NON-EQUILIBRIUM REACTION QUOTIENT

NAME _____ SECTION _____

1. The reaction

$$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$$

occurs in a 1.0 L container at a given temperature. Initially the concentration of $[H_2]$ and $[I_2]$ are both 0.350 M. In the table below are the results of 6 successive measurements where the concentration of each species in the reaction is provided.

Measurement #	$[H_2]$ (M)	$[I_2]$ (M)	[HI] (M)	ratio $[HI]^2/[H_2][I_2]$
1	0.350	0.350	0	0
2	0.255	0.255	0.190	
3	0.155	0.155	0.390	
4	0.0900	0.0900	0.520	
5	0.0775	0.0775	0.545	
6	0.0775	0.0775	0.545	

Calculate the magnitude of the reaction quotient, $\frac{[HI]^2}{[H_2]\,[I_2]}$ for each measurement and enter the value into the appropriate cell in the table above. (Show at least one of the calculations here.)

a. What is happening to the value of the reaction quotient moving from Exp. #1 to Exp. #5?

b. For Exp. #4 what is the concentration of H_2 and I_2 reacting?

c. For Exp. #4 what is the concentration of HI formed?

d. Explain the relationship between the concentration of H_2 and I_2 reacting and the concentration of HI forming.

e. What is happening in Exp. #5 and #6?

f. What is the magnitude of the equilibrium constant for this reaction?

g. If an Exp. #7 and an Exp. #8 were performed, what would you expect the reaction quotient to be?

2. The reaction

$$NOBr(g) \rightleftharpoons NO(g) + \tfrac{1}{2}Br_2(g)$$

has been carefully studied at 350 °C and the K_c is 0.079. Which direction will the reaction proceed to establish equilibrium under each of the following initial conditions?

a. $[NOBr]_o = 0.100\ M : [NO]_o = 0 : [Br_2]_o = 0$

b. $[NOBr]_o = 0 : [NO]_o = 0.100\ M : [Br_2]_o = 0.100\ M$

c. $[NOBr]_o = 0.100\ M : [NO]_o = 0 : [Br_2]_o = 0.100\ M$

d. $[NOBr]_o = 0.100\ M : [NO]_o = 0.100\ M : [Br_2]_o = 0.100\ M$

e. $[NOBr]_o = 0.200\ M : [NO]_o = 0.0500\ M : [Br_2]_o = 0.100\ M$