Chem 112 **Spring 2020** **Quiz 3** **Whelan**

SID | | | | | | | | | Last Key First Answer

Question 1 (3 Points)

Thallium-201 is used medically to diagnose heart problems. The **half-life of thallium-201** is **72.9 hours**. If you **begin** with **55.6 mg** of this isotope, **what mass remains** after **193 hours** have passed? Since the decomposition is a radioactive decay reaction, it is first order.

Must Show Work for Full Credit

$k = \frac{\ln 2}{t_{1/2}}$

$k = 9.51 \times 10^{-3}$

$\ln \frac{[A]_t}{[A]_0} = -kt$

$[A]_0 = 55.6$; $[A]_t = ?$

$t = 193$ hrs

$k = 9.51 \times 10^{-3}$

$\ln \frac{[A]_t}{55.6} = -9.51 \times 10^{-3}(193)$

$\ln [A]_t - \ln 55.6 = -1.835$

$\ln [A]_t - 4.018 = -1.835$

$\ln [A]_t = 2.183$

8.87 mg

Question 2 (3 Points)

The following **initial rate data** are for the oxidation of nitrogen monoxide by oxygen at 25°C: $2\ NO + O_2 = 2\ NO_2$

I. Rate $= k[NO]^x[O_2]^y$

Experiment	$[NO]_0$ M	$[O_2]_0$ M	Initial Rate, $M.s^{-1}$
1	9.10×10^{-3}	5.61×10^{-4}	4.20×10^{-4}
2	1.82×10^{-2}	5.61×10^{-4}	1.68×10^{-3}
3	9.10×10^{-3}	1.12×10^{-3}	8.38×10^{-4}
4	1.82×10^{-2}	1.12×10^{-3}	3.35×10^{-3}

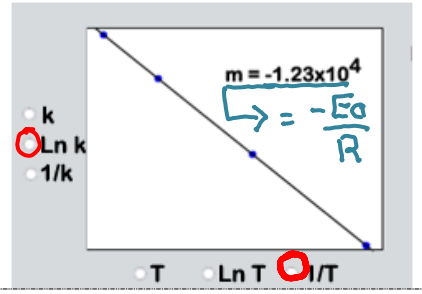
$y = 1$

$x = 2$

a) What is the **order of the reaction with respect to NO**? 2

b) What is the **overall order of the reaction**? 3

Question 3 (2 Points)



The graph on the left was used to determine the **Activation Energy** for:

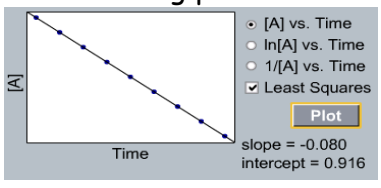
$2\ N_2O_5(g) = 4\ NO_2(g) + O_2(g)$

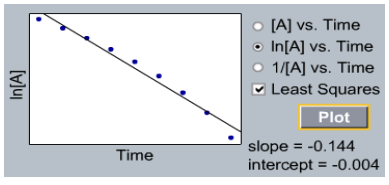
a) Circle the correct labels for graphs x and y axis?

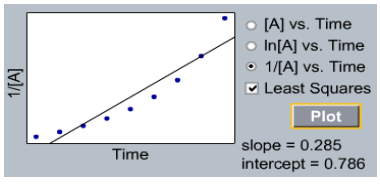
b) Ea = 102.3 $kJ.mol^{-1}$

Question 4 (2 Points)

The following plots are for the reaction **A = B** in which the **[A]** was monitored for 8 mins







From these plots the it can be determined that the **Rate** = 0.80 $[A]^0$