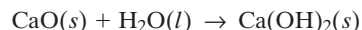


- Write a balanced equation for the burning of magnesium in oxygen.
 - If enough magnesium burns in air to produce 2.04 g of magnesium oxide but only 1.79 g is obtained, what is the percentage yield?
 - Magnesium will react with pure nitrogen to form the nitride, Mg_3N_2 . Write a balanced equation for this reaction.
 - If 0.097 mol of Mg react with nitrogen and 0.027 mol of Mg_3N_2 is produced, what is the percentage yield of the reaction?
- 231.** Some alcohols can be converted to organic acids by using sodium dichromate and sulfuric acid. The following equation shows the reaction of 1-propanol to propanoic acid:
- $$3\text{CH}_3\text{CH}_2\text{CH}_2\text{OH} + 2\text{Na}_2\text{Cr}_2\text{O}_7 + 8\text{H}_2\text{SO}_4 \rightarrow 3\text{CH}_3\text{CH}_2\text{COOH} + 2\text{Cr}_2(\text{SO}_4)_3 + 2\text{Na}_2\text{SO}_4 + 11\text{H}_2\text{O}$$
- If 0.89 g of 1-propanol reacts and 0.88 g of propanoic acid is produced, what is the percentage yield?
 - A chemist uses this reaction to obtain 1.50 mol of propanoic acid. The reaction consumes 136 g of propanol. Calculate the percentage yield.
 - Some 1-propanol of uncertain purity is used in the reaction. If 116 g of $\text{Na}_2\text{Cr}_2\text{O}_7$ are consumed in the reaction and 28.1 g of propanoic acid are produced, what is the percentage yield?
- 232.** Acrylonitrile, $\text{C}_3\text{H}_3\text{N}(\text{g})$, is an important ingredient in the production of various fibers and plastics. Acrylonitrile is produced from the following reaction:
- $$\text{C}_3\text{H}_6(\text{g}) + \text{NH}_3(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{C}_3\text{H}_3\text{N}(\text{g}) + \text{H}_2\text{O}(\text{g})$$
- If 850. g of C_3H_6 is mixed with 300. g of NH_3 and unlimited O_2 , to produce 850. g of acrylonitrile, what is the percentage yield? You must first balance the equation.
- 233.** Methanol, CH_3OH , is frequently used in race cars as fuel. It is produced as the sole product of the combination of carbon monoxide gas and hydrogen gas.
- If 430. kg of hydrogen react, what mass of methanol could be produced?
 - If 3.12×10^3 kg of methanol are actually produced, what is the percentage yield?
- 234.** The compound, $\text{C}_6\text{H}_{16}\text{N}_2$, is one of the starting materials in the production of nylon. It can be prepared from the following reaction involving adipic acid, $\text{C}_6\text{H}_{10}\text{O}_4$:
- $$\text{C}_6\text{H}_{10}\text{O}_4(\text{l}) + 2\text{NH}_3(\text{g}) + 4\text{H}_2(\text{g}) \rightarrow \text{C}_6\text{H}_{16}\text{N}_2(\text{l}) + 4\text{H}_2\text{O}$$
- What is the percentage yield if 750. g of adipic acid results in the production of 578 g of $\text{C}_6\text{H}_{16}\text{N}_2$?
- 235.** Plants convert carbon dioxide to oxygen during photosynthesis according to the following equation:
- $$\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$$
- Balance this equation, and calculate how much oxygen would be produced if 1.37×10^4 g of carbon dioxide reacts with a percentage yield of 63.4%.
- 236.** Lime, CaO , is frequently added to streams and lakes which have been polluted by acid rain. The calcium

oxide reacts with the water to form a base that can neutralize the acid as shown in the following reaction:



If 2.67×10^2 mol of base are needed to neutralize the acid in a lake, and the above reaction has a percentage yield of 54.3%, what is the mass, in kilograms, of lime that must be added to the lake?

Gas Laws: Chap. 11, Sec. 2

Boyle's Law

In each of the following problems, assume that the temperature and molar quantity of gas do not change.

- 237.** Calculate the unknown quantity in each of the following measurements of gases.

P_1	V_1	P_2	V_2
a. 3.0 atm	25 mL	6.0 atm	? mL
b. 99.97 kPa	550. mL	? kPa	275 mL
c. 0.89 atm	? L	3.56 atm	20.0 L
d. ? kPa	800. mL	500. kPa	160. mL
e. 0.040 atm	? L	250 atm	1.0×10^{-2} L

- 238.** A sample of neon gas occupies a volume of 2.8 L at 1.8 atm. What will its volume be at 1.2 atm?
- 239.** To what pressure would you have to compress 48.0 L of oxygen gas at 99.3 kPa in order to reduce its volume to 16.0 L?
- 240.** A chemist collects 59.0 mL of sulfur dioxide gas on a day when the atmospheric pressure is 0.989 atm. On the next day, the pressure has changed to 0.967 atm. What will the volume of the SO_2 gas be on the second day?
- 241.** 2.2 L of hydrogen at 6.5 atm pressure is used to fill a balloon at a final pressure of 1.15 atm. What is its final volume?

Charles's Law

In each of the following problems, assume that the pressure and molar quantity of gas do not change.

- 242.** Calculate the unknown quantity in each of the following measurements of gases:

V_1	T_1	V_2	T_2
a. 40.0 mL	280. K	? mL	350. K
b. 0.606 L	300. K	0.404 L	? K
c. ? mL	292 K	250. mL	365 K
d. 100. mL	? K	125 mL	305 K
e. 0.0024 L	22°C	? L	-14°C