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

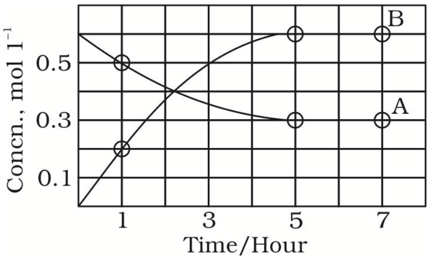
16. A first order reaction, $A \rightarrow B$, requires activation energy of 70kJ mol^{-1}. When a 20% solution of A was kept at 25°C for 20 min, 25% decomposition took place. What will be percentage decomposition in the same time in a 30% solution maintained at 40°C? Assume that activation energy remains constant in this range of temperature. **(1993)**

17. The gas phase decomposition of dimethyl ether follows first order kinetics : **(1993)**

$$CH_3 - O - CH_3(g) \longrightarrow CH_4(g) + H_2(g) + CO(g)$$

The reaction is carried out in a constant volume container at 500°C and has a half-life of 14.5 min. Initially only dimethyl ether is present at a pressure of 0.40 atm. What is the total pressure of the system after 12 min? Assume ideal gas behaviour.

18. The progress of the reaction, $A \rightleftharpoons nB$, with time, is presented in figure given below. Determine. **(1994)**



(i) The value of n,
(ii) The equilibrium constant K, and
(iii) the initial rate of conversion of A.

19. For the reaction : $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$ **(1994)**

Under certain conditions of temperature and partial pressure of the reactants, the rate of formation of NH_3 is 0.001 kg/h^{-1}. The rate of conversion of H_2 under the same condition is ________kg/h^{-1}.

20. From the following data for the reaction between A and B **(1994)**

[A], (mol/L)	**[B], (mol/L)**	**Initial rate (mol L^{-1}s^{-1}) at**	
		300 K	**320 K**
2.5×10^{-4}	3.0×10^{-5}	5.0×10^{-4}	2.0×10^{-3}
5.0×10^{-4}	6.0×10^{-5}	4.0×10^{-3}	--
1.0×10^{-3}	6.0×10^{-5}	1.6×10^{-2}	--

Calculate:

(i) the order of the reaction with respect to A and with respect to B
(ii) the rate constant at 300 K **(iii)** the pre-exponential factor.

21. At 380° C, the half-life period for the first order decomposition of H_2O_2 is 360 min. The energy of activation of the reaction is 200 kJ mol^{-1}. Calculate the time required for 75% decomposition at 450°C. **(1995)**

22. In Arrhenius equation, $k = A\exp^{(-E_a/RT)}$. A may be termed as the rate constant at __________. **(1997)**

23. The rate constant for the first order decomposition of a certain reaction is described by the equation

$$\log k(s^{-1}) = 14.34 - \frac{1.25 \times 10^4 K}{T}$$ **(1997)**

(i) What is the energy of activation for the reaction?

(ii) At what temperature will its half-life period be 256 min?

24. **(i)** The rate constant of a reaction is $1.5 \times 10^7 s^{-1}$ at 50°C and $4.5 \times 10^7 s^{-1}$ at 100°C. Evaluate the Arrhenius parameters A and E_a. **(1998)**

(ii) For the reaction, $N_2O_5(g) \longrightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$

Calculate the mole fraction $N_2O_5(g)$ decomposed at a constant volume and temperature, if the initial pressure is 600 mm Hg and the pressure at any time is 960 mm Hg. Assume ideal gas behaviour.

***25.** For the first order reaction, **(1998)**

(A) the degree of dissociation is equal to $(1 - e^{-kt})$

(B) a plot of reciprocal concentration of the reactant vs time gives a straight line

(C) the time taken for the completion of 75% reaction is thrice the $\frac{1}{2}$ of the reaction

(D) the pre-exponential factor in the Arrhenius equation has dimension of time, T^{-1}

***26.** The following statement(s) is (are) correct: **(1999)**

(A) A plot of log k_p versus 1/T is linear

(B) A plot of log [X] versus time is linear for a first-order reaction, $X \rightarrow P$

(C) A plot of P versus 1/T is linear at constant volume

(D) A plot of P versus 1/V is linear at constant

27. The rate constant for an isomerisation reaction, $A \longrightarrow B$ is $3.42 \times 10^{-3} M/min$. If the initial concentration of A is 1 M, calculate the rate of the reaction after 1 h. **(1999)**

28. A hydrogenation reaction is carried out at 500 K. If the same reaction is carried out in the presence of a catalyst at the same rate, the temperature required is 400 K. Calculate the activation energy of the reaction if the catalyst lowers the activation barrier by 20 kJ mol^{-1}. **(2000)**

29. The rate constant for the reaction, $2N_2O_5 \longrightarrow 4NO_2 + O_2$ is $1.3 \times 10^{-5} s^{-1}$. If the rate is 3.90×10^{-5} mol $L^{-1}s^{-1}$, then the concentration of N_2O_5 (in mol L^{-1}) is: **(2000)**

(A) 1.4 **(B)** 1.2 **(C)** 0.04 **(D)** 3

30. If 'I' is the intensity of absorbed light and 'C' is the concentration of AB for the photochemical process, $AB + h\nu \rightarrow AB$, the rate of formation of AB is directly proportional to : **(2001)**

(A) C **(B)** I **(C)** I^2 **(D)** C.I