JEE MAIN : CHAPTER WISE TEST PAPER-3

SUBJECT :- CHEMISTRY **DATE.....**
CLASS :- 12th **NAME.....**
CHAPTER :- CHEMICAL KINETICS **SECTION.....**

(SECTION-A)

1. Units of rate constant of first and zero order reactions in terms of molarity M unit are respectively
(A) sec^{-1}, M sec^{-1} (B) sec^{-1}, M
(C) M.sec^{-1}, sec^{-1} (D) M, sec^{-1}

2. The differential rate law for the reaction $H_2 + I_2 \rightarrow 2HI$ is :

(A) $-\frac{d[H_2]}{dt} = -\frac{d[I_2]}{dt} = -\frac{d[HI]}{dt}$

(B) $\frac{d[H_2]}{dt} = \frac{d[I_2]}{dt} = \frac{1}{2}\frac{d[HI]}{dt}$

(C) $\frac{1}{2}\frac{d[H_2]}{dt} = \frac{1}{2}\frac{d[I_2]}{dt} = -\frac{d[HI]}{dt}$

(D) $-2\frac{d[H_2]}{dt} = -2\frac{d[I_2]}{dt} = +\frac{d[HI]}{dt}$

3. The rate equation for the reaction $2A + B \longrightarrow$ C is found to be : rate = k[A] [B]. The correct statement in relation to this reaction is that the :
(A) unit of k must be sec^{-1}
(B) $t_{1/2}$ is a constant
(C) rate of formation of C is twice the rate of disappearance of A
(D) value of k is independent of initial concentrations of A and B.

4. A reaction involving two different reactants can never be :
(A) unimolecular reaction
(B) first order reaction
(C) second order reaction
(D) bimolecular reaction

5. Consider the following reaction $2A(g) \rightarrow 3B(g) + C(g)$.
Starting with pure A having pressure 2atm initially, the total pressure is exactly doubled in 2hrs. The possible order of reaction is
(A) zero (B) first
(C) second (D) third

6. For the reaction : $2NO_2^- + 4H^+ + 2I^- \rightarrow I_2 + 2NO + 2H_2O$
The rate of reaction can be written as :

$\frac{-d[NO_2^-]}{dt} = k_1[NO_2^-][H^+]^2[I^-]$

$\frac{d[H^+]}{dt} = -k_2[NO_2^-][H^+]^2[I^-]$

$\frac{d[NO]}{dt} = k_3[NO_2^-][H^+]^2[I^-]$

The relationship between k_1 , k_2 and k_3 is :
(A) $k_1 = k_2 = k_3$ (B) $k_1 = 2k_2 = k_3$
(C) $k_1 = \frac{k_2}{2} = k_3$ (D) $2k_1 = k_2 = 3k_3$

7. A reaction was found to be second order with respect to the concentration of carbon monoxide. If the concentration of carbon monoxide is doubled, with everything else kept the same, the rate of reaction will be
(A) remain unchanged
(B) tripled
(C) increased by a factor of 4
(D) doubled

8. A substance undergoes a series of chemical reaction as shown

$A \xrightarrow{K_1} B \xrightarrow{K_2} C \xrightarrow{K_3} D$ with rate constant $K_1 = \frac{\ln 2}{2000}\ sec^{-1}$, $K_2 = \frac{\ln 2}{10}\ sec^{-1}$, $K_3 = 20 \ln 2\ sec^{-1}$. What will be the value of $\frac{[A]}{[C]}$ once steady state is obtained.

