

1. (2 Pts) Determine the oxidation number of each element in $K_3Fe(CN)_6$



2. (1 Pt) The oxidation number of Cr in $Cr_2O_7^{2-}$ is +6.

3. (2 Pts) Identify the elements that are oxidized and reduced in the following reaction.



Br is oxidized and Cl is reduced

$KClO_3$ is the oxidizing agent and HBr is the reducing agent

4. (2 Pts) What mass of $C_{12}H_{22}O_{11}$ (sucrose) is needed to prepare 255 mL of a 0.570 M solution of sucrose in water? Show your work.

$$\frac{255 \text{ mL}}{1000 \text{ mL}} \times \frac{0.570 \text{ mol}}{\text{mol}} \times \frac{342.296 \text{ g}}{\text{mol}} = 49.8 \text{ g}$$

5. (2 Pts) A 50.0 mL sample of 0.436 M $(NH_4)_2SO_4$ is diluted with water to a total volume of 250.0 mL.

a. What is the ammonium sulfate concentration in the resulting solution? Show work.

$M_1V_1 = M_2V_2$ $M_2 = \frac{(0.436 \text{ M})(50.0 \text{ mL})}{250.0 \text{ mL}} = 0.0872 \text{ M}$

b. What is the ammonium ion concentration in the resulting solution? Show work.

$2 \times 0.0872 = 0.174 \text{ M } NH_4^+ \text{ ion}$

6. (2 Pts) 25.0 mL of a 0.2450 M NH_4Cl solution is added to 55.5 mL of 0.1655 M $FeCl_3$. What is the concentration of chloride ion in the final solution? Show work.

You must find the total moles Cl^- and the final volume.

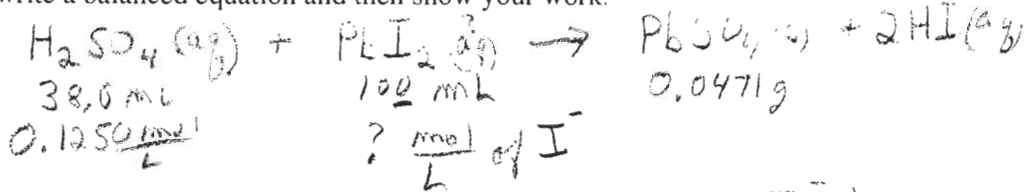
For NH_4Cl : $\frac{25.0 \text{ mL}}{1000 \text{ mL}} \times \frac{0.2450 \text{ mol}}{\text{mol}} \times \frac{1 \text{ mol } Cl^-}{1 \text{ mol } NH_4Cl} = 0.006125 \text{ mol } Cl^-$

For $FeCl_3$: $\frac{55.5 \text{ mL}}{1000 \text{ mL}} \times \frac{0.1655 \text{ mol}}{\text{mol}} \times \frac{3 \text{ mol } Cl^-}{1 \text{ mol } FeCl_3} = 0.027556$

$\frac{0.03368 \text{ mol } Cl^-}{0.0805 \text{ L}} = 0.418 \text{ M } Cl^-$

Key

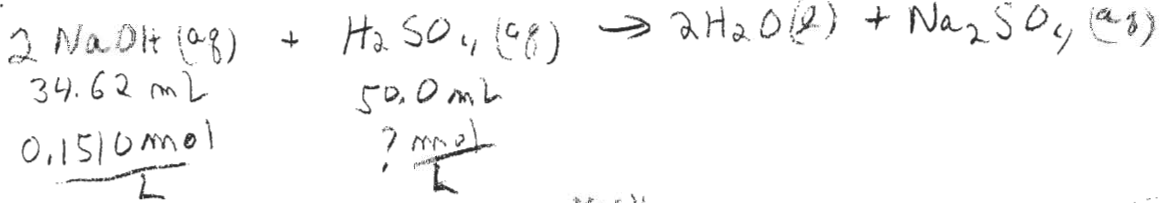
7. (4 Pts) When 38.0 mL of 0.1250 M H₂SO₄ is added to 100. mL of a solution of PbI₂, a precipitate of PbSO₄ forms. The PbSO₄ is then filtered from the solution, dried, and weighed. If the recovered PbSO₄ is found to have a mass of 0.0471 g, what was the concentration of iodide ions in the original solution? You must first write a balanced equation and then show your work.



0.0471 g PbSO ₄	mol PbSO₄	2 mole I ⁻	= 0.00311 $\frac{\text{mol I}^-}{\text{L}}$
	303.26 g PbSO ₄	1 mol PbSO ₄	0.100 L

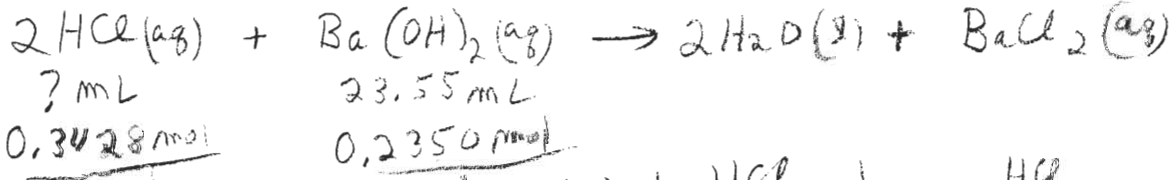
3.11 x 10⁻³ M

8. (3 Pts) 34.62 mL of 0.1510 M NaOH was needed to neutralize 50.0 mL of an H₂SO₄ solution. What is the concentration of the original sulfuric acid solution? You must first write a balance equation and then show all work.



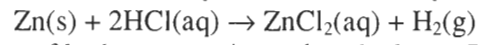
34.62 mL NaOH	0.1510 mol NaOH	1 mol H ₂ SO ₄	= 0.0523 $\frac{\text{mol H}_2\text{SO}_4}{\text{L H}_2\text{SO}_4}$
0.0500 L H ₂ SO ₄	1000 mL NaOH	2 mol NaOH	

9. (3 Pts) What volume (mL) of a 0.3428 M HCl(aq) solution is required to completely neutralize 23.55 mL of a 0.2350 M Ba(OH)₂(aq) solution? Write a balanced equation and show all work.

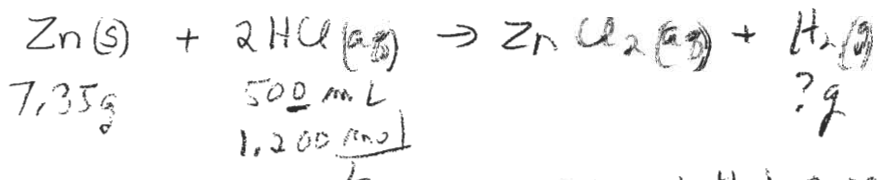


23.55 mL Ba(OH) ₂	0.2350 mol Ba(OH) ₂	2 mol HCl	= 32.29 mL HCl
	1000 mL Ba(OH) ₂	1 mol Ba(OH) ₂	0.3428 mol HCl

10. (4 Pts) Zinc dissolves in hydrochloric acid to yield hydrogen gas:



What mass of hydrogen gas is produced when a 7.35 g chunk of zinc dissolves in 500. mL of 1.200M HCl?



React since Zn is Limiting Reactant

Based on Zn:

7.35 g Zn	mol Zn	1 mol H ₂	= 0.227 g H ₂
	65.39 g Zn	1 mol Zn	1 mol H ₂

Based on HCl:

500 mL HCl	1.200 mol HCl	1 mol H ₂	= 0.606 g H ₂
	1000 mL HCl	2 mol HCl	1 mol H ₂