



CHEMISTRY

BOOKS - JEEVITH PUBLICATIONS CHEMISTRY (KANNADA ENGLISH)

CHEMICAL KINETICS

Answer The Following Questions

1. Define rate of a reaction.



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2. Give the unit of rate of reaction.



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3. What is average rate of reaction ? Give its expression in terms of reactants and products.



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4. What is instantaneous rate of a reaction ?

Give its expression in terms of reactants and products.



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5. What are the factors which influence rate of a reaction.



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6. What is simple collision theory ? Give its significance.



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7. Define order of a reaction.



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8. What is rate law ?



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9. Calculate the overall order of a reaction which has the rate expression.

(a) $\text{Rate} = k[A]^{1/2}[B]^{3/2}$

(b) $\text{Rate} = k[A]^{2/2}[B]^{-1}$

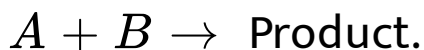
(c) $\text{Rate} = k[A]^{1/2}[B]^{-1}$

$\text{Rate} = [A]^X[B]^Y = \text{Order} = x + y$



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10. A reaction is first order with respect to the reactant A and Second order with respect to the reactant B in a reaction.



(i) Write the differential rate equation.

(ii) How is rate of reaction affected on increasing the concentration of B by 2 times.



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11. A reaction is second order with respect to a reactant. How is the rate of reaction affected if the concentration of the reactant is

(i) Doubled

(ii) reduced to half ?



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12. A reaction is first order in A and second order in B.

(i) Write the differential rate equation.

(ii) How is rate affected on increasing the concentration of B three times ?

(iii) How is rate affected when the concentration of both A and B are doubled ?



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13. Show that the rate of first order reaction is doubled when concentration of the reactant is doubled.



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14. What is zero order reaction ? Give two examples.



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15. Give an example for zero order reaction.



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16. Rate = $k[NO]^2[O_2]^1$. By how many times does the rate of reaction change when the

volume of the reaction vessel is reduced to $1/3^{rd}$ of its original volume ? Will there be any change in the order of the reaction.



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17. What is first order reaction ? Give two examples.



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18. What is second order reaction ? Give two examples.



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19. Give the unit for zero order first order and second order rate constants.



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20. Unit of rate constant of a reaction is same as the unit of rate of reaction. What is the order of the reaction.



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21. Identify the reaction order from each of the following rate constants.

(i) $k = 2.3 \times 10^{-3} \text{ L mol}^{-1} \text{ s}^{-1}$

(ii) $k = 3 \times 10^{-1} \text{ s}^{-1}$



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22. Rate constant of a reaction is $k = 3.14 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$. What is the order of the reaction.

A. 0

B. 1

C. 2

D. 3

Answer: A



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23. What is psuedo first order reaction ? Give example.



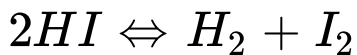
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24. What is molecularity of a reaction ?



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25. Write the molecularity for the reaction



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26. What is unimolecular reaction ? Give an example.



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27. What is bimolecular reaction ? Give an example.



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28. What is ter molecular reaction ? Give an example.



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29. Give four differences between order and molecularity of a reaction.



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30. Derive an integrated rate equation for rate constant of a zero order reaction.



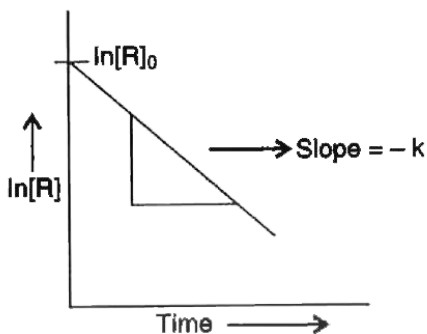
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31. Derive the integrated rate equation for rate constant of a zero reaction.



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32. From the following graph, identify order of reaction and mention the unit of its rate constant.





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33. What is half life period of a reaction ? Show that half period for a zero order reaction is directly proportional to initial concentration.



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34. How many times does the $t_{1/2}$ of zero order reaction increases if the initial concentration of the reactant is doubled ?





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35. In a zero order reaction, the time taken to reduce the concentration of reactant from 50% to 25% is 30 minutes. What is the time required to reduce the concentration from 25% to 12.5%?



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36. What is half life period of a reaction ? Show that half of a first order reaction is

independent of initial concentration.



