CHM 102 EXAM II

Show all calculations with correct units and significant figures. Write in complete sentences. Turn in your take-home questions with this exam. Good Luck!!!

1. View the boxes of particles below, which contain acids with various $K_a$'s. (15)

   Rank the acids from strongest to the weakest:

   Strongest _____ > _____ > _____ > _____ > _____ Weakest

   Which acid has the smallest $K_a$? _____

2. Calculate the pH of neutrality at 0°C where $K_w = 1.14 \times 10^{-15}$. (15)

   What is the pOH of neutrality at this temperature?

   At 25°C, $K_w$ is $1.00 \times 10^{-14}$. Is the dissociation of water an endothermic or exothermic reaction? Why?
3. Calculate the pH of a 0.25 M methylamine solution, \( \text{CH}_3\text{NH}_2 \). \( K_b = 4.2 \times 10^{-4} \) (10)

If the pH of this solution was lowered, how would the dissociation reaction shift?

4. You need to make a buffer with a pH of 4.80. Acetic acid has a pK\(_a\) of 4.74. Is this a good choice of acid? Why? (10)

Explain how you would prepare this buffer using the acetic acid and any other reagent of choice. List all components and their concentrations.

5. Consider the endothermic reaction given below and how it will respond to the various stresses listed. (20)

\[
\text{HCN (aq)} \rightleftharpoons \text{H}^+ (aq) + \text{CN}^- (aq)
\]

<table>
<thead>
<tr>
<th>Stress</th>
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<tbody>
<tr>
<td>Add HCl (aq)</td>
<td></td>
<td>Add NaCN (aq)</td>
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<tr>
<td>Add NaOH (s)</td>
<td></td>
<td>Add NaCl (aq)</td>
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<tr>
<td>Lower temperature</td>
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<td>Dilute with water</td>
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