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Last KeyFirst Answer

<p>Question 1 6 Points</p>	<p>a. Write a <b>net ionic equation</b> to show that <b>hydrosulfuric acid</b>, behaves as an acid in water.  <math display="block">\text{H}_2\text{S}(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{HSO}_3^+ + \text{HS}^-</math>           (= or ⇌)</p> <p>b. Write a <b>net ionic equation</b> to show how <b>sodium hydroxide</b> behaves as a base in water.  <math display="block">\text{NaOH}(\text{aq}) = \text{Na}^+ + \text{OH}^-</math>           (= or ⇌)</p>
<p>Question 2 8 Points</p>	<p>a. <math>\text{HNO}_3</math>      <u>1</u>      1. Strong Acid            b. <math>\text{HCOOH}</math>      <u>2</u>      2. Weak Acid            c. <math>\text{C}_5\text{H}_5\text{N}</math>      <u>4</u>      3. Strong Base            d. <math>\text{NH}_4^+</math>      <u>2</u>      4. Weak Base</p>
<p>Question 3 4 Points</p>	<p>An aqueous solution has a <b>hydroxide ion</b> concentration of <math>1.0 \times 10^{-2}</math> M.</p> <p>a) What is the <b>hydronium ion</b> concentration in this solution?      <u><math>1 \times 10^{-12}</math></u> M            b) Is this solution <b>acidic</b>, <b>basic</b> or <b>neutral</b>?      <u>Basic</u></p>
<p>Question 4 6 Points</p>	<p>An aqueous solution has a <b>pOH</b> of 6</p> <p>a) What is the <b>pH</b> of this solution?      <u>8</u>            b) What is the <b>hydronium ion</b> concentration in this solution?      <u><math>1 \times 10^{-8}</math></u> M            c) What is the <b>hydroxide ion</b> concentration in this solution?      <u><math>1 \times 10^{-6}</math></u> M</p>
<p>Question 5 6 Points</p>	<p>Arrange the following solutions in order of <b>increasing acidity</b>:            1 = <b>least acidic</b> ; 3 = <b>most acidic</b></p> <p>a) Solution with a <b>pH = 11</b>      <u>1</u>            b) Solution with a <b>hydroxide ion</b> concentration = <math>1 \times 10^{-11}</math> M      <u>3</u>            c) Solution with a <b>hydronium ion</b> concentration = <math>1 \times 10^{-9}</math> M      <u>2</u></p>
<p>Question 6 6 Points</p>	<p>The <b>hydronium</b> concentration in an aqueous solution is <math>3.51 \times 10^{-2}</math> M.</p> <p>a. The <b>hydroxide ion</b> concentration is:      <u><math>2.82 \times 10^{-13}</math></u> M            b. The <b>pH</b> of this solution is:      <u>1.45</u>            c. The <b>pOH</b> is:      <u>12.55</u></p>

