Name _____ *Key* _____ ID _____ Sec ___

Each question is worth one mark

Q1. What is the conjugate base of $H_2PO_4^-$?

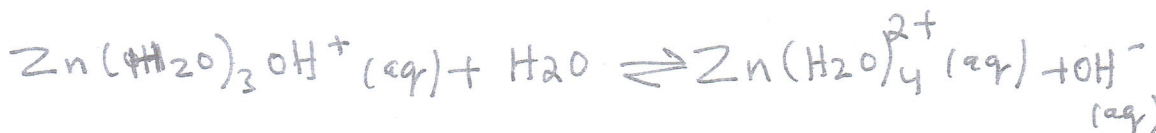A) HPO_4^{2-} B) PO_4^{3-} C) H_3PO_4 D) H_3O^+ E) OH^-

(A is circled)

Q2. Given

K_a of $HNO_2 = 6.0 \times 10^{-4}$ pK_a of $HClO = 7.55$ K_b of $NH_3 = 1.8 \times 10^{-5}$

Which one of the weak acids HNO_2, $HClO$, and NH_4^+ is the strongest?

(HNO_2 is circled)

Q3.
Show by an equation that $Zn(H_2O)_3OH^+$ is a base.

$$Zn(H_2O)_3OH^+ (aq) + H_2O \rightleftharpoons Zn(H_2O)_4^{2+} (aq) + OH^- (aq)$$

Q4. Determine the pH of a 0.461 M $C_6H_5CO_2H$ M solution if the K_a of $C_6H_5CO_2H$ is 6.5×10^{-5}.

A) 2.26   B) 4.52   C) 11.74   D) 9.48   E) 5.48

(A is circled)

$$K_a = \frac{x^2}{0.461} \Rightarrow x = [H^+] = 5.47 \times 10^{-3} M$$

Q5. Determine the pH of a 0.22 M NaF solution at 25°C. The K_a of HF is 3.5×10^{-5}.

A) 10.20   B) 5.10   C) 8.90   D) 11.44   E) 2.56

(C is circled)

$$K_b \sim \frac{x^2}{0.22} \Rightarrow x = [OH^-] = 7.93 \times 10^{-6} M$$

Q6. Which one of the following salt will form a basic solution?

A) $FeCl_3$ B) K_2CO_3 C) $CaBr_2$ D) NH_4Br

(B is circled)

Q7.
Would NH_4CN solution be acidic, basic, or neutral? Explain.

(basic is circled)

Given:
K_b of $NH_3 = 1.8 \times 10^{-5}$ $\Rightarrow K_a(NH_4^+) = 5.6 \times 10^{-10}$
K_a of $HCN = 5.8 \times 10^{-10}$ $\Rightarrow K_b(CN^-) = 1.7 \times 10^{-5}$

$\therefore K_b(CN^-) > K_a(NH_4^+)$

$\Rightarrow NH_4CN$ solution is basic