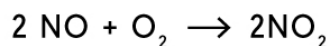


Limiting Reagent Worksheet

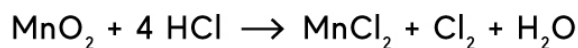
- 1 Nitric oxide (NO) reacts with oxygen gas (O₂) to form nitrogen dioxide (NO₂) gas.



In one experiment, 0.866 mol of NO is mixed with 0.503 mol of O₂.

- a Determine the limiting reagent.
- b Calculate the number of moles of NO₂ produced.

- 2 Consider the following reaction:

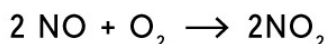


- a Suppose 0.86 mol of MnO₂ reacts with 48.2 g of HCl. Which reagent will be used first?
- b How many grams of Cl₂ will be produced?

Limiting Reagent Worksheet

Answers

- ① Nitric oxide (NO) reacts with oxygen gas (O₂) to form nitrogen dioxide (NO₂) gas.



In one experiment, 0.866 mol of NO is mixed with 0.503 mol of O₂.

- (a) Determine the limiting reagent.
(b) Calculate the number of moles of NO₂ produced.

Let us determine the amount of NO₂ produced by each reactant.

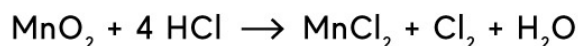
$$0.866 \text{ mol NO} \times \frac{2 \text{ mol NO}_2}{2 \text{ mol NO}} = 0.866 \text{ mol NO}_2$$

$$0.503 \text{ mol O}_2 \times \frac{2 \text{ mol NO}_2}{1 \text{ mol O}_2} = 1.01 \text{ mol NO}_2$$

a) NO is the limiting reagent since it produces the least amount of NO₂, thereby limiting production.

b) The amount of NO₂ produced is 0.866 mol.

- ② Consider the following reaction:



- (a) Suppose 0.86 mol of MnO₂ reacts with 48.2 g of HCl. Which reagent will be used first?
(b) How many grams of Cl₂ will be produced?

Let us calculate the number of moles of Cl₂ produced, assuming a complete reaction for each reactant.

$$0.86 \text{ mol MnO}_2 \times \frac{1 \text{ mol Cl}_2}{1 \text{ mol MnO}_2} = 0.86 \text{ mol Cl}_2$$

$$48.2 \text{ g HCl} \times \frac{1 \text{ mol HCl}}{36.46 \text{ g HCl}} \times \frac{1 \text{ mol Cl}_2}{4 \text{ mol HCl}} = 0.33 \text{ mol Cl}_2$$

a) HCl is the limiting reagent. It limits the amount of Cl₂ produced. It will be used up first.

b) The amount of Cl₂ produced is 0.330 mole. Let us convert this to grams.

$$0.330 \text{ mol Cl}_2 \times \frac{70.90 \text{ g Cl}_2}{1 \text{ mol Cl}_2} = 23.4 \text{ g Cl}_2$$