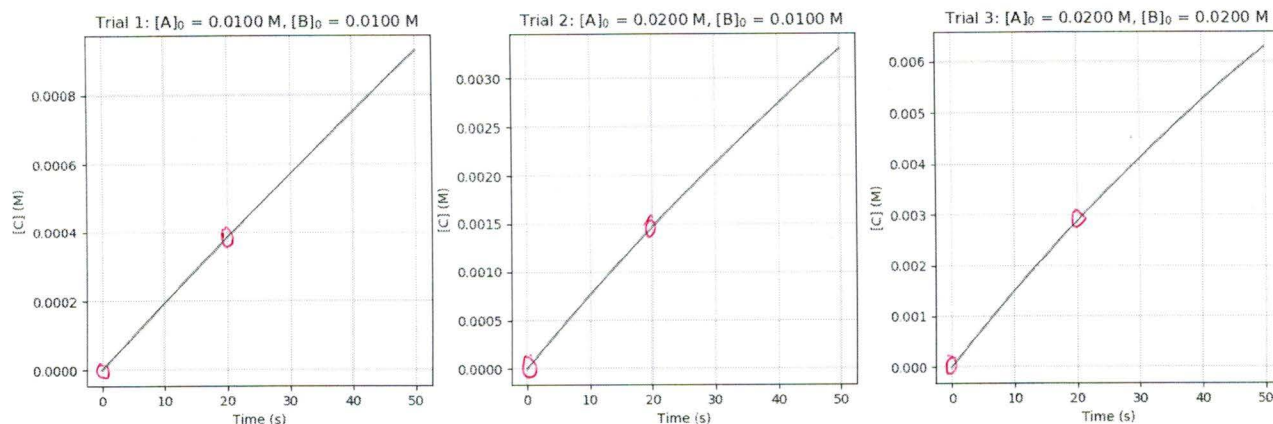## Quiz 14.1 – Reaction Rates and Rate Equations

Name: *Key*

For all questions in this quiz, consider the reaction: $A + 2B \longrightarrow 3C$.

Below are graphs of the concentration of C over time under three different initial conditions:

Trial 1: $[A]_0 = 0.0100$ M, $[B]_0 = 0.0100$ M
Trial 2: $[A]_0 = 0.0200$ M, $[B]_0 = 0.0100$ M
Trial 3: $[A]_0 = 0.0200$ M, $[B]_0 = 0.0200$ M

Question 1

$$rate = \frac{1}{3}\frac{\Delta[c]}{20s}$$

From the data in the graphs, estimate the average reaction rate over the first $20\ s$ for each trial

$$rate = \frac{0.00028\ M}{60\ s} = 6.33\cdot10^{-6}\ \frac{M}{s}$$

$$\frac{0.0015\ M}{60\ s} = 0.000025\ M/s$$
$$2.50\cdot10^{-5}\ M/s$$

$$\frac{0.0029\ M}{60s} = 4.8\cdot10^{-5}\ M/s$$

Question 2

Find the reaction order for both of the reactants, and the overall reaction order

$$\frac{rate\ 2}{rate\ 1} = \frac{k\,[A]_2^m\,[B]_2^n}{k\,[A]_1^m\,[B]_1^n}$$

$$\frac{2.5\cdot10^{-5}\ M/s}{6.33\cdot10^{-6}\ M/s} = \left(\frac{0.0200}{0.0100}\right)^m$$

$$3.95 = 2^m \rightarrow \boxed{m=2}$$

$$\frac{4.8\cdot10^{-5}}{2.5\cdot10^{-5}} = \left(\frac{0.0200}{0.0100}\right)^n$$

$$1.92 = 2^n \rightarrow \boxed{n=1}$$

Question 3

Give the value for the rate constant k, with appropriate units

$$rate = k\,[A]^2\,[B] \qquad Overall = \boxed{3}$$

$$4.8\cdot10^{-5}\ M/s = k\,(0.0200\ M)^2\cdot0.0200\ M \rightarrow k = 6.00\ \frac{1}{s\,M^2}$$

Question 4

Name the five factors which control rates of reaction:

- Particle Size
- Concentrations
- Temperature
- Energetics/Sterics
- Catalyst