Chapter 20 Worksheet 1 Kinetics

Name: _____ UGA ID: _____

Instructions:

- Please enter your first and last name as it appears on the eLC roster (do not use a nickname).
- Your UGA myID is a combination of letters and numbers (example: mine is sre13137). **Do not use your 81x number.**
- If you have a printer, print the worksheet, write your answers on the template showing your work where appropriate, convert it to a PDF and Upload this worksheet to Gradescope by 11:59 p.m. on Friday, September 4. **You do not need to upload anything to eLC.**
- If you do not have a printer, type your answers in the boxes and write your work on separate sheets of paper and convert your work to a PD. Upload the PDF of your work to eLC: go to Tools, Assignments, then "Chapter 20 Worksheet1". Then upload the worksheet template to Gradescope by 11:59 p.m. on Friday, September 4.

1. Consider the rate equation for this reaction and the reactant orders X and Y: **rate = $k[ClO_2]^X[OH^-]^Y$**

$2\ ClO_2(aq) + 2\ OH^-(aq) \rightarrow ClO_3^-(aq) + ClO_2^-(aq) + H_2O(l)$

_____

A. Rate = $k[ClO_2][OH^-]$

B. Rate = $k[ClO_2]^2[OH^-]^2$

C. Rate = $k[ClO_2][OH^-]^2$

D. Rate = $k[ClO_2]^2[OH^-]$

E. Rate = $k[ClO_2]^2$

F. Rate = $k\ [OH^-]^2$

Experiment	$[ClO_2]$	$[OH^-]$	Rate
1	0.012	0.012	2.07×10^{-4}
2	0.012	0.024	4.14×10^{-4}
3	0.024	0.012	8.28×10^{-4}
4	0.024	0.024	1.66×10^{-3}

2. A certain reaction is zero order in reactant A and second order in reactant B. If the concentrations of both reactants are doubled, what happens to the reaction rate?

_____

A. The rate of reaction is quadrupled.

B. The rate of reaction is doubled.

C. The rate of reaction remains the same.

D. The rate of reaction is halved.

E. The rate of reaction is quartered.

3. For m = 2, If you triple the concentration of [A], you

. rate = $k[A]^m[B]^n$

_____

A. triple the rate.

B. Increase the rate by order of 5.

C. increase the rate by an order of 6.

D. increase the rate by an order of 9.

4. Consider the reaction $C_4H_9Br + OH^- \rightarrow C_4H_9OH + Br^-$. When the concentration of C_4H_9Br is doubled, the rate of the reaction increases by a factor of two. When the concentrations of all reactants and products are doubled, the rate also doubles. What is the overall order of the reaction?

A. Zero order

B. First order

C. Second order

D. Third order

E. Fourth order

F. Fifth order

5. The rate expression for a reaction is shown to be rate = $k[A]^2[B_2]$. If, during a reaction, the concentration of A was suddenly halved and the concentration of B was suddenly doubled, the rate of reaction would

A. increase by a factor of 8.

B. increase by a factor of 4.

C. increase by a factor of 2.

D. remain the same.

E. decrease by a factor of 2.

F. decrease by a factor of 4.

G. decrease by a factor of 8.

6. Consider the following reaction, whose rate can be expressed as

$2NO_2Br(g) \rightarrow 2NO_2(g) + Br_2(g)$ Rate = $\frac{\Delta [Br_2]}{\Delta t}$

A. Rate = $\frac{\Delta [NO_2]}{\Delta t} = \frac{\Delta [NO_2Br]}{\Delta t}$

B. Rate = $-\frac{1}{2}\frac{\Delta [NO_2]}{\Delta t} = \frac{1}{2}\frac{\Delta [NO_2Br]}{\Delta t}$

C. Rate = $\frac{1}{2}\frac{\Delta [NO_2]}{\Delta t} = \frac{1}{2}\frac{\Delta [NO_2Br]}{\Delta t}$

D. Rate = $\frac{1}{2}\frac{\Delta [NO_2]}{\Delta t} = -\frac{1}{2}\frac{\Delta [NO_2Br]}{\Delta t}$

7. Over the time interval 300 to 400 seconds, the rate of reaction with respect to A is $\Delta[A]/\Delta t = 3.7 \times 10^{-5}$ M/s. Over the same time interval what is the rate of reaction with respect to B, $\Delta[B]/\Delta t$?

$$4A(g) + B(g) \rightarrow 2C(g)$$

A. $\Delta[B]/\Delta t = \Delta[A]/\Delta t = 3.7 \times 10^{-5}$ M/s

B. $\Delta[B]/\Delta t = (-1/4)(\Delta[A]/\Delta t) = (-1/4)(-3.7 \times 10^{-5}\ M/s) = 9.2 \times 10^{-6}$ M/s

C. $\Delta[B]/\Delta t = (1/2)(\Delta[A]/\Delta t) = (1/2)(3.7 \times 10^{-5}\ M/s) = 1.8 \times 10^{-5}$ M/s

D. $\Delta[B]/\Delta t = -(1/2)(\Delta[A]/\Delta t) = -(1/2)(3.7 \times 10^{-5}\ M/s) = -1.8 \times 10^{-5}$ M/s

8. Molecular hydrogen can be made from methane gas by the reaction below. How is the rate of disappearance of CH_4 related to the rate of appearance of H_2?

$$-\frac{\Delta[CH_4]}{\Delta t} = ?$$

$$CH_4\ (g) + H_2O\ (l) \rightarrow CO\ (g) + 3H_2\ (g)$$

A. $+\frac{\Delta[H_2]}{\Delta t}$

B. $+\frac{1}{3}\frac{\Delta[H_2]}{\Delta t}$

C. $+3\frac{\Delta[H_2]}{\Delta t}$

9. The reaction that occurs in a Breathalyzer, a device used to determine the alcohol level in a person's bloodstream, is given below. If the rate of appearance of $Cr_2(SO_4)_3$ is 1.24 mol/min at a particular moment, what is the rate of disappearance of C_2H_6O at that moment?

$$2\ K_2Cr_2O_7 + 8\ H_2SO_4 + 3\ C_2H_6O \rightarrow 2\ Cr_2(SO_4)_3 + 2\ K_2SO_4 + 11\ H_2O$$

A. 0.413 mol/min

B. 0.826 mol/min

C. 1.86 mol/min

D. 3.72 mol/min

10. The reaction A → B is first order in [A]. Consider the following data.

Time (s)	0.0	5.0	10.0	15.0	20.0
[A] (M)	0.20	0.14	0.10	0.071	0.040

What is the rate constant (s-1) for this reaction?

A. 3.0×10^{-2}

B. 14

C. 0.46

D. 4.0×10^{2}

E. 7.8×10^{-2}