

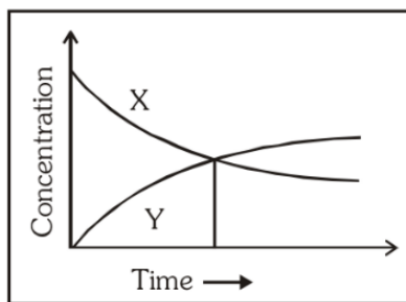
## DPP –6 [Integrated rate law-2 (Graphs)]

### Chapter: Chemical Kinetics

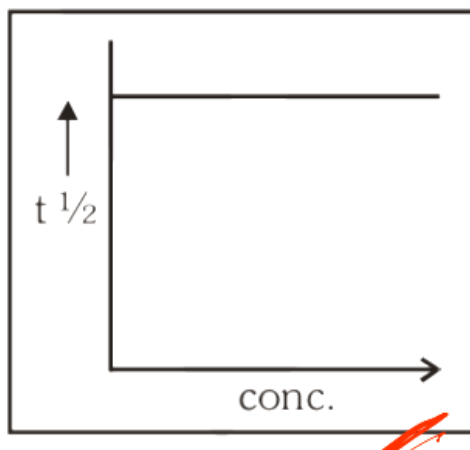
*“Every tough question is training. Every mistake is progress. I don’t stop — I figure it out”*

#### TYPE-1 : Graph-Based Question

1. The accompanying figure depicts the change in concentration of species X and Y for the reaction  $X \rightarrow Y$  as a function of time the point of intersection of the two curves represents.

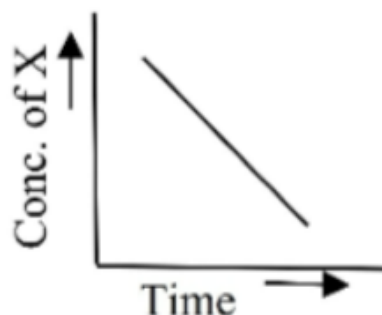


- (1)  $t_{1/2}$
  - (2)  $t_{3/4}$
  - (3)  $t_{2/3}$
  - (4) Data are insufficient to predict
2. Plot of  $\log(a - x)$  vs time  $t$  is straight line. This indicates that the reaction is of –
    - (1) Second order
    - (2) First order
    - (3) Zero order
    - (4) third order
  3. A graph between  $t_{1/2}$  and concentration for  $n^{\text{th}}$  order reaction is a straight line. Reaction of this nature is completed 50% in 10 minutes when concentration is  $2 \text{ mol L}^{-1}$ . This is decomposed 50% in  $t$  minutes at  $4 \text{ mol L}^{-1}$ ,  $n$  and  $t$  are respectively



- (1) 0, 20 min.
- (2) 1, 10 min.
- (3) 1, 20 min.
- (4) 0, 5 min.

4. For a general reaction  $X \rightarrow Y$ , the plot of  $\text{conc.}$  of  $X$  vs time is given in the figure. What is the order of the reaction and what are the units of rate constant?



- (1) Zero,  $\text{mol L}^{-1} \text{s}^{-1}$
- (2) First,  $\text{mol L}^{-1} \text{s}^{-1}$
- (3) First,  $\text{s}^{-1}$
- (4) Zero,  $\text{L mol}^{-1} \text{s}^{-1}$

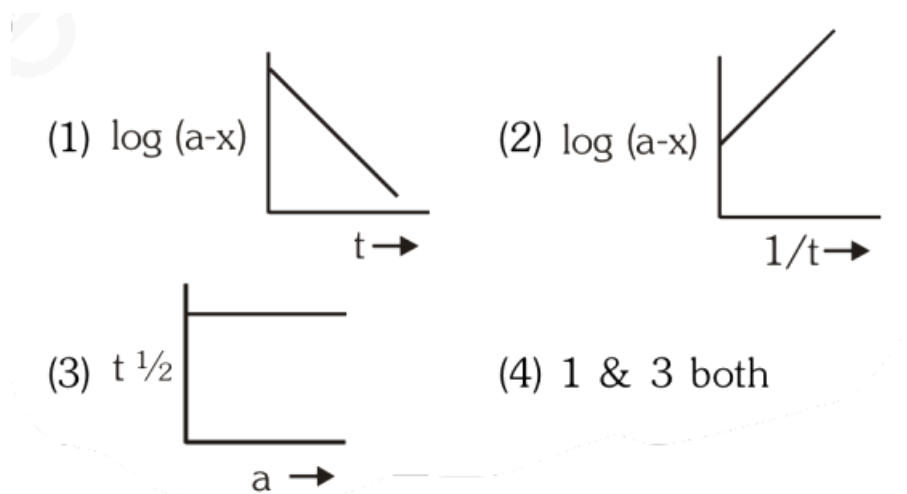
5. The reaction



is first order with respect to  $\text{N}_2\text{O}_5$ . Which of the following graph would yield a straight line?

