Unit 4 Review

Complete the following activities and answer the following questions to prepare for the exam. Also include your notes and labs in your preparation.

1. What is the atomic mass of iron?
2. Methylene chloride (CH2Cl2) is used as a solvent in paint strippers. What is the formula mass of CH2Cl2?
3. What is the atomic mass of oxygen?
4. Chlorine bleach (sodium hypochlorite, NaClO) is a common household cleaning agent. What is the formula mass of NaClO?

Calculate the molar mass (the mass of 1 mole) for each of the following compounds:

1. methylamine (CH3NH2)
2. benzene (C6H6)
3. copper (II) sulfide
4. mercury (II) dichromate

Determine the mass in grams of each of the following:

1. 6.02 X 1023 atoms of Al (hint: convert to moles first)
2. 12.04 X 1023 atoms of Au
3. 5.4 X 1023 B atoms
4. 8.02 X 1022 atoms S
5. 1.5 mol K
6. 0.02550 mol Pt
7. 4.25 mole Cu
8. 1.37 mole Nickel (II) nitrate

Determine the number of moles in each case:

1. 2.25 X 1025 atoms Al
2. 50 molecules barium nitrate
3. 5.87 X 1023 atoms Sn
4. 4 X 1023 atoms Ba
5. 11.5 g Ca
6. 0.0075 g N2
7. 3.25 X 105 g copper (II) hydroxide
8. If I gave you a 1-liter bottle filled with water, how many grams of water would you have?
9. How many moles of hydrogen atoms is that?
10. How many atoms of hydrogen?
11. How many grams are there in 2 X 1023 atoms of platinum?
12. How many atoms are there is 350 grams of nitrogen trisulfide?
13. Water is produced in the following reaction: 2H2 + O2 🡪 2H2O
14. How many moles of hydrogen are needed to react with 10 moles of oxygen?
15. If you wanted 25 moles of water, how much oxygen should you start with?
16. What is the mass of the 25 moles of water produced in the previous problem?
17. Given the chemical equation, how many moles of each reactant are needed to produce 7.5 moles NaOH? Na2CO3 + Ca(OH)2 🡪 2NaOH + CaCO3
18. Ethane (C2H6) burns according to the *unbalanced* reaction C2H6 + O2 🡪 CO2 + H2O.
19. How many moles of oxygen are required for 1.175 moles of ethane?
20. How many moles of each product are formed?
21. Sulfuric acid reacts with sodium hydroxide according to the following:

H2SO4 + NaOH 🡪 Na2SO4 + H2O.

1. Balance the equation for the reaction.
2. How many moles of sulfuric acid would be required to react with 3.95 mol NaOH?
3. What is the mass of this amount of sulfuric acid?
4. What mass of each product is formed in this reaction?
5. In a soda-acid fire extinguisher, concentrated sulfuric acid reacts with sodium bicarbonate to produce carbon dioxide, sodium sulfate and water.
6. How many moles of sodium bicarbonate would be needed to react with 130 g of sulfuric acid?
7. What mass of each product would be formed?
8. Methanol (CH3OH) is an important industrial compound that is produced from the following reaction: CO(g) + H2(g) 🡪 CH3OH(g). What mass of each reactant would be needed to produce 5.0 g of methanol?
9. 225 g of ethane is burned (combusted). What mass of carbon dioxide is added to our atmosphere?
10. Sulfur trioxide is synthesized from sulfur dioxide and oxygen. How many grams of sulfur trioxide are will be produced by reacting abundant sulfur dioxide with 50.0 g of oxygen?
11. When potassium bicarbonate is heated, it decomposes into potassium carbonate, carbon dioxide and water. What mass of potassium carbonate will be produced when 4.0 grams of potassium bicarbonate reacts?
12. Sodium hydroxide is prepared from sodium and water via the following explosive reaction:

2Na + 2H2O 🡪 2NaOH + H2

How many moles of hydrogen can be prepared by treating an abundance of sodium with 2.8 g of water?

1. What mass of table salt can be prepared by reacting 18.9 g BaCl2 with an excess of Na2SO4 as represented in the following reaction?

BaCl2 + Na2SO4 🡪 BaSO4 + 2 NaCl

1. An excess of copper is reacted with 15.0 g of silver nitrate. What mass of silver metal will be produced? Assume copper (II) in the product.
2. Given the reactant amounts specified in each chemical equation, determine the limiting reactant in each case:

a) HCl + NaOH 🡪 NaCl + H2O

 3.0 mol 2.5 mol

b) Zn + 2HCl 🡪 ZnCl2 + H2

 5.0 mol 8.0 mol

c) 2Fe(OH)3 + 3H2SO4 🡪 Fe2(SO4)3 + 6H2O

 2.0 mol 2.5 mol

1. For each reaction in the previous problem, determine the number of moles of excess reactant that remains.
2. For each reaction above, calculate the number of moles of each product formed.
3. In a container, 9.0 moles of nitrogen react with 11.0 moles of hydrogen producing ammonia (NH3).
4. Write the equation for this reaction.
5. Which reactant is the limiting reactant?
6. Which reactant is in excess?
7. How many moles of excess reactant are left?
8. How many moles of each product are produced?
9. Calcium chloride reacts with sodium phosphate in a double displacement reaction.
10. Write the equation for this reaction.
11. If 70.0 g of calcium chloride is mixed with a solution containing 90.0 g of sodium phosphate, which reactant is the limiting reactant?
12. Which reactant is in excess?
13. How many moles of excess reactant are left?
14. How many grams of each product are produced?