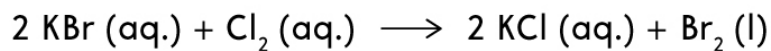


Name : _____ Date : _____

LIMITING REAGENT AND PERCENTAGE YIELD

- ① Consider the following equation:



- a) Suppose 0.855 g of Cl_2 and 3.205 g of KBr are mixed in a solution. Which is the limiting reagent?
- b) How much excess reagent is left?
- ② Solid copper (I) oxide reacts with oxygen to form copper (II) oxide. Suppose 4.18 g of copper (I) oxide reacts with 5.77 g of oxygen. Write down the chemical reaction. What is the theoretical yield? If the actual amount of copper (II) oxide produced is 4.28 g, what is the percentage yield?

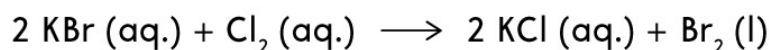
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LIMITING REAGENT AND PERCENTAGE YIELD

Answers

- ① Consider the following equation:



- a) Suppose 0.855 g of Cl_2 and 3.205 g of KBr are mixed in a solution. Which is the limiting reagent?

$$0.855 \text{ g Cl}_2 \times \frac{1 \text{ mol Cl}_2}{71 \text{ g Cl}_2} \times \frac{2 \text{ mol KCl}}{1 \text{ mol Cl}_2} \times \frac{74.6 \text{ g KCl}}{1 \text{ mol KCl}} = 1.8 \text{ g KCl}$$

$$3.205 \text{ g KBr} \times \frac{1 \text{ mol KBr}}{119 \text{ g KBr}} \times \frac{2 \text{ mol KCl}}{2 \text{ mol KBr}} \times \frac{74.6 \text{ g KCl}}{1 \text{ mol KCl}} = 2.01 \text{ g KCl}$$

Cl_2 is the limiting reagent.

- b) How much excess reagent is left?

$$0.855 \text{ g Cl}_2 \times \frac{1 \text{ mol Cl}_2}{71 \text{ g Cl}_2} \times \frac{1 \text{ mol Br}_2}{1 \text{ mol Cl}_2} \times \frac{159.8 \text{ g Br}_2}{1 \text{ mol Br}_2} = 1.92 \text{ g Br}_2$$

2.01 g of KCl and 1.92 g of Br_2 are formed.

- ② Solid copper (I) oxide reacts with oxygen to form copper (II) oxide. Suppose 4.18 g of copper (I) oxide reacts with 5.77 g of oxygen. Write down the chemical reaction. What is the theoretical yield? If the actual amount of copper (II) oxide produced is 4.28 g, what is the percentage yield?



$$4.18 \text{ g Cu}_2\text{O} \times \frac{1 \text{ mol Cu}_2\text{O}}{143.1 \text{ g Cu}_2\text{O}} \times \frac{4 \text{ mol CuO}}{2 \text{ mol Cu}_2\text{O}} \times \frac{79.55 \text{ g CuO}}{1 \text{ mol CuO}} = 4.65 \text{ g CuO}$$

$$5.77 \text{ g O}_2 \times \frac{1 \text{ mol O}_2}{32 \text{ g O}_2} \times \frac{4 \text{ mol CuO}}{1 \text{ mol O}_2} \times \frac{79.55 \text{ g CuO}}{1 \text{ mol CuO}} = 57.4 \text{ g CuO}$$

Since Cu_2O is the limiting reagent, the theoretical yield of CuO is 4.65 g.

$$\text{Percentage yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100 = \frac{4.28 \text{ g}}{4.65 \text{ g}} \times 100 = 92 \%$$