Sample Questions from the past midterms in Chem 111

1) Explain the concept of reaction order. What can you say about the reaction order for iodination of acetone in acidic solutions? Justify your answer. The balanced chemical reaction is shown below:

\[
\text{CH}_3\text{COCH}_3 + \text{I}_2 + \text{H}^+ \rightarrow \text{CH}_3\text{COCH}_2\text{I} + \text{HI}
\]

2) A student working over the weekend accidentally spilled the vial with $^{32}$P phosphate on the lab floor at 7 A.M Sunday morning. Despite efforts to decontaminate the lab, a radiation level\(^1\) of 477 Bq/cm\(^2\) was measured in the contaminated area 7 A.M. on Monday. After how many days can the lab personnel return to work if the maximal permissible contamination is 300 Bq/cm\(^2\).

3) Outline technical implementation of a pressure-jump apparatus that was used by Jacob et al to study protein folding.

4) Give the relationship between the rate coefficient (rate constant) and the half-life in the irreversible first-order reaction. Hint: You may derive it easily from the rate law if you do not remember this result.

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\(^1\) The SI unit of radioactivity is 1 becquerel (1 Bq = amount of material that produces 1 nuclear decay per second)