

Mastering Chemistry With Ravi Arora

DPP - Daily Practice Problems

Chapter-wise Sheets

Date : Start Time : End Time :

CHEMISTRY (CC18)

SYLLABUS : Chemical Kinetics

Max. Marks : 120

Marking Scheme : + 4 for correct & (-1) for incorrect

Time : 60 min.

INSTRUCTIONS : This Daily Practice Problem Sheet contains 30 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

- The temperature dependence of rate constant (k) of a chemical reaction is written in terms of Arrhenius equation, $k = A.e^{-E_a/RT}$ Activation energy (E_a) of the reaction can be calculated by plotting
 - k vs. $\frac{1}{\log T}$
 - $\log k$ vs. $\frac{1}{T}$
 - $\log k$ vs. $\frac{1}{\log T}$
 - k vs. T
- The rate constant of the reaction $A \rightarrow B$ is $0.6 \times 10^{-3} \text{ mol L}^{-1} \text{ S}^{-1}$. If the concentration of A is 5 M then concentration of B after 20 minutes is :
 - 1.08 M
 - 3.60 M
 - 0.36 M
 - 0.72 M
- The half life period for catalytic decomposition of AB_3 at 50 mm Hg is 4 hrs and at 100 mm Hg it is 2 hrs. The order of reaction is
 - 1
 - 2
 - 3
 - 0
- For the first order reaction $C_2H_4O(g) \rightarrow CH_4(g) + CO(g)$, the initial pressure of $C_2H_4O(g)$ is 80 torr and total pressure at the end of 20 minutes is 120 torr. The time needed for 75% decomposition of C_2H_4O would be :
 - 20 minutes
 - 40 minutes
 - 80 minutes
 - 120 minutes

RESPONSE GRID

1. (a) (b) (c) (d) 2. (a) (b) (c) (d) 3. (a) (b) (c) (d) 4. (a) (b) (c) (d)

Space for Rough Work

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5. When a biochemical reaction is carried out in laboratory in the absence of enzyme then rate of reaction obtained is 10^{-6} times, then activation energy of reaction in the Presence of enzyme is
- (a) $\frac{6}{RT}$
 (b) Different from E_a obtained in laboratory
 (c) P is required
 (d) Can't say anything
6. In a reaction $A \rightarrow$ Products, when start is made from 8.0×10^{-2} M of A, half-life is found to be 120 minute. For the initial concentration 4.0×10^{-2} M, the half-life of the reaction becomes 240 minute. The order of the reaction is :
- (a) zero (b) one
 (c) two (d) 0.5
7. In a first-order reaction $A \rightarrow B$, if k is rate constant and initial concentration of the reactant A is 0.5 M, then the half-life is
- (a) $\frac{\log 2}{k}$ (b) $\frac{\log 2}{k\sqrt{0.5}}$
 (c) $\frac{\ln 2}{k}$ (d) $\frac{0.693}{0.5k}$
8. The rate expression for the reaction $A(g) + B(g) \rightarrow C(g)$ is $\text{rate} = kC_A^2 C_B^{1/2}$. What changes in the initial concentrations of A and B will cause the rate of reaction to increase by a factor of eight?
- (a) $C_A \times 2; C_B \times 2$ (b) $C_A \times 2; C_B \times 4$
 (c) $C_A \times 1; C_B \times 4$ (d) $C_A \times 4; C_B \times 1$
9. The reaction $A(g) + 2B(g) \rightarrow C(g) + D(g)$ is an elementary process. In an experiment involving this reaction, the initial partial pressures of A and B are $p_A = 0.60$ atm and $p_B = 0.80$ atm respectively. When $p_C = 0.20$ atm, the rate of the reaction relative to the initial rate is
- (a) 1/6 (b) 1/12
 (c) 1/36 (d) 1/18
10. Select the rate law that corresponds to data shown for the following reaction
- $A + B \longrightarrow$ products.
- | Exp. | [A] | [B] | Initial rate |
|------|-------|-------|--------------|
| 1 | 0.012 | 0.035 | 0.1 |
| 2 | 0.024 | 0.070 | 0.8 |
| 3 | 0.024 | 0.035 | 0.1 |
| 4 | 0.012 | 0.070 | 0.8 |
- (a) $\text{rate} = k[B]^3$
 (b) $\text{rate} = k[B]^4$
 (c) $\text{rate} = k[A][B]^3$
 (d) $\text{rate} = k[A]^2[B]^2$
11. A radioactive element gets spilled over the floor of a room. Its half-life period is 30 days. If the initial velocity is ten times the permissible value, after how many days will it be safe to enter the room?
- (a) 100 days (b) 1000 days
 (c) 300 days (d) 10 days
12. The energies of activation for forward and reverse reactions for $A_2 + B_2 \rightleftharpoons 2AB$ are 180 kJ mol^{-1} and 200 kJ mol^{-1} respectively. The presence of a catalyst lowers the activation energy of both (forward and reverse) reactions by 100 kJ mol^{-1} . The enthalpy change of the reaction ($A_2 + B_2 \rightleftharpoons 2AB$) in the presence of a catalyst will be (in kJ mol^{-1})
- (a) 20 (b) 300
 (c) 120 (d) 280
13. Consider the reaction :
- $Cl_2(aq) + H_2S(aq) \rightarrow S(s) + 2H^+(aq) + 2Cl^-(aq)$
- The rate equation for this reaction is
- $\text{rate} = k[Cl_2][H_2S]$
- Which of these mechanisms is/are consistent with this rate equation?
- A. $Cl_2 + H_2S \rightarrow H^+ + Cl^- + Cl^+ + HS^-$ (slow)
 $Cl^+ + HS^- \rightarrow H^+ + Cl^- + S$ (fast)

