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*This assignment covers material found in sections 6.5 and 6.6. Show all of your work for full marks including all formulas, balanced ionization or dissociation equations, substitution of values and final answers with correct units and significant figures.*

1. Calculate the pH **and** pOH of the following. Include the ionization or dissociation equation as needed. (3 marks each)
  - a.  $1.3 \times 10^{-2}$  M HBr
  - b.  $4.8 \times 10^{-3}$  M NaOH
2. Determine the  $[\text{H}_3\text{O}^+]$  **and**  $[\text{OH}^-]$  of the following solutions: (2 marks each)
  - a.  $\text{pH} = 2$
  - b.  $\text{pH} = 9$

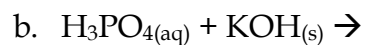
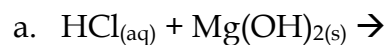
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3. Calculate the  $[\text{H}_3\text{O}^+]$  and pOH in a 300.0 mL solution that has a concentration of 0.040M of HCl. Include the ionization equation. (4 marks)

4. A solution of HF contains 12 grams in 500.0mL. (5 marks)
- Find  $[\text{H}^+]$ . Make sure to show the ionization equation (with water).
  - Calculate the pH of the above solution.

5. Predict the products of the following neutralization reactions (be sure to balance the equation and include states as well). (2 marks)



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6. Determine if the pH at the equivalence point is 7, >7 or <7 for the following titrations: (3 marks)
  - a.  $\text{NH}_3$  titrated with  $\text{HCl}$
  - b.  $\text{Ba}(\text{OH})_2$  titrated with  $\text{HCl}$
  - c.  $\text{HF}$  titrated with  $\text{NaOH}$
  
7. In a titration, 34.8 mL of 0.115M  $\text{HNO}_3$  were required to neutralize 25mL of solution of  $\text{Ca}(\text{OH})_2$ . What was the original concentration of the  $\text{Ca}(\text{OH})_2$  solution? Include the neutralization equation for full marks. (4 marks)
  
  
  
  
  
  
  
  
  
  
8. Choose the most correct indicator given: 0.1L of a 1M  $\text{HCl}$  solution is added to a 0.1L of a 1.01M  $\text{NaOH}$  solution. (8 marks). Show your work for full marks.
  - a. Bromocresol green-the solution is blue
  - b. Phenol red- the solution is yellow
  - c. Alizarin yellow-the solution is dark orange
  - d. Phenolphthalein- the solution is colourless

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9. Would it take more 0.1M HCl or 0.1M H<sub>2</sub>SO<sub>4</sub> to neutralize 30mL of NaOH? Explain how you know. (2 marks)
10. Consider 25.0mL of 0.100M HA (HA is a fictional acid), for which  $K_a = 1.00 \times 10^{-5}$ , titrated with 0.0500M NaOH solution. What is the initial pH **before** adding any titrate? (4 marks)
11. 50.0mL of 0.185M Sr(OH)<sub>2</sub> is reacted with 35.0mL of a solution containing 0.130g of HCl.
- Calculate the pOH resulting from the mixture. (8 marks)
  - Suggest an indicator that will be effective for this incomplete titration and explain your choice. (2 marks)