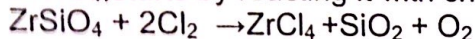


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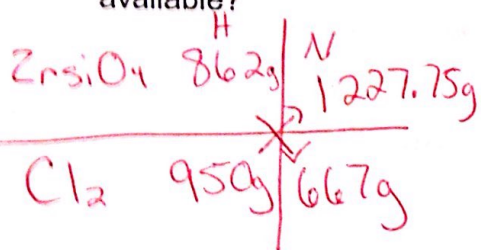
Key

Spring Semester Review (as of 4/27)  
Lab Practical Review

1. A process by which zirconium metal can be produced from the mineral zirconium(IV) orthosilicate,  $ZrSiO_4$ , starts by reacting it with chlorine gas to form zirconium(IV) chloride.



What is the theoretical yield of  $ZrCl_4$  can be produced if 862 g of  $ZrSiO_4$  and 950. g of  $Cl_2$  are available?



$$862g \times \frac{1mol}{183g} \times \frac{2mol Cl_2}{1mol ZrSiO_4} \times \frac{70.8g}{1mol} = 667g$$

$$950g \times \frac{1mol}{70.8g} \times \frac{1mol ZrSiO_4}{2mol Cl_2} \times \frac{183g}{1mol} = 1227.75g$$

What is the limiting reactant?

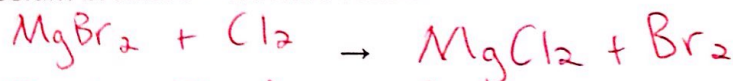
$$ZrSiO_4 \quad 862g \times \frac{1mol}{183g} \times \frac{1mol}{1mol} \times \frac{232.8g}{1mol} = \boxed{1096.6g ZrCl_4}$$

2. Jenny has 32g of potassium chloride and wants to add it to water to make an aqueous solution with a concentration of 0.55M. What should be the total volume of the solution she wants to make?

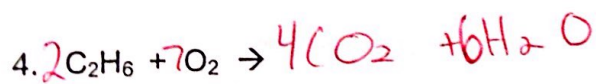
$$32g^{KCl} \times \frac{1mol}{74.4g} \times \frac{1L}{0.55mol} \times \frac{1000mL}{1L} = \boxed{782mL}$$

Predict the products and balance the equations. Classify each reaction.

3. magnesium bromide + chlorine reacts

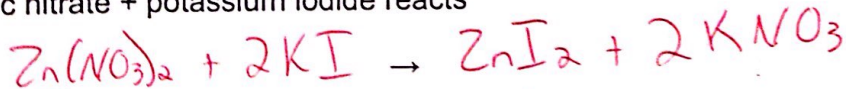


Type: Single Displacement



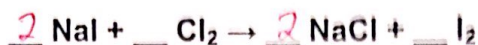
Type: Combustion

5. zinc nitrate + potassium iodide reacts



Type: Double Displacement

6. What volume of 1.32 M NaI solution is needed to fully react with 9.08 L of chlorine gas measured at 76.3°C and 6.87 kPa?



$$6.87 \text{ kPa} \times \frac{1 \text{ atm}}{101.325 \text{ kPa}} = 0.0678 \text{ atm}$$

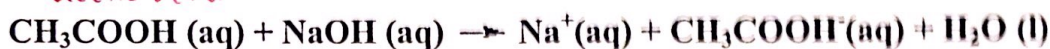
$$PV = nRT$$

$$0.0678 \text{ atm} \cdot 9.08 \text{ L} = n \cdot 0.0821 \cdot 349.3$$

$$n = 0.02147 \text{ mol} \times \frac{2 \text{ mol NaI}}{1 \text{ mol Cl}_2} \times \frac{1 \text{ L}}{1.32 \text{ mol}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = \boxed{32.53 \text{ mL}}$$

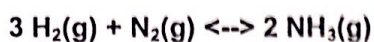
7. Calculate the molarity of an acetic acid solution if 34.57 mL of this solution are needed to neutralize 25.19 mL of 0.1025 M sodium hydroxide.

acetic acid



$$25.19 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{0.1025 \text{ mol NaOH}}{1 \text{ L}} \times \frac{1 \text{ mol}}{1 \text{ mol}} = \frac{0.00258 \text{ mol CH}_3\text{CO}_2}{0.03457 \text{ L}} = \boxed{0.07469 \text{ M}}$$

8. Given the following reaction, how will the following changes shift the system?



- a. Extra  $\text{NH}_3$  is added  
shift to reactant
- b.  $\text{N}_2$  is removed from the system  
shift to reactant
- c.  $\text{H}_2$  is added  
shift to products
- d. The pressure is increased  
shift to products

The lab practical is not limited to only these questions above. Many questions will require you to perform procedures in the lab with accuracy and precision. Any content from this semester is fair game.

Spring Semester:

Chemical Reactions

Gas Laws

Acids and Bases

Stoichiometry

Solutions

Equilibrium