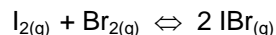


## Equilibrium Problems - Set IV

1. When 3.0 moles of  $I_2$  and 4.0 moles of  $Br_2$  are placed in a 2.0 liter vessel at  $150^\circ C$ , the following reaction occurs until equilibrium is reached:

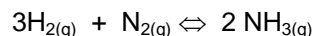


Chemical analysis shows that the vessel contains 3.2 moles of  $IBr$ . Calculate the  $K$  for this equilibrium system. (3.05)

2. At a certain temperature the reaction  $CO_{(g)} + Cl_{2(g)} \rightleftharpoons COCl_{2(g)}$  has an equilibrium constant ( $K$ ) of 13.8. Is the following mixture an equilibrium mixture? If not, in which direction (forward or reverse) will the reaction proceed to reach equilibrium? (forward)

$$[CO]_i = 2.5 \text{ M} \quad [Cl_2]_i = 1.2 \text{ M} \quad [COCl_2]_i = 5.0 \text{ M}$$

3. When 6 moles of  $H_2$  and 6 moles of  $N_2$  are placed in a 3 L vessel at  $400^\circ C$ , the following reaction occurs until equilibrium is obtained:



Upon analysis it was found that 3 moles of  $NH_3$  are present at equilibrium. What is the value of  $K$  for this equilibrium system? (5.33)

4. The reaction  $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$  has the equilibrium constant value  $K = 0.24$  at  $300^\circ C$ .

(a) Is the following reaction mixture at equilibrium:  $[PCl_5] = 2.6 \text{ M}$ ;  $[PCl_3] = 0.5 \text{ M}$ ;  $[Cl_2] = 0.5 \text{ M}$ ? (no)

(b) Predict the direction in which the system will react to reach equilibrium. (forward rx)

5. At  $400^\circ C$ ,  $K = 64$  for the equilibrium  $H_{2(g)} + I_{2(g)} \rightleftharpoons 2 HI_{(g)}$

If 1.0 mol of  $H_2$  and 2.0 mol of  $I_2$  are introduced into an empty 0.5 L vessel, find the equilibrium concentrations of all components at  $400^\circ C$ . (.11M ; 2.11M ; 3.78M)