

Note: Problems listed here are at a higher level. Please attempt these only after completing your assigned textbook homework. Solving these problems help you with the written portion of the upcoming quizzes and exam(s). Rewrite these problem statements and do all problems in your homework notebook. Don't memorize any of these problems. Learn the concept behind each and identify your weaknesses. If you are not solving these correctly, identify the missing links from your learning. Next, go back to your notes and study the concepts and examples we did in class and review your textbook homework. The hardest situation to deal with from both student and instructor's point of view is: "*I don't know what I don't know*"! Turn this into 'I know what I don't know' and work on that by getting the right help from your instructor and productive study partners.

Take your problem solving skills to a different level...

- 1) Liquid form of silicon tetrachloride is used in electronic industry to make computer chips. This product can be obtained by reacting beach sand, SiO_2 with carbon and chlorine gas. The second product is carbon monoxide gas.
 - a. Write a balanced reaction including all states of matter.

 - b. What is the theoretical yield of silicon tetrachloride if 56.5 g of silicon dioxide is mixed with 23.2 g of carbon?
 - c. The limiting reactant is _____ .
 - d. Calculate mass of excess reactant left over after the reaction.

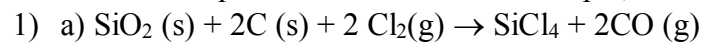
 - e. If the reaction has a 85.5 % yield, what mass of product is actually obtained by mixing the reactants according to part b?

- 2) During space missions, the carbon dioxide content in the exhale of astronauts must be removed by reacting it with lithium hydroxide. Reaction products are lithium carbonate and water.
 - a. Write a balanced reaction including all states of matter.

- b. If each astronaut produces 1.1 kg of carbon dioxide gas per day and there are 5 astronauts on board, calculate mass (kg) of LiOH necessary for a 10 day space shuttle mission.
- 3) Solid sugar, $C_6H_{12}O_6$ can be fermented in the presence of yeast (a biological organism) in order to produce liquid ethyl alcohol, C_2H_5OH and carbon dioxide.
- Write a balanced reaction including all states of matter and reaction condition.
 - What is the theoretical mass of ethyl alcohol that can be produced from fermentation of 120. g of sugar?
 - If distillation of reaction mixture, after the reaction, yields 52 g of pure alcohol, calculate the % yield.
- 4) Propane C_3H_8 is commonly used in home barbeques in liquid form. Propane reaction involves combustion to produce heat energy. Calculate mass (kg) of carbon dioxide gas produced when a 5.0 gallon tank containing liquid propane is completely combusted. Assume that liquid propane has a density of 0.64 g/mL.

Answers:

Note: "E" means exponent of base 10. For example, 1.67E23 means: 1.67×10^{23}

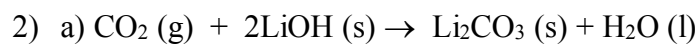


b) 160. g

c) SiO_2

d) 0.6 g

e) 137 g



b) 60. kg



b) 61.4 g

c) 85%

4) 36 kg