NAME: HONORS CHEMISTRY

SECTION: The Reaction Quotient

It's easy to calculate the Q, the ratio of reactants to products, based on the equilibrium constant expression, in a reversible reaction *at a particular moment* (not necessarily at equilibrium). Q is called the "reaction quotient," and it takes the same form as the equilibrium constant expression. By comparing the calculated value of Q to the accepted value for K_{eq}, it is possible to predict in which direction the system will move to achieve equilibrium. (Note: Q can have any value, but K is fixed!)

If $Q < K$ too many reactants; the reaction will shift "right"
If $Q > K$ too many products; the reaction will shift "left"
If $Q = K$ the system is already at equilibrium; no shift

Consider the reaction: $N_2 + 3\ H_2 \leftrightarrow 2\ NH_3$

Write the equilibrium-constant expression:

At 500°C, the value of $K_{eq} = 6.0 \times 10^{-2}$

Predict the direction in which the system will shift to reach equilibrium in each of the following cases:

a) $[NH_3] = 1.0 \times 10^{-3}$ M $[N_2] = 1.0 \times 10^{-5}$ M $[H_2] = 2.0 \times 10^{-3}$ M

First calculate Q:

then compare Q to K:

Conclusion: ____

b) $[NH_3] = 2.00 \times 10^{-4}$ M $[N_2] = 1.50 \times 10^{-5}$ M $[H_2] = 3.54 \times 10^{-1}$ M

Conclusion: ____

c) $[NH_3] = 1.0 \times 10^{-4}$ M $[N_2] = 5.0$ M $[H_2] = 1.0 \times 10^{-2}$ M

Conclusion: ____