

Activity

## Stoichiometry Word Problems 2



- Cellular respiration occurs in animal cells, a reaction that is essentially the combustion of a sugar called glucose,  $C_6H_{12}O_6$ . If the average human uses 550 liters of oxygen when breathing, how many grams of glucose are used by this process?
- Nitroglycerin,  $C_3H_5(ONO_2)_3$ , was invented in 1846 by an Italian chemist named Ascanio Sobrero. Nitroglycerine contains both an oxidant and a fuel. When it detonates, it decomposes to form carbon dioxide, water, nitrogen, and oxygen, all in a gaseous state. Every mole of the explosive that decomposes in this way generates a tremendous amount of energy – approximately 1.5 MJ (1 MJ = 1 megajoule =  $1 \times 10^6$  J = 1 MJ).
  - If 1.135 kilograms of nitroglycerin detonates, how many total liters of gas (assuming STP) are produced?
  - How much energy is produced by the explosion?
- Sodium hydroxide is a strong, inexpensive base used commonly in many industrial chemical processes. It is manufactured by creating a strong aqueous brine (NaCl) solution and applying an intense electrical current. The sodium ions react with the water to generate sodium hydroxide, hydrogen gas, and chlorine gas. If 2345 g of salt is mixed with 4562 g of water:
  - How much base is produced?
  - Which reactant is limiting?
  - How much of the excess reactant is left over?
- Prior to World War II, ammonia was produced by a process called dry distillation, by which ammonium chloride and quicklime (calcium oxide) react to form calcium chloride, calcium hydroxide, and ammonia. The reaction looks like this:
 
$$NH_4Cl + CaO \rightarrow CaCl_2 + Ca(OH)_2 + NH_3$$

If 75.6 g of ammonium chloride is allowed to react with 52.8 g of quicklime:

  - How many grams of the excess reactant are left over?
  - How many grams of ammonia are formed?
- Hydrochloric acid reacts with zinc metal to form zinc chloride and hydrogen gas. If 345.2 g of zinc metal reacts with 231.6 grams of acid. How many liters of hydrogen gas are produced? How many moles of zinc chloride are produced?
- Dappolonium gas ( $Dp_2$  mw = 5 g/mol) and Rockthehousium (Rk, mw = 7 g/mol) combine to form Dapphousium ( $RkDp_2$ ), an amazingly hard material with transdimensional properties. If 17.0 grams of  $Dp_2$  and 32.0 grams of Rk combine, which is the limiting reactant? How many grams of Dapphousium is formed?