DPP –5 [Integrated Rate Law -1]

Chapter: Chemical Kinetics

"The only way to do great work is to love what you do––Steve Jobs'

PART–1 : ZERO ORDER REACTIONS

TYPE–1.1 : Direct Formula Based Questions

1. **K for a zero order reaction is 2 $\times 10^{-2}$ mol L^{-1} s^{-1}. If the concentration of the reactant after 25 s is 0.5 M, the initial concentration must have been.**
   (1) 0.5 M (2) 1.25 M
   (3) 12.5 M (4) 1.0 M
2. **The rate constant of a zero order reaction is 0.2 mol $dm^{-3}h^{-1}$. If the concentration of the reactant after 30 minutes is 0.05 mol dm^{-3}. Then its initial concentration would be :–**
   (1) 6.05 mol dm^{-3} (2) 0.15 mol dm^{-3}
   (3) 0.25 mol dm^{-3} (4) 4.00 mol dm^{-3}
3. **For which of the following, the unit of rate and rate constant of the reaction are identical :–**
   (1) First order reaction
   (2) Zero order reaction
   (3) Second order reaction
   (4) Fractional order of reaction

TYPE–1.2 : Half-Life Based Questions

4. **Which of the following statement is not correct for the reaction whose rate is r = k (rate constant)**
   (1) rate of reaction is independent of concentration of reactant
   (2) $t_{1/2}$ of reaction is not depends upon concentration of reactant
   (3) rate constant is independent of concentration of reactant
   (4) this is zero order reaction
5. **The reaction 2X → B is a zeroth order reaction. If the initial concentration of X is 0.2 M, the half-life is 6 h. When the initial concentration of X is 0.5 M, the time required to reach its final concentration of 0.2 M will be :**

   [JEE(Main) 2019 Online (11-01-19), 4/120]

   (1) 18.0 h (2) 12.0 h
   (3) 7.2 h (4) 9.0 h

PART–2 : FIRST ORDER REACTIONS

TYPE–2.1 : Direct Formula Based Questions

6. **If the first order reaction involves gaseous reactants and gaseous products the unit of its rate is –**
   (1) atm. (2) atm - s
   (3) atm $-$ s^{-1} (4) atm^2 s^2
7. **The rate constant of a first order reaction is 4×10^{-3} s^{-1}. At a reactant concentration of 0.02 M, the rate of reaction would be–**
   (1) 8×10^{-5} M s^{-1} (2) 4×10^{-3} M s^{-1}
   (3) 2×10^{-1} M s^{-1} (4) 4×10^{-1} M s^{-1}
8. **In a first order reaction the concentration of the reactant is decreased from 1.0 M to 0.25 M in 20 min. The rate constant of the reaction would be –**
   (1) 10 min^{-1} (2) 6.931 min^{-1}
   (3) 0.6931 min^{-1} (4) 0.06931 min^{-1}
9. **In the biologically-catalysed oxidation of ethanol, the concentration of ethanol decreases in a first order reaction from 800 mol dm^{-3} to 50 mol dm^{-3} in 2 $\times 10^4$ s. The rate constant (s^{-1}) of the reaction is :**

   [JEE-2003(S), 3/84]

   (A) 3.45×10^{-5} (B) 1.38×10^{-4}
   (C) 1.00×10^{-4} (D) 5.00×10^{-5}
10. **For a given reaction of first order it takes 20 minute for the concentration to drop from 1 M to 0.6 M. The time required for the concentration to drop from 0.6 M to 0.36 M will be :**
    (1) More than 20 min
    (2) Less than 20 min
    (3) Equal to 20 min
    (4) Infinity
11. **In the first order reaction, 75% of the reactant disappeared in 1.388 h. Calculate the rate constant of the reaction :–**
    (1) 1 s^{-1} (2) 2.8×10^{-4} s^{-1}
    (3) 17.2×10^{-3} s^{-1} (4) 1.8×10^{-3} s^{-1}
12. **A first order reaction is carried out with an initial concentration of 10 mol per litre and 80% of the reactant changes into the product. Now if the same reaction is carried out with an initial concentration of 5 mol per litre for the same period the percentage of the reactant changing to the product is.**
    (1) 40 (2) 80
    (3) 160 (4) Cannot be calculated
13. **A substance 'A' decomposes in solution following the first order kinetics flask I contains 1 L of 1M solution of A and flask ll contains 100 ml of 0.6 M solution. After 8 hr. the concentration of A in flask. I become 0.25 M, what will be the time for concetration of A in flask ll to become 0.3 M.**
    (1) 0.4 hr.
    (2) 2.4 hr.