**RESPONSE
GRID**

5. (a)(b)(c)(d) 6. (a)(b)(c)(d) 7. (a)(b)(c)(d) 8. (a)(b)(c)(d) 9. (a)(b)(c)(d)
 10. (a)(b)(c)(d) 11. (a)(b)(c)(d) 12. (a)(b)(c)(d) 13. (a)(b)(c)(d)

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- B. $\text{H}_2\text{S} \rightleftharpoons \text{H}^+ + \text{HS}^-$ (fast equilibrium)
 $\text{Cl}_2 + \text{HS}^- \rightarrow 2\text{Cl}^- + \text{H}^+ + \text{S}$ (Slow)
- (a) B only (b) Both A and B
 (c) Neither A nor B (d) A only
- 14.** The initial rates of reaction
 $3\text{A} + 2\text{B} + \text{C} \longrightarrow \text{Products}$, at different initial concentrations are given below:
- | Initial rate,
M s^{-1} | $[\text{A}]_0, \text{M}$ | $[\text{B}]_0, \text{M}$ | $[\text{C}]_0, \text{M}$ |
|------------------------------------|--------------------------|--------------------------|--------------------------|
| 5.0×10^{-3} | 0.010 | 0.005 | 0.010 |
| 5.0×10^{-3} | 0.010 | 0.005 | 0.015 |
| 1.0×10^{-2} | 0.010 | 0.010 | 0.010 |
| 1.25×10^{-3} | 0.005 | 0.005 | 0.010 |
- The order with respect to the reactants, A, B and C are respectively
 (a) 3, 2, 0 (b) 3, 2, 1 (c) 2, 2, 0 (d) 2, 1, 0
- 15.** In a reversible reaction the energy of activation of the forward reaction is 50 kcal. The energy of activation for the reverse reaction will be
 (a) < 50 kcal
 (b) either greater than or less than 50 kcal
 (c) 50 kcal
 (d) > 50 kcal
- 16.** Half life period of a first-order reaction is 1386 seconds. The specific rate constant of the reaction is:
 (a) $0.5 \times 10^{-2} \text{ s}^{-1}$ (b) $0.5 \times 10^{-3} \text{ s}^{-1}$
 (c) $5.0 \times 10^{-2} \text{ s}^{-1}$ (d) $5.0 \times 10^{-3} \text{ s}^{-1}$
- 17.** $t_{\frac{1}{4}}$ can be taken as the time taken for the concentration of a reactant to drop to $\frac{3}{4}$ of its initial value. If the rate constant for a first order reaction is k , the $t_{\frac{1}{4}}$ can be written as
 (a) $0.75/k$ (b) $0.69/k$
 (c) $0.29/k$ (d) $0.10/k$
- 18.** Activation energy (E_a) and rate constants (k_1 and k_2) of a chemical reaction at two different temperatures (T_1 and T_2) are related by :
 (a) $\ln \frac{k_2}{k_1} = -\frac{E_a}{R} \left(\frac{1}{T_1} - \frac{1}{T_2} \right)$ (b) $\ln \frac{k_2}{k_1} = -\frac{E_a}{R} \frac{1}{T_2} - \frac{1}{T_1}$
 (c) $\ln \frac{k_2}{k_1} = -\frac{E_a}{R} \frac{1}{T_2} + \frac{1}{T_1}$ (d) $\ln \frac{k_2}{k_1} = \frac{E_a}{R} \frac{1}{T_1} - \frac{1}{T_2}$
- 19.** Consider a reaction $a\text{G} + b\text{H} \rightarrow \text{Products}$. 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
 (a) 0 (b) 1
 (c) 2 (d) 3
- 20.** The rate law for a reaction between the substances A and B is given by
 Rate = $k [\text{A}]^n [\text{B}]^m$
 On doubling the concentration of A and halving the concentration of B, the ratio of the new rate to the earlier rate of the reaction will be as
 (a) $(m+n)$ (b) $(n-m)$
 (c) $2^{(n-m)}$ (d) $\frac{1}{2^{(m+n)}}$
- 21.** The rate constants k_1 and k_2 for two different reactions are $10^{16} \cdot e^{-2000/T}$ and $10^{15} \cdot e^{-1000/T}$, respectively. The temperature at which $k_1 = k_2$ is :
 (a) 1000K (b) $\frac{2000}{2.303}$ K (c) 2000K (d) $\frac{1000}{2.303}$ K

