CLASS 12 BATCH

FOR CHEMISTRY

LECTURE - 01

CHEMICAL KINETICS

Today's Goal

Rate of Reaction
Types of Rate
Factors affecting rate

Chemical Kinetics

In this chapter the rate or velocity or speed of reaction is studied

Types of Reaction :

SLOW REACTION
Rusting of iron in the presence of air and moisture.

MODERATE REACTION
Inversion of cane sugar
Hydrolysis of starch

FAST REACTION
Ionic reactions – $AgNO_3$ + NaCl

Rate of Reaction

Unit of Rate of Reaction

1. In terms of concentration

2. In terms of Pressure

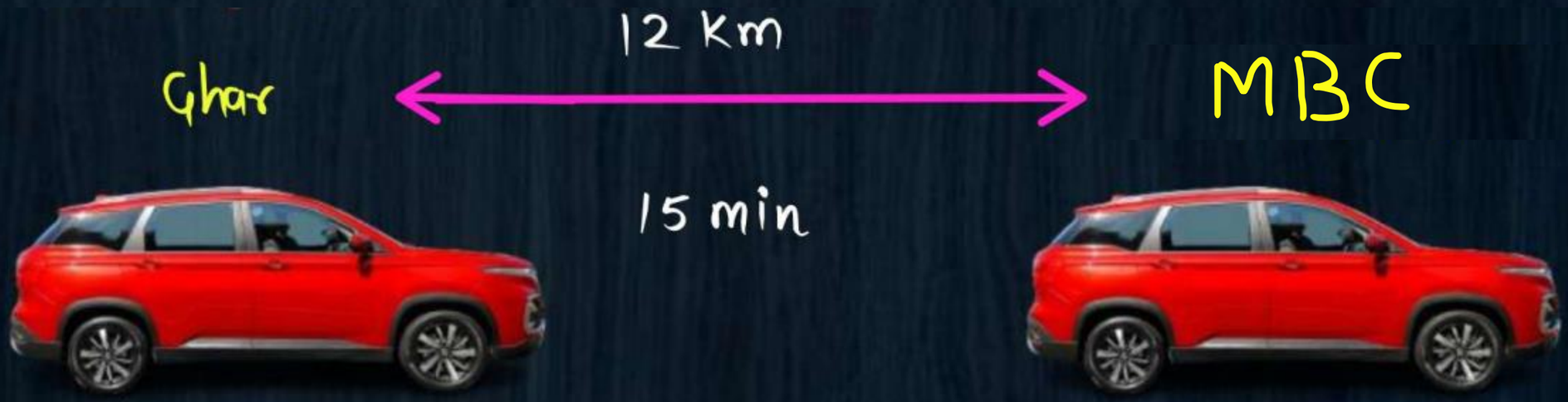
Types of rate of reaction

1. Average Rate

2. Instantaneous rate

