# Practice Problems Set #4

**DIRECTIONS:**

- YOU MUST ANSWER **EVERY QUESTION** IN ORDER TO GET **ANY** CREDIT!!!
- **HIGHLIGHT EACH QUESTION NUMBER** ON YOUR NOTEBOOK PAPER SO I CAN QUICKLY SEE THAT YOU HAVE DONE ALL THE PROBLEMS.  IF I CAN'T FIND AN ANSWER, YOU WON'T GET CREDIT FOR ANY OF THE PROBLEMS!!!!
- **HIGHLIGHT ANY QUESTION NUMBERS ON THIS PAGE THAT YOU WANT HELP WITH, HAVE QUESTIONS WITH, ETC!!!**

| Q # | QUESTION |
|---|---|
| 1 | In the reaction $N_2 + 3H_2 \rightarrow 2NH_3$, how many moles of ammonia would be produced from 3.8 moles of nitrogen gas? |
| 2 | In the following unbalanced equation, how many moles of water will be produced from 6 moles of oxygen gas? $C_3H_8 + O_2 \rightarrow CO_2 + H_2O$ |
| 3 | What mass of $NH_3$ will be produced when 60.4 grams of $H_2$ are reacted? $N_2 + 3H_2 \rightarrow 2NH_3$ |
| 4 | What mass of $CO_2$ will be produced when 12.5 grams of $C_2H_4$ are reacted in this unbalanced equation? $C_2H_4 + O_2 \rightarrow CO_2 + H_2O$ |
| 5 | How many moles of hydrogen are required to react with $9.6 \times 10^{31}$ molecules s of $Cl_2$ in the following *unbalanced* reaction: $H_2 + Cl_2 \rightarrow HCl$ ? |
| 6 | Is the following reaction endothermic or exothermic? $2NO + H_2 \rightarrow N_2O + H_2O + 36$ kJ |
| 7 | Is the following reaction endothermic or exothermic? $CO_2 + H_2 + heat \rightarrow CO + H_2O$ |
| 8 | Is the following reaction endothermic or exothermic? $N_2 + 3H_2 \rightarrow 2NH_3$ $\Delta H = -22kJ$ |
| 9 | Which of the following are endothermic and which are exothermic? An ice cube melting, Water freezing, A piece of wood burning, Water boiling |
| 10 | The specific heat capacity of a substance is 0.87 J/g°C.  How many joules of energy are needed to warm 4.3 grams of it from 20°C to 39°? |
| 11 | The amount of heat needed to heat 5 grams of a substance from 30°C to 90°C is 190 J.  What is the specific heat capacity? |
| 12 | It takes 480 J to heat up 10 grams of a substance with a specific heat capacity of 0.18J/g°C.  What was the change in temperature? |
| 13 | How much energy is required to melt 20 grams of ice at -30ºC to liquid water at 50ºC? |
| 14 | How much energy is required to melt 40 grams of ice to steam at 130ºC? |
| 15 | How much energy is required to melt 3 grams of ice at -15C to steam at 150ºC? |
| 16 | Write a paragraph describing the difference between Thermo and Kinetics |
| 17 | Draw an energy diagram and label the activation energy for an endothermic reaction. |
| 18 | Draw an energy diagram and label the activation energy for an exothermic reaction. |
| 19 | What factors can speed up or slow down a reaction? |
| 20 | A solution is prepared by dissolving 10 grams of sodium sulfide in enough water to make 200 mL of solution. What is the molarity? |
| 21 | A solution is prepared by dissolving 30 grams of potassium sulfate in enough water to make 100 mL of solution.  What is the molarity? |
| 22 | What mass of solute is contained in 390 mL of a 0.587 M calcium chloride solution? |
| 23 | What is collision theory? |
| 24 | How does collision theory explain why reaction rates change when you change concentration and temperature? |
| 25 | What is a catalyst, and how does it work? Sketch a graph to show how it works. |
| 26 | If you were to write the rate expression for the reaction, would the part of PCl5 be positive rate or negative rate? Why?:   $PCl_5 (g) \rightarrow PCl_3 (g) + Cl_2 (g)$ |
| 27 | Solid phosphorus and oxygen gas react to form tetraphosphorus decoxide.  Determine the average rate of reaction for oxygen during the first 20 s if the concentration changes from 0.400 mol/L to 0.000 mol/L during this time interval. |
| 28 | At 40ºC, hydrogen chloride gas will form from the reaction of gaseous hydrogen and chlorine, according to the following balanced chemical equation: $H_2 (g) + Cl_2 (g) \rightarrow 2$ HCl (g).  Using the data provided, calculate the average rate of reaction between times 0sec and 5.42 sec. |

Table for Question 28:

| Time (s) | Concentration (mol/L) HCl (g) |
|---|---|
| 0 | 0.000 |
| 2.16 | 1.000 |
| 5.42 | 1.500 |