<p>Question 7 6 Points</p>	<p>a) For following net ionic equation:  <math>\text{HClO}(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{ClO}^- + \text{H}_3\text{O}^+</math>  <i>- Circle the appropriate answer - B-L = Bronsted Lowry</i></p> <p><math>\text{H}_2\text{O}</math>                      B-L Acid      <u>B-L Base</u></p> <p><math>\text{ClO}^-</math>                      B-L Acid      <u>B-L Base</u></p> <p>b) The formula for the conjugate <u>Base</u> of <math>\text{H}_3\text{O}^+</math> is:                      <u><math>\text{H}_2\text{O}</math></u></p> <p>c) The formula for the conjugate <u>Acid</u> of <math>\text{ClO}^-</math> is:                      <u><math>\text{HClO}</math></u></p>
<p>Question 8 4 Points</p>	<p>A buffer solution that is <b>0.436M</b> in <b>HCN</b> and <b>0.436M</b> in <b>KCN</b> has a pH of <b>9.40</b>.</p> <p>Addition of <b>which of the following</b> would <b>increase the capacity of the buffer</b> for added <math>\text{H}_3\text{O}^+</math>?</p> <p><input checked="" type="checkbox"/> KCN    <input type="checkbox"/> HCN</p> <p><input checked="" type="checkbox"/> both HCN and KCN    <input type="checkbox"/> pure water</p> <p><input type="checkbox"/> none of these choices</p>
<p>Question 9 4 Points</p>	<p>Which of the following aqueous solutions are buffer solutions ?</p> <p><input checked="" type="checkbox"/> 0.14M HF + 0.17M KF    <input type="checkbox"/> 0.34M <math>\text{Ba}(\text{ClO}_4)_2</math> + 0.25M <math>\text{BaI}_2</math></p> <p><input type="checkbox"/> 0.19M <math>\text{Ca}(\text{OH})_2</math> + 0.21M <math>\text{CaCl}_2</math>    <input checked="" type="checkbox"/> 0.34M <math>\text{NH}_4\text{NO}_3</math> + 0.34M <math>\text{NH}_3</math></p> <p><input type="checkbox"/> 0.25M HCl + 0.17M KCl</p>
<p>Question 10 6 Points</p>	<p>A buffer solution is made that is <b>0.472M</b> in <math>\text{H}_2\text{CO}_3</math> and <b>0.472M</b> in <math>\text{NaHCO}_3</math>.</p> <p>a) <math>K_a</math> for <math>\text{H}_2\text{CO}_3</math> is <math>4.2 \times 10^{-7}</math>, what is the pH of the buffer solution?                      <u>6.4</u></p> <p>b) Write the <b>net ionic equation</b> for the reaction that occurs when <b>0.129 mol NaOH</b> is added to <b>1.00 L</b> of the buffer solution.</p> <p><u><math>\text{H}_2\text{CO}_3(\text{aq}) + \text{OH}^- = \text{H}_2\text{O}(\text{l}) + \text{HCO}_3^-</math></u></p>
<p>Question 11 6 Points</p>	<p>A buffer solution is <b>0.440M</b> in <b>HCN</b> and <b>0.324M</b> in <b>NaCN</b>. If <math>K_a</math> for <b>HCN</b> is <math>4.0 \times 10^{-10}</math>, what is the pH of this buffer solution?</p> <p>Must show work</p> <p><math display="block">\text{pH} = -\log_{10}(4.0 \times 10^{-10}) + \log_{10} \frac{[\text{CN}^-]}{[\text{HCN}]}</math></p> <p><math display="block">= 9.397 + \log_{10} \left( \frac{0.324}{0.440} \right)</math></p> <p><math display="block">= 9.397 + \log_{10}(0.736)</math></p> <p><math display="block">= 9.397 - 0.133</math></p> <p style="text-align: right;">pH = <span style="border: 1px solid black; padding: 2px;">9.26</span></p>

Question 12  
6 Points

A small amount of **strong acid** is added to a **buffer** made from **HCN** and **NaCN**. What changes if any will occur to the following.

Choose from the following choices:

Increase significantly  
Decrease significantly

Increase  
Decrease

Increase slightly  
Decrease slightly

- a) pOH Increase slightly  
b) [HCN] Increase

Question 13  
6 Points

The isotope  ${}^{60}_{27}\text{Co}$  is but one of many isotopes whose **Neutron/Proton ratio** is too large.

