Class 12 Chemistry · Chapter 3: Chemical Kinetics

Worksheet · 20 marks · about 40 minutes · based on NCERT

Name _____ Class and section _____ Date _____

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1. The gas-phase reaction $2NO(g) + 2H_2(g) \rightarrow N_2(g) + 2H_2O(g)$ follows Rate = $k[NO]^2[H_2]$. With concentration in mol L^{-1} and time in seconds, the unit of k is [1]

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

2. A zero order reaction has k = 0.005 mol L^{-1} min^{-1}. If the initial concentration is 0.40 mol L^{-1}, the half-life is [1]

(a) 80 min
(b) 40 min
(c) 20 min
(d) 138.6 min

3. For $CHCl_3 + Cl_2 \rightarrow CCl_4 + HCl$, the experimental rate law is Rate = $k[CHCl_3][Cl_2]^{1/2}$. The overall order of the reaction is [1]

(a) 1
(b) 2
(c) 3/2
(d) 1/2

4. In the iodide-catalysed decomposition of H_2O_2, the fast step is the elementary reaction $H_2O_2 + IO^- \rightarrow H_2O + I^- + O_2$. The molecularity of this step is [1]

(a) 2
(b) 1
(c) 3
(d) 4

5. Which statement about order and molecularity is correct? [1]

(a) Molecularity is found by measuring the rate at different concentrations.
(b) Molecularity can be zero for a reaction on a metal surface.
(c) Order has meaning only for elementary reactions.
(d) Order can be zero or a fraction, but molecularity cannot.

6. A first order reaction has $k = 6.93 \times 10^{-3}$ min^{-1}. How long will it take for 87.5% of the reactant to be used up? [2]

7. State the two conditions a collision must meet to give products, and name the factor introduced in collision theory to account for one of them. [2]

8. For $4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$, NO is formed at 3.6×10^{-3} mol L^{-1} s^{-1} at an instant. Calculate (i) the rate of disappearance of O_2 and (ii) the rate of formation of H_2O at that instant. [2]

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9. The reaction $H_2(g) + 2ICl(g) \rightarrow I_2(g) + 2HCl(g)$ is proposed to go in two steps: (1) $H_2 + ICl \rightarrow HI + HCl$ (slow); (2) $HI + ICl \rightarrow I_2 + HCl$ (fast). (i) Write the rate law this mechanism predicts and its order. (ii) Name the intermediate and give the molecularity of each step. (iii) Why is the order not 3, though three molecules appear in the overall equation? [3]

10. A reaction has Ea = 46.0 kJ mol^{-1} and k = 1.5×10^{-4} s^{-1} at 300 K. Taking A as constant, calculate k at 320 K. (2.303 R = 19.15 J K^{-1} mol^{-1}, antilog 0.500 = 3.16) [3]

11. A compound X decomposes by first order kinetics. Its concentration falls from 0.80 mol L^{-1} to 0.20 mol L^{-1} in 46.2 min. Calculate (i) the rate constant, (ii) the half-life, and (iii) the time for the concentration to fall to 0.05 mol L^{-1}. (log 2 = 0.3010) [3]

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