**Name: Period: Seat#:**

**Worksheet #3**

**Conceptual Questions**

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| 1. A study of reaction \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is called chemical \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
 | 1. What are the FOUR major factors that affect reaction rate?
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| 1. Reaction rate refers to how quickly or slowly the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_disappear and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ appear. It is measured in terms of the\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the reactants.
 |
| 1. Write a generic equation for Reaction Rate
 | 1. Why would a mixture of gases react faster when the volume they occupy is decreased?
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| 1. Why would iron filings rust faster than an iron nail?
 | 1. What is meant by the rate-determining step?
 |
| 1. How would the increasing of partial pressure of reactive components of a gaseous mixture affect the rate at which the components react with one another?
 | 1. What information is needed to relate the rate of disappearance of reactants to the rate of appearance of products? (Hint: Chemical equation)
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| 1. How would you change temperature of a reaction if you wanted to increase the rate of reaction? Explain how this effects the reaction using the collision theory.
 | 1. Why would the rate of reaction decrease as the reaction produces more products?
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| 1. If you put 100g of NaOH in cube form and 200g of NaOH in powered form which will react with HCl at a faster rate? Explain why
 | 1. What is the activation energy? In other words, what two things is the Activation Energy being used for?
 |
| 1. What is a catalyst and why is it different from a reactant in an equation?
 | 1. In the following three step reaction, which step is the fastest? Which step is the slowest?
 |
| 1. Draw an exothermic reaction graph shown with and without a catalyst
 |
| 1. Write the rate expression for 2H2O 🡪 2H2 + O2
 |
| 1. Write the rate expression for 2SO2 + O2 🡪 2SO3
 |
| 1. Write the rate expression for 2NO + 2H2 🡪 N2 + 2H2O
 |

**Mathematical Questions**

* Show all work involved.
* Get an actual answer when applicable, including units! Box your answer!

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| 1. The following table relates the ***time*** and the ***mass of Zn*** during the reaction between Zn and 0.5M HNO3:

 ***Zn(s) + 2HNO3(aq) 🡪 H2(g) + Zn(NO3***)***2(aq)***   **Time Mass of Zn (g)** *0.0 s 36.2 g*  *60.0 s 29.6 g*  *120.0 s 25.0 g*  *180.0 s 22.0 g*  |  **a)** Calculate the rxn rate, in g/s, from 0s to 60 s.     **b)** Calculate the rxn rate, in g/s, from 120s to 180 s.  |
| 1. A chemist wishes to determine the rate of reaction of zinc with hydrochloric acid.

 The equation for the reaction is:    ***Zn(s) + 2HCl(aq) 🡪 H2(g) + ZnCl2(aq)*** A piece of zinc is dropped into 1.00 L of 0.100 M HCl and the following data were obtained:   **Time Mass of Zinc (g)** 0 s 0.016 g 4 s 0.014 g 8 s 0.012 g  12 s 0.010 g  16 s 0.008 g  20 s 0.006 g  | **a)** Calculate the Rate of Reaction in  *grams of Zn consumed per second.*   **b)** Calculate the Rate of Reaction in  *moles of Zn consumed per second.*   |
| 1. Solid phosphorus and oxygen gas react to form tetraphosphorus decoxide. Determine the average rate of reaction for oxygen during the first 40 s if the concentration changes from 0.200 mol/L to 0.0001 mol/L during this time interval.
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| 1. At 40ºC, hydrogen chloride gas will form from the reaction of gaseous hydrogen and chlorine, according to the following balanced chemical equation:

**H2 (g) + Cl2 (g) → 2 HCl (g).**

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|  | **Concentration (mol/L)** |
| **Time (s)** | **H2 (g)** | **Cl2 (g)** | **HCl (g)** |
| 0 | 1.000 | 1.000 | 0.000 |
| 2.16 | 0.500 | 0.500 | 1.000 |
| 4.32 | 0.250 | 0.250 | 1.500 |

Using the data provided, calculate the following average rates:1. hydrogen gas in the first 2.16 s.
 | 1. hydrogen chloride gas in the first 4.32 s
2. chlorine gas between 2.16 s & 4.32 s
3. hydrogen gas in the first 4.32 s
 |
| 1. Hydrogen peroxide in aqueous solution will decompose to produce oxygen gas and water. Use the graph to:

1. Calculate the average reaction rate of hydrogen peroxide between 0 s and 5 s.
2. Calculate the average reaction rate for the oxygen gas between 0 s and 2 s.
 | 1. Calculate the average reaction rate for the oxygen gas between 4 s and 6 s.
2. Calculate the average reaction rate for the oxygen gas between 6 s and 8 s.
3. Using your answers for 3b-3e, is the rate of a reaction a constant value from start to finish? Why do you think it is or isn’t a constant value? What is causing the rate to stay the same or change?
 |
| 1. Consider the following reaction: 8A + 5B 🡪 8C + 6D [C] is increasing at a rate of 4.0 mol L-1 s-1
	1. Write a rate expression for this reaction that you will use to calculate answers to parts b-d
	2. At what rate is [B] changing?
	3. At what rate is [C] changing?
	4. At what rate is [D] changing?
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