- (1)  $\log(P_{\text{N}_2\text{O}_5})$  v/s time with negative slope
- (2)  $P_{\text{N}_2\text{O}_5}^{-1}$  v/s time
- (3)  $P_{\text{N}_2\text{O}_5}$  v/s time
- (4)  $\log(P_{\text{N}_2\text{O}_5})$  v/s time with positive slope

6. Which of the following curves represents a 1st order reaction?



7. Match the plots in column I with their orders in column II and mark the appropriate choice.

Column I		Column II	
(a)		(i)	Zero order
(b)		(ii)	First order
(c)		(iii)	Second order
(d)		(iv)	Third order

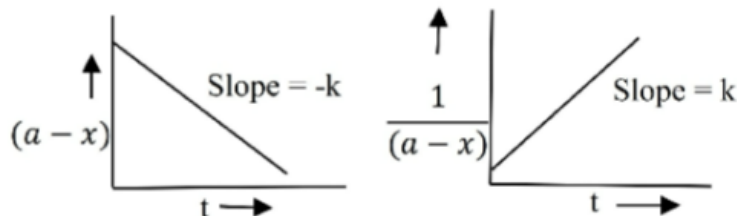
(1) (a)→(iii), (b)→(ii), (c)→(i), (d)→(ii)

(2) (a)→(i), (b)→(iii), (c)→(ii), (d)→(iv)

(3) (a)→(iv), (b)→(iii), (c)→(ii), (d)→(i)

(4) (a)→(ii), (b)→(i), (c)→(iii), (d)→(iv)

8. Two plots are shown below between concentration and time  $t$ . Which of the given orders are shown by the graph respectively?

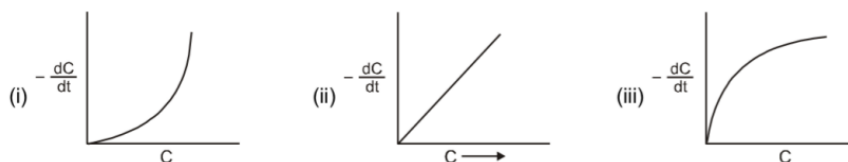


- (1) Zero order and first order
- (2) First order and second order
- (3) Zero order and second order
- (4) First order and first order

9. Match the following:

Column-I (Graph)		Column -II (Slope)	
(A)	$c$ vs $t$ (abscissa) for zero order	(p)	unity
(B)	$\log c$ vs $t$ (abscissa) for first order	(q)	zero
(C)	$\left(-\frac{dc}{dt}\right)$ vs $c$ for zero order	(r)	$-k$
(D)	$\ln\left(-\frac{dc}{dt}\right)$ vs $\ln c$ for first order	(s)	$-\frac{k}{2.303}$

10. In three different reactions, involving a single reactant in each case, a plot of rate of the reaction on the y-axis, versus concentration of the reactant on the x-axis, yields three different curves shown below.

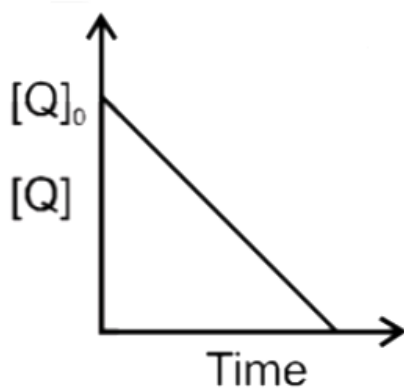


What are the possible orders of the reactions (i), (ii), (iii).

- (A) 1, 2, 3
- (B) 2, 1, 1/2
- (C) 0, 1, 2
- (D) 0, 1,  $\frac{1}{2}$

11. In the reaction,  $P + Q \rightarrow R + S$  the time taken for 75% reaction of P is twice the time taken for 50% reaction of P. The concentration of Q varies with reaction time as shown in the figure. The overall order of the reaction is:

[JEE(Advanced) 2013, 2/120]



