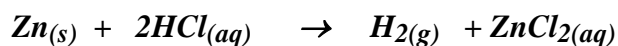


Chemistry 12

Worksheet 1-1 - Measuring Reaction Rates

1. A chemist wishes to determine the rate of reaction of zinc with hydrochloric acid. The equation for the reaction is:



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
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.

Answer _____

- b) Calculate the **Rate of Reaction** in moles of Zn consumed per second.

Answer _____

- c) Write out the complete ionic equation for the reaction.

- d) What will happen to the $[\text{H}^+]$ as the reaction proceeds? _____

- e) What will happen to the $[\text{Cl}^-]$ as the reaction proceeds? _____

2. When magnesium is reacted with dilute hydrochloric acid (HCl), a reaction occurs in which hydrogen gas and magnesium chloride is formed.

- a) Write a **balanced formula equation** for this reaction.

- b) If the rate of consumption of magnesium is 5.0×10^{-9} mol/s, find the *rate of consumption of HCl* in moles/s.

Answer _____

- c) If the rate of consumption of magnesium is 5.0×10^{-9} mol/s, find the *rate of production of H₂* in g/s.

Answer _____

- d) If the rate of consumption of magnesium is 5.0×10^{-9} mol/s, find the *rate of production of H₂* in L/s (@STP).

Answer _____

- e) If the rate of consumption of magnesium is 5.0×10^{-9} mol/s, find the *mass of Mg consumed in 5.0 minutes*.

Answer _____

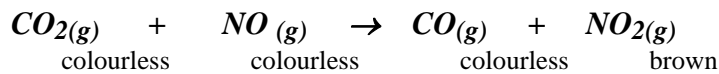
3. When butane (C₄H₁₀) is burned in air (*oxygen*), the products *carbon dioxide* and *water* are formed.

- a) Write a ***balanced formula equation*** for this reaction.

- b) If butane is consumed at an average rate of 0.116 grams/s, determine the rate of production of CO₂ in g/s.

Answer _____

4. Given the reaction:



Suggest a method which could be used to *monitor* the rate of this reaction.

Why wouldn't total pressure be a good way to monitor the rate of this reaction?

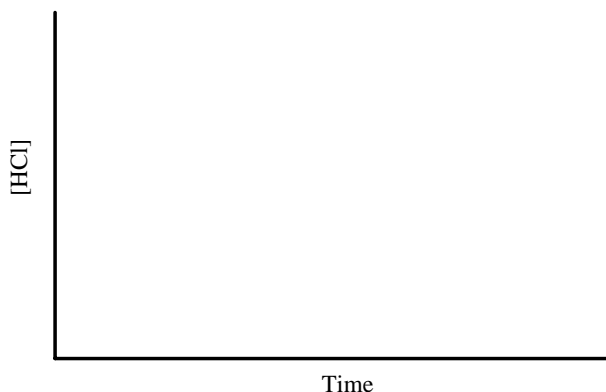
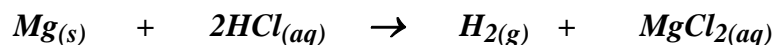
5. Equal volumes of $\text{Fe}^{2+}(\text{aq})$ and $\text{C}_2\text{O}_4^{2-}(\text{aq})$ are individually reacted with $0.10 \text{ M MnO}_4^{-}(\text{aq})$, and the following data were obtained:

Reactant	Concentration	Temperature	Time for complete reaction
Fe^{2+}	0.20 M	25°C	1.6 s
$\text{C}_2\text{O}_4^{2-}$	0.40 M	35°C	17.0 s

Explain in detail why these results are obtained.

6. The longer the *time of reaction*, the _____ the *rate of reaction*.

7. On the following set of axes, draw the shape of the curve you would expect if you plotted the $[HCl]$ vs. **Time**, starting immediately after the two reactants are mixed. The equation for the reaction is:



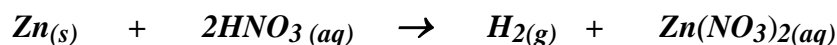
Explain how you got that particular shape. Be detailed.

8. Give some examples of situations where we might want to **increase** the rate of a particular reaction.

9. Give some examples of situations where we might want to **decrease** the rate of a particular reaction.

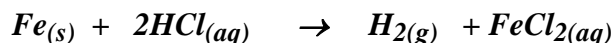
10. Give **two** reasons why *water* is effective at putting out fires. Use concepts learned in this unit so far.

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



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 reaction rate, in g/s, from time 0 to 60 s.
- b) Calculate the reaction rate, in g/s, from time 120s to 180 s.
- c) Explain why the rate in calculation "b" is less than that of calculation "a".
12. Consider the *rate* of the following reaction:

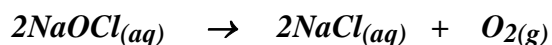


- a) Is rate dependent on *temperature*? _____. Explain your answer.

- b) Is rate dependent on *pressure*? _____. Explain your answer.

- c) Is rate dependent on *surface area*? _____. Explain your answer.

13. Consider the *rate* of the following reaction:



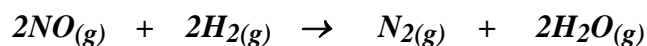
a) Is rate dependent on *temperature*? _____. Explain your answer.

b) Is rate dependent on *pressure*? _____. Explain your answer.

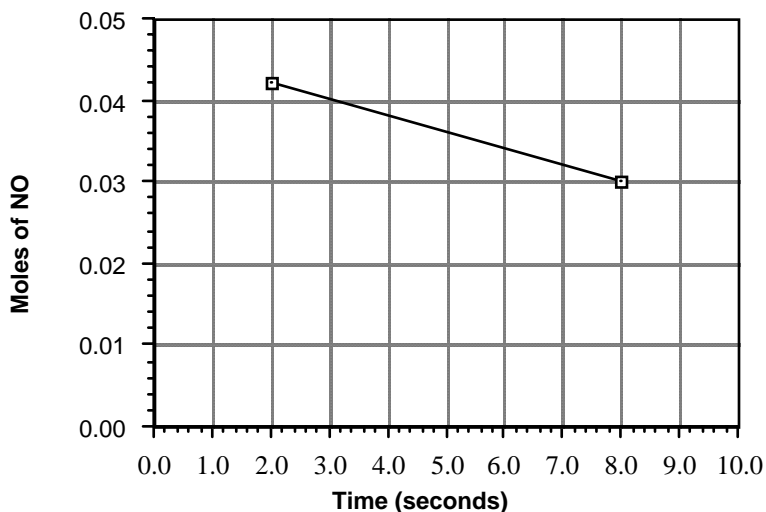
c) Is rate dependent on *surface area*? _____. Explain your answer.

c) Is rate dependent on $[NaOCl]$? _____. Explain your answer.

14. Consider the following reaction:



Data collected for the above reaction was used to construct the following graph:



From this graph, determine the **rate of reaction** in *moles of NO consumed per second*.