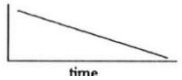
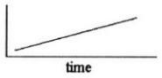
Advanced Chemistry **NAME: _____PER: _____**
Change of Concentration with Time

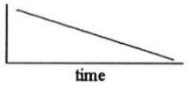
Instructions: Complete the following problems. SHOW ALL WORK in the empty space below the questions. Remembers the units. Round to the correct number of significant figures.

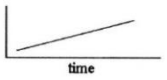
Concept Questions

1. Which one of the following graphs shows the correct relationship between concentration and time for a reaction that is second order in [A]?

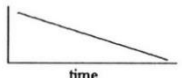
A) 

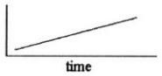
C) 

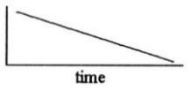
B) 

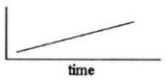
D) 

2. Which one of the following graphs shows the correct relationship between concentration and time for a reaction that is first order in [A]?

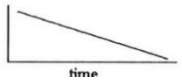
A) 

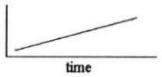
C) 

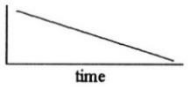
B) 

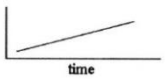
D) 

3. Which one of the following graphs shows the correct relationship between concentration and time for a reaction that is zero order in [A]?

A) 

C) 

B) 

D) 

First-Order Problems: $\ln[A]_t - \ln[A]_0 = -kt$

4. The decomposition of N_2O_5 in solution in carbon tetrachloride proceeds via the reaction

$$2N_2O_5\,(soln) \rightarrow 4NO_2\,(soln) + O_2\,(soln)$$

The reaction is **first order** and has a rate constant of $4.82 \times 10^{-3} s^{-1}$ at 64°C. If the reaction is initiated with 0.058 M, what is the concentration after 151 s?

5. The initial concentration of reactant in a **first-order** reaction is 0.27 M. The concentration of the reactant was 0.19 M after 0.50 s. What is the rate constant for the reaction?

Second-Order Problems: $1/[A]_t = kt + 1/[A]_0$

6. The reaction: $2NO_2 \rightarrow 2NO + O_2$ follows **second-order** kinetics. At 300°C, [NO2] drops from 0.0100 M to 0.00650 M in 100.0 s. The rate constant for the reaction is _____ $M^{-1}s^{-1}$.

7. The following reaction is **second order** in [A] and the rate constant is 0.039 $M^{-1}s^{-1}$: $A \rightarrow B$
The concentration of A was 0.30 M at 23 s. The initial concentration of A was _____ M.

Zero-Order Problems $[A]_t = -kt + [A]_0$

8. The equation A → B + C is a **zero-order** reaction with a rate constant is 0.47 M/s. If the initial concentration of A is 36.1 M, it takes _____ s for the concentration to decrease to 14.2 M.

9. The equation A → B + C is a **zero-order** reaction. At 200°C, [A] drops from 26.8 M to 16.5 M in 13 seconds. The rate constant for the reaction is _____ M/s.