- (A) 2
- (B) 3
- (C) 0
- (D) 1

## TYPE-2 : Finding Order of Reaction

12. The reaction  $L \rightarrow M$  is started with 10 g/L. After 30 minute and 90 minute, 5 g/L and 1.25 g/L are left respectively. The order of reaction is
- (1) 0
  - (2) 2
  - (3) 1
  - (4) 3
13. The doubling the initial concentration of a reactant doubles  $t_{1/2}$  of the reaction, then order of the reaction is–
- (1) 3
  - (2) 2
  - (3) 1
  - (4) 0
14. The half life period for catalytic decomposition of  $AB_3$  at 50 mm is found to be 4 hrs and at 100 mm it is 2 hrs. The order of reaction is –
- (1) 3
  - (2) 1
  - (3) 2
  - (4) 0
15. The rate constant for a reaction is  $10.8 \times 10^{-5} \text{ mol L}^{-1} \text{ s}^{-1}$  The reaction obeys –
- (1) First order
  - (2) Zero order
  - (3) Second order
  - (4) All are wrong
16. The rate constant (K) for the reaction  $2A + B \rightarrow \text{product}$ , was found to be  $2.5 \times 10^{-5} \text{ L mol}^{-1} \text{ s}^{-1}$  after 15 s,  $2.60 \times 10^{-5} \text{ L mol}^{-1} \text{ s}^{-1}$  after 30 s and  $2.55 \times 10^{-5} \text{ L mol}^{-1} \text{ s}^{-1}$  after 50 s. The order of reaction is
- (1) 2
  - (2) 3
  - (3) Zero
  - (4) 1
17. From different sets of data of  $t_{1/2}$  at different initial concentrations say 'a' for a given reaction, the  $[t_{1/2} \times a]$  is found to be constant. The order of reaction is :-

- (1) 0
- (2) 1
- (3) 2
- (4) 3

18. The following data were obtained at a certain temperature for the decomposition of ammonia

$p$ (mm)	50	100	200
$t_{1/2}$	3.64	1.82	0.91

The order of the reaction is :-

- (1) 0
  - (2) 1
  - (3) 2
  - (4) 3
19. If 50 % of a reaction occurs in 100 second and 75 % of the reaction occurs in 200 second, the order of this reaction is: [JEE(Main) 2018 Online (16-04-18), 4/120]

- (1) 2
- (2) 3
- (3) Zero
- (4) 1

20. Consider a reaction  $aG + bH \rightarrow$  Products. When concentration of both the reactants G and H is doubled, the rate increases by eight times. However, when concentration of G is doubled keeping the concentration of H fixed, the rate is doubled. The overall order of the reaction is: [JEE-2007, 3/162]

- (A) 0
- (B) 1
- (C) 2
- (D) 3

21. Under the same reaction conditions, initial concentration of  $1.386 \text{ mol dm}^{-3}$  of a substance becomes half in 40 seconds and 20 seconds through first order and zero order kinetics, respectively. Ratio  $\left(\frac{k_1}{k_0}\right)$  of the rate constant for first order ( $k_1$ ) and zero order ( $k_0$ ) of the reaction is, [JEE-2008, 3/162]

- (A)  $0.5 \text{ mol}^{-1} \text{ dm}^3$
- (B)  $1.0 \text{ mol dm}^{-3}$
- (C)  $1.5 \text{ mol dm}^{-3}$
- (D)  $2.0 \text{ mol}^{-1} \text{ dm}^3$

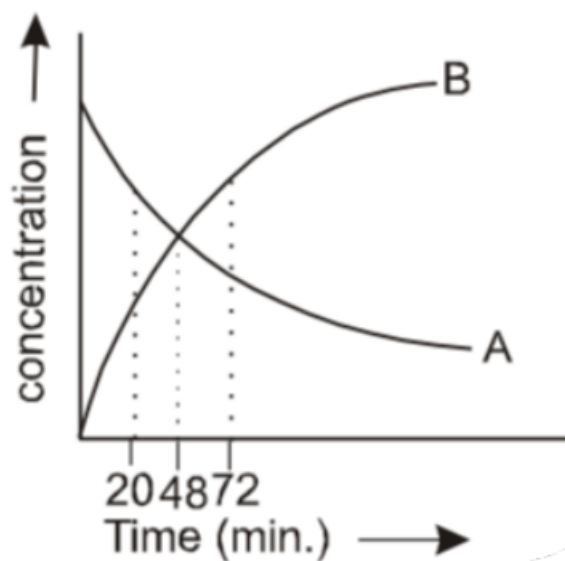
22. The concentration of R in the reaction  $R \rightarrow P$  was measured as a function of time and the following data is obtained:

[R] (molar)	1.0	0.75	0.40	0.10
t(min.)	0.0	0.05	0.12	0.18

The order of the reaction is:

[JEE-2010, 3/163]

23. For a first order reaction,  $nA \rightarrow B$  whose concentration vs time curve is as shown in the figure. If half life for the reaction is 24 minutes. Find out the value of n.



- (A) 1
- (B) 2
- (C) 3
- (D) 4