

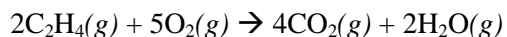
Gas Law Stoichiometry

1) The air bags in a car are filled with a white powdery substance, sodium azide (NaN_3). During a collision, the sodium azide decomposes into sodium metal and nitrogen gas (N_2). The air bag inflates with nitrogen because gases take up so much more space than solids do.



To effectively save your skull from impact, a 30.0-L bag needs to be filled to a pressure of 1064 torr at 25°C. How many grams of sodium azide powder should be in the non-inflated air bag prior to a collision?

2) Acetylene torches are used for welding. These torches use a mixture of acetylene gas, C_2H_4 , and oxygen gas, O_2 to produce the following combustion reaction:



Imagine that you have a 7.00 L gas tank and a 3.50 L gas tank. You need to fill one tank with oxygen and the other with acetylene to use in conjunction with your welding torch. If you fill the larger tank with oxygen to a pressure of 150 atm, to what pressure should you fill the acetylene tank to ensure that you run out of each gas at the same time? Assume constant temperature.

3) Air is an 80:20 mixture of nitrogen molecules and oxygen molecules, respectively.

What is the density of air at STP? Hint: determine the moles of each gas in a given volume of air.