Stoichiometry Worksheet and Key

2 KClO₃ → 2 KCl + 3 O₂

1. How many moles of O₂ will be formed from 1.65 moles of KClO₃?

\[
\frac{1.65 \text{ mol KClO}_3}{\text{mol KClO}_3} \times \frac{\_ \text{ mol O}_2}{\_ \text{ mol KClO}_3} = \_ \text{ mol O}_2
\]

2. How many moles of KClO₃ are needed to make 3.50 moles of KCl?

\[
\frac{3.50 \text{ mol KCl}}{\text{mol KCl}} = \_ \text{ mol KClO}_3
\]

3. How many moles of KCl will be formed from 2.73 moles of KClO₃?

\[
\frac{2.73 \text{ mol KClO}_3}{\text{mol KClO}_3} = \_ \text{ mol KCl}
\]

4 Fe + 3 O₂ → 2 Fe₂O₃

4. How many moles of Fe₂O₃ are produced when 0.275 moles of Fe is reacted?

\[
\frac{0.275 \text{ mol Fe}}{\text{mol Fe}} = \_ \text{ mol Fe₂O₃}
\]

5. How many moles of Fe₂O₃ are produced when 31.0 moles of O₂ is reacted?

\[
\frac{31.0 \text{ mol O}_2}{\text{mol O}_2} = \_ \text{ mol Fe₂O₃}
\]

6. How many moles of O₂ are needed to react with 8.9 moles of Fe?

\[
\frac{8.9 \text{ mol Fe}}{\text{mol Fe}} = \_ \text{ mol O}_2
\]

2 H₂O → 2 H₂ + O₂

7. How many moles of O₂ are produced when 1.26 moles of H₂O is reacted?

8. How many moles of H₂O are needed to produce 55.7 moles of H₂?

9. If enough H₂O is reacted to produce 3.40 moles of H₂, then how many moles of O₂ must have been made?
   (a bit challenging, but just think about it and you can probably figure it out)
2 KClO₃ \rightarrow 2 KCl + 3 O₂

10. How many grams of O₂ will be formed from 3.76 grams of KClO₃?

\[
\begin{array}{ccc}
3.76 \text{g KClO}_3 & \rightarrow & 1 \text{ mol KClO}_3 & \rightarrow & \text{ mol O}_2 & \rightarrow & \text{ g O}_2 \\
122.55 \text{g KClO}_3 & \rightarrow & \text{ mol KClO}_3 & \rightarrow & \text{ mol O}_2 & \rightarrow & \text{ g O}_2
\end{array}
\]

11. How many grams of KClO₃ are needed to make 30.0 grams of KCl?

\[
\begin{array}{ccc}
30.0 \text{g KCl} & \rightarrow & \text{ mol KCl} & \rightarrow & \text{ mol KClO}_3 & \rightarrow & \text{ g KClO}_3 \\
& & \text{ mol KCl} & \rightarrow & \text{ mol KClO}_3 & \rightarrow & \text{ g KClO}_3
\end{array}
\]

12. How many grams of KCl will be formed from 2.73 g of KClO₃?

\[
\begin{array}{ccc}
2.73 \text{g KClO}_3 & \rightarrow & \text{ mol KClO}_3 & \rightarrow & \text{ mol KCl} & \rightarrow & \text{ g KCl}
\end{array}
\]

\[4 \text{Fe} + 3 \text{O}_2 \rightarrow 2 \text{Fe}_2\text{O}_3\]

13. How many grams of Fe₂O₃ are produced when 42.7 grams of Fe is reacted?

\[
\begin{array}{ccc}
42.7 \text{g Fe} & \rightarrow & \text{ mol Fe} & \rightarrow & \text{ mol Fe}_2\text{O}_3 & \rightarrow & \text{ g Fe}_2\text{O}_3 \\
& & \text{ mol Fe} & \rightarrow & \text{ mol Fe}_2\text{O}_3 & \rightarrow & \text{ g Fe}_2\text{O}_3
\end{array}
\]

14. How many grams of Fe₂O₃ are produced when 17.0 grams of O₂ is reacted?

\[
\begin{array}{ccc}
17.0 \text{g O}_2 & \rightarrow & \text{ mol O}_2 & \rightarrow & \text{ mol Fe}_2\text{O}_3 & \rightarrow & \text{ g Fe}_2\text{O}_3
\end{array}
\]

15. How many grams of O₂ are needed to react with 125 grams of Fe?

\[
\begin{array}{ccc}
& & \text{ g Fe} & \rightarrow & \text{ mol Fe}_2\text{O}_3 & \rightarrow & \text{ g Fe}_2\text{O}_3
\end{array}
\]

Some cars can use butane (C₄H₁₀) as fuel:

\[2 \text{C}_4\text{H}_{10} + 13 \text{O}_2 \rightarrow 8 \text{CO}_2 + 10 \text{H}_2\text{O}\]

