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Course: CHM 210.

Date: 19/04/2020.

Matric No: 18/ENG01/022.

PHYSICAL CHEMISTRY ASSIGNMENT 2.

We can derive the equation for calculating the half-life of a second order as follows:

1/[A]=kt+1/[A]0

or

1/[A]−1/[A]0=kt

If

t=t1/2

then

[A]=1/2[A]0

and we can write:

1/1/2[A]0−1/[A]0 kt1/2 2[A]0−1/[A]0 kt1/2 1/[A]0 kt1/2

Thus:

t1/2=1/k[A]0

For a second-order reaction, t1/2 is inversely proportional to the concentration of the reactant, and the half-life increases as the reaction proceeds because the concentration of reactant decreases. Consequently, we find the use of the half-life concept to be more complex for second-order reactions than for first-order reactions. Unlike with first-order reactions, the rate constant of a second-order reaction cannot be calculated directly from the half-life unless the initial concentration is known. Therefore the half-life of a second-order reaction is concentration dependent.