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37. What happens to the half life period of a first order reaction if the concentration of the reactants is increased ?



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38. A reaction completes 50% in 2 hours and 75% in 4 hours. What is the order of the

reaction. Give reason.



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39. What is the effect of temperature on the rate of a reaction ?



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40. Write Arrhenius equation. Mention the symbols stands for.



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41. Define temperature coefficient of a reaction. What is general value of it ?



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42. Write

i) Arrhenius equation.

ii) The formula to calculate half life. Period of zero order reaction.



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43. Write the energy distribution curve showing temperature dependence of rate of a reaction.



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44. What is activation energy ?



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45. Give equation to calculate activation energy when rate constants known at two different temperatures.



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46. What is catalyst. Give an example.



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47. How catalyst increases rate of a reaction.



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48. What happens to the energy of activation of a reaction when positive catalyst is added.



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49. Draw a graph of potential energy v/s reaction co-ordinate showing the effect of a catalyst on activation energy.



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50. Explain the effect of catalyst on the activation energy of the reaction with the graph.



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51. Define collision frequency.



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52. Give an expression to find out rate of a reaction according to collision theory.



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53. According to collision theory, what are the two factors that lead to effective collisions



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Problems Section

1. For the reaction $R \rightarrow P$, the concentration of a reactant changes from 0.03 M to 0.02 M in 25 minutes. Calculate average rate of reaction.



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2. In a reaction $2A \rightarrow \text{product}$, the concentration of A decreases from 0.5 mol L⁻¹ to 0.4 mol L⁻¹ in 10 minutes. Calculate the rate during this interval.



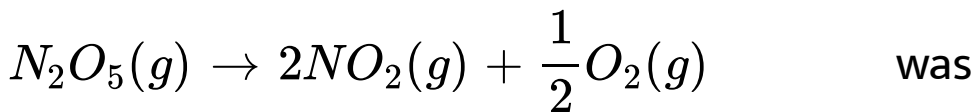
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3. The conversion of molecules X to Y follows second order kinetics. If concentration of X is increased to three times how will it affect the rate of formation of Y.



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4. The initial concentration of N_2O_5 in the following first order reaction



$1.24 \times 10^{-2} \text{ mol } L^{-1}$ at 318K. The

concentration of N_2O_5 after 60 minutes was $0.2 \times 10^{-2} \text{ mol L}^{-1}$. Calculate the rate constant of the reaction.



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5. The rate constant of a certain first order reaction is 200 S^{-1} . What is its half life period ?



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6. A certain first order reaction is half completed in 46 min. Calculate the rate constant and also time for 75% completion of the reaction.



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7. Show that in case of a first order reaction, the time taken for completion of 99.9% reaction is ten times the time required for half change of the reaction.





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8. Show that $t_{99\%} = 2 \times t_{90\%}$



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9. Rate constant of a first order reaction is 0.0693 min^{-1} . Calculate the percentage of the reactant remaining at the end of 60 minutes.



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10. The rate constant for a first order reaction is $60s^{-1}$. How much time will it take to reduce the initial concentration of the reactant to its $1/16^{th}$ value.



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11. A first order reaction takes 40 min for 30% decomposition.



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12. The half life for radioactive decay of ^{14}C is 5730 years. An archaeological artifact containing wood had only 80% of the ^{14}C found in a living tree. Estimate the age of the sample .



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13. A first order reaction is found to have a rate constant $K = 5.5 \times 10^{-14} \text{S}^{-1}$. Find the half-life of the reaction.





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14. A first order reaction has a rate constant $1.15 \times 10^{-3} \text{ s}^{-1}$. How long will 5g of this reactant take to reduce to 3g ?



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15. Time required to decompose SO_2Cl_2 to half of its initial amount is 60 minutes. IF the decomposition is a first order reaction. Calculate the rate constant of the reaction.



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16. The rate constant of a particular reaction doubles when the temperature changes from 300K to 310 K, calculate the energy of activation.



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17. The rate constant of a reaction at 500 K and 700 K are 0.02 s^{-1} and 0.07 s^{-1} respectively.

Calculate the value of E_a



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18. The rate of a chemical reaction doubles for an increase of 10K in absolute temperature from 298K. Calculate E_a .



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19. The rate of a reaction becomes four times when the temperature changes from 293 K to

313 K. Calculate the energy of activation (E_a) of the reaction assuming that it does not change with temperature.



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