Date Planned : __ / __ / __	Daily Tutorial Sheet-3	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	JEE Main (Archive)	Exact Duration :_____

31. The rate of a reaction A doubles on increasing the temperature from 300 to 310 K. By how much, the temperature of reaction B should be increased from 300 K so that rate doubles if activation energy of the reaction B is twice to that of reaction A. **(2017)**

(A) 9.84 K **(B)** 4.92 K **(C)** 2.45 K **(D)** 19.67 K

32. Two reactions R_1 and R_2 have identical pre-exponential factors. Activation energy of R_1 exceeds that of R_2 by $10\,kJ\ mol^{-1}$. If k_1 and k_2 are rate constants for reactions R_1 and R_2 respectively at 300 K, then $\ln(k_2/k_1)$ is equal to : $(R = 8.314\,J\,mol^{-1}K^{-1})$ **(2017)**

(A) 4 **(B)** 8 **(C)** 12 **(D)** 6

33. At 518° C, the rate of decomposition of a sample of gaseous acetaldehyde, initially at a pressure of 363 Torr, was 1.00 Torr s^{-1} when 5% had reacted and 0.5 Torr s^{-1} when 33% had reacted. The order of the reaction is : **(2018)**

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

34. The following results were obtained during kinetic studies of the reaction; $2A + B \rightarrow$ Products

Experiment	[A] (in mol L^{-1})	[B] (in mol L^{-1})	Initial Rate of reaction (in mol L^{-1} mol^{-1})
I	0.10	0.20	6.93×10^{-3}
II	0.10	0.25	6.93×10^{-3}
III	0.20	0.30	1.386×10^{-2}

The time (in minutes) required to consume half of A is: **(2019)**

(A) 1 **(B)** 10 **(C)** 100 **(D)** 5

35. For the reaction, $2A + B \rightarrow$ products, when the concentrations of A and B both were doubled, the rate of the reaction increased from 0.3 mol $L^{-1}s^{-1}$ to 2.4 mol $L^{-1}s^{-1}$. When the concentration of A alone is doubled, the rate increased from 0.3 mol $L^{-1}s^{-1}$ to 0.6 mol $L^{-1}s^{-1}$. **(2019)**

Which of the following statements is correct ?

(A) Order of the reaction with respect to A is 2

(B) Order of the reaction with respect to B is 1

(C) Order of the reaction with respect to B is 2

(D) Total order of the reaction is 4

36. For an elementary chemical reaction, $A_2 \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} 2A$, the expression for $\frac{d[A]}{dt}$ is : **(2019)**

(A) $k_1[A_2] - k_{-1}[A]^2$ **(B)** $2k_1[A_2] - k_{-1}[A]^2$

(C) $2k_1[A_2] - 2k_{-1}[A]^2$ **(D)** $k_1[A_2] + k_{-1}[A]^2$

37. For the chemical reaction $X \rightleftharpoons Y$, the standard reaction Gibbs energy depends on temperature $T(\text{in K})$ as $\Delta_r G^0(\text{in kJ mol}^{-1}) = 120 - \frac{3}{8}T$. The major component of the reaction mixture at T is : **(2019)**

(A) X if $T = 315\,K$ **(B)** Y if $T = 300\,K$ **(C)** Y if $T = 280\,K$ **(D)** X if $T = 350\,K$

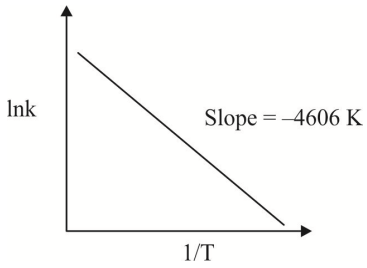
38. If a reaction follows the Arrhenius equation, the plot lnk vs $1/(RT)$ gives straight line with a gradient (–y) unit. The energy required to activate the reactant is : **(2019)**

(A) –y unit **(B)** yR unit **(C)** y unit **(D)** y/R unit

39. Decomposition of X exhibits a rate constant of 0.05 μg/year. How many years are required for the decomposition of 5 μg of X into 2.5 μg ? **(2019)**

(A) 40 **(B)** 20 **(C)** 50 **(D)** 25

40. For a reaction, consider the plot of ln k versus 1/T given in the figure. If the rate constant of this reaction at 400 K is $10^{-5}s^{-1}$, then the rate constant at 500 K is: **(2019)**



