

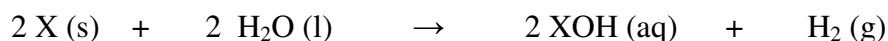
Review for Unit Test: Stoichiometry

1. What is meant by the “limiting factor”? Explain why the limiting factor is important.
2. For the reaction: $\text{AlCl}_3 (\text{aq}) + 3 \text{NaOH} (\text{aq}) \rightarrow \text{Al}(\text{OH})_3 (\text{s}) + 3 \text{NaCl} (\text{aq})$
 - a) How many **moles** of sodium hydroxide are needed in order to form 8.43 moles of aluminum hydroxide?
 - b) What mass of sodium hydroxide is required to react with 50.7 g of aluminum chloride?
3. For the reaction: $4 \text{Fe} (\text{s}) + 3 \text{O}_2 (\text{g}) \rightarrow 2 \text{Fe}_2\text{O}_3 (\text{s})$
 - a) What volume of pure oxygen gas at STP is required to react with 1.5 g of pure iron?
 - b) Air is 20.9 % oxygen. What volume of air is required to react with 1.5 g of pure iron?

4. For the reaction: $\text{SiO}_2 (\text{s}) + 4 \text{HF} (\text{g}) \rightarrow \text{SiF}_4 (\text{s}) + 2 \text{H}_2\text{O} (\text{v})$

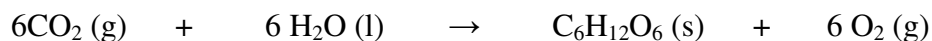
What volume of $\text{H}_2\text{O} (\text{v})$ is produced when 35.0 g of SiO_2 react with 63.0 L of HF gas? Assume that all gases and vapours are at STP.

5. An unknown element “X” reacts according to the following chemical equation:



When 22.76 g of “X” reacts, 1.000 g of hydrogen gas is produced (at STP). What is the molar mass and probable identity of the element “X” ?

6. Plants produce sugar by photosynthesis using the reaction:

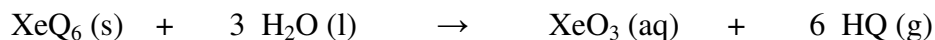


- a) How many litres of pure carbon dioxide are required by a green plant in order to produce 450.0 g of glucose, $\text{C}_6\text{H}_{12}\text{O}_6 (\text{s})$?
- b) How many litres of air are needed to supply the required CO_2 in part (a), assuming that air is 0.0400% carbon dioxide by volume?

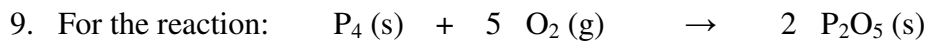
7. For the reaction: $2 \text{Fe}_2\text{O}_3 (\text{s}) + 3 \text{C} (\text{s}) \rightarrow 4 \text{Fe} (\text{s}) + 3 \text{CO}_2 (\text{g})$

What volume of carbon dioxide will be formed when 50.0 g of iron (III) oxide react with 2.50 g of pure carbon?

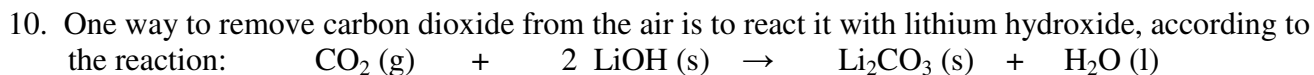
8. An unknown element “Q” reacts according to the following chemical equation:



When XeQ_6 reacts with exactly 13.80 g of water, 30.65 g of HQ (g) are formed. What is the molar mass and likely identity of “Q”?



- a) If 7.50 grams of P_4 are reacted with excess O_2 , how many grams of P_2O_5 may be produced? That is, what is the theoretical yield of P_2O_5 ?
- b) If 13.6 g of P_2O_5 are actually produced, what is the percentage yield of P_2O_5 ?



- a) When 20.00 g of lithium hydroxide are reacted with carbon dioxide gas, what mass of lithium carbonate may be produced?
- b) If the actual mass of lithium carbonate that is produced is 29.40 g, calculate the percentage yield for this reaction.

Answers:

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|--|---|
| 2a) 25.3 mol NaOH | b) 45.6 g |
| 3a) 0.45 L of O_2 | b) 2.2 L of air |
| 4) SiO_2 is the limiting factor. | 26.1 L of H_2O is produced. |
| 5) MM_X is 22.99 g/mol. "X" is probably sodium. | |
| 6a) 336 L of CO_2 | b) 8.40×10^5 L of air |
| 7) C is limiting factor. | 4.66 L of CO_2 will form. |
| 8) MM_Q is 19.00 g/mol. "X" is probably fluorine. | |
| 9a) 17.2 g of P_2O_5 | b) 79.1% yield |
| 10a) 30.85 g of Li_2CO_3 | b) 95.30 % yield |