- a) The **only form of radioactive decay** available to  ${}^{60}_{27}\text{Co}$  is: Beta emission  
b) The **balanced nuclear equation** for this decay:  ${}^{60}_{27}\text{Co} =$   ${}^0_{-1}\text{e}$  +  ${}^{60}_{28}\text{Ni}$

Question 14  
6 Points

Write a balanced nuclear equation for the following:

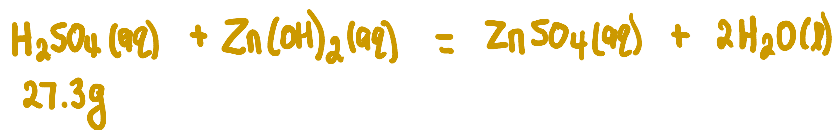
- a)  ${}^{214}_{82}\text{Pb}$  undergoing beta decay:  ${}^{214}_{82}\text{Pb} =$   ${}^0_{-1}\text{e}$  +  ${}^{214}_{83}\text{Bi}$   
b)  ${}^{28}_{15}\text{P}$  undergoing positron emission:  ${}^{28}_{15}\text{P} =$   ${}^0_{+1}\text{e}$  +  ${}^{28}_{14}\text{Si}$   
c)  ${}^{41}_{20}\text{Ca}$  undergoing electron capture:  ${}^{41}_{20}\text{Ca} +$   ${}^0_{-1}\text{e}$  =  ${}^{41}_{19}\text{K}$

Question 15  
6 Points

How many **moles of water** will be formed upon the complete reaction of **27.3 grams of sulfuric acid** with **excess zinc(II) hydroxide**?

sulfuric acid (aq) + zinc(II) hydroxide (s) = zinc(II) sulfate (aq) + water (l)

For full credit you must show work and include a balanced chemical equation.



$$\text{H}_2\text{SO}_4: 2(1.01) + 32.07 + 4(16.00) = 98.09 \text{ g} \cdot \text{mol}^{-1}$$

$$\frac{27.3 \text{ g H}_2\text{SO}_4}{98.09 \text{ g}} \times 1 \text{ mol} = 0.278 \text{ mol H}_2\text{SO}_4$$

$$\frac{0.278 \text{ mol H}_2\text{SO}_4}{1 \text{ H}_2\text{SO}_4} \times 2 \text{ H}_2\text{O} = 0.557 \text{ mol H}_2\text{O}$$

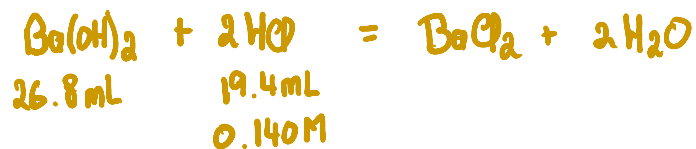
**0.577** mol

Question 16  
8 Points

An aqueous solution of **barium hydroxide** is standardized by titration with a **0.140 M** solution of **hydrochloric acid**.

If **26.8 mL** of **base** are required to neutralize **19.4 mL** of the acid, what is the **molarity** of the **barium hydroxide** solution?

For full credit you must show work and include a balanced chemical equation.



$$\# \text{ mol HCl} = 0.140 (0.0194) = 2.72 \times 10^{-3} \text{ mol HCl}$$

$$\frac{2.72 \times 10^{-3} \text{ mol HCl}}{2 \text{ HCl}} \left| \frac{1 \text{ Ba(OH)}_2}{2 \text{ HCl}} \right. = 1.36 \times 10^{-3} \text{ mol Ba(OH)}_2$$

$$M = \frac{1.36 \times 10^{-3}}{0.0268} = 0.0507$$

**0.0507** M

Question 17  
6 Points

What volume of a **0.142 M** solution of **aluminum bromide** contains the same number of moles of **aluminum bromide** as there are in **43.2 mL** of a **0.124 M** solution of **aluminum bromide**?

Must show work

$$\# \text{ mol AlBr}_3 = 0.124 (0.0432) = 5.36 \times 10^{-3}$$

$$\begin{aligned} \# \text{ mol AlBr}_3 &= M \times V(\text{L}) \\ 5.36 \times 10^{-3} &= 0.142 \times V(\text{L}) \end{aligned}$$

$$V(\text{L}) = \frac{5.36 \times 10^{-3}}{0.142} = 0.0377$$

**0.0377** L

Exam III Score