(A) $10^{-4}s^{-1}$

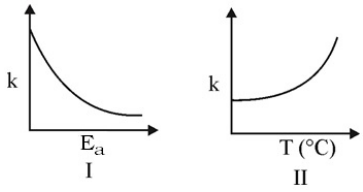
(B) $10^{-6}s^{-1}$

(C) $4\times10^{-4}s^{-1}$

(D) $2\times10^{-4}s^{-1}$

41. Consider the given plots for a reaction obeying Arrhenius equation ($0°C < T < 300°C$) : (k and E_a are rate constant and activation energy, respectively) **(2019)**

Choose the correct option:



(A) Both I and II are correct

(B) I is wrong but II is right

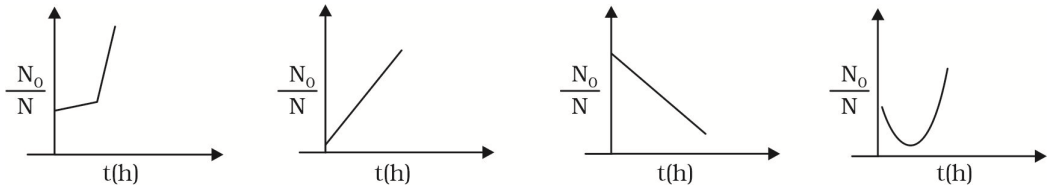
(C) I is right but II is wrong

(D) Both I and II are wrong

42. The reaction $2X \rightarrow B$ is a zeroth order reaction. If the initial concentration of X is 0.2 M, the half-life is 6h. When the initial concentration of X is 0.5 M, the time required to reach its final concentration of 0.2 M will be: **(2019)**

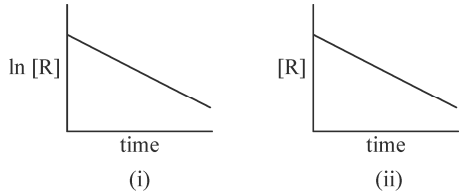
(A) 18.0 h **(B)** 12.0 h **(C)** 7.2 h **(D)** 9.0 h

43. A bacterial infection in an internal wound grows as $N'(t) = N_0 \exp(t)$, where the time t is in hours. A dose of antibiotic, taken orally, needs 1 hour to reach the wound. Once it reaches there, the bacterial population goes down as $\frac{dN}{dt} = -5N^2$. What will be the plot of $\frac{N_0}{N}$ vs. t after 1 hour? **(2019)**



(A) **(B)** **(C)** **(D)**

44. The given plots represent the variation of the concentration of a reactant *R* with time for different reactions (i) and (ii). The respective orders of the reactions are: **(2019)**



(A) 1, 0

(B) 0, 2

(C) 1, 1

(D) 0, 1

45. For the reaction $2A + B \rightarrow C$, the values of initial rate at different reactant concentrations are given in the table below. The rate law for the reaction is: **(2019)**

$[A](mol\,L^{-1})$	$[B](mol\,L^{-1})$	Initial Rate $(mol\,L^{-1}s^{-1})$
0.05	0.05	0.045
0.10	0.05	0.090
0.20	0.10	0.72

(A) Rate = $k[A]^2[B]$ **(B)** Rate = $k[A]^2[B]^2$

(C) Rate = $k[A][B]$ **(D)** Rate = $k[A][B]^2$

46. In the following reaction; $xA \rightarrow yB$ **(2019)**

$\log_{10}\left[-\frac{d[A]}{dt}\right] = \log_{10}\left[\frac{d[B]}{dt}\right] + 0.3010$ 'A' and 'B' respectively can be:

(A) C_2H_2 and C_6H_6 **(B)** C_2H_4 and C_4H_8

(C) N_2O_4 and NO_2 **(D)** n-Butane and Iso-butane

47. NO_2 required for a reaction is produced by the decomposition of N_2O_5 in CCl_4 as per the equation $2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$. The initial concentration of N_2O_5 is 3.00 $mol\,L^{-1}$ and it is 2.75 $mol\,L^{-1}$ after 30 minutes. The rate of formation of NO_2 is : **(2019)**

(A) $2.083 \times 10^{-3} mol\,L^{-1}\,min^{-1}$ **(B)** $4.167 \times 10^{-3} mol\,L^{-1}\,min^{-1}$

