50$, $K = 2.0$; pH 3.00; and $E^\circ_{\text{cell}} = +1.10$ V. Each result remains bounded to its own printed model.

1. Use the equation card to find the percent of the supplied O_2 consumed: $0.25/0.30 \times 100\%$.
2. The energy card assigns +100 kJ to twice the reaction amount. What amount is assigned to three times the reaction amount? State the proportional-card assumption.
3. Explain why product direction from $Q < K$ and positive E°_{cell} are not interchangeable statements, even though both use signs/comparisons.
4. Write the narrowest two-model conclusion using pH 3.00 and the kinetics-card factor change. Include one explicit limit.

Key. 1. 83.3% of supplied O_2 is consumed in the equation model. 2. +150 kJ, assuming the stated idealized proportional card. 3. Q/K assigns equilibrium direction; cell potential is an electrochemical potential calculation. Neither gives rate, safety, or a product conclusion. 4. Example: the pH card gives 1.0×10^{-3} M hydronium and the fixed-condition kinetics card pairs a factor-2 concentration change with a factor-2 rate change; neither identifies all solutes or supplies a general rate law.