(3) 4.0 hr.
(4) Unpredictable as rate constant is not given

14. **A reaction is of first order. After 100 minutes 75 gm of the reactant A are decomposed when 100 gm are taken initially, calculate the time required when 150 gm of the reactant A are decomposed, the initial weight taken is 200 gm :–**
(1) 100 minutes (2) 200 minutes
(3) 150 minutes (4) 175 minutes

15. **In a first order reaction the a/(a − x) was found to be 8 after 10 minute. The rate constant is**
(1) $\frac{(2.303 \times 3\log 2)}{10}$ (2) $\frac{(2.303 \times 2\log 3)}{10}$
(3) $10 \times 2.303 \times 2\log 3$ (4) $10 \times 2.303 \times 3\log 2$

TYPE–2.2 : Half-Life Based Questions

16. **For a first order reaction A → products, the rate of reaction at [A] = 0.2 M is 1×10^{-2} mol $L^{-1}min^{-1}$. The half life period for the reaction is –**
(1) 832 min. (2) 440 s
(3) 416 min. (4) 14 min.

17. **A first order reaction has a half life period of 69.3 s. At 0.10 mol L^{-1} reactant concentration, the rate will be –**
(1) 10^{-4} M s^{-1} (2) 10^{-3} M s^{-1}
(3) 10^{-1} M s^{-1} (4) 6.93×10^{-1} M s^{-1}

18. **The rate of a first order reaction is 0.04 mole $litre^{-1}$ s^{-1} at 10 minutes and 0.03 mol $litre^{-1}$ s^{-1} at 20 minutes after initiation. Find the half life of the reaction.**
[JEE-2001(M), 5/100]
(24 min)

19. **The half life for the first order reaction $N_2O_5 \rightarrow 2NO_2 + \frac{1}{2}O_2$ is 24 hrs. at 30°C. Starting with 10 g of N_2O_5 how many grams of N_2O_5 will remain after a period of 96 hours ?**
(1) 1.25 g (2) 0.63 g
(3) 1.77 g (4) 0.5 g

20. **The half-life period of a first order reaction is 15 minutes. The amount of substance left after one hour will be :**
[JEE(Main) 2014 Online (09-04-14), 4/120]
(1) 1/4 of the original amount (2) 1/8 of the original amount
(3) 1/16 of the original amount (4) 1/32 of the original amount

21. **75 % of a first order reaction was found to complete in 32 min. When will 50 % of the same reaction complete –**
(1) 24 min (2) 16 min
(3) 8 min (4) 4 min

22. **What is the half life of a radioactive substance if 87.5% of any given amount of the substance disintegrate in 40 minutes ?**
(1) 160 min (2) 10 min
(3) 20 min (4) 13 min 20 sec.

23. **99 % of a first order reaction was completed in 32 min. when will 99.9 % of the reaction complete ?**

(1) 50 min. (2) 46 min.
(3) 49 min. (4) 48 min.

24. **In the case of first order reaction, the ratio of time required for 99.9 % completion to 50 % completion is :–**
(1) 2 (2) 5
(3) 10 (4) None

25. **The expression which gives $\frac{1}{4}$ th life of Ist order reaction is :–**
(1) $\frac{K}{2.303}\log\frac{4}{3}$ (2) $\frac{2.303}{K}\log 3$
(3) $\frac{2.303}{K}\log\frac{3}{4}$ (4) $\frac{2.303}{K}\log\frac{4}{3}$

26. **For a first order reaction, A → P, t (half-life) is 10 days. The time required for $\frac{1}{4}^{th}$ conversion of A (in days) is : (ln 2 = 0.693, ln 3 = 1.1)**

[JEE(Main) 2018 Online (15-04-18), 4/120]

(1) 5 (2) 3.2
(3) 4.1 (4) 2.5

27. **Which is incorrect :–**
(1) Half life of a first order reaction is independent of initial concentration
(2) Rate of reaction is constant for first order reaction
(3) Unit of K for second order reaction is mol^{-1} L s^{-1}
(4) Half life of zero order is proportional to initial concentration

28. **The decomposition of N_2O_5 occurs as, $2N_2O_5 \rightarrow 4NO_2 + O_2$, and follows first order kinetics; hence**
(1) The reaction is bimolecular
(2) The reaction is unimolecular
(3) $t_{1/2}\ \alpha\ a^\circ$
(4) $t_{1/2}\ \alpha\ a^2$

29. **An organic compound undergoes first-order decomposition. The time taken for its decomposition to 1/8 and 1/10 of its initial concentration are $t_{1/8}$ and $t_{1/10}$ respectively. What is the value of $\frac{[t_{1/8}]}{[t_{1/10}]} \times 10$?**
($\log_{10}2 = 0.3$) (9)

[JEE-2012, 4/136]

30. **In the following first order reactions,**
A + Reagent → Product, B + Reagent → Product
Calculate the ratio of K_1 / K_2, 50% of B has been reacted, when 94% of A has been reacted –
(1) 4.06 (2) 0.246
(3) 2.06 (4) 0.06

31. **Decomposition of X exhibits a rate constant of 0.05 g/year. How many years are required for the decomposition of 5 g of X into 2.5 g ?**

[JEE(Main) 2019 Online (12-01-19), 4/120]

(1) 40 (2) 25
(3) 20 (4) 50