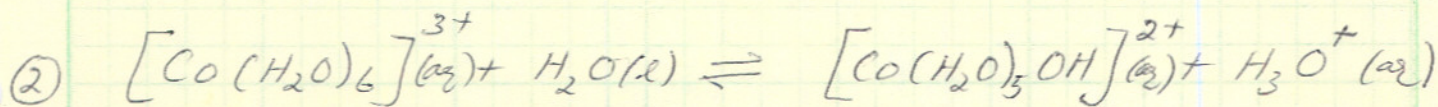
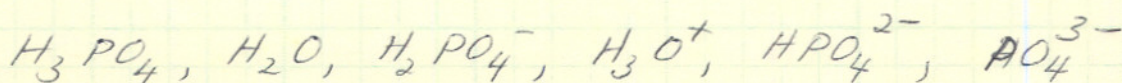
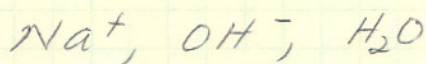
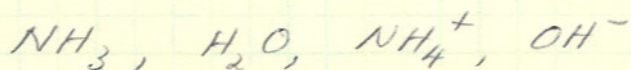
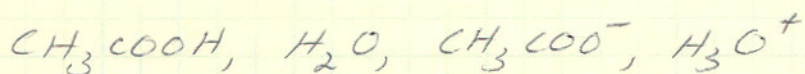
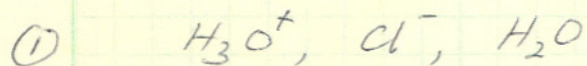


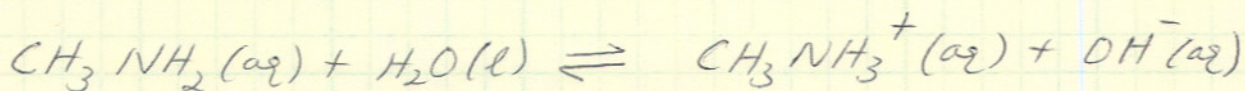
Introduction to Natural Science

Spring Quarter, Week 5, Chemistry Workshop

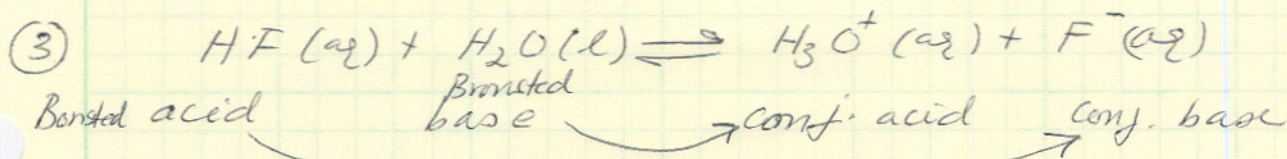
Answer Key



$$K_a = \frac{[Co(H_2O)_5OH]^{2+}_{aq} [H_3O^+]_{aq}}{[Co(H_2O)_6]^{3+}_{aq}}$$



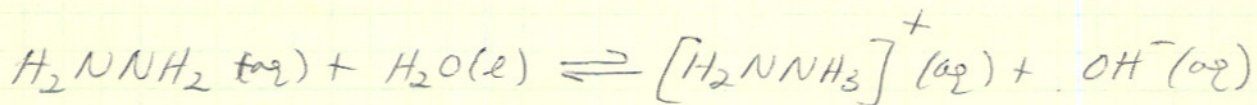
$$K_b = \frac{[CH_3NH_3^+]_{aq} [OH^-]_{aq}}{[CH_3NH_2]_{aq}}$$





$$x = 2.11 \times 10^{-3} = [\text{H}_3\text{O}^+]$$

$$\text{pH} = -\log [\text{H}_3\text{O}^+] = \underline{\underline{2.68}} \quad \text{pOH} = \underline{\underline{11.32}}$$



initial	2.0 M	0	0
change	-x	+x	+x
equilibrium	(2.0-x)	x	x

$$K_b = \frac{[\text{H}_2\text{NNH}_3^+]_{\text{eq}} [\text{OH}^-]_{\text{eq}}}{[\text{H}_2\text{NNH}_2]_{\text{eq}}} = \frac{x^2}{2.0-x} = 3.0 \times 10^{-6}$$

$$x^2 + 3.0 \times 10^{-6} x - 6.0 \times 10^{-6} = 0$$

$$x = \frac{-3.0 \times 10^{-6} \pm \sqrt{(3.0 \times 10^{-6})^2 + 4(6.0 \times 10^{-6})}}{2}$$

$$x = 2.45 \times 10^{-3} = [\text{OH}^-]$$

$$\text{pOH} = -\log [\text{OH}^-] = \underline{\underline{2.61}} \quad \text{pH} = \underline{\underline{11.39}}$$

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(5)	<u>HCl</u>	molarity	volume	# of moles of $H_3O^+$
		5.00M	90.0mL	$\frac{5.00 \text{ mol} \times 90.0 \times 10^{-3} \text{ L}}{L}$ = 0.450 mol

	<u>HNO<sub>3</sub></u>	8.00M	30.0mL	$\frac{8.00 \text{ mol} \times 30.0 \times 10^{-3} \text{ L}}{L}$ = 0.240 mol
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total			120.0mL	0.690 mol
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$$\text{Total } [H_3O^+] \text{ concentration} = \frac{0.690 \text{ mol}}{120.0 \text{ mL}} \times \frac{10^3 \text{ mL}}{L}$$

$$= ~~5.75 \text{ mol L}^{-1}~~ \quad 5.75 \text{ mol L}^{-1}$$

$$pH = -\log [H_3O^+] = \underline{\underline{-0.76}}$$

$$pOH = \underline{\underline{14.76}}$$

$$[H_3O^+] = \underline{\underline{5.75 \text{ mol L}^{-1}}}$$

$$[H_3O^+][OH^-] = 1 \times 10^{-14}$$

$$\Rightarrow [OH^-] = \underline{\underline{1.74 \times 10^{-15}}}$$