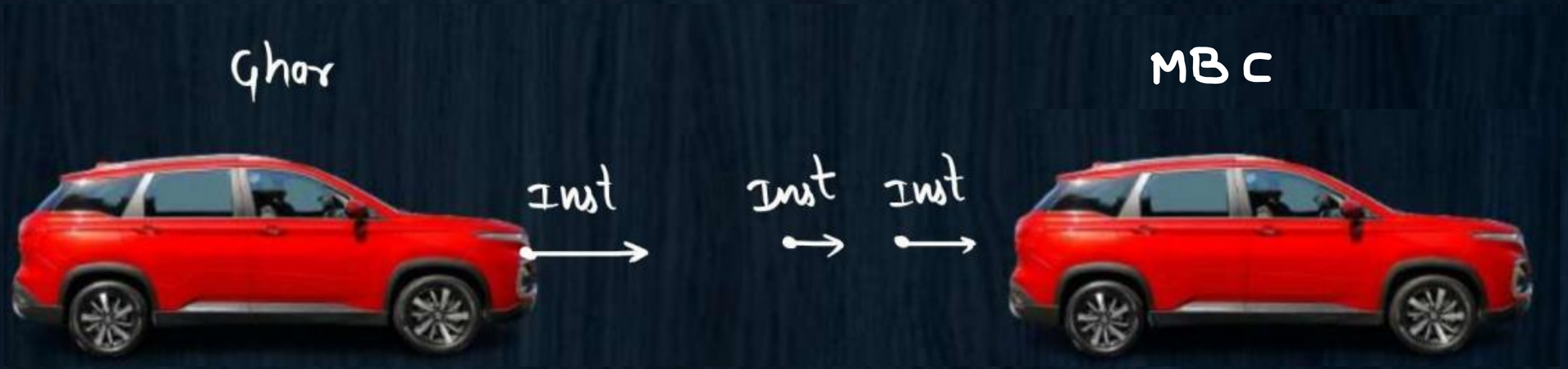
Types of rate

1. Average Rate



Types of rate

1. Instantaneous Rate



Rate of disappearance or consumption

Rate of Appearance or formation

How to write the expression of Rate of Reaction

Factors affecting Rate of Reaction

- Concentration
- Pressure
- Catalyst
- Temperature
- Surface area

Graphical Analysis

For Reactant

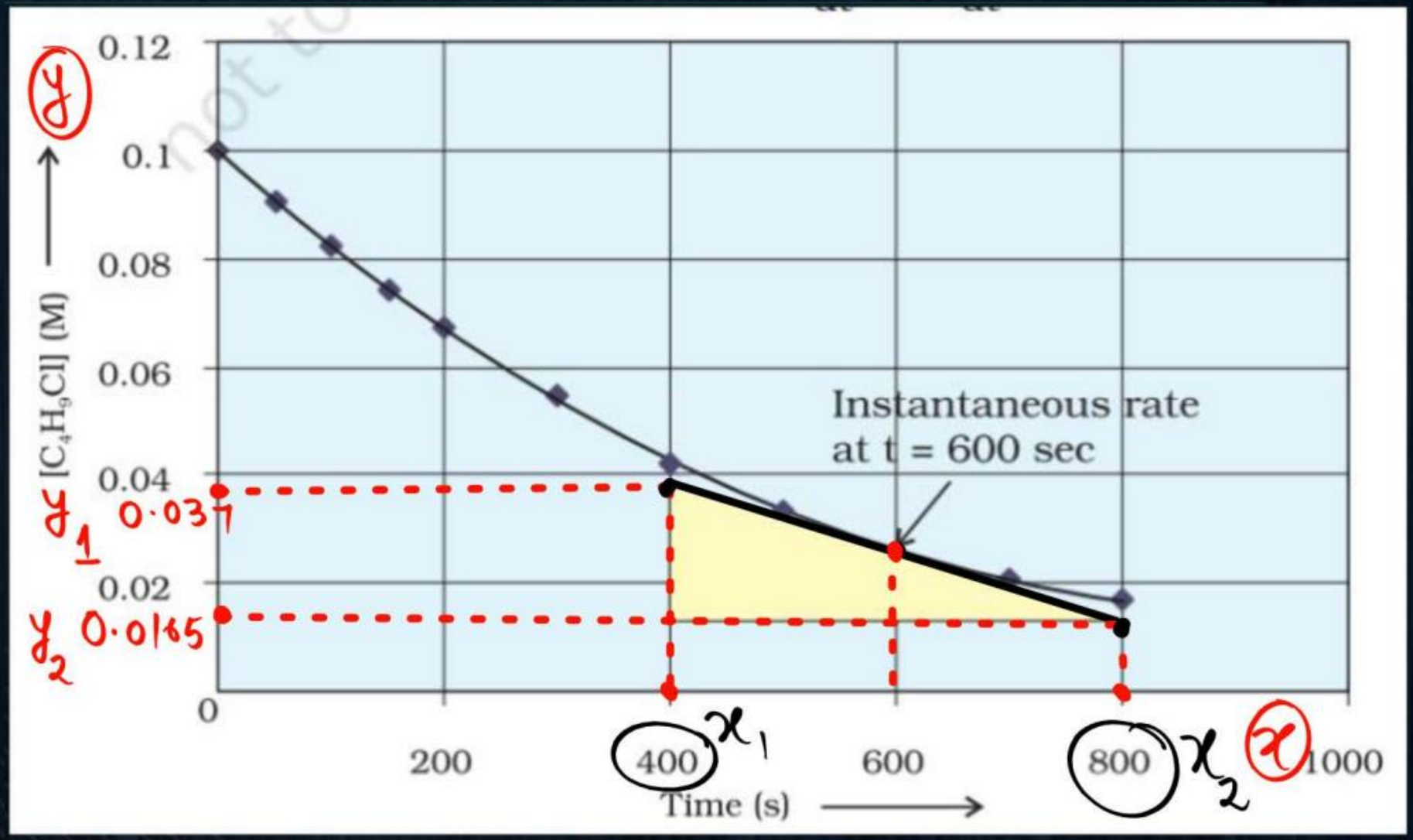
Graphical Analysis

For Product

Calculation of Average and Instantaneous rate

t/s	0	50	100	150	200	300	400	700	800
$[C_4H_9Cl]$/mol L^{-1}	0.100	0.0905	0.0820	0.0741	0.0671	0.0549	0.0439	0.0210	0.017

