Parineeta Jain
23
1032222105
TY BTech Bioengineering

BRE Assignment

PAGE NO.
DATE 23/1/25

[10 Marks]

Q.1) The following table shows how the concentration of reactant A varied with time in a particular experiment.

Time (min) x-axis	Concentration of A (mol/l) y-axis
0	2.77×10^{-4}
18	2.32×10^{-4}
31	2.05×10^{-4}
55	1.59×10^{-4}
79	1.26×10^{-4}
157	0.58×10^{-4}
∞	0.00

a) Plot a graph of concentration of A against time
b) Draw tangents to the curves at 10, 50, 100 and 150 minutes and calculate the slopes.
c) Plot a graph of rate of reaction against concentration of A.

i) Find if the line passes through origin. Explain
ii) With the help of a graph, state the relationship b/w the rate of a reaction and concentration of reactant both in words and mathematically.
iii) Find the value of rate constant from graph
iv) What is the order of reaction.

→ Calculations

Slopes:

$$m = \frac{y_2 - y_1}{x_2 - x_1} =$$

(a) Slopes = $\frac{\Delta y}{\Delta x}$ = $\frac{2.27 \times 10^{-4} - 2.49 \times 10^{-4}}{10 - 0}$ = 0.028×10^{-4}

10min (rate)

(b) Slopes = $\frac{\Delta y}{\Delta x}$ = $\frac{1.64 - 2.49}{50 - 10}$ = 0.021×10^{-4}

50min

(c) Slopes = $\frac{\Delta y}{\Delta x}$ = 0.013×10^{-4}

100min

(d) $\frac{0.58 - 0.99}{150 - 100}$ = $\frac{8.2 \times 10^{-3} \times 10^{-4}}{0.82 \times 10^{-6}}$

Time (min)	Slope (rate ~~constant~~)	Concentration
10	2.8×10^{-6}	2.49×10^{-4}
50	2.1×10^{-6}	1.64×10^{-4}
100	1.3×10^{-6}	0.99×10^{-4}
150	0.82×10^{-6}	0.58×10^{-4}

$R \propto C_A$

→ • Rate of reaction = KC_A

• rate of reaction is proportional to concentration of the reactant

→ At the origin, rate of reaction is zero as the concentration of reactant is also zero.

→ Rate Constant:

$$K = \text{Slope} = \frac{\Delta \text{rate}}{\Delta \text{concentration}}$$

$$= \frac{2.8 \times 10^{-6}}{2.49 \times 10^{-4}} = 11.2 \times 10^{-3} \text{ min}^{-1}$$

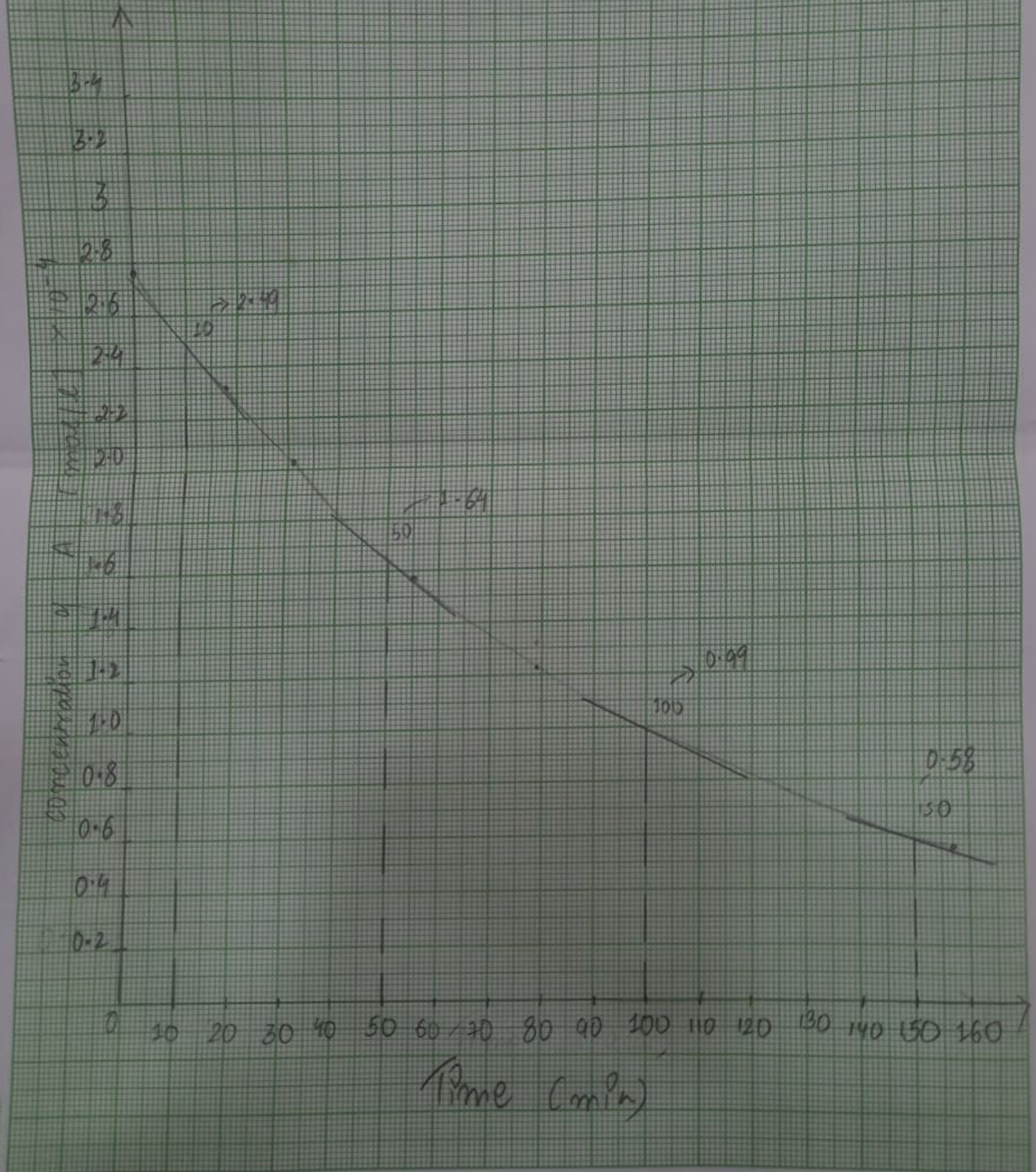
→ Order of the reaction:

The reaction is first order with respect to A, as the rate is proportional to the first power of concentration of A.

Scale

x axis : 1 unit = 10 mins

y axis : 1 unit = 0.2 mole $\times 10^{-4}$



Rate Vs concentration of A

Scale:
x axis - 1 unit = 0.2 mole/l
y axis - 1 unit = 0.2 mol/(l min)