QB365

Important Questions - Chemical Kinetics

12th Standard CBSE

Chemistry Reg.No. : | | | | | | |

Time : 01:00:00 Hrs

Total Marks : 50

Section - A

1) The unit of rate constant for a zero order reaction is **1**

(a) mol L^{-1} s^{-1} (b) L mol^{-1} s^{-1} (c) L^2mol^{-1} s^{-1} (d) s^{-1}

2) The molecularity and order of the reaction 2 NO (g) + O_2 (g) $\rightarrow$2NO_2 (g) are respectively **1**

(a) one and one (b) two and two (c) three and three (d) two and three

3) The rate constant, the activation energy and the Arrchenius parameter of a chemical reaction at 25°C are 3.0 $\times$ 10 $^{-4}s^{-1}$,104.4 kJ mol^{-1}, and 6.0 $\times$ 10^{14} s^{-1} respectively. The value of the rate constant as T $\longrightarrow$ ∞ is **1**

(a) $2.0 \times 10^{18} s^{-1}$ (b) $6.0 \times 10^{14} s^{-1}$ (c) Infinity (d) $3.6 \times 10^{30} s^{-1}$

4) The chemical reactions in which the reactions require high amount of activation energy are generally **1**

(a) slow (b) fast (c) instantaneous (d) none of these

5) In the presence of a catalyst, the heat evolved or absorbed during the reaction **1**

(a) increases (b) decreases (c) remains unchanged (d) may increase or decrease

6) Zero order reactions (1) $t_{100\%} = [A]_{0/k}$ **1**

7) Linear plot with -ve slope and intercept (2) Conc.[A] vs time t for zero order **1**

8) Second half life or first order reaction (3) is same as the first **1**

9) Diamond (4) ordinarily rate of conversion is imperceptible **1**

10) Order of a complex reaction is determined by (5) order of slowest step **1**

Section - B

11) What is physical significance of energy of activation? Explain with diagram. **2**

12) Explain the terms: (i) Rate determining step of a reaction (ii) Molecularity of a reaction **2**

13) Calculate the rate constant of a reaction at 293 K, given that: E_α = 103 kJ mol^{-1}, k = 7.87 $\times$ 10^{-7} s^{-1} at 273 K, R - 8.314 JK^{-1} mol^{-1}. **2**

14) Show that for a first order reaction, the time required for half the change (half-life period) is independent of initial concentration. **2**

(Or)

Derive the general form of expression for the half-life first order reaction.

15) Show by using rate law, how much rate of reaction: 2NO(g) + O_2(g) $\rightarrow$ $2NO_2$(g) will change if the volume of the reaction vessel is reduced to one-third of its initial value. **2**

Section - C

16) At 300 ^{o}C the thermal dissociation of HI is found to be 20%. What will be the equilibrium concentrations of H_2 and I_2 in the system $H_2 + I_2 \rightleftharpoons 2HI$ at this temperature if the equilibrium concentration of HI in it be 0.96 mol L^{-1}? **3**

17) Show that in case of first order reaction, the time required for 99.9% of the reaction to complete is 10 times that required for half of the reaction to take place. [log 2 = 0.301] **3**

18) What is the effect of temperature on the rate constant of reaction? How can this temperature effect on rate constant be represented quantitatively? **3**

19) Calculate the half-life of a first order reaction from their rate constants given below: (a) 200 s^{-1} (b) 2 min^{-1} (c) 4 $year^{-1}$ **3**

20) Express the rate of the following reaction in terms of different reactants and products:$4NH_3(g)+5O_2(g) \longrightarrow 4NO(g)+6H_2O(g)$ If the rate of formation of NO is 3.6×10^{-3}mol $L^{-1}s^{-1}$,calculate (i)the rate of disappearance of NH_3 (ii)rate of formation of H_2O. **3**

Section - D

21) (a) Define the following: (i) Order of a reaction (ii) Elementary step in a reaction (b) A first order reaction has a rate constant value of 0.00510 min^{-1}. If we begin with 0.10 M concentration of the reactant, how much of the reactant will remain after 3.0 hours? **5**

22) (a) Distinguish between molecularity an order of a reaction. **5**

(b) The activation energy for the reaction

$2HI(g) \rightarrow H_2(g) + I_2(g)$

is 209.5 kJ mol^{-1} at 581 K. Calculate the fraction of molecules having energy equal to or greater than activation energy.

[R = 8.314 JK^{-1} mol^{-1}]

23) The half time of first order decomposition of nitramide is 2.1 hour at 15^{o}C. $NH_2NO_2(aq) \longrightarrow N_2O(g) + H_2O(l)$ If 6.2 g of MH_2NO_2 is allowed to decompose, calculate (i) time taken for NH_2NO_2 to decompose 99% and (ii) volume of dry N_2O produced at this point, measured at STP. **5**

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