Chemical Kinetics

1. For the reaction \( A + B \rightarrow A_B \): Rate \( = k[A][B]^2 \) with \( k = 2 \times 10^{-3} \text{ mol}^{-2} \text{ s}^{-1} \), calculate the initial rate of the reaction when \( [A] = 0.1 \text{ mol} \) and \( [B] = 0.5 \text{ mol} \). Calculate the rate of reaction after \( 2 \text{ min} \), when \( [A] = 0.05 \text{ mol} \). Calculate the half-life of a first-order reaction from the rate constant given below: \( k = 0.05 \text{ min}^{-1} \). Calculate the age of the sample if only 80% of the 
\( \text{C}^{14} \) found in living tissue is the first-order reaction takes 40 minutes for 30% decomposition. Calculate the concentration of \( A \), remaining after 100 s, if the initial concentration of \( A \) is 1.0 mol. \( 0 \text{.384 mol}^{-1} \)

2. Sucrose decomposes in an acid solution into glucose and fructose according to the following rate law with \( \frac{1}{4} = 2 \text{.00 hours} \). What fraction of the sample of sucrose remains after \( \frac{1}{8} \text{ hours} \)? \( 0.154 \)

3. A first-order reaction has a rate constant \( 1.5 \times 10^{-3} \text{ s}^{-1} \). How long will it take for 50% of its initial amount of the reactant to be used? \( \frac{1}{3} \text{ hours} \). How long will it be before half of its initial amount of the reactant is used? \( 444 \text{ s} \).