

Ch 4: Rxns Ans Key

Solution Stoichiometry/Double Displacement Questions:

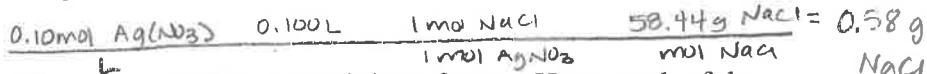
1. How many grams of NaCl are needed to precipitate all silver ions (Ag^+) from 100.0 mL of 0.10 M AgNO_3 solution?



100.0mL

0.10M

↓



2. When barium chloride reacts with sodium sulfate, a precipitate forms. How much of the precipitate can form if 100.0 mL of 0.5 M barium chloride reacts with 100.0 mL of 0.25 M sodium sulfate?



100mL
0.5M

↓

100.0mL
0.25M

↓

0.05mol

0.025mol

0.025mol

L.R.

0.025 mol BaSO_4 or 5.8g

↓

0.05mol

Acid Base Neutralization Questions:

1. When 75.0 mL of a 0.50 M KOH solution is mixed with 80.0 mL of a 0.30 M HI solution, will the resultant solution be acidic, basic, or neutral? Show calculation to support your answer.



75.0mL
0.50M

↓

80.0mL
0.30M

↓

0.0375mol

0.024mol

since mol KOH (Base) > mol HI (acid)

and 1:1, solution is basic

($\text{pH} > 7$)

2. How many mL of a 0.30 M CsOH solution are needed to neutralize 20.0 mL of a 0.40 M H_2SO_4 solution?



7mL
0.30M

↓

0.0080mol H_2SO_4

$\frac{2\text{mol CsOH}}{1\text{mol H}_2\text{SO}_4}$

= 0.016mol CsOH

$$0.30\text{L} = \frac{0.016\text{mol}}{x\text{ L}}$$

3. What volume of 0.1 M $\text{Ba}(\text{OH})_2$ is needed to neutralize 25.0 mL of 0.5 M HCl?



?mL
0.5M

↓

0.0125mol

$\frac{1\text{mol Ba}(\text{OH})_2}{2\text{mol HCl}} = 0.00625\text{mol Ba}(\text{OH})_2$

$$0.1\text{M} = \frac{0.00625\text{mol}}{x\text{ L}}$$

$$x\text{L} = 0.0625\text{L} = 62.5\text{mL}$$

4. It takes 60.0 mL of HI to neutralize 40.0 mL of a 0.25 M KOH solution. What is the molarity of HI?



60.0mL 40.0mL
0.25M



$$[\text{HI}] = \frac{0.010\text{mol}}{0.060\text{L}} =$$

0.17M

5. You are given a stock solution of concentrated HBr which is 10.0 M. You need to prepare 400.0 mL of a 0.50 M HBr solution. How many mL of the stock solution will you need and how many mL of water will you need?

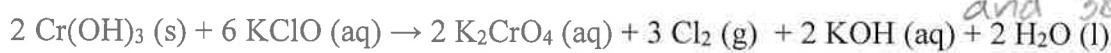


$$10.0\text{M} \rightarrow 400.0\text{mL of 0.50M} \quad 10.0\text{M}(V_1) = (400.\text{mL})(0.50\text{M})$$

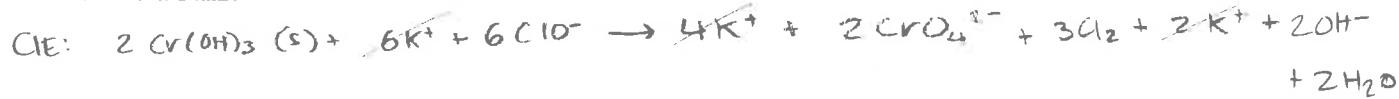
$$V_1 = 20.0\text{mL}$$

Redox Questions:

need 20.0mL of 10.0M HBr
and 380.mL H₂O



1. Write a NIE.



2. What mass of chromium (III) hydroxide would be needed to completely react with 100.0mL of 0.40 M potassium hypochlorite solution?

$$\frac{0.040\text{mol KClO}}{6\text{ mol KClO}} \times \frac{2\text{ mol Cr(OH)}_3}{2\text{ mol KClO}} \times \frac{\text{MM}}{1\text{ mol Cr(OH)}_3} = 1.4\text{ g Cr(OH)}_3$$

3. If the reaction took place at STP, how many mL of chlorine gas would be produced? Recall: at STP, standard molar volume is 22.4 L/mol

$$\text{STP} = 0^\circ\text{C} \neq 1 \text{ atm}$$

$$\frac{0.040\text{mol KClO}}{6\text{ mol KClO}} \times \frac{3\text{ mol Cl}_2}{2\text{ mol Cr(OH)}_3} \times \frac{22.4\text{ L}}{1\text{ mol}} \times \frac{1000\text{mL}}{1\text{ L}} = 448\text{ mL Cl}_2 \quad \text{LR}$$

$$\frac{1.4\text{ g Cr(OH)}_3}{1\text{ mol}} \times \frac{3\text{ mol Cl}_2}{2\text{ mol Cr(OH)}_3} \times \frac{22.4\text{ L}}{1\text{ mol}} \times \frac{1000\text{mL}}{1\text{ L}} = 672\text{ mL Cl}_2$$

Redox Titration Questions:

$\text{Na}_2\text{Cr}_2\text{O}_7$ (40.0 mL of 0.5 M) is titrated with KI (60.0 mL of 0.25 M)



1. Name the two compounds involved in this reaction: $\text{Na}_2\text{Cr}_2\text{O}_7$ and KI.

sodium dichromate & potassium iodide

2. Identify the analyte and the titrant.



3. Identify what is oxidized and what is reduced. Explain your answer.



Cr oxid state = +6



I⁻ oxidized

$\text{Na}_2\text{Cr}_2\text{O}_7$

40.0 mL

0.5 M



0.02 mol

→ 0.04 mol Cr³⁺

KI

60.0 mL

0.25 M



0.015 mol

0.030 mol Cr³⁺

$$\text{LR} = \text{KI}$$