(C) $1.667 \times 10^{-2} mol\,L^{-1}\,min^{-1}$ **(D)** $8.333 \times 10^{-3} mol\,L^{-1}\,min^{-1}$

48. For the reaction of H_2 with I_2, the constant is $2.5 \times 10^{-4}\,dm^3\,mol^{-1}s^{-1}$ at 327 °C and $1.0\,dm^3\,mol^{-1}s^{-1}$ at 527°C. The activation energy for the reaction, in $kJ\,mol^{-1}$ is: **(2019)**

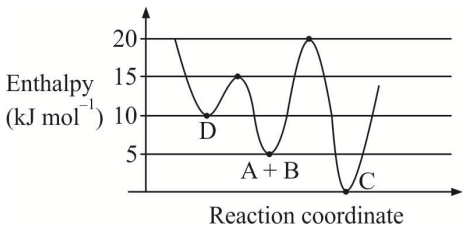
$(R = 8.314\,J\,K^{-1}\,mol^{-1})$

(A) 150 **(B)** 72 **(C)** 166 **(D)** 59

49. Consider the given plot of enthalpy of the following reaction between A and B. **(2019)**

$A + B \rightarrow C + D.$

Identify the incorrect statement.



(A) C is the thermodynamically stable product

(B) Activation enthalpy to form C is 5 $kJ\,mol^{-1}$ less than that to form D

(C) Formation of A and B from C has highest enthalpy of activation

(D) D is kinetically stable product

50. For a reaction scheme $A \xrightarrow{k_1} B \xrightarrow{k_2} C$, if the rate of formation of B is set to be zero then the concentration of B is given by: **(2019)**

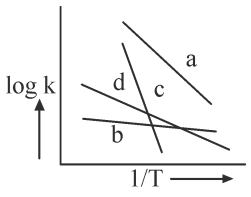
(A) $(k_1 + k_2)[A]$ **(B)** $(k_1 - k_2)[A]$ **(C)** $k_1 k_2 [A]$ **(D)** $\left(\frac{k_1}{k_2}\right)[A]$

51. For the reaction $2H_2(g) + 2NO(g) \rightarrow N_2(g) + 2H_2O(g)$ the observed rate expression is, rate $= k_f[NO]^2[H_2]$. The rate expression for the reverse reaction is: **(2020)**

(A) $k_b[N_2][H_2O]^2 / [H_2]$ **(B)** $k_b[N_2][H_2O]$

(C) $k_b[N_2][H_2O]^2 / [NO]$ **(D)** $k_b[N_2][H_2O]^2$

52. Consider the following plots of rate constant versus $\frac{1}{T}$ for four different reactions. Which of the following orders is correct for the activation energies of these reactions? **(2020)**



(A) $E_b > E_d > E_c > E_a$

(B) $E_a > E_c > E_d > E_b$

(C) $E_b > E_a > E_d > E_c$

(D) $E_c > E_a > E_d > E_b$

53. For following reactions **(2020)**

$$A \xrightarrow{700\,K} \text{Product}$$

$$A \xrightarrow[\text{catalyst}]{500\,K} \text{Product}$$

it was found that the E_a is decreased by 30 kJ/mol in the presence of catalyst. If the rate remains unchanged, the activation energy for catalyzed reaction is (Assume pre exponential factor is same):

(A) 105 kJ/mol **(B)** 198 kJ/mol **(C)** 75 kJ/mol **(D)** 135 kJ/mol

54. The rate of a certain biochemical reaction at physiological temperature (T) occurs 10^6 times faster with enzyme than without. The change in the reaction energy upon adding enzyme is : **(2020)**

(A) $+6RT$ **(B)** $-6RT$ **(C)** $+6(2.303)RT$ **(D)** $-6(2.303)RT$

55. During the nuclear explosion, one of the products is ^{90}Sr with half-life of 6.93 years. If 1μg of ^{90}Sr was absorbed in the bones of a newly born baby in place of Ca, how much time, in years, is required to reduce it by 90% if it is not lost metabolically_____. **(2020)**

56. A sample of milk splits after 60 min. at 300 K and after 40 min. at 400 K when the population of lactobacillus acidophilus in it doubles. The activation energy (in kJ/mol) for this process is closest to _____ . **(2020)**

(Given, $R = 8.3\ J\ mol^{-1}K^{-1}, \ln\left(\frac{2}{3}\right) = 0.4, e^{-3} = 4.0$)