## CHEM 1105 TEST\#3

NAME:
Date: July 11, 2016
Student Number:

1. Circle the correct answer below.

The reaction $2 \mathrm{X}(\mathrm{g})+\mathrm{Y}(\mathrm{g}) \rightarrow \mathrm{Z}(\mathrm{g})$ is first order in X and first order in Y. For this reaction
a) rate of reaction $=k[\mathrm{X}]^{2}[\mathrm{Y}]$
b) rate of reaction $=\mathrm{k}[\mathrm{X}]^{2}$
c) $-\frac{\Delta[X]}{\Delta t}=-\frac{\Delta[Y]}{\Delta t}$
d) $\frac{\Delta[Z]}{\Delta t}=-\frac{\Delta[Y]}{\Delta t}$
2. Consider the hypothetical reaction

$$
2 \mathrm{~A}(\mathrm{~g})+5 \mathrm{~B}(\mathrm{~g})+3 \mathrm{C}(\mathrm{~g}) \rightarrow \mathrm{D}(\mathrm{~g})+\mathrm{E}(\mathrm{~g})
$$

Suppose that at some point during the reaction $[\mathrm{D}]=0.2885 \mathrm{M}$ and that 2.55 minutes $(\mathrm{min})$ later D is 0.3546 M .
a) What is the rate of appearance of $\mathrm{D}\left(\frac{\Delta[D]}{\Delta t}\right)$ during this time period in $\mathrm{M} / \mathrm{min}$ ?
b) Calculate the rate of disappearance of $A$.
c) Calculate the rate of disappearance of B.
3. Using the method of initial rates and the data for the following reaction at $25^{\circ} \mathrm{C}$ :
$2 \mathrm{~A}(\mathrm{~g})+5 \mathrm{~B}(\mathrm{~g})+3 \mathrm{C}(\mathrm{g}) \rightarrow \mathrm{D}(\mathrm{g})+\mathrm{E}(\mathrm{g})$

| $[\mathrm{A}](\mathrm{M})$ | $[\mathrm{B}](\mathrm{M})$ | $[\mathrm{C}](\mathrm{M})$ | Initial Rate(M/s) |
| :---: | :---: | :---: | :---: |
| 0.15 | 0.25 | 0.40 | 0.0960 |
| 0.15 | 0.25 | 0.80 | 0.768 |
| 0.30 | 0.25 | 0.40 | 0.192 |
| 0.15 | 0.50 | 0.80 | 0.768 |

a) Determine the order with respect to each reactant.
b) Determine the overall reaction order.
c) Write the rate law for the reaction.
d) Determine the value of the rate constant with units.

## BONUS QUESTION:

Does the rate law found in this question correspond to the stoichiometry of the balanced reaction equation? Should it? Why or why not? Explain.

## Answer Set for CHEM 1105 TEST\#3

1.d)
2.a) $\frac{\Delta[D]}{\Delta t}=0.0259 \mathrm{M} / \mathrm{min}$; b) $-\frac{\Delta[A]}{\Delta t}=0.0518 \mathrm{M} / \mathrm{min}$; c) $-\frac{\Delta[B]}{\Delta t}=0.130 \mathrm{M} / \mathrm{min}$
3.a) First order with respect to $A$, zero order with respect to $B$, and third order with respect to $C$.
b) fourth order overall.
c) rate $=\mathrm{k}[\mathrm{A}(\mathrm{g})][\mathrm{C}(\mathrm{g})]^{3}$
d) $\mathrm{k}=10.0 \mathrm{M}^{-3} \cdot \mathrm{~s}^{-1}$

## BONUS QUESTION:

The rate law found in this question does not correspond to the stoichiometry of the balanced reaction equation. Both will not necessarily correspond if this reaction has a reaction mechanism and occurs in a series of smaller steps.

