CHM152 Quiz 5 25 Pts Spring 2008 Name: Key

Show all work to receive credit.

1. (4 Pts) Determine the pH of a KOH solution made from 0.185 g KOH and enough water to make 100 mL of solution. (K 39.01, O 16.00, H 1.008) (strong BASE)

$$\frac{0.185\text{ g KOH}}{56.018\text{ g}}\left|\frac{\text{mol}}{0.100\text{ L}}\right. = 0.0330\text{ M}$$

$$pOH = -\log[0.0330] = 1.481 \qquad pH = 14 - pOH = 12.519$$

2. (3 Pts) What is the pH of 20.0 mL of 0.0020 M HCl?

strong Acid

So $pH = -\log(0.0020) = 2.70$

3. (4 Pts) What is the pH of 0.014 M $Ca(OH)_2$ solution?

$[OH^-] = 0.028$ $\quad pOH = -\log(0.028) = 1.55$

$pH = 14 - pOH = 12.45$

4. (3 Pts) The pH of tomato juice is about 4.5. Calculate the concentration of hydrogen ions.

$$10^{-pH} = 10^{-4.5} = 3.16 \times 10^{-5}$$

5. (5 Pts) Nicotinic acid has a K_a value of 1.4×10^{-5}. Calculate the pH of 25 mL of 0.10 M nicotinic acid solution.

$$K_a = \frac{[H_3O^+][A^-]}{[HA]}$$

$$HA + H_2O \rightleftharpoons H_3O^+ + A^-$$

	HA	H_3O^+	A^-
I	0.10	0	0
C	−x	x	x
E	0.10 − x	x	x

$$1.4\times10^{-5} = \frac{x^2}{0.10 - x}$$ ← try to Drop

$x = 0.00118 = [H_3O^+]$ $\quad pH = -\log[H_3O^+] = 2.93$

6. (6 Pts) 20.00 mL of 0.10 M HCl are mixed with 25.00 mL of 0.10 M KOH. Determine the pH of the resulting solution. (Both strong)

CHEMISTRY $HCl + KOH \rightarrow H_2O + KCl +$ XS?

NET IONIC $H^+ + OH^- \rightarrow H_2O +$ XS?

① moles H^+: $20.00\times10^{-3}\text{ L HCl} \left| \frac{0.10\text{ mol HCl}}{1\text{ L}} \right| \frac{1\text{ mol } H^+}{1\text{ mol HCl}} = 0.0020\text{ mol } H^+$

② mol OH^-: $25.00\times10^{-3}\text{ L KOH} \left| \frac{0.10\text{ mol KOH}}{1\text{ L KOH}} \right| \frac{\text{mol } OH^-}{1\text{ mol KOH}} = 0.0025\text{ mol } OH^-$

$0.0005\text{ mol } OH^-$ XS

Subtract for XS

$$pOH = -\log\frac{0.0005}{45\times10^{-3}\text{ L}} = 1.95 \qquad pH = 14 - pOH = 12.05$$