16. How many grams of CO₂ are produced from the combustion of 100. grams of butane?

\[
\begin{array}{ccc}
100. \text{g C}_4\text{H}_{10} & \rightarrow & \text{ mol C}_4\text{H}_{10} & \rightarrow & \text{ mol CO}_2 & \rightarrow & \text{ g CO}_2
\end{array}
\]

17. How many grams of O₂ are needed to react with of 100. grams of butane?

\[
\begin{array}{ccc}
100. \text{g C}_4\text{H}_{10} & \rightarrow & \text{ mol C}_4\text{H}_{10} & \rightarrow & \text{ mol O}_2 & \rightarrow & \text{ g O}_2
\end{array}
\]

18 How many grams of H₂O are produced when 5.38g of O₂ is reacted?
**KEY**

\[ 2 \text{KClO}_3 \rightarrow 2 \text{KCl} + 3 \text{O}_2 \]

1. How many moles of \( \text{O}_2 \) will be formed from 1.65 moles of \( \text{KClO}_3 \)?

\[
\begin{array}{c|c|c}
\text{1.65 mol KClO}_3 & \text{3 mol O}_2 & \text{2.48 mol O}_2 \\
\hline
\text{2 mol KClO}_3 & \text{2 mol KCl} & \text{2 mol KClO}_3 \\
\end{array}
\]

2. How many moles of \( \text{KClO}_3 \) are needed to make 3.50 moles of \( \text{KCl} \)?

\[
\begin{array}{c|c|c}
\text{3.50 mol KCl} & \text{2 mol KClO}_3 & \text{3.50 mol KClO}_3 \\
\hline
\text{2 mol KCl} & \text{2 mol KClO}_3 & \text{2 mol KClO}_3 \\
\end{array}
\]

3. How many moles of \( \text{KCl} \) will be formed from 2.73 moles of \( \text{KClO}_3 \)?

\[
\begin{array}{c|c|c}
\text{2.73 moles KClO}_3 & \text{2 mol KCl} & \text{2.73 mol KCl} \\
\hline
\text{2 mol KClO}_3 & \text{2 mol KClO}_3 & \text{2 mol KClO}_3 \\
\end{array}
\]

\[ 4 \text{Fe} + 3 \text{O}_2 \rightarrow 2 \text{Fe}_2\text{O}_3 \]

4. How many moles of \( \text{Fe}_2\text{O}_3 \) are produced when 0.275 moles of \( \text{Fe} \) are reacted?

\[
\begin{array}{c|c|c}
\text{0.275 mol Fe} & \text{2 mol Fe}_2\text{O}_3 & \text{0.138 mol Fe}_2\text{O}_3 \\
\hline
\text{4 mol Fe} & \text{4 mol Fe} & \text{4 mol Fe} \\
\end{array}
\]

5. How many moles of \( \text{Fe}_2\text{O}_3 \) are produced when 31.0 moles of \( \text{O}_2 \) are reacted?

\[
\begin{array}{c|c|c}
\text{31.0 mol O}_2 & \text{2 mol Fe}_2\text{O}_3 & \text{20.7 mol Fe}_2\text{O}_3 \\
\hline
\text{3 mol O}_2 & \text{3 mol O}_2 & \text{3 mol O}_2 \\
\end{array}
\]

6. How many moles of \( \text{O}_2 \) are needed to react with 8.9 moles of \( \text{Fe} \)?

\[
\begin{array}{c|c|c}
\text{8.9 mol Fe} & \text{3 mol O}_2 & \text{6.7 mol O}_2 \\
\hline
\text{4 mol Fe} & \text{4 mol Fe} & \text{4 mol Fe} \\
\end{array}
\]

\[ 2 \text{H}_2\text{O} \rightarrow 2 \text{H}_2 + \text{O}_2 \]

7. How many moles of \( \text{O}_2 \) are produced when 1.26 moles of \( \text{H}_2\text{O} \) is reacted?

\[
\begin{array}{c|c|c}
\text{1.26 mol H}_2\text{O} & \text{1 mol O}_2 & \text{.630 mol O}_2 \\
\hline
\text{2 mol H}_2\text{O} & \text{2 mol H}_2\text{O} & \text{2 mol H}_2\text{O} \\
\end{array}
\]

8. How many moles of \( \text{H}_2\text{O} \) are needed to produce 55.7 moles of \( \text{H}_2 \)?

\[
\begin{array}{c|c|c}
\text{55.7 mol H}_2 & \text{2 mol H}_2\text{O} & \text{55.7 mol H}_2\text{O} \\
\hline
\text{2 mol H}_2 & \text{2 mol H}_2 & \text{2 mol H}_2 \\
\end{array}
\]

9. If enough \( \text{H}_2\text{O} \) is reacted to produce 3.40 moles of \( \text{H}_2 \), then how many moles of \( \text{O}_2 \) must have been made?

