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Really Ch. 12 Practice Test

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Period 6

Chemistry Chapter 11 "Practice Test"

1. Stoichiometry is the study of the quantitative relationships that exist in chemical reactions.
2. The coefficients in a balanced equation indicate(s) the number of particles of each substance taking place in the reaction.
3. What is the first thing you must do in solving any stoichiometric equation? Balance the equation.
4. What is the molar ratio of hydrogen to oxygen in this equation?

   $2H_2 + O_2 \rightarrow 2H_2O$ $\frac{2 \text{ mole } H_2}{1 \text{ mole } O_2}$
5. A balanced equation verifies the law of conservation of mass & energy.
6. What is the same in mass-mass, mass-volume and volume-volume problems? Sum of mass & energy.
7. In a chemical equation of gases, the coefficents represent the ratio of volume of reactants & volume of products.
8. STP value for temperature is 0°C. For pressure 1 atm.
9. What is stoichiometric proportion? when reactants are available in the exact ratio as described by the balanced equation.
10. Describe a limiting reactant and it's role in a chemical reaction.
11. Which is always greater, actual yield or theoretical yield?
12. What is precent yield and how is it determined?

rest on next sheet!

Problems

13. Aluminum reacts with HCl to produce aluminum chloride ($AlCl_3$) and hydrogen gas. Write a balanced equation for the reaction and calculate the number of moles of HCl required to react with 0.87 mol of Al.

14. Calcium carbonate ($CaCO_3$) combines with HCl to produce calcium chloride ($CaCl_2$), water and carbon dioxide gas. Write the balanced equation for this reaction. How many moles of HCl are required to react with 2.5 mol of $CaCO_3$? How many moles of CO_2 would be produced?

15. When 9.8 g of Al_2O_3 decomposes, how many grams of aluminum metal are produced?

16. How many liters of HCl are produced by the reaction of 5.7L hydrogen with and equal amount of chlorine?

17. If 30.2 g of aluminum react with HCl to produce aluminum chloride and hydrogen gas, how many liters of hydrogen are produced at STP?

18. In a reaction of 15.3 g of NaCl with 60.8 g of $Pb(NO_3)_2$, how many grams of lead (II) chloride will be produced? What is the limiting reactant?

19. What is the precent yield of NaCl if 4.89 g Na reacts with excess Cl_2 gas to produce 10.6 g NaCl?

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(10) A limiting reactant is the reactant that limits the amount of product formed in a chemical reaction.

(11) The theoretical yield is always greater than the actual yield.

(12) Percent yield is the per cent of the expected yield that was actually obtained. It is determined by the equation:

$$\%\ \text{Yield} = \frac{\text{Actual Yield}}{\text{Theoretical Yield}} \times 100\%$$

(13) $2Al_{(s)} + 6HCl_{(aq)} \rightarrow 2AlCl_{3(aq)} + 3H_{2(g)}$

$$\frac{.87\ \text{mol Al}}{1} \cdot \frac{6\ \text{mol HCl}}{2\ \text{mol Al}} = 2.61 \rightarrow \boxed{2.6\ \text{mol HCl}}$$

(14) $CaCO_{3(aq)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + H_2O_{(\ell)} + CO_{2(g)}$

$$\frac{2.5\ \text{mol } CaCO_3}{1} \cdot \frac{2\ \text{mol HCl}}{1\ \text{mol } CaCO_3} = \boxed{5.0\ \text{mol HCl}}$$

$$\frac{2.5\ \text{mol } CaCO_3}{1} \cdot \frac{1\ \text{mol } CO_2}{1\ \text{mol } CaCO_3} = \boxed{2.5\ \text{mol } CO_2}$$

(15) $2Al_2O_3 \rightarrow 4Al + 3O_2$

$$\frac{9.8\ \text{g } Al_2O_3}{1} \cdot \frac{1\ \text{mol } Al_2O_3}{102.0\ \text{g } Al_2O_3} \cdot \frac{4\ \text{mol Al}}{2\ \text{mol } Al_2O_3} \cdot \frac{27.0\ \text{g Al}}{1\ \text{mol Al}} = \boxed{5.2\ \text{g Al}}$$

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(16) $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$

$\frac{5.7\ L\ H_2}{1} \cdot \frac{2\ L\ HCl}{1\ L\ H_2} = 11.4\ L \Rightarrow \boxed{11\ L\ HCl}$

$\frac{5.7\ L\ Cl_2}{1} \cdot \frac{2\ L\ HCl}{1\ L\ Cl_2} = 11.4$ ↑ Same!

(17) $2Al_{(s)} + 6HCl_{(aq)} \rightarrow 2AlCl_{3(aq)} + 3H_{2(g)}$

$\frac{30.2\ g\ Al}{1} \cdot \frac{1\ mol\ Al}{27.0\ g\ Al} \cdot \frac{3\ mol\ H_2}{2\ mol\ Al} \cdot \frac{22.4\ L\ H_2}{1\ mol\ H_2} = \boxed{37.6\ L\ H_2}$

* Assumption is that the aluminum is the limiting reactant since amount of HCl was given. HCl is considered the "excess" reactant.

(18) $2NaCl_{(aq)} + Pb(NO_3)_{2(aq)} \longrightarrow PbCl_{2(aq)} + 2NaNO_{3(aq)}$

$\frac{15.3\ g\ NaCl}{1} \cdot \frac{1\ mol\ NaCl}{58.5\ g\ NaCl} \cdot \frac{1\ mol\ PbCl_2}{2\ mol\ NaCl} \cdot \frac{242.7\ g\ PbCl_2}{1\ mol\ PbCl_2} = 31.7\ g\ PbCl_2$

$\frac{60.8\ g\ Pb(NO_3)_2}{1} \cdot \frac{1\ mol\ Pb(NO_3)_2}{331.2\ g\ Pb(NO_3)_2} \cdot \frac{1\ mol\ PbCl_2}{1\ mol\ Pb(NO_3)_2} \cdot \frac{242.7\ g\ PbCl_2}{1\ mol\ PbCl_2} = 44.6\ g$

∴ $\boxed{31.7\ g\ PbCl_2}$ will be produced, & NaCl is the limiting reactant.

(19) $2Na_{(s)} + Cl_{2(g)} \rightarrow 2NaCl_{(s)}$

$\frac{4.89\ g\ Na}{1} \cdot \frac{1\ mol\ Na}{23.0\ g\ Na} \cdot \frac{2\ mol\ NaCl}{2\ mol\ Na} \cdot \frac{58.5\ g\ NaCl}{1\ mol\ NaCl} = 12.4\ g\ NaCl$

$\%\ Yield = \frac{10.6\ g\ NaCl}{12.4\ g\ NaCl} \times 100\% = \boxed{85.5\%}$