{[ ] represents concentration}
(A) 40000 (B) 20000
(C) 200 (D) 400

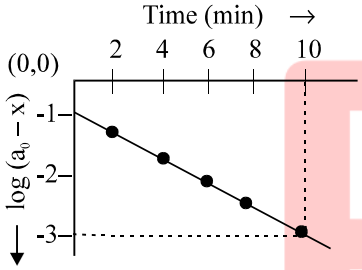
9. A first order reaction is 50% completed in 20 minutes at 27°C and in 5 min at 47°C. The energy of activation of the reaction is
(A) 43.85 kJ/mol (B) 55.14 kJ/mol
(C) 11.97 kJ/mol (D) 6.65 kJ/mol

10. The half life of the unimolecular elementary reaction $A(g) \longrightarrow B(g) + C(g)$ is 6.93 min. How long will it take for the concentration of A to be reduced to 10 % of the initial value?
(A) 10.053 min (B) 4.6 min
(C) 46 min (D) 23.03 min

11. For the first order reaction $A \longrightarrow B + C$, carried out at 27 °C if 3.8×10^{-16} % of the reactant molecules exists in the activated state, the E_a (activation energy) of the reaction is
(A) 12 kJ/mole (B) 831.4 kJ/mole
(C) 100 kJ/mole (D) 88.57 kJ/mole

12. For reaction $A \longrightarrow B$, the rate constant $k_1 = A_1 e^{-Ea_1/RT}$ and for the reaction $P \longrightarrow Q$, the rate constant $k_2 = A_2 e^{-Ea_2/RT}$. If $A_1 = 10^8$; $A_2 = 10^{10}$ and $Ea_1 = 600$ cal/mol, $Ea_2 = 1200$ cal/mol, then the temperature at which $k_1 = k_2$ is (R = 2 cal/K-mol)
(A) 600 K (B) 300×4.606 K
(C) $\frac{300}{4.606}$ K (D) $\frac{4.606}{600}$ K

13. For the first order decomposition of $SO_2Cl_2(g)$, $[SO_2Cl_2(g) \rightarrow SO_2(g) + Cl_2(g)]$,
a graph of $\log (a_0 - x)$ vs t is shown in figure.
What is the rate constant (sec^{-1})?



(A) 0.2 (B) 4.6×10^{-1}
(C) 7.7×10^{-3} (D) 1.15×10^{-2}

14. For the reaction

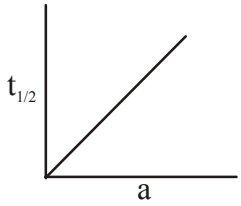
$CH_3COCH_3 + Br_2 \xrightarrow{H^+} CH_3COCH_2Br + H^+ + Br^-$

the following data was collected

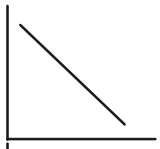
[Acetone]	$[Br_2]$	$[H^+]$	Rate of reaction (Ms^{-1})
0.15	0.025	0.025	6×10^{-4}
0.15	0.050	0.025	6×10^{-4}
0.15	0.025	0.050	12×10^{-4}
0.20	0.025	0.025	8.0×10^{-4}

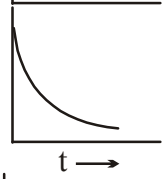
The order of the reaction w.r.t. CH_3COCH_3 and Br_2 respectively are :
(A) 0,1 (B) 1,0 (C) 1,1 (D) 1,2

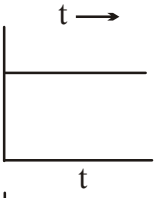
15. Consider the reaction $A \longrightarrow B$, graph between half life ($t_{1/2}$) and initial concentration (a) of the reactant is

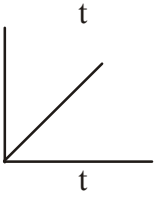


Hence graph between $-\frac{d[A]}{dt}$ and time will be

(A) 

(B) 

(C) 

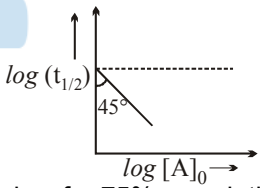
(D) 

16. Consider the reaction :

$A \longrightarrow B + C$

Initial concentration of A is 1 M. 20 minutes time is required for completion of 20 % reaction.
If $\frac{d[B]}{dt} = k[A]$, then half life ($t_{1/2}$) is
(A) 55.44 min. (B) 50 min
(C) 62.13 min (D) None of these

17. For a reaction half life varies with initial concentration as follow.



If time taken for 75% completion of reaction is 300 minutes, then time taken to complete 25% reaction if we start with same initial concentration at same temperature is
(A) 33.33 min. (B) 50 min.
(C) 66.66 min. (D) 100 min.

