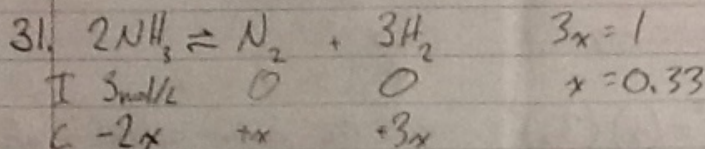
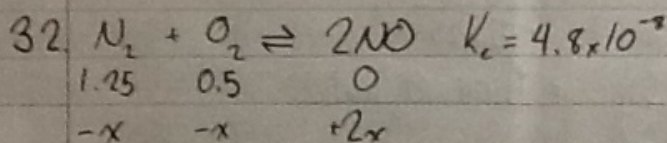


Problems



4/4 E 2.34 mol/L 0.33 mol/L 1 mol/L

$$K_c = \frac{[\text{N}_2][\text{H}_2]^3}{[\text{NH}_3]^2} = \frac{(0.33)(1)^3}{(2.34)^2} = 0.0603$$



4/4
$$K_c = 4.8 \times 10^{-8} = \frac{(2x)^2}{(1.25-x)(0.5-x)}$$

$$4.8 \times 10^{-8} = \frac{4x^2}{0.625}$$

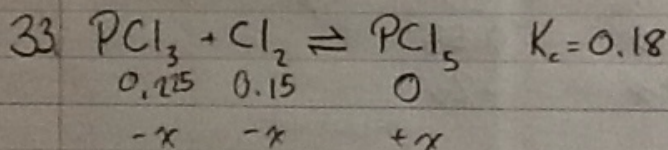
$$4x^2 = 3 \times 10^{-8}$$

$$x = 8.66 \times 10^{-5}$$

$$\therefore [\text{N}_2] = 1.2499 \text{ mol/L}$$

$$[\text{O}_2] = 0.4999 \text{ mol/L}$$

$$[\text{NO}] = 1.73 \times 10^{-4}$$



4/4
$$K_c = 0.18 = \frac{x}{(0.275-x)(0.15-x)}$$

$$x = (0.03375 - 0.375x + x^2)(0.18)$$

$$x = 0.006075 - 0.0675x + 0.18x^2$$

$$0 = 0.006075 - 1.0675x + 0.18x^2$$

$$x = \frac{1.0675 \pm \sqrt{1.0675^2 - 4(0.18)(0.006075)}}{2(0.18)}$$

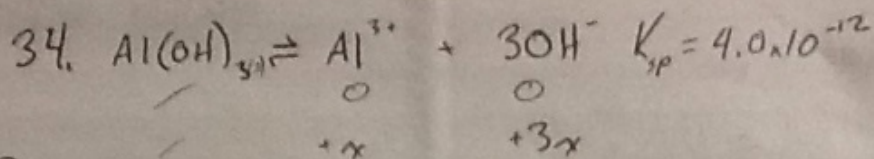
$$= \frac{1.0675 \pm 1.0634}{0.36}$$

$$= 5.925 \text{ or } 0.00583$$

$$\therefore [\text{PCl}_3] = 0.219 \text{ mol/L}$$

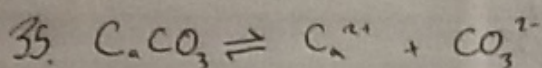
$$[\text{Cl}_2] = 0.144 \text{ mol/L}$$

$$[\text{PCl}_5] = 0.00583 \text{ mol/L}$$



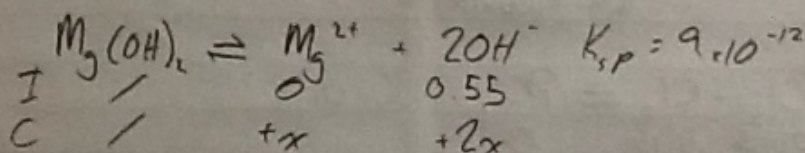
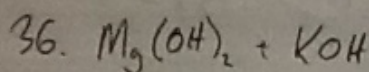
3/
3 $K_{sp} = 4 \times 10^{-12} = (x)(3x)^3$ \therefore the molar solubility of $\text{Al}(\text{OH})_3$ is $6.2 \times 10^{-4} \text{ mol/L}$

$4 \times 10^{-12} = 27x^4$
 $x = 6.2 \times 10^{-4}$



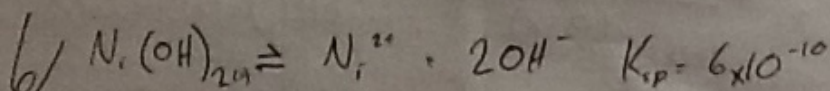
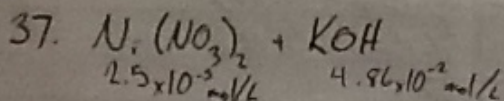
2.5/
3 $n = \frac{m}{M} = \frac{5.6 \times 10^{-5}}{0.025} = 1.26 \times 10^{-4}$

$\frac{1.26 \times 10^{-4}}{0.025} = 5.04 \times 10^{-3} \text{ mol/L}$
 $K_{sp} = [\text{Ca}^{2+}][\text{CO}_3^{2-}] = (5.04 \times 10^{-3})^2 = 2.54 \times 10^{-5}$



3/
3 $K_{sp} = 9 \times 10^{-12} = (x)(0.55 + 2x)^2$ \therefore the solubility of $\text{Mg}(\text{OH})_2$ is $2.975 \times 10^{-11} \text{ mol/L}$

$9 \times 10^{-12} = (x)(0.55)^2$
 $x = 2.975 \times 10^{-11}$



6 $[\text{Ni}(\text{NO}_3)_2] = [\text{Ni}^{2+}] = 2.5 \times 10^{-3} \times \frac{845}{1040} = 2.03 \times 10^{-3} \text{ mol/L}$

$[\text{KOH}] = [\text{OH}^-] = 4.86 \times 10^{-2} \times \frac{145}{1040} = 9.11 \times 10^{-3} \text{ mol/L}$

$Q = (2.03 \times 10^{-3})(9.11 \times 10^{-3})^2 = 1.69 \times 10^{-9}$

$\therefore Q > K$, a precipitate will form

$$38. \Delta H_f^\circ = [-393.5] + 2(-45.9) - [(-333.5) + (-285.8)]$$

$$= 134 \text{ kJ}$$

$$\Delta S^\circ = [213.78 + 2(192.78)] - [104.6 + 69.95]$$

$$= 424.79 \text{ J/K}$$

$$= 0.42479 \text{ kJ/K}$$

$$\Delta G = \Delta H_f^\circ - T \Delta S^\circ$$

$$= 134 - (298)(0.42479)$$

$$= 7.41$$

No, the reaction will not be spontaneous at SATP. It would need a higher temp. to be spontaneous in the forward direction.