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CHM152 Quiz5 25 Pts Falll 2016 Name: Key

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1. Which one of the following is a buffer solution?
   A) 0.40 M HCN and 0.10 KCN
   B) 0.20 M CH_3COOH
   C) 1.0 M HNO_3 and 1.0 M $NaNO_3$
   D) 0.10 M KCN
   E) 0.50 M HCl and 0.10 NaCl

weak acid and its conj. base.

2. You have 500.0 mL of a buffer solution containing 0.20 M acetic acid (CH_3COOH) and 0.30 M sodium acetate (CH_3COONa). What will the pH of this solution be after the addition of 20.0 mL of 1.00 M NaOH solution? [$K_a = 1.8 \times 10^{-5}$]
   A) 4.41 B) 4.74 C) 4.56 D) 4.92 E) 5.07

moles of HOAc: $0.500\,L \mid \frac{0.20\ mol}{L} = 0.10\ mol\ HOAc$

moles of OAc^-: $0.500\,L \mid \frac{0.30\ mol}{L} = 0.15\ mol\ OAc^-$

moles of OH^-: $0.0200\,L \mid \frac{1.00\ mol}{L} = 0.0200\ mol\ OH^-$

$$pH = -\log 1.8\times10^{-5} + \log \frac{0.15+0.0200}{0.10-0.0200} = 5.07$$

3. 35.00 mL of a 0.30 M HCl solution is titrated with 0.35 M NaOH. What is the pH of the solution after 40.00 mL of the NaOH has been added?
   A) 2.46 B) 11.54 C) 7.00 D) 12.72 E) 12.67

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

$35.00\ mL\ HCl \mid \frac{0.30\ moles\ HCl}{1000\ mL\ HCl} = 0.0105\ mol\ H^+$

$40.00\ mL\ NaOH \mid \frac{0.35\ mole\ NaOH}{1000\ mL\ NaOH} = 0.0140\ mol\ OH^-$

Gives $0.0035\ mol$ XS OH^-

$$pOH = -\log \frac{0.0035}{0.075} = 1.33 \qquad pH = 14 - pOH = 12.67$$

4. Calculate the H^+ ion concentration in a 8.8×10^{-4} M $Ca(OH)_2$ solution.
   A) 8.8×10^{-4} M B) 1.8×10^{-3} M C) 2.2×10^{-11} M D) 1.1×10^{-11} M E) 5.7×10^{-12} M

$[OH^-] = 2 \times 8.8\times10^{-4} = 0.00176$

$$[H^+] = \frac{K_w}{[OH^-]} = \frac{10^{-14}}{0.00176} = 5.7\times10^{-12}$$

5. Which one of these salts will form a *basic* solution upon dissolving in water?
   A) NaCl B) $NaNO_2$ C) NH_4NO_3 D) KBr E) $AlCl_3$

$$NO_2^- + H_2O \rightleftharpoons HNO_2 + OH^-$$