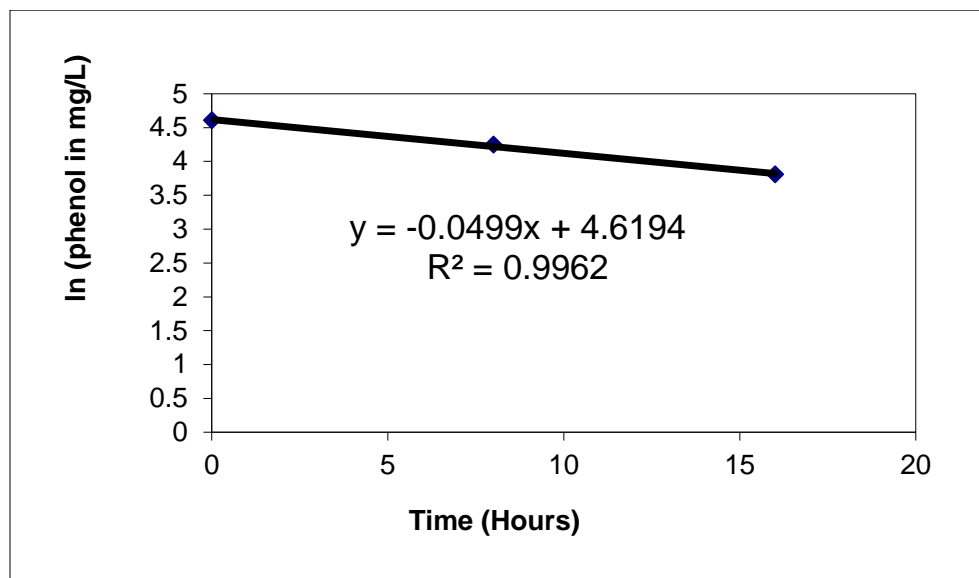


Assignment # 2 Due Monday February 11, 2019

1. A pollutant C is being removed over time in a reactor but the reaction order does not follow zero or first order. It follows the second order. If it takes 0.1 hours for the pollutant to decrease from 100 mg/l to 4 mg/L, what is the value of the reaction rate and its units? Indicate how you would plot data to obtain the value of k?

Remember $\frac{dC}{dt} = -kC^n$ or in this case $\frac{dC}{dt} = -kC^2$

2. An experiment was conducted to determine the reaction order and reaction rate for biodegradation of phenol (removal of phenol by bacteria). The phenol concentration versus time data was plotted and is shown below:



What is the reaction order?

What is the value of the reaction rate?

What is the initial phenol concentration in mg/L?

How much time in minutes will it take for 80% of the phenol to be removed?

3. The USA conducted numerous nuclear tests in the Marshall Islands in the 1940-1950s. The concentration of radioactive cesium (^{137}Cs) in the island air in **1946** was determined to be **120,000 Bq/L** (Bq=Bequerel a measure of radioactivity). The half life of ^{137}Cs is known to be **30 years**. The acceptable levels of cesium for human exposure is **1.3×10^{-7} Bq/L**. How long (in years) will it take for the ^{137}Cs levels in the Marshall Islands to reach acceptable levels?

4. A 99.99 % removal is required by a plant for bacteria in water. Bacteria kill is a first order reaction. If the kill rate is 2.65 min^{-1} , what is the the time in hours for the kill?