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Worksheet #3

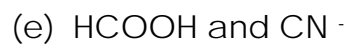
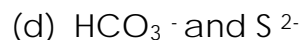
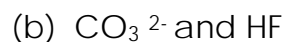
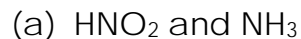
Section 4.10

1. In fifty (50) words or less, write a really interesting story. (You mention Matt 4 times)
2. In fifty (50) words or less, explain why I'm losing my hair.
3. In fifty (50) words or less, explain why some students are starting to slip in this class.
4. In fifty (50) words or less, explain why Big P (Pasan) would make a good husband.

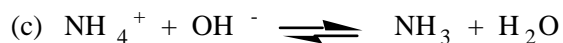
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5. Write the Bronsted-Lowry acid-base equilibria which occur when the following pairs of substances are mixed in solution. Identify the conjugate pairs formed.



6. In the following equilibria, predict whether reactants or products are favoured.



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7. Write the major equilibrium reactions which occur when the following substances are put into water. Ignore reactions between the ions and water. All salts are 100% dissociated in water. Do the resulting equilibria favour the reactants or products?

(a) HSO_4^- and NO_2^-

(b) H_3PO_4 and HPO_4^{2-}

(c) HCO_3^- and HSO_3^-

(d) NH_4F [$\text{NH}_4\text{F} \rightleftharpoons \text{NH}_4^+ + \text{F}^-$]

(e) HSO_3^- and HC_2O_4^-

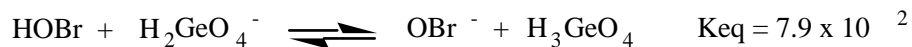
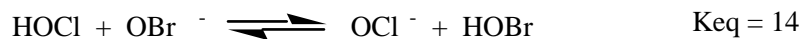
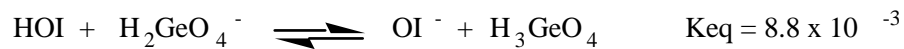
(f) H_2O_2 and HS^-

(g) $(\text{NH}_4)_2\text{CO}_3$ [$(\text{NH}_4)_2\text{CO}_3 \rightleftharpoons 2 \text{NH}_4^+ + \text{CO}_3^{2-}$]

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8. Given:



Arrange the four acids involved in order from strongest to weakest.

Section 4.119. Calculate pH **and** pOH, to the correct number of significant digits, in the following solutions.

(a) $[\text{H}_3\text{O}^+] = 1.0 \times 10^{-5} \text{ M}$

(b) $[\text{OH}^-] = 7.53 \times 10^{-3} \text{ M}$

(c) $[\text{OH}^-] = 4.9 \times 10^{-6} \text{ M}$

(d) $[\text{H}_3\text{O}^+] = 12.5 \text{ M}$

(e) $[\text{OH}^-] = 0.0125 \text{ M}$

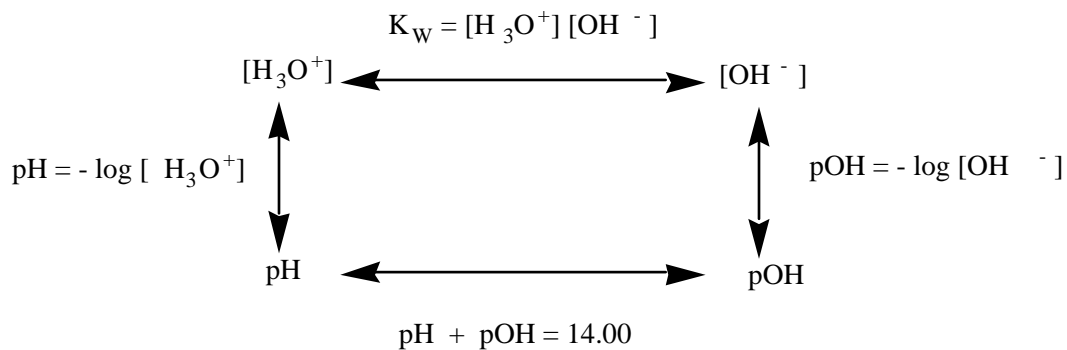
(f) $[\text{H}_3\text{O}^+] = 1.0 \text{ M}$

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9.1

Use the diagram below to perform the necessary calculations in to complete the table below:



	$[H_3O^+]$	pH	pOH	$[OH^-]$	Solution (acidic, basic, or neutral)
1.	3.0×10^{-4}				
2.			6.66		
3.		11.72			
4.				1.7×10^{-6}	
5.	8.0×10^{-5}				
6.					neutral
7.		12.0			
8.			15.0		
9.				8.7×10^{-3}	
10.		3.58			

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10. Calculate $[\text{H}_3\text{O}^+]$ **and** $[\text{OH}^-]$, to the correct number of significant digits, in the following solutions.

