Chemical Equilibrium

#3

For the reaction

$2\ NH_{3(g)} \rightleftharpoons N_{2(g)} + 3\ H_{2(g)}$

$K_c = 17$ at a certain temperature.

Suppose following initial concentrations:

$$[NH_3]_o = 0.200\ \frac{mol}{L} \qquad [N_2]_o = 1.000\ \frac{mol}{L} \qquad [H_2]_o = 1.000\ \frac{mol}{L}$$

a. Calculate the concentration quotient.

b. In which sense does the reaction occur?

Solution

a.

$$Q = \frac{\left[N_{2(g)}\right]^1 \times \left[H_{2(g)}\right]^3}{\left[NH_{3(g)}\right]^2} = \frac{(1.000)\times(1.000)^3}{(0.200)^2} = 25$$

b.

Q differs from K_c. So there is no equilibrium.

Q (25) is a little bit too large (K_c =17) to have equilibrium.
So the reaction occurs in that sense so that Q decreases.
Reaction to the left.