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Ex.3 The term $\frac{dx}{dt}$ in the rate expression refers to the -

[A] Concentration of the reactants

[B] increase in Concentration of the reactants

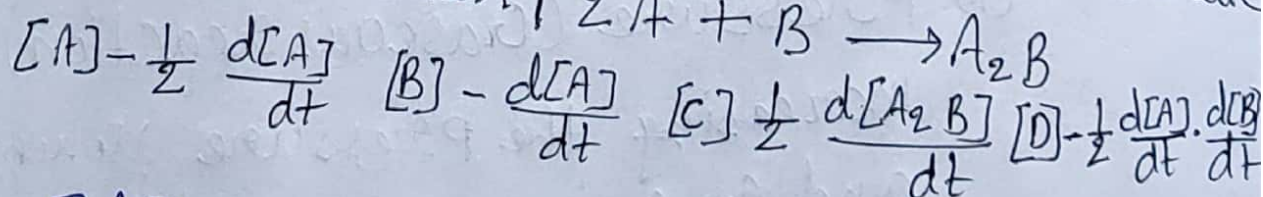
[C] instantaneous rate of the reaction

[D] average rate of the reaction.

Solⁿ [C]

It is expression for instantaneous rate.

Ex.4 which of the following expression can be used to describe the instantaneous rate of the reaction?



Solⁿ [A]

The instantaneous rate of the reaction can

be expressed by any of the following expressions $-\frac{1}{2} \frac{d[A]}{dt}$ or $-\frac{d[B]}{dt}$ or $\frac{d[A_2B]}{dt}$

EX.5 Which of the following will react at the highest rate?

[A] 1 mol of A and 1 mol of B in a 1 L vessel

[B] 2 mol of A and 2 mol of B in a 2 L vessel

[C] 3 mol of A and 3 mol of B in a 3 L vessel

[D] All would react at the same rate

Sol.ⁿ [D]

Since all have same conc. of reactants, all would react at same rate.

5. FACTORS AFFECTING THE RATE OF REACTION -N

(i) Concentration: Law of mass action enunciates that greater is the conc. of the reactants, the more rapidly the reaction proceeds.

(ii) Pressure (Gaseous reaction): On increasing the pressure, volume decreases and conc. increases and hence the rate increases.

(iii) Temperature: It is generally observed

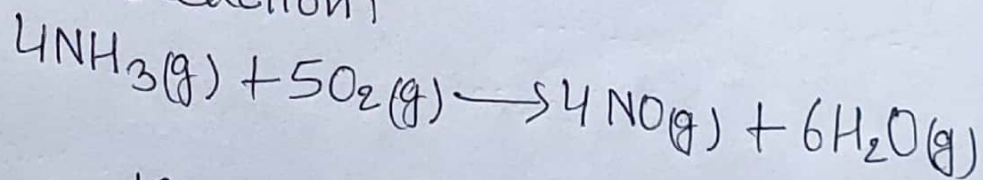
that rise in temperature increases the reaction rate.

(iv) Nature of the reactants: The rate depends upon specific bonds involved and hence on the nature of reactants.

(v) Surface area of reactants: $g > l > s$ In heterogeneous reactions, more powdered is the form of reactants, more is the velocity. [as more active centres are provided]

(vi) Catalyst: Affects the rate immensely.

Ex. 6 For the reaction,



Given: $\frac{d[\text{NO}]}{dt} = 3.6 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$

Calculate: (i) rate of disappearance of ammonia

(ii) rate of formation of water

Sol. From the eqn. it is clear that

$$\text{Rate} = -\frac{1}{4} \frac{d[\text{NH}_3]}{dt} = \frac{1}{4} \frac{d[\text{NO}]}{dt} = \frac{1}{6} \frac{d[\text{H}_2\text{O}]}{dt} \quad \text{Thus } -\frac{1}{4} \frac{d[\text{NH}_3]}{dt} = \frac{1}{4} \frac{d[\text{NO}]}{dt}$$

$$\text{Or, } -\frac{d[\text{NH}_3]}{dt} = \frac{d[\text{NO}]}{dt} = 3.6 \times 10^{-3} \text{ mol l}^{-1} \text{ s}^{-1} \quad \text{Also } \frac{1}{4} \frac{d[\text{NO}]}{dt} = \frac{1}{6} \frac{d[\text{H}_2\text{O}]}{dt}$$

$$\frac{3}{2} \frac{d[\text{NO}]}{dt} = \frac{d[\text{H}_2\text{O}]}{dt}$$

$$\frac{3}{2} \times 3.6 \times 10^{-3} = \frac{d[\text{H}_2\text{O}]}{dt}$$

$$\frac{d[\text{H}_2\text{O}]}{dt} = 5.4 \times 10^{-3} \text{ mol l}^{-1} \text{ s}^{-1}$$