

#10, 13, 14, 17, 18, 20, 21, 22, 23, 25, 29, 39



- 10) a) Red ~ NH₃, Green ~ H₂, Blue ~ N₂
- b) . H₂ decreases more than N₂ (3:1 ratio)
 . plots increase/decrease as RXN proceeds
- c) once they all plateau they are at equilibrium
- 13) K much greater than 1 ($K \gg 1$) means large concentrations of products; this RXN is a good source of products
- 14) K much less than 1 ($K \ll 1$) means large concentrations of reactants; this RXN is a poor source of products
- 17) K + K_p are equilibrium constants (K is mol/L); (K_p is atm)
 generally

Q is reaction quotient, Q is exactly the same as K or K_p but instead of equil. concentrations, uses initial concentrations

Q = K then @ equil. (or if Q_p = K_p)

- 18) $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$ $K = \frac{[\text{HI}]^2}{[\text{H}_2][\text{I}_2]}$ 1) different K expressions
 2) 1st K = K_p 2nd K ≠ K_p
- $\text{H}_2(\text{g}) + \text{I}_2(\text{s}) \rightleftharpoons 2\text{HI}(\text{g})$ $K = \frac{[\text{HI}]^2}{[\text{H}_2]}$ 3) change volume effects only
 RXN 1

20) a) TRUE ONLY if solids + liquids or False (solids + liquids don't affect equil.)

b) K is constant unless temp. changes

c) False, depends if endo- or exo-thermic

d) False since depends on moles of gases on each side

e) TRUE

21) a) $K = \frac{[NO]^2}{[N_2][O_2]}$

b) $K = \frac{[NO_2]^2}{[N_2O_4]}$

c) $K = \frac{[SiCl_4][H_2]^2}{[SiH_4][Cl_2]^2}$

d) $K = \frac{[PCl_3]^2 [Br_2]^3}{[PBr_3]^2 [Cl_2]}$

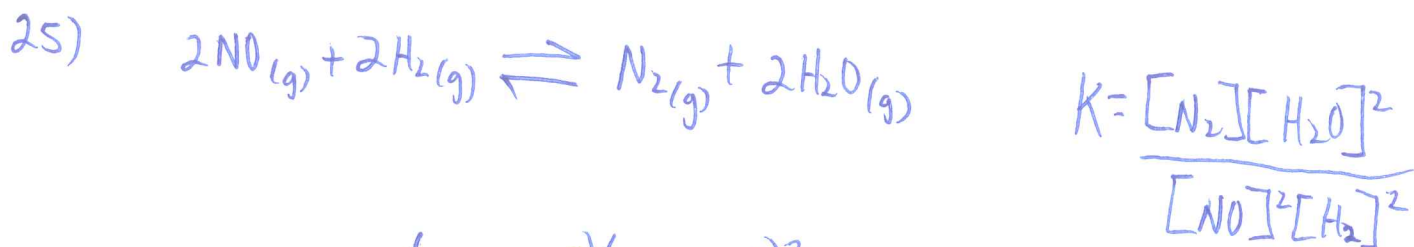
22) a) $K_p = \frac{(P_{NO})^2}{(P_{N_2})(P_{O_2})}$

b) $K_p = \frac{(P_{NO_2})^2}{(P_{N_2O_4})}$

c) $K_p = \frac{(P_{SiCl_4})(P_{H_2})^2}{(P_{SiH_4})(P_{Cl_2})^2}$

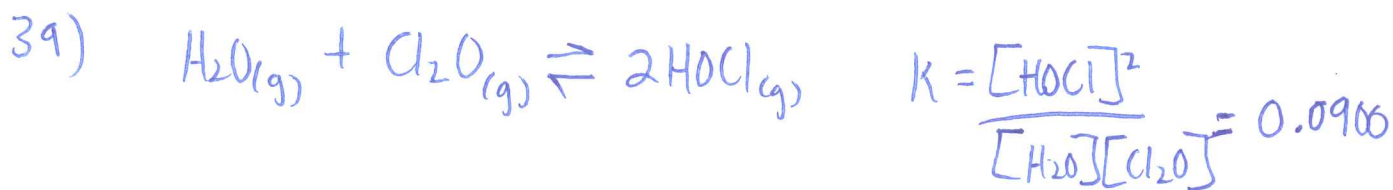
d) $K_p = \frac{P_{PCl_3}^2 \times P_{Br_2}^3}{P_{PBr_3}^2 \times P_{Cl_2}^3}$

23) IN CLASS



$$K = \frac{(5.3 \times 10^{-2})(2.9 \times 10^{-3})^2}{(8.1 \times 10^{-3})(4.1 \times 10^{-5})^2} = \boxed{4.0 \times 10^6}$$

29) $K_p = \frac{P_{\text{NO}}^2 \times P_{\text{O}_2}}{P_{\text{NO}_2}^2} = \frac{(6.5 \times 10^{-5})^2 (4.5 \times 10^{-5})}{(0.55)^2} = \boxed{6.3 \times 10^{-13}}$



$Q = K$ (equil.) $Q > K$, shift left $Q < K$, shift right

a) $Q = \frac{[\text{HOCl}]_0^2}{[\text{H}_2\text{O}]_0 [\text{Cl}_2\text{O}]_0} = \frac{\left(\frac{1.0 \text{ mol}}{1.0 \text{ L}}\right)^2}{\left(\frac{0.10 \text{ mol}}{1.0 \text{ L}}\right) \left(\frac{0.10 \text{ mol}}{1.0 \text{ L}}\right)} = 1.0 \times 10^2$ $Q > K$ shift left

b) $Q = \frac{\left(\frac{0.084 \text{ mol}}{2.0 \text{ L}}\right)^2}{\left(\frac{0.98 \text{ mol}}{2.0 \text{ L}}\right) \left(\frac{0.080 \text{ mol}}{2.0 \text{ L}}\right)} = 0.090 = K$, @ equil.

c) $Q = \frac{\left(\frac{0.25 \text{ mol}}{3.0 \text{ L}}\right)^2}{\left(\frac{0.56 \text{ mol}}{3.0 \text{ L}}\right) \left(\frac{0.0010 \text{ mol}}{3.0 \text{ L}}\right)} = 110$ $Q > K$, shift left