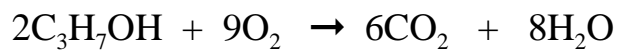




4. For the reaction:



A) Calculate the number of moles of  $\text{CO}_2$  produced from 0.600 mol  $\text{C}_3\text{H}_7\text{OH}$  reacting with sufficient  $\text{O}_2$ .

SET-UP

ANS 1.80 mol

B) Calculate the number of moles of  $\text{O}_2$  reacting with sufficient  $\text{C}_3\text{H}_7\text{OH}$  required to produce 3.60 mol of  $\text{H}_2\text{O}$ .

SET-UP

ANS 4.05 mol

C) Calculate the number of moles of  $\text{O}_2$  required to react with 1.80 mol  $\text{C}_3\text{H}_7\text{OH}$ .

SET-UP

ANS 8.10 mol

(Still using the reaction:  $2\text{C}_3\text{H}_7\text{OH} + 9\text{O}_2 \rightarrow 6\text{CO}_2 + 8\text{H}_2\text{O}$ )

- D) Calculate the number of moles of  $\text{O}_2$  required to react with 1.80 g of  $\text{C}_3\text{H}_7\text{OH}$ .  
SET-UP

ANS 0.135 mol

- E) Calculate the number of moles of  $\text{C}_3\text{H}_7\text{OH}$  required to react with 1.80 grams  $\text{O}_2$ .  
SET-UP

ANS 0.0125 mol

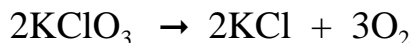
- F) Calculate the number of molecules of  $\text{CO}_2$  and the number of grams  $\text{H}_2\text{O}$  produced when 0.450 mole of  $\text{O}_2$  reacts with sufficient  $\text{C}_3\text{H}_7\text{OH}$ .  
SET-UP: (For molecules of  $\text{CO}_2$ )

ANS  $1.81 \times 10^{23}$

SET-UP: (For grams  $\text{H}_2\text{O}$ )

ANS 7.20 g

5.  $\text{KClO}_3$  decomposes upon heating to form  $\text{KCl}$  and  $\text{O}_2$ . The reaction is:



How many grams of  $\text{KClO}_3$  must be heated to form 24.6 grams  $\text{O}_2$ ?

SET-UP

ANS: 62.8 g

6. The percent yield is defined as the mass of the material actually recovered from a reaction divided by the mass calculated from the reactants times 100 %. The equation is:

$$\% \text{ yield} = \frac{m_{\text{actual}}}{m_{\text{calculated}}} \times 100\% \text{ } ^1. \text{ The calculated amount in the previous question was 24.6 g}$$

$\text{O}_2$ . If one had actually recovered 20.0 g of  $\text{O}_2$ , what would the percent yield have been?

ANS: 81.3 %

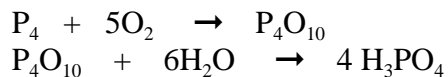
7. Using the reaction given in question 5, calculate the percent yield if one used 250.0 g of  $\text{KClO}_3$  to produce  $\text{O}_2$ , and was able to recover 84.2 g of  $\text{O}_2$ .

ANS: 86.0 %

---

<sup>1</sup> Mass % is being discouraged by IUPAC at the moment, with the replacement being mass fraction,  $w$ , which is given by the formula:  $w_i = \frac{m_i}{\sum m_j}$  where  $i$  is included in the exhaustive  $j$ . However, %, which is always mass percent unless otherwise stated, is still very prevalent.

8. Phosphoric acid ( $\text{H}_3\text{PO}_4$ , molar mass 98.0) can be prepared from  $\text{P}_4$  and  $\text{O}_2$  by the following series of reactions.



16.5 grams of  $\text{H}_3\text{PO}_4$  were formed by reacting 0.0500 mole of  $\text{P}_4$  with sufficient  $\text{O}_2$  and  $\text{H}_2\text{O}$ . Calculate the percent yield.

SET-UP

ANS 84.2 %

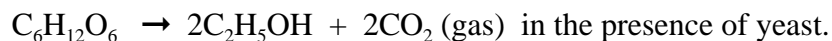
Percent purity is defined as mass of pure material (or material of interest) divided by the total mass of material present times 100 %. The equation for this is:

$$\% \text{ purity} = \frac{m_{\text{pure}}}{\Sigma m_{\text{all present}}} \times 100\%$$

9. A sample consists of 55.0 g of salt and 35.0 g of sand. What is the purity of the salt?

ANS 61.1 %

10. Ethyl alcohol ( $C_2H_5OH$ ) may be prepared by the fermentation of glucose ( $C_6H_{12}O_6$ ) as indicated by the equation:



How many liters of ethyl alcohol (density of ethyl alcohol is  $0.790 \text{ g mL}^{-1}$ ) can be prepared from 2.00 kilograms of a mixture that is 85.0% glucose?

SET-UP

ANS 1.10 L

11. How many grams of  $Al_2O_3$  can be produced by reacting 0.450 mole aluminum with  $2.40 \times 10^{23}$  molecules of oxygen? The reaction is:



SET-UP

ANSWER using Al: 23.0 g

ANSWER using  $O_2$ : 27.1 g

You need to do both calculations.

ANS 23.0 g