

Chapter 9

Practice Test

Name: _____

Date: _____ Per: _____

Directions: Answer the following questions in the spaces provided. Show as much work as possible. Maintain 3 decimal places throughout your calculations. Box your answers & include units!

Balance the following:

1. _____ Al + _____ Fe₂O₃ → _____ Fe + _____ Al₂O₃
2. _____ PbCl₂ + _____ Li₂SO₄ → _____ PbSO₄ + _____ LiCl
3. _____ Cl₂ + _____ KBr → _____ KCl + _____ Br₂

Sample: Convert 60.0g NaOH to formula units NaOH

| | | | | |
|---|----------------------------|--|---|---|
| $\frac{60.0\text{g NaOH}}{39.997\text{g NaOH}}$ | $\frac{1\text{ mol NaOH}}$ | $\frac{6.022 \times 10^{23}\text{ units NaOH}}{1\text{ mol NaOH}}$ | = | $9.03 \times 10^{23}\text{ units NaOH}$ |
|---|----------------------------|--|---|---|

4. Convert 44.1g NaHCO₃ to formula units NaHCO₃

| | | | | |
|-------|--|-------|---|-------|
| _____ | | _____ | = | _____ |
|-------|--|-------|---|-------|

Sample: Given the unbalanced reaction, $\text{TiCl}_4 + \text{H}_2\text{O} \rightarrow \text{TiO}_2 + \text{HCl}$

a. Write the balanced equation: $\text{TiCl}_4 + 2\text{H}_2\text{O} \rightarrow \text{TiO}_2 + 4\text{HCl}$

How many moles of HCl would be produced from:

b. 2 moles of TiCl₄ 8 moles HCl c. 0.5 moles of H₂O 1 mole HCl

b. since the mole ratio of TiCl₄ : HCl is 1:4, the number of moles of HCl must always be 4 times the moles of TiCl₄

c. since the mole ratio of H₂O : HCl is 2:4, the number of moles of HCl must always be 2 times the moles of H₂O

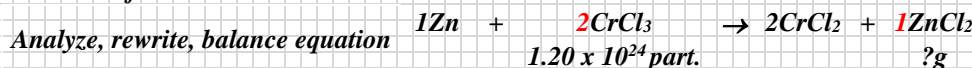
5. Given the unbalanced equation, $\text{Fe} + \text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + \text{H}_2$

a. Write the balanced equation: _____

How many moles of Fe₃O₄ would be produced from:

b. 2.5 moles of Fe _____ c. 1.5 moles of H₂O _____

Sample: Given the equation $\text{Zn} + \text{CrCl}_3 \rightarrow \text{CrCl}_2 + \text{ZnCl}_2$, find the mass of ZnCl₂ formed if 1.20×10^{24} formula units of CrCl₃ reacts with an excess of Zn.



Solve for only reactant $\frac{1.20 \times 10^{24}\text{ part. CrCl}_3}{6.022 \times 10^{23}\text{ part. CrCl}_3} \times \frac{1\text{ mol CrCl}_3}{2\text{ mol CrCl}_3} \times \frac{1\text{ mol ZnCl}_2}{1\text{ mol ZnCl}_2} \times \frac{136.286\text{g ZnCl}_2}{1\text{ mol ZnCl}_2} = \boxed{136\text{g ZnCl}_2}$

6. Given the equation $\text{WO}_3 + \text{H}_2 \rightarrow \text{W} + \text{H}_2\text{O}$, find the mass of W formed if 3.00×10^{22} formula units of WO₃ reacts with an excess of H₂.

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Sample: Given the equation $\text{RbCl} + \text{O}_2 \rightarrow \text{RbClO}_4$, find the mass of RbClO_4 formed if 2.70g of O_2 reacts with 135g RbCl .



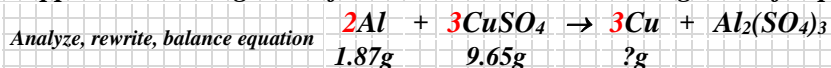
Solve for 1st reactant $\frac{135\text{g RbCl}}{120.921\text{g RbCl}} \times \frac{1\text{ mol RbCl}}{120.921\text{g RbCl}} \times \frac{1\text{ mol RbClO}_4}{1\text{ mol RbCl}} \times \frac{184.917\text{g RbClO}_4}{1\text{ mol RbClO}_4} = 206.45\text{g RbClO}_4$

Solve for 2nd reactant $\frac{2.70\text{g O}_2}{31.998\text{g O}_2} \times \frac{1\text{ mol O}_2}{31.998\text{g O}_2} \times \frac{1\text{ mol RbClO}_4}{2\text{ mol O}_2} \times \frac{184.917\text{g RbClO}_4}{1\text{ mol RbClO}_4} = \boxed{7.80\text{g RbClO}_4}$

In a limiting reactant problem the correct answer will be the lower of the two calculated values.

7. Given the unbalanced equation $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$, find the mass of CO_2 produced from the reaction of 56.1g of CH_4 with 91.2g of O_2 .

Sample: Using the equation $\text{Al} + \text{CuSO}_4 \rightarrow \text{Cu} + \text{Al}_2(\text{SO}_4)_3$, calculate the percent yield if you experimentally produce 3.65 grams of copper when 1.87 grams of aluminum reacts with 9.65 grams of copper (II) sulfate.



Solve for 1st reactant $\frac{1.87\text{g Al}}{26.982\text{g Al}} \times \frac{1\text{ mol Al}}{26.982\text{g Al}} \times \frac{3\text{ mol Cu}}{2\text{ mol Al}} \times \frac{63.546\text{g Cu}}{1\text{ mol Cu}} = 6.61\text{g Cu}$

Solve for 2nd reactant $\frac{9.65\text{g CuSO}_4}{159.608\text{g CuSO}_4} \times \frac{1\text{ mol CuSO}_4}{159.608\text{g CuSO}_4} \times \frac{3\text{ mol Cu}}{3\text{ mol CuSO}_4} \times \frac{63.546\text{g Cu}}{1\text{ mol Cu}} = \boxed{3.84\text{g Cu}}$

Calculate % yield = $\frac{\text{actual yield (from question)}}{\text{theoretical yield (calculated above)}} \times 100 \rightarrow \rightarrow \frac{3.65\text{g Cu}}{3.84\text{g Cu}} \times 100 = \boxed{95.1\%}$

8. Given the unbalanced equation $\text{Ba}(\text{NO}_3)_2 + \text{Na}_2\text{CrO}_4 \rightarrow \text{BaCrO}_4 + \text{NaNO}_3$, find the mass of NaNO_3 formed if 18.6g $\text{Ba}(\text{NO}_3)_2$ reacts with 46.1g Na_2CrO_4 .

When the reaction is carried out, 10.5 g of NaNO_3 is formed. Calculate the percent yield.