**RESPONSE
GRID**

14. (a)(b)(c)(d) **15.** (a)(b)(c)(d) **16.** (a)(b)(c)(d) **17.** (a)(b)(c)(d) **18.** (a)(b)(c)(d)
19. (a)(b)(c)(d) **20.** (a)(b)(c)(d) **21.** (a)(b)(c)(d)

Space for Rough Work

22. Match the columns

Column - I

- (A) $k = \frac{[R_0] - [R]}{t}$
 (B) $k = \frac{2.303}{t} \log \frac{[R_0]}{[R]}$
 (C) Value of k for first order reaction when $t = t_1$ and $[R] = \frac{[R]_0}{2}$
 (D) Value of k for zero order reaction when $t = t_{1/2}$ and $[R] = \frac{[R]_0}{2}$

Column - II

- (p) $k = \frac{2.303}{t_{1/2}} \log 2$
 (q) Rate constant for zero order reaction
 (r) $k = \frac{[R]_0}{2t_{1/2}}$
 (s) Rate constant for first order reaction

- (a) A - (s), B - (q), C - (p), D - (r)
 (b) A - (q), B - (s), C - (p), D - (r)
 (c) A - (q), B - (p), C - (s), D - (r)
 (d) A - (q), B - (s), C - (p), D - (t)

23. The slope in Arrhenius plot, is equal to:

- (a) $-\frac{E_a}{2.303R}$ (b) $\frac{E_a}{R}$
 (c) $-\frac{R}{2.303E_a}$ (d) None of these

24. For the reaction $A + B \longrightarrow$ products, it is observed that:

- (1) On doubling the initial concentration of A only, the rate of reaction is also doubled and
 (2) On doubling the initial concentrations of both A and B, there is a change by a factor of 8 in the rate of the reaction.

The rate of this reaction is given by:

- (a) $\text{rate} = k [A] [B]^2$ (b) $\text{rate} = k [A]^2 [B]^2$
 (c) $\text{rate} = k [A] [B]$ (d) $\text{rate} = k [A]^2 [B]$

25. For the reaction $2N_2O_5 \rightarrow 4NO_2 + O_2$, rate and rate constant are $1.02 \times 10^{-4} \text{ mol lit}^{-1} \text{ sec}^{-1}$ and $3.4 \times 10^{-5} \text{ sec}^{-1}$ respectively then concentration of N_2O_5 at that time will be

- (a) 1.732M (b) 3M
 (c) $3.4 \times 10^5 \text{M}$ (d) $1.02 \times 10^{-4} \text{M}$

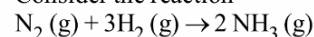
26. The given reaction



is an example of

- (a) first order reaction (b) second order reaction
 (c) third order reaction (d) None of these

27. Consider the reaction



The equality relationship between $\frac{d[NH_3]}{dt}$ and $-\frac{d[H_2]}{dt}$ is

- (a) $+\frac{d[NH_3]}{dt} = -\frac{2}{3} \frac{d[H_2]}{dt}$ (b) $+\frac{d[NH_3]}{dt} = -\frac{3}{2} \frac{d[H_2]}{dt}$
 (c) $\frac{d[NH_3]}{dt} = -\frac{d[H_2]}{dt}$ (d) $\frac{d[NH_3]}{dt} = -\frac{1}{3} \frac{d[H_2]}{dt}$

28. Which of the following statements is incorrect?

- (a) Activation energy for the forward reaction equals to activation energy for the reverse reaction
 (b) For a reversible reaction, an increase in temperature increases the reaction rate for both the forward and the backward reaction
 (c) The larger the initial reactant concentration for a second order reaction, the shorter is its half-life.
 (d) When Δt is infinitesimally small, the average rate equals the instantaneous rate

29. $3A \rightarrow B + C$, it would be a zero order reaction when

- (a) the rate of reaction is proportional to square of concentration of A
 (b) the rate of reaction remains same at any concentration of A
 (c) the rate remains unchanged at any concentration of B and C
 (d) the rate of reaction doubles if concentration of B is increased to double

30. The decomposition of a substance follows first order kinetics. Its concentration is reduced to 1/8th of its initial value in 24 minutes. The rate constant of the decomposition process is

- (a) $1/24 \text{ min}^{-1}$ (b) $\frac{0.692}{24} \text{ min}^{-1}$
 (c) $\frac{2.303}{24} \log \left(\frac{1}{8}\right) \text{ min}^{-1}$ (d) $\frac{2.303}{24} \log \left(\frac{8}{1}\right) \text{ min}^{-1}$

**RESPONSE
GRID**

22. (a)(b)(c)(d) 23. (a)(b)(c)(d) 24. (a)(b)(c)(d) 25. (a)(b)(c)(d) 26. (a)(b)(c)(d)
 27. (a)(b)(c)(d) 28. (a)(b)(c)(d) 29. (a)(b)(c)(d) 30. (a)(b)(c)(d)

DAILY PRACTICE PROBLEM DPP CHAPTERWISE 18 - CHEMISTRY

Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	38	Qualifying Score	56
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			