Chemical Equilibrium, Q & K

STUDENT PRACTICE WORKSHEET

Name: _____ Date: _____

Directions: Circle the best answer for 1–6. Show your full reasoning and units for 7–8. Compare with the separate key after completing the page.

Part A — Concept checks

1. **At chemical equilibrium the forward and reverse rates are…**

   A. both zero B. equal C. always increasing D. unrelated

2. **If Q < K, the reaction has a net tendency to shift…**

   A. left B. right C. nowhere D. only if catalyzed

3. **For A ⇌ 2 B, the expression for Kc is…**

   A. [A]/[B] B. [B]/[A] C. $[B]^2/[A]$ D. $[A]^2/[B]$

4. **Which species is omitted from a Kc expression?**

   A. $O_2(g)$ B. $H_2(g)$ C. $H_2O(g)$ D. $CaCO_3(s)$

5. **Does a catalyst change K at a fixed temperature?**

   A. yes, always increases B. yes, always decreases C. no D. only for endothermic reactions

6. **If Q > K, the net reaction tends toward…**

   A. more reactants B. more products C. no change ever D. infinite rate

Part B — Application and explanation

7. For 2 $NO_2(g) \rightleftharpoons N_2O_4(g)$, $[N_2O_4] = 0.040$ M and $[NO_2] = 0.020$ M at equilibrium. Find Kc.

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8. Explain why this guideline matters, with an example of what could go wrong if you ignore it: A catalyst helps equilibrium be reached more quickly but does not change K or the final equilibrium composition at fixed temperature.

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REFERENCE RELATIONSHIP

for aA + bB ⇌ cC + dD, Kc = [C]^c[D]^d / ([A]^a[B]^b)