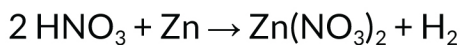
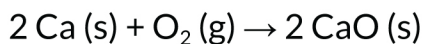


# GAS STOICHIOMETRY Worksheet

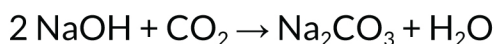
1. How many mL of 0.50 M nitric acid are required to release 3.44 liters of hydrogen gas at 1.33 atm and 45 °C?



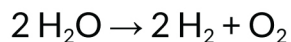
2. What volume of oxygen, measured at 35 °C and 752 mm Hg, is required to burn 3.26 grams of calcium?



3. What is the molarity of a 5 L sodium hydroxide solution that would completely react with 2 L of carbon dioxide gas measured at STP?



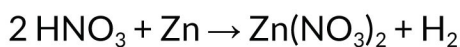
4. How many liters of dry hydrogen gas, measured at 796 torr and 25 °C, will be released by decomposing 255 milliliters of  $\text{H}_2\text{O} (\text{g})$  at 1.33 atm and 25 °C?



# GAS STOICHIOMETRY Worksheet

## Answers

1. How many mL of 0.50 M nitric acid are required to release 3.44 liters of hydrogen gas at 1.33 atm and 45 °C?

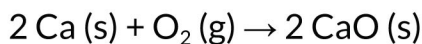


Temperature in Kelvin:  $45 \text{ }^\circ\text{C} = 273 + 45 = 318 \text{ K}$

Number of moles of  $\text{H}_2$ :  $n = PV/RT = (1.33 \text{ atm} \times 3.44 \text{ L}) / (0.082 \text{ L-atm mol}^{-1} \text{ K}^{-1} \times 318 \text{ K}) = 0.175 \text{ mol H}_2$

$0.175 \text{ mol H}_2 \times (2 \text{ mol HNO}_3 \times 1 \text{ mol H}_2) \times (1000 \text{ mL HNO}_3 / 0.5 \text{ mol HNO}_3) = 700 \text{ mL HNO}_3$

2. What volume of oxygen, measured at 35 °C and 752 mm Hg, is required to burn 3.26 grams of calcium?



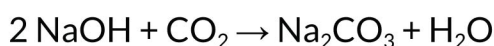
$3.26 \text{ g Ca} \times (1 \text{ mol Ca} / 40.1 \text{ g Ca}) \times (1 \text{ mol O}_2 / 2 \text{ mol Ca}) = 0.0406 \text{ mol O}_2$

Temperature in Kelvin:  $35 \text{ }^\circ\text{C} = 273 + 35 = 308 \text{ K}$

Pressure in atm:  $752 \text{ mm Hg} / 760 \text{ mm-atm}^{-1} \text{ Hg} = 0.989 \text{ atm}$

$V = nRT/P = (0.0406 \text{ mol} \times 0.082 \text{ L-atm mol}^{-1} \text{ K}^{-1} \times 308 \text{ K}) / 0.989 \text{ atm} = 1.04 \text{ L O}_2$

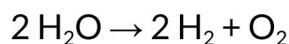
3. What is the molarity of a 5 L sodium hydroxide solution that would completely react with 2 L of carbon dioxide gas measured at STP?



$2 \text{ L CO}_2 \times (1 \text{ mol CO}_2 / 22.4 \text{ L CO}_2) \times (2 \text{ mol NaOH} / 1 \text{ mol CO}_2) = 0.179 \text{ mol NaOH}$

Molarity:  $M = 0.179 \text{ mol NaOH} / 5 \text{ L NaOH} = 0.0357 \text{ M}$

4. How many liters of dry hydrogen gas, measured at 796 torr and 25 °C, will be released by decomposing 255 milliliters of  $\text{H}_2\text{O (g)}$  at 1.33 atm and 25 °C?



Temperature in Kelvin:  $25 \text{ }^\circ\text{C} = 273 + 25 = 298 \text{ K}$

Pressure in atm:  $796 \text{ torr} / 760 \text{ torr atm}^{-1} = 1.047 \text{ atm}$

Number of moles of  $\text{H}_2\text{O}$ :  $PV/RT = (1.33 \text{ atm} \times 0.255 \text{ L}) / (0.082 \text{ L-atm mol}^{-1} \text{ K}^{-1} \times 298 \text{ K}) = 0.0139 \text{ mol H}_2\text{O}$

$0.0139 \text{ mol H}_2\text{O} \times (2 \text{ mol H}_2 / 2 \text{ mol H}_2\text{O}) = 0.0139 \text{ mol H}_2$

Volume of  $\text{H}_2$ :  $V = nRT/P = (0.0139 \text{ mol} \times 0.082 \text{ L-atm mol}^{-1} \text{ K}^{-1} \times 298 \text{ K}) / 1.047 \text{ atm} = 0.325 \text{ L H}_2$