(a bit challenging, but just think about it and you can probably figure it out)

\[
\begin{array}{c|c|c}
\text{3.40 mol H}_2 & \text{1 mol O}_2 & \text{1.70 mol O}_2 \\
\hline
\text{2 mol H}_2 & \text{2 mol H}_2 & \text{2 mol H}_2 \\
\end{array}
\]
10. How many grams of \( \text{O}_2 \) will be formed from 3.76 grams of \( \text{KClO}_3 \)?

\[
\begin{array}{ccc}
3.76 \text{g KClO}_3 & 1 \text{ mol KClO}_3 & 3 \text{ mol O}_2 & 32.00 \text{ g O}_2 \\
122.55 \text{ g KClO}_3 & 2 \text{ mol KClO}_3 & 1 \text{ mol O}_2 & 1.47 \text{ g O}_2 \\
\end{array}
\]

11. How many grams of \( \text{KClO}_3 \) are needed to make 30.0 grams of \( \text{KCl} \)?

\[
\begin{array}{ccc}
74.55 \text{ g KCl} & 1 \text{ mol KCl} & 2 \text{ mol KClO}_3 & 122.55 \text{ g KClO}_3 \\
1 \text{ mol KClO}_3 & 2 \text{ mol KCl} & 1 \text{ mol KClO}_3 & 49.3 \text{ g KClO}_3 \\
\end{array}
\]

12. How many grams of \( \text{KCl} \) will be formed from 2.73 g of \( \text{KClO}_3 \)?

\[
\begin{array}{ccc}
122.55 \text{ g KClO}_3 & 1 \text{ mol KClO}_3 & 2 \text{ mol KCl} \\
1 \text{ mol KCl} & 74.55 \text{ g KCl} & 1 \text{ mol KCl} \\
\end{array}
\]

13. How many grams of \( \text{Fe}_2\text{O}_3 \) are produced when 42.7 grams of \( \text{Fe} \) is reacted?

\[
\begin{array}{ccc}
42.7 \text{g Fe} & 1 \text{ mole Fe} & 2 \text{ mol Fe}_2\text{O}_3 & 159.70 \text{ g Fe}_2\text{O}_3 \\
55.85 \text{ g Fe} & 4 \text{ mol Fe} & 1 \text{ mol Fe}_2\text{O}_3 & 61.0 \text{ g Fe}_2\text{O}_3 \\
\end{array}
\]

14. How many grams of \( \text{Fe}_2\text{O}_3 \) are produced when 17.0 grams of \( \text{O}_2 \) is reacted?

\[
\begin{array}{ccc}
17.0 \text{g O}_2 & 1 \text{ mol O}_2 & 2 \text{ mol Fe}_2\text{O}_3 & 159.70 \text{ g Fe}_2\text{O}_3 \\
32.00 \text{ g O}_2 & 3 \text{ mol O}_2 & 1 \text{ mol Fe}_2\text{O}_3 & 56.6 \text{ g Fe}_2\text{O}_3 \\
\end{array}
\]

15. How many grams of \( \text{O}_2 \) are produced when 125 grams of \( \text{Fe} \) is reacted?

\[
\begin{array}{ccc}
125 \text{g Fe} & 1 \text{ mol Fe} & 3 \text{ mol O}_2 & 32.00 \text{ g O}_2 \\
55.85 \text{ g Fe} & 4 \text{ mol Fe} & 1 \text{ mol O}_2 & 53.7 \text{ g O}_2 \\
\end{array}
\]

Some cars can use butane (\( \text{C}_4\text{H}_{10} \)) as fuel:

\[
\text{2 C}_4\text{H}_{10} + 13 \text{ O}_2 \rightarrow 8 \text{ CO}_2 + 10 \text{ H}_2\text{O}
\]

16. How many grams of \( \text{CO}_2 \) are produced from the combustion of 100. grams of \( \text{butane} \)?

\[
\begin{array}{ccc}
100. \text{g C}_4\text{H}_{10} & 1 \text{ mol C}_4\text{H}_{10} & 8 \text{ mol CO}_2 & 44.01 \text{ g CO}_2 \\
58.14 \text{ g C}_4\text{H}_{10} & 2 \text{ mol C}_4\text{H}_{10} & 1 \text{ mol CO}_2 & 303 \text{ g CO}_2 \\
\end{array}
\]

17. How many grams of \( \text{O}_2 \) are needed to react with 100. grams of \( \text{butane} \)?

\[
\begin{array}{ccc}
100. \text{g C}_4\text{H}_{10} & 1 \text{ mol C}_4\text{H}_{10} & 13 \text{ mol O}_2 & 32.00 \text{ g O}_2 \\
58.14 \text{ g C}_4\text{H}_{10} & 2 \text{ mol C}_4\text{H}_{10} & 1 \text{ mol O}_2 & 358 \text{ g O}_2 \\
\end{array}
\]

18. How many grams of \( \text{H}_2\text{O} \) are produced when 5.38g of \( \text{O}_2 \) is reacted?

\[
\begin{array}{ccc}
5.38 \text{g O}_2 & 1 \text{ mol O}_2 & 10 \text{ mol H}_2\text{O} & 18.02 \text{ g H}_2\text{O} \\
32.00 \text{ g O}_2 & 13 \text{ mol O}_2 & 1 \text{ mol H}_2\text{O} & 2.33 \text{ g H}_2\text{O} \\
\end{array}
\]