18. Decomposition of reaction $3A(g) \longrightarrow 2B(g) + 2C(s)$ follows **first order** kinetics. Starting with **pure A (at 6 atm)**, the pressure developed after 20 minute and after a long time are **5.05 atm** and **4.05 atm,** respectively. Identify the **correct** statement.
(A) Time for 75% completion is slightly more than 40 minute.
(B) Time for 87.5% completion is slightly less than 60 minute.
(C) Time for 93.75% completion is exactly 80 minute.
(D) Time for 90% completion is more than 80 minute.

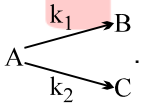
19. The decomposition of a drug in human was found to be a first order process. The activation energy for the decomposition is (3100R × ln2) and pre-exponential factor A = 4096 hr^{-1}. How long will it take the concentration of the drug in the blood to fall to half of its initial value at 310K?
Given : ln2 = 0.7
(A) 10.5 hr (B) 0.175 min
(C) 10.5 min (D) 0.175 sec

20. **Statement-1** : For the reaction : 2A + B ⟶ C, the rate of disappearance of A is twice the rate of disappearance of B
Statement-2 : For the reaction : 2A + B ⟶ C, Rate of reaction is $\frac{d[C]}{dt}$
(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
(C) Statement-1 is true, statement-2 is false.
(D) Statement-1 is false, statement-2 is true.

(SECTION-B)

21. The following mechanism has been proposed for the reaction of NO with Br_2 to form NOBr.
$NO(g) + Br_2(g) \rightleftharpoons NOBr_2(g)$; $NOBr_2(g) + NO(g) \longrightarrow 2NOBr(g)$ (slow step)
If the second step is the rate determining step, the order of the reaction with respect to NO(g) is

22. For the Ist order reaction : A(g) → B(g) + C(g) + D(s) taking place at constant pressure and temperature condition. Initially volume of container containing only A was found to be 10L and after 0.693 hrs it was 17.5 L. The rate constant for the reaction is (hr^{-1}):

23. Consider the reaction 

. The rate constant for two parallel reactions were found to be 10^{-2} $dm^3mol^{-1}s^{-1}(k_1)$ and 4×10^{-2} $dm^3mol^{-1}s^{-1}(k_2)$. If the corresponding energies of activation of the parallel reactions are 80 and 100 kJ respectively. What is the apparent (net) overall energy of activation of given reaction.

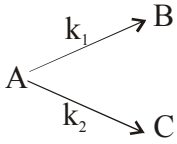
24. If 0.01% of a substance undergoing decomposition is consumed in 1 millisecond when the concentration is 0.02 M and in 0.25 millisecond when the concentration is 0.04 M, what is the order of the reaction?

25. For the given reaction,
A ⟶ Product

Initial conc.	$t_{1/2}$
0.1 M	2 hr
0.2 M	30 min

Order of reaction is

26. A reaction takes place in 3 steps, the rate constant are K_1 , K_2 and K_3 and energies of activation are 40, 30 and 20 kJ respectively. If overall rate constant $K = \frac{K_1K_3}{K_2}$, then overall energy of activation is :

27. Consider the elementary reaction :


Given : $k_1 = k_2 = \frac{\ln 2}{20}$ min^{-1}. A, B and C all are optically active compound. If optical rotation per unit concentration of A, B and C are 60°, – 40° and – 80° and initial concentration of A is 1M, then **time** at which reaction mixture will be **optically inactive** is :

28. The temperature coefficient (μ) of a reaction at 300 K is "e". Assuming temperature coefficient to be dependent on temperature what would be the value of $\log_e\left(\frac{K_{620}}{K_{300}}\right)$?

29. The half-life of a radioactive isotope is three hours. If the initial mass of the iosotope were 256 g, the mass of it remaining undecayed after 18 hours would be

30. The rate of a chemical reaction doubles for every 10ºC rise of temperature. If the temperature is raised by 50°C, the rate of the reaction increases by about :