(a) $\text{pH} = 3.0$

(b) $\text{pOH} = 5.633$

(c) $\text{pH} = 6.413$

(d) $\text{pH} = 8.50$

(e) $\text{pH} = -0.55$

(f) $\text{pOH} = 11.542$

11. Recall that:



Assume a system is not at 25 °C but rather involves a sample of pure water at its boiling temperature.

(a) What happens to the pH of the water as the temperature increases? Explain.

(b) What happens to the pOH of the water as the temperature increases? Explain.

(c) What happens to the value of pK_w (Hint: $-\log K_w$) as the water temperature increases? Explain.

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12. At 60 °C, the value of pK_w is 13.018. Calculate pH, pOH, $[H_3O^+]$ and $[OH^-]$ in water at 60 °C.
13. You have 0.5 M solutions of two weak acids. The pH of HA is 3.75 and the pH of HB is 5.84. Which solution will have the greater conductivity: HA or HB? Use calculations to support your answer.
14. State whether the following represent conditions which are ACIDIC, NEUTRAL, or BASIC.
- | | |
|--|---|
| (a) pH = 4 | (b) pOH = 9 |
| (c) $[H_3O^+] = 1 \times 10^{-10} \text{ M}$ | (d) $[OH^-] = 1 \times 10^{-2} \text{ M}$ |
| (e) pOH = 7 | (f) $[H_3O^+] = 5 \times 10^{-7} \text{ M}$ |
| (g) pH = 8 | (h) $[OH^-] = 0.008 \text{ M}$ |
| (i) $[OH^-] = 1 \times 10^{-7} \text{ M}$ | (j) pOH = 7.6 |

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Section 4.12

15. Calculate the pH resulting from mixing 50.0 mL of 0.150 M NaOH with 50.0 mL of 0.200 M HCl.

16. Calculate the pOH resulting from the mixture of 50.0 mL 0.0185 M $\text{Sr}(\text{OH})_2$ with 35.0 mL of a solution containing 0.130 g HCl.

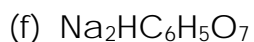
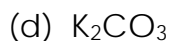
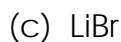
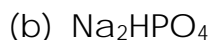
17. Calculate the pH which results when 0.450 g of LiOH are added to 200.0 mL of water containing 9.50 g of HI. Assume the volume of the final mixture is 200.0 mL.

18. A chemist had 2.000 L of a 0.00120 M KOH solution. What mass of $\text{HCl}_{(\text{g})}$ would have to be added to the KOH solution to produce a solution having a pH of 10.875? Assume no volume change occurs when the $\text{HCl}_{(\text{g})}$ is dissolved.

19. What mass of $\text{Ca}(\text{OH})_2$ must be added to 500.0 mL of 0.0150 M HBr to create a solution with pH = 2.750?

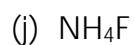
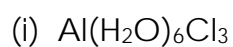
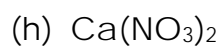
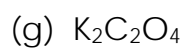
Section 4.13

20. Write the hydrolysis reaction for the following salts in water and state whether the resulting solution is acidic, basic, or neutral. Note that two steps are involved for each reaction: first you must write an equation to show how the salt dissociates in water, and then write a reaction equation for the predominant reaction (if any) which occurs between the **ions** and **water**. (Ignore any reactions between ions). For some of the salts you will have to perform a calculation to decide whether the solution produced is acidic or basic.



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21. You have two solutions: 1 M KF and 1 M HF. Which solution has the greater conductivity? Explain your answer.

22. Arrange the following 0.1 M solutions from highest to lowest pH.

