

LECTURE 10

PREVIOUS YEAR PROBLEMS

Q1(JEE MAINS 2019)

The following results were obtained during kinetic studies of the reaction:
 $2A + B \rightarrow \text{Products}$

Experiment	[A] (in mol L ⁻¹)	[B] (in mol L ⁻¹)	Initial Rate of reaction (in mol L ⁻¹ min ⁻¹)
(I)	0.10	0.20	6.93×10^{-3}
(II)	0.10	0.25	6.93×10^{-3}
(III)	0.20	0.30	1.386×10^{-2}

The time (in minutes) required to consume half of A is:

A 10

B 5

C 100

D 1

Mail

Correct option is B)

$$6.93 \times 10^{-3} = k \times (0.1)^x(0.2)^y \dots\dots\dots(i)$$

$$6.93 \times 10^{-3} = k \times (0.1)^x(0.25)^y \dots\dots\dots(ii)$$

From the above equation, $y = 0$

$$\text{and } 1.386 \times 10^{-2} = k \times (0.2)^x(0.30)^y \dots\dots\dots(iii)$$

Divide equation (i) by (iii), we get

$$\frac{1}{2} = \left(\frac{1}{2}\right)^x \Rightarrow x = 1$$

$$\text{So } r = k \times (0.1) \times (0.2)^0$$

$$6.93 \times 10^{-3} = k \times 0.1 \times (0.2)^0$$

$$k = 6.93 \times 10^{-2}$$

$$t_{1/2} = \frac{0.693}{2k} = \frac{0.693}{0.693 \times 10^{-1} \times 2} = \frac{10}{2} = 5$$