

Unit 10 – Chapter 5: Gases

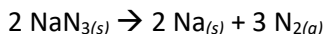
Name _____

Assignment #2: Gas Stoichiometry

Period _____

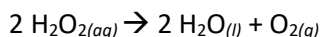
- 1) A student adds 4.00 g of dry ice (solid CO_2) to an empty balloon. What will be the volume of the balloon at STP after all the dry ice sublimates (converts to gaseous CO_2)?

- 2) Air bags are activated when a severe impact causes a steel ball to compress a spring and electrically ignite a detonator cap. This causes sodium azide (NaN_3) to decompose explosively according to the following reaction:



What mass of $\text{NaN}_{3(s)}$ must be reacted to inflate an air bag to 70.0 L at STP?

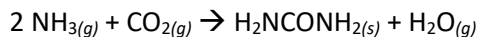
- 3) Concentrated hydrogen peroxide solutions are explosively decomposed by traces of transition metal ions (such as Mn or Fe):



What volume of pure $\text{O}_{2(g)}$, collected at 27°C and 746 torr, would be generated by decomposition of 125 g of a 50.0% by mass hydrogen peroxide solution? Ignore any water vapor that may be present.

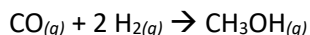
- 4) Consider the reaction between 50.0 mL of liquid methyl alcohol, CH_3OH (density = 0.850 g/mL), and 22.8 L of O_2 at 27°C and a pressure of 2.00 atm. The products of the reaction are $\text{CO}_{2(g)}$ and $\text{H}_2\text{O}_{(g)}$. Calculate the number of moles of H_2O formed if the reaction goes to completion.

- 5) Urea (H_2NCONH_2) is used extensively as a nitrogen source in fertilizers. It is produced commercially from the reaction of ammonia and carbon dioxide using both heat and pressure as catalysts:



Ammonia gas at 223°C and 90.0 atm flows into a reactor at a rate of 500.0 L/min. Carbon dioxide at 223°C and 45 atm flows into the reactor at a rate of 600.0 L/min. What mass of urea is produced **per minute** by this reaction assuming 100% yield?

- 6) Methanol, CH_3OH , can be produced by the following reaction:



Hydrogen at STP flows into a reactor at a rate of 16.0 L/min. Carbon monoxide at STP flows into the reactor at a rate of 25.0 L/min. If 5.30 g of methanol is produced per minute, what is the percent yield of the reaction?