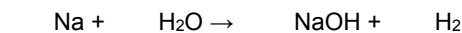Chemistry Final Exam Review
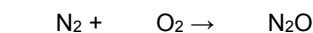
Balancing Chemical Equations

1. Sodium reacts with water as shown in the following reaction.

   ___ Na + ___ H_2O → ___ NaOH + ___ H_2

   Determine the correct coefficients for the balanced equation of this reaction.

2. Diatomic nitrogen and oxygen can combine to form dinitrogen monoxide. Balanced the following reaction described in the equation below.

   ___ N_2 + ___ O_2 → ___ N_2O

3. Combining potassium with chlorine produces potassium chloride. Check the equation below to determine if it is correctly balanced. If not, explain why? (Hint: BrINClHOF)

   1 K + 1 Cl → 1 KCl
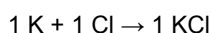
4. The combustion of methane (CH_4) in oxygen (O_2) produces water vapor (H_2O) and carbon dioxide (CO_2). Balance the following equation for the reaction below:

   ___CH_4 + ___O_2 → ___H_2O + ___CO_2
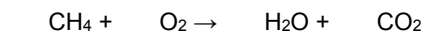
Molar Mass & the Mole

5. Define the following terms:
   a. mole   b. atomic mass   c. atomic mass unit (amu)

6. What is the molar mass of carbonic acid, H_2CO_3?

7. Sulfur trioxide (SO_3) is a significant air pollutant. Using the molecular formula, determine the molar mass of this gas.

8. Dinitrogen tetroxide or rocket fuel has the chemical formula N_2O_4. What is the molar mass of dinitrogen tetroxide?

Conversion Problems

9. What is the mass (in grams) of 6.75 moles of hydrogen sulfide (H_2S)?

10. What is the mass of 5 moles of H_2O?

11. What is the volume in liters of 76 grams of fluorine (F_2) at a temperature of 0°C and 101.3 kilopascals?

12. One mole of aluminum has a mass of 27 grams. What is the mass of a sample of aluminum which contains 4.20×10^{24} atoms?

13. How many atoms are in 86.0 grams of NH_3?

14. One mole of chromium atoms has a mass of 52 grams. Determine the mass of a single atom of chromium, in grams.

15. In a sample of 124 g of copper, how many moles are present?

16. How many platinum atoms are present in a sample of exactly five moles?

Stoichiometry

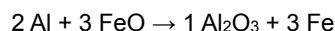17. $2 Fe + 3 O_2 → 2 Fe_2O_3$

   If 60 grams of Fe is reacted with excess oxygen, how many grams of iron (III) oxide (Fe_2O_3) are produced?

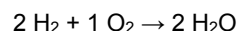18. 8.0 grams of nitrogen is mixed with excess oxygen according to the equation below.

   $2 N_2 + 1 O_2 → 2 N_2O$
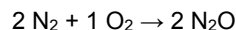
   How many grams of N_2O are produced?

19. Aluminum combines with iron (I) oxide in this balanced reaction.

   $2 Al + 3 FeO → 1 Al_2O_3 + 3 Fe$

   How much FeO must react to produce 84 grams of Al_2O_3?

20. Examine this balanced chemical reaction.

   $2 H_2 + 1 O_2 → 2 H_2O$

   4 grams of Hydrogen are consumed in this reaction. Determine the number of moles of water produced.

21. $2 Na + 2 H_2O → 2 NaOH + 1 H_2$

   A student is given the mass of Na consumed in the reaction above and asked to calculate the amount of hydrogen (H_2) produced. They produce the following work:

   known g Na x $\dfrac{2.02 \text{ g } H_2 \text{ x } 1 \text{ mol } H_2}{22.99 \text{ g Na x 2 mol Na}}$ = unknown g H_2
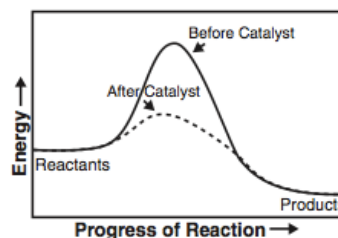
   Describe in words what they did to solve for mass of H_2.

Scientific Method

22. What is the difference between a hypothesis and a theory?

23. Provide one example each of a hypothesis and a theory.

Laboratory

24. The graph below describes the affect of a catalyst on a chemical reaction. What can you infer about the rate of reaction from this graph?

25. Draw a picture of the following laboratory equipment.
   a. beaker   c. erlenmeyer flask   e. funnel
   b. test tube   d. graduated cylinder   f. calorimeter