

1) A drug administered to a patient is consumed by a first order reaction. The half-life of the process is 200. minutes. If a 40.0 mg dose is initially given, how much remains in the body after 12 hours?

2)  $^{14}_6\text{C}$  is used to determine the age of carbon-containing artifacts. The half-life of this isotope is 5730 years. If 72.0% of the original isotope is present in one such artifact, how old is it?

3) The decomposition of a peroxide initiator for addition polymerization is second order in the peroxide. The reaction is  $2 \text{BP} \rightarrow 4 \text{R}$ . The rate constant for the reaction is  $3.35 \times 10^4 \text{ M}^{-1}\text{sec}^{-1}$  at 353 K. The starting concentration of the BP is  $1.00 \times 10^{-6} \text{ M}$ . How much peroxide remains after exactly one minute?

4) The dimerization reaction to form a gene activator protein has a rate constant of  $9.00 \times 10^8 \text{ M}^{-1}\text{sec}^{-1}$  at 37.0 °C. The process is  $2 \text{IM} \rightarrow \text{GAP}$ . If the initial monomer (IM) concentration is 10.0 nM, how long does it take for 50.0 % of the IM to dimerize?

1) 3.29 mg    2) 2710 years    3)  $1.99 \times 10^{-7} \text{ M}$     4) 0.0556 sec