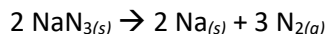


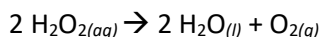
- 1) A student adds 4.00 g of dry ice (solid  $\text{CO}_2$ ) to an empty balloon. What will be the volume of the balloon at STP after all the dry ice sublimates (converts to gaseous  $\text{CO}_2$ )?

- 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 ( $\text{NaN}_3$ ) 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?

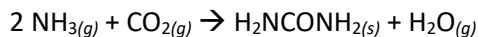
- 3) Concentrated hydrogen peroxide solutions are explosively decomposed by traces of transition metal ions (such as Mn or Fe):



What volume of pure  $\text{O}_{2(g)}$ , collected at  $27^\circ\text{C}$  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.

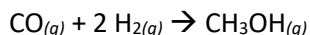
- 4) Consider the reaction between 50.0 mL of liquid methyl alcohol,  $\text{CH}_3\text{OH}$  (density = 0.850 g/mL), and 22.8 L of  $\text{O}_2$  at  $27^\circ\text{C}$  and a pressure of 2.00 atm. The products of the reaction are  $\text{CO}_{2(g)}$  and  $\text{H}_2\text{O}_{(g)}$ . Calculate the number of moles of  $\text{H}_2\text{O}$  formed if the reaction goes to completion.

- 5) Urea ( $\text{H}_2\text{NCONH}_2$ ) 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  $223^\circ\text{C}$  and 90.0 atm flows into a reactor at a rate of 500.0 L/min. Carbon dioxide at  $223^\circ\text{C}$  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,  $\text{CH}_3\text{OH}$ , 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?