Advanced Chemistry
Chapter 14: Chemical Kinetics

Name _____ Period ____

Mock Test

Part 1: Reaction Rates

1. Calculate the average rate in which A disappears over the time interval 0.00 s to 150.0 s if the original concentration was 1.25 M and the final concentration was 0.54 M.

2. The rate of disappearance of HBr in the gas phase reaction

$$2HBr\ (g) \rightarrow H_2\ (g) + Br_2\ (g)$$

is 0.709 Ms^{-1} at 150.0°C. The rate of appearance of Br_2 is _____ Ms^{-}

Part 2: Rate Laws

3. The following data in the table was obtained for the reaction: A + B → C

Experiment Number	[A] (M)	[B] (M)	Initial Rate (M/s)
1	0.273	0.763	2.83
2	0.273	1.526	2.83
3	0.819	0.763	25.47

a) What is the rate law for the reaction?

b) What is the overall order of the reaction?

c) What is rate constant?

d) What is the rate of the reaction when [A] = 0.550 M and [B] = 0.350 M.

Part 3: Concentration & Half Life

4. What is the half-life of a **zero-order** reaction that initially starts with a concentration of 0.792 M if the concentration was found to be 0.447 M after 156.0 seconds?

5. The half-life of a **first-order** reaction is 14.2 min. If the initial concentration of reactant is 0.130 M, it takes _____ min for it to decrease to 0.0450 M.

6. The half-life of a **second-order** reaction is 216 seconds. If the initial concentration of the reactant is 0.312 M, what would the final concentration be after 90.0 seconds?

Part 4: Reaction Mechanisms

7. The kinetics of the reaction A + B + C → D was experimentally tested, and the rate law was determined to be rate = k[A][B][C]. The following three mechanisms have been proposed for the reaction. Complete the table for each mechanism providing individual rate laws, molecularity, overall reaction, and overall rate law of the mechanism. Finally, determine which mechanism fits the chemical equation and rate law given above.

		Elementary Step	Speed	Individual Rate Law	Molecularity
Mechanism 1	Step 1	A+ B ⇌ X	(fast, equilibrium)		
	Step 2	X + C → Y	(slow)		
	Step 3	Y → D	(fast)		
	Overall Reaction				
	Overall Rate Law				

		Elementary Step	Speed	Individual Rate Law	Molecularity
Mechanism 2	Step 1	A+ B → X	(slow)		
	Step 2	X + C → D	(fast)		
	Overall Reaction				
	Overall Rate Law				

		Elementary Step	Speed	Individual Rate Law	Molecularity
Mechanism 3	Step 1	A + B + C → X	Slow		
	Step 2	X + A → D	fast		
	Overall Reaction				
	Overall Rate Law				

The mechanism that was consistent with the overall reaction and rate law from the experiment was mechanism _____.

a) 1
b) 2
c) 3
d) None of the following