ANSWER KEY.

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7.5 Magnitude of the Equilibrium Constant

AP Chemistry | ANSWER KEY

K > 1: products favored. K < 1: reactants favored. K close to 1: similar amounts. Justify with "Because K is ___ than 1, ..."

1. For each K, are reactants or products favored? Justify each answer.

(a) $K = 3.4 \times 10^{12}$

Products. Because K is much greater than 1, the mixture is almost all product (essentially complete).

(b) $K = 0.95$

Neither strongly. Because K is close to 1, reactants and products are present in similar amounts, with slightly more reactant.

(c) $K = 6.1 \times 10^{-9}$

Reactants. Because K is much less than 1, the mixture is mostly reactant.

2. For $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$, $K = 1.0 \times 10^{-30}$ at 25 °C. Air is mostly N_2 and O_2. Does air at 25 °C contain much NO? Explain.

No. Because K is far less than 1, almost no NO forms at equilibrium. There is a tiny amount, but not zero.

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3. For A ⇌ B, K = 0.25. At equilibrium [A] = 0.40 M. Find [B].

K = [B]/[A], so [B] = (0.25)(0.40) = 0.10 M

4. For A ⇌ B, K = 1.0. A flask starts with 2.0 M A. Find [A] and [B] at equilibrium.

[A] + [B] = 2.0 and [B]/[A] = 1.0, so [A] = [B] = 1.0 M

5. Three reactions have the form X ⇌ Y: $K_1 = 2.0 \times 10^{-4}$, $K_2 = 15$, $K_3 = 8.0 \times 10^{5}$. Rank them from smallest to largest [Y]/[X] at equilibrium.

Reaction 1 < Reaction 2 < Reaction 3. For X ⇌ Y, [Y]/[X] equals K.

6. A student says a reaction with $K = 5.0 \times 10^{-4}$ must be very slow. Is that correct?

No. K tells how far a reaction goes (the mixture at equilibrium), not how fast it gets there. Speed depends on kinetics, like activation energy.

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