Calculation of Average and Instantaneous rate



Calculation of Average and Instantaneous rate

$$r_{inst} \text{ at } 600\ s = -\left(\frac{0.0165 - 0.037}{(800 - 400)s}\right) \text{ mol } L^{-1} = 5.12 \times 10^{-5} \text{ mol } L^{-1} s^{-1}$$

Calculation of Average and Instantaneous rate

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Q

Write Expression for ROR

$$Hg_{(l)} + Cl_{2\,(g)} \longrightarrow HgCl_{2\,(s)}$$

Q

Write Expression for ROR

$2HI \longrightarrow H_2 + I_2$

1. The differential rate law equation for the elementary reaction A + 2B → 3C, is :

A $-\frac{d[A]}{dt} = -\frac{d[B]}{dt} = \frac{d[C]}{dt}$

B $-\frac{d[A]}{dt} = -\frac{1}{2}\frac{d[B]}{dt} = \frac{1}{3}\frac{d[C]}{dt}$

C $-\frac{d[A]}{dt} = +\frac{1}{2}\frac{d[B]}{dt} = \frac{1}{3}\frac{d[C]}{dt}$

D None of these

2. The rate of reaction is expressed in different ways as follows:

$$+\frac{1}{2}\frac{d[C]}{dt} = -\frac{1}{3}\frac{d[D]}{dt} = +\frac{1}{4}\frac{d[A]}{dt} = -\frac{d[B]}{dt}$$

The reaction is:

A. $4A + B \rightarrow 2C + 3D$

B. $B + 3D \rightarrow 4A + 2C$

C. $A + B \rightarrow C + D$

D. $B + D \rightarrow A + C$

Q

3. In the following reaction, how is the rate of appearance of the underlined product related to the rate of disappearance of the underlined reactant

$\underline{BrO_3^-} + 5\,Br^- + 6H^+ \rightarrow \underline{3Br_2} + 3H_2O$

A $-\frac{d[BrO_3^-]}{dt} = \frac{d[Br_2]}{dt}$

B $-\frac{1}{3}\frac{d[BrO_3^-]}{dt} = \frac{d[Br_2]}{dt}$

C $\frac{-d[BrO_3^-]}{dt} = \frac{1}{3}\frac{d[Br_2]}{dt}$

D None of these

Q

4. In the reaction A + 2B → 6C + 2D, if the initial rate $-\frac{d[A]}{dt}$ at t=0 is 2.6×10^{-2} M sec^{-1}, what will be the value of $-\frac{d[B]}{dt}$ at t =0 ?

A 8.5×10^{-2} M sec^{-1}

B 2.5×10^{-2} M sec^{-1}

C 5.2×10^{-2} M sec^{-1}

D 7.5×10^{-2} M sec^{-1}

5. The rate of a chemical reaction depends upon:

[Punjab PMT 1999; AFMC 2002]

A. Catalyst

B. Pressure

C. Concentration

D. All of these

Q

6. A gaseous hypothetical chemical equation $2A \rightarrow 4B + C$ is carried out in a closed vessel. The concentration of B is found to increase by 5×10^{-3} mol L^{-1} in 10 sec. The rate of appearance of B is: [AFMC 2001]

A 5×10^{-4} mol L^{-1} sec^{-1}

B 5×10^{-5} mol L^{-1} sec^{-1}

C 6×10^{-5} mol L^{-1} sec^{-1}

D 4×10^{-5} mol L^{-1} sec^{-1}

Q

7. For the reaction R → P, the concentration of a reactant changes from 0.03 M to 0.02 M in 25 minutes. Calculate the average rate of reaction using units of time both in minutes and seconds. [NCERT]

A 4×10^{-4} M min^{-1}, 6.67×10^{-6} M sec^{-1}

B 4×10^{-4} M min^{-1}, 9×10^{-6} M sec^{-1}

C 2×10^{-4} M min^{-1}, 6.67×10^{-6} M sec^{-1}

D 6×10^{-4} M min^{-1}, 4×10^{-6} M sec^{-1}

Q

8. In a reaction, $2A \rightarrow$ Products, the concentration of A decreases from 0.5 mol L^{-1} to 0.4 mol L^{-1} in 10 minutes. Calculate the rate during this interval? [NCERT]

A. 5×10^{-3} M min^{-1}

B. 8×10^{-3} M min^{-1}

C. 2×10^{-3} M min^{-1}

D. 6×10^{-3} M min^{-1}

THANK YOU !!

Homework

NCERT LAST CHAPTER READING

DPP Of this Lecture