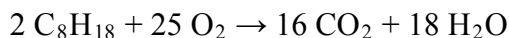


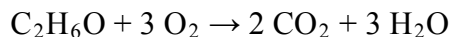
## Stoichiometry Worksheet 1 (mole to mole)

1. A chemist describes a particular experiment in this way: "0.0400 mol of  $\text{H}_2\text{O}_2$  decomposed into 0.0400 mol of  $\text{H}_2\text{O}$  and 0.0200 mol of  $\text{O}_2$ ." Express the chemistry of this reaction by a conventional equation.

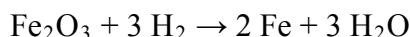
2. The octane present in gasoline burns according to the following equation:



- (a) How many moles of  $\text{O}_2$  are needed to react fully with 4 moles of octane?  
(b) How many moles of  $\text{CO}_2$  can form from 1 mole of octane?  
(c) How many moles of water are produced by the combustion of 6 moles of octane?  
(d) If this reaction is to be used to synthesize 8 mole of  $\text{CO}_2$ , how many moles of oxygen are needed? How many moles of octane?
3. The alcohol in "gasohol" burns according to the following equation.



- (a) If 25 moles of ethyl alcohol burns this way, how many moles of oxygen are needed?  
(b) If 30 moles of oxygen is consumed by this reaction, how many moles of alcohol are used up? How many moles of carbon dioxide are formed?  
(c) In one test, 23 moles of carbon dioxide was produced by this reaction. How many moles of oxygen were consumed?  
(d) In another test, 41 moles of water is collected from this reaction. How many moles of alcohol had been consumed? How many moles of oxygen were used up? How many moles of  $\text{CO}_2$  also formed?
4. One way to change iron ore,  $\text{Fe}_2\text{O}_3$ , into metallic iron is to heat it together with hydrogen.

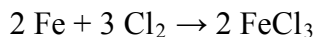


- (a) How many moles of iron are made from 25 moles of  $\text{Fe}_2\text{O}_3$ ?  
(b) How many moles of hydrogen are needed to make 30 moles of Fe?
5. The Solvay process is used to make sodium carbonate,  $\text{Na}_2\text{CO}_3$ , a chemical that ranked 11th among all chemicals in annual production in 1986. The process begins with the passing of ammonia and carbon dioxide through a solution of sodium chloride. This makes sodium bicarbonate and ammonium chloride:

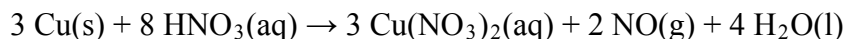


How many moles of sodium bicarbonate could, in theory, be made from 100 moles of  $\text{NaCl}$ ?

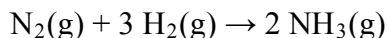
6. How many moles of iron, Fe, can be made from Fe<sub>2</sub>O<sub>3</sub> by the use of 18 moles of carbon monoxide, CO, in the following reaction: Fe<sub>2</sub>O<sub>3</sub> + 3 CO → 2 Fe + 3 CO<sub>2</sub>?
7. How many moles of H<sub>2</sub>O are produced when 6 moles of O<sub>2</sub> is consumed in burning methyl alcohol, CH<sub>3</sub>OH, according to the following equation: 2 CH<sub>3</sub>OH + 3 O<sub>2</sub> → 2 CO<sub>2</sub> + 4 H<sub>2</sub>O?
8. Solution of iron(III) chloride, FeCl<sub>3</sub>, are used in photoengraving and to make ink. This compound can be made by the following reaction.



- (a) How many moles of FeCl<sub>3</sub> form from 24 moles of Cl<sub>2</sub>?
  - (b) How many moles of Fe are needed to combine with 24 moles of Cl<sub>2</sub> by this reaction?
  - (c) If 0.5000 mole of Fe is to be used by this reaction, how many moles of Cl<sub>2</sub> are needed and how many moles of FeCl<sub>3</sub> form?
9. How many moles of nitric acid, HNO<sub>3</sub>, are needed to react with 2.56 moles of Cu in the following reaction: 3 Cu + 8 HNO<sub>3</sub> → 3 Cu(NO<sub>3</sub>)<sub>2</sub> + 2 NO + H<sub>2</sub>O?
  10. How many moles of carbon dioxide are produced by burning 1.50 moles of C<sub>2</sub>H<sub>5</sub>OH?
  11. The questions below refer to the equation:



- (a) How many moles of NO are produced by the reaction of 4.0 moles of copper with excess HNO<sub>3</sub>?
  - (b) How many moles of HNO<sub>3</sub> are required to react completely with 5.0 moles of copper?
  - (c) How many moles of NO are produced by the reaction of 6.35 grams of Cu with excess HNO<sub>3</sub>?
12. Ammonia is produced synthetically by the reaction:



Assume the reaction is complete and answer these questions:

- (a) How many moles of NH<sub>3</sub> are formed when one mole of N<sub>2</sub> reacts with excess hydrogen?
- (b) If 18.0 x 10<sup>23</sup> molecules of H<sub>2</sub> react with sufficient nitrogen, how many moles of NH<sub>3</sub> are produced?
- (c) When 0.1 mole of N<sub>2</sub> combines with 0.3 moles of H<sub>2</sub>, how many moles of NH<sub>3</sub> are produced?