Date Planned : __ / __ / __	Daily Tutorial Sheet-2	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	JEE Main (Archive)	Exact Duration :_____

16. The half life period of a first order chemical reaction is 6.93 minutes. The time required for the completion of 99% of the chemical reaction will be : (log 2 = 0.301) **(2009)**

(A) 230.3 minutes **(B)** 23.03 minutes

(C) 46.06 minutes **(D)** 460.6 minutes

17. The time for half life period of a certain reaction $A \rightarrow$ products is 1 hour. When the initial concentration of the reactant 'A', is $2.0\,mol\,L^{-1}$, how much time does it take for its concentration to come from 0.50 to $0.25\,mol\,L^{-1}$ if it is a zero order reaction ? **(2010)**

(A) 4 h **(B)** 0.5 h

(C) 0.25 h **(D)** 1 h

18. Consider the reaction : $Cl_2(aq) + H_2S(aq) \rightarrow S(s) + 2H^+(aq) + 2Cl^-(aq)$ **(2010)**

The rate equation for this reaction is 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)

(B) $H_2S \rightarrow H^+ + HS^-$ (Fast equilibrium)

$Cl_2 + HS^- \rightarrow 2Cl^- + H^+ + S$ (Slow)

(A) B only **(B)** Both A and B

(C) Neither A nor B **(D)** A only

19. The rate of a chemical reaction doubles for every 10°C rise of temperature. If the temperature is raised by 50°C, the rate of the reaction increases by about : **(2011)**

(A) 24 times **(B)** 32 times **(C)** 64 times **(D)** 10 times

20. A reactant A forms two products **(2011)**

$A \xrightarrow{k_1} B$, Activation energy E_{a_1}

$A \xrightarrow{k_2} C$, Activation energy E_{a_2}

If $E_{a_2} = 2E_{a_1}$ then k_1 and k_2 are related as

(A) $k_1 = 2k_2\, e^{E_{a_2}/RT}$ **(B)** $k_1 = k_2\, e^{E_{a_1}/RT}$

(C) $k_2 = k_1\, e^{E_{a_2}/RT}$ **(D)** $k_1 = Ak_2\, e^{E_{a_1}/RT}$

21. For a first order reaction, $(A) \rightarrow$ products, the concentration of A changes from 0.1 M to 0.025 M in 40 minutes. The rate of reaction when the concentration of A is 0.01 M is : **(2012)**

(A) 1.73×10^{-5} M / min **(B)** 3.47×10^{-4} M / min

(C) 3.47×10^{-5} M / min **(D)** 1.73×10^{-4} M / min

22. For the non-stoichiometric reaction $2A + B \rightarrow C + D$, The following kinetic data were obtained in three separate experiments, all at 298 K. **(2014)**

Initial Concentration [A]	Initial Concentration [B]	Initial rate of formation of C (mol $L^{-1}S^{-1}$)
0.1 M	0.1 M	1.2×10^{-3}
0.1 M	0.2 M	1.2×10^{-3}
0.2 M	0.1 M	2.4×10^{-3}

The rate law for the formation of C is:

(A) $\frac{dc}{dt} = k[A]$ **(B)** $\frac{dc}{dt} = k[A][B]$

(C) $\frac{dc}{dt} = k[A]^2[B]$ **(D)** $\frac{dc}{dt} = k[A][B]^2$

23. Higher order (> 3) reactions are rare due to : **(2015)**

(A) low probability of simultaneous collision of all the reacting species

(B) increase in entropy and activation energy as more molecules are involved

(C) shifting of equilibrium towards reactants due to elastic collisions

(D) loss of active species on collision

24. The reaction **(2015)**

$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$

follows first order kinetics. The pressure of a vessel containing only N_2O_5 was found to increase from 50 mm Hg to 87.5 mm Hg in 30 min. The pressure exerted by the gases after 60 min. will be (Assume temperature remains constant) :

(A) 106.25 mm Hg **(B)** 116.25 mm Hg **(C)** 125 mm Hg **(D)** 150 mm Hg]

25. For the equilibrium, $A(g) \rightleftharpoons B(g)$, ΔH is $-40 kJ/mol$. If the ratio of the activation energies of the forward (E_f) and reverse (E_b) reaction is $\frac{2}{3}$ then : **(2015)**

(A) $E_f = 60\,kJ/mol$; $E_b = 100\,kJ/mol$ **(B)** $E_f = 30\,kJ/mol$; $E_b = 70\,kJ/mol$

(C) $E_f = 80\,kJ/mol$; $E_b = 120\,kJ/mol$ **(D)** $E_f = 70\,kJ/mol$; $E_b = 30\,kJ/mol$

26. $A + 2B \rightarrow C$, the rate equation for this reaction is given as **(2015)**

$Rate = k[A][B]$.

If the concentration of A is kept the same but that of B is doubled what will happen to the rate itself ?

(A) halved **(B)** the same

(C) doubled **(D)** quadrupled

27. The rate law for the reaction below is given by the expression k [A][B] **(2016)**

$A + B \rightarrow$ Product

If the concentration of B is increased from 0.1 to 0.3 mole, keeping the value of A at 0.1 mole, the rate constant will be :

(A) k **(B)** k/3 **(C)** 3k **(D)** 9k

28. Decomposition of H_2O_2 follows a first order reaction. In fifty minutes the concentration of H_2O_2 decreases from 0.5 to 0.125 M in one such decomposition. When the concentration of H_2O_2 reaches 0.05 M, the rate of formation of O_2 will be : **(2016)**

(A) $6.93\times10^{-4}\,\text{mol min}^{-1}$ **(B)** $2.66\,\text{L min}^{-1}$ at STP

(C) $1.34\times10^{-2}\,\text{mol min}^{-1}$ **(D)** $6.93\times10^{-2}\,\text{mol min}^{-1}$

29. The reaction of ozone with oxygen atoms in the presence of chlorine atoms can occur by a two step process shown below: **(2016)**

$O_3(g) + Cl^{\bullet}(g) \longrightarrow O_2(g) + ClO^{\bullet}(g)$ .... (i)

$k_i = 5.2\times10^{9}\,\text{L mol}^{-1}\text{s}^{-1}$

$ClO^{\bullet}(g) + O^{\bullet}(g) \longrightarrow O_2(g) + Cl^{\bullet}(g)$ .... (ii)

$k_{ii} = 2.6\times10^{10}\,\text{L mol}^{-1}\text{s}^{-1}$

The closest rate constant for the overall reaction $O_3(g) + O^{\bullet}(g) \longrightarrow 2O_2(g)$ is :

(A) $5.2\times10^{9}\,\text{L mol}^{-1}\text{s}^{-1}$ **(B)** $2.6\times10^{10}\,\text{L mol}^{-1}\text{s}^{-1}$

(C) $3.1\times10^{10}\,\text{L mol}^{-1}\text{s}^{-1}$ **(D)** $1.4\times10^{20}\,\text{L mol}^{-1}\text{s}^{-1}$

30. The rate of a reaction quadruples when the temperature changes from 300 to 310 K. The activation energy of this reaction is : (Assume activation energy and pre-exponential factor are independent of temperature ; In 2 = 0.693 ; $R = 8.314\,\text{J mol}^{-1}\text{K}^{-1}$) **(2017)**

(A) $107.2\,\text{kJ mol}^{-1}$ **(B)** $53.6\,\text{kJ mol}^{-1}$

(C) $26.8\,\text{kJ mol}^{-1}$ **(D)** $214.4\,\text{kJ mol}^{-1}$