

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 c	hemic	al reac	ction will b	e : (log 2 :	= 0.	.301)					(20	09)

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

64 times

(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)

32 times

(C)

**(A)** 24 times **(B)** 

**(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,  $(A) \rightarrow \text{products}$ , 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)

92

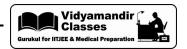
(A)  $1.73 \times 10^{-5} \text{M} / \text{min}$ 

**(B)**  $3.47 \times 10^{-4} \,\text{M/min}$ 

(C)  $3.47 \times 10^{-5} \text{ M/min}$ 

**(D)**  $1.73 \times 10^{-4} \,\text{M} / \text{min}$ 

 $\odot$ 



**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	Initial Concentration	Initial rate of formation of
[A]	[B]	C (mol L <sup>-1</sup> S <sup>-1</sup> )
0.1 M	0.1 M	$1.2 \times 10^{-3}$
0.1 M	0.2 M	
0.2 M	0.1 M	$1.2 \times 10^{-3}$
		$2.4 \times 10^{-3}$

The rate law for the formation of C is:

$$\frac{dc}{dt} = k[A]$$

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

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

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

**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)

 $2\mathrm{N}_2\mathrm{O}_5(g) \to 4\mathrm{NO}_2(g) + \mathrm{O}_2(g)$ 

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

150 mm Hg ]

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

(A)  $E_f = 60 \text{ kJ/mol}$ ;  $E_b = 100 \text{ kJ/mol}$ 

**(B)**  $E_f = 30 \,\text{kJ/mol}$ ;  $E_b = 70 \,\text{kJ/mol}$ 

(C)  $E_f = 80 \,\text{kJ/mol}$ ;  $E_b = 120 \,\text{kJ/mol}$ 

**(D)**  $E_f = 70 \,\text{kJ/mol}$ ;  $E_b = 30 \,\text{kJ/mol}$ 

**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)

 $A + B \rightarrow Product$ 

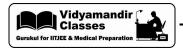
If the concentration of B is increased from 0.1 to 0.3 mole, keeping the value of A at 0.1 mole, the rate constant will be :

(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)  $6.93 \times 10^{-4} \,\mathrm{mol\,min}^{-1}$
- **(B)**  $2.66 \, \text{L min}^{-1}$  at STP
- (C)  $1.34 \times 10^{-2} \text{ mol min}^{-1}$
- **(D)**  $6.93 \times 10^{-2} \text{ mol min}^{-1}$
- **29.** The reaction of ozone with oxygen atoms in the presence of chlorine atoms can occur by a two step process shown below: (2016)

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

$$k_i = 5.2 \times 10^9 L \text{ mol}^{-1} \text{s}^{-1}$$

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

$$k_{ii} = 2.6 \times 10^{10} L \ mol^{-1} s^{-1}$$

The closest rate constant for the overall reaction  $O_3(g)+O^{\:\raisebox{3.5pt}{\text{\circle*{1.5}}}}(g)\longrightarrow 2O_2(g)$  is :

(A)  $5.2 \times 10^9 \text{ L mol}^{-1} \text{s}^{-1}$ 

**(B)**  $2.6 \times 10^{10} \text{L mol}^{-1} \text{s}^{-1}$ 

- (C)  $3.1 \times 10^{10} \text{L mol}^{-1} \text{s}^{-1}$
- **(D)**  $1.4 \times 10^{20} \, \text{L mol}^{-1} \text{s}^{-1}$
- 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;  $R = 8.314 \, J \, \text{mol}^{-1} \, \text{K}^{-1}$ ) (2017)
  - (A)  $107.2 \text{ kJ mol}^{-1}$

**(B)**  $53.6 \,\mathrm{kJ} \,\mathrm{mol}^{-1}$ 

(C)  $26.8 \text{ kJ mol}^{-1}$ 

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