NAME: **HONORS CHEMISTRY**

SECTION: Rate Expressions and Reaction Rates

Refer to your notes from the podcast while you answer these questions!

# **Monitoring Reactions**

1. Consider the reaction between aqueous copper(II) chloride and aqueous lead(II) nitrate:

 CuCl2(aq) + Pb(NO3)2(aq) 🡪 Cu(NO3)2(aq) + PbCl2(s)

What property of the reaction could most easily be monitored to determine the rate of reaction?

1. Chromium metal displaces hydrogen from hydrochloric acid:

 2Cr(s) + 6 HCl(aq) 🡪 2 CrCl3(aq) + 3 H2(g)

1. List two methods for monitoring the progress of this reaction.
2. What else needs to be measured to determine the reaction rate?
3. Write a rate expression for this reaction in terms of the disappearance of hydrochloric acid.
4. Write a rate expression for this reaction in terms of the appearance of hydrogen gas.
5. Consider the reaction that occurs when nitrogen dioxide is dissolved in water:

 3NO2(g) + H2O(l) 🡪 2 HNO3(l) + NO(g)

If NO gas is produced at a rate of 1.5 mol/min, at what rate does NO2(g) disappear? Show your work or explain how you arrived at your answer.

1. **Using Concentration vs. Time Graphs**

****Use Figure 1 to answer questions 4-8.

1. Is (NH4)S2O8 a reactant or a product? Justify your answer.
2. What happens to the rate of reaction over time? Explain.
3. Calculate the initial rate of change in concentration of (NH4)S2O8 in M/s. Show your work.
4. Calculate the average rate of change in concentration of (NH4)S2O8 between t = 50 s and t = 150 s. Show your work.
5. Explain how to calculate the instantaneous rate of change in concentration of at t = 100 s. Show the necessary work.
6. Collision Theory
7. Use figures 2 and 3 below to determine the temperature at which the reaction rate will be faster. Explain your reasoning.

 

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 Figure 2—Energy distribution at 100K Figure 3—Energy distribution at 400K