CHEMISTRY

BOOKS - JMD CHEMISTRY (PUNJABI ENGLISH)

CHEMICAL KINEMATICS

Example

1. The units of rate constant for first order equation.

A. s^{-1}

B. $molL^{-1}s^{-1}$

C. L^{-1}

D. $L^{-1}s^{-1}$

Answer: A

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2. On increasing temparature of the reacting system by 10 degrees, the rate of reaction

almost doubles. The most appropriate reason for this is :

A. collision frequency increases

B. actevating energy decreases with increase in temparature

C. the fraction of molecules having energy equal to threshould energy or more increases

D. the value of threshold energy decreases.

Answer: C

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3. If rate of reaction between a and B is expressed as $k[A][B]^2$, the reaction is

A. first order in A

B. second order in B

C. overall having third order

D. All are correct

Answer: D

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4. Rate constant of a reaction at 290K was found to be 3.2×10^{-3} . At 300K , it will be :

A. 1.28×10^{-2}

B. 9.6×10^{-3}

C. 6.4×10^{-3}

D. 3.2×10^{-4}.

Answer: C

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5. If the reaction between A and B to give C shows first order kinetics in A and Second order in B, the rate equation can be writen as :

A. $rate = k[A][B]^{\frac{1}{2}}$

B. `rate=k[A]^(1/2)[B]

C. $rate = k[A][B]^2$

D. $rate = k[A]^2[B].$

Answer: C

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6. For the reaction,

$2N_2O_5 \rightarrow 4NO_2 + O_2$,

rate of reaction in terms of O_2 is d[O_2]/dt . In term of N_2O_5 will be:

A. $-d\frac{N_2O_5}{dt}$

B. $+d\frac{N_2O_5}{dt}$

C. $-\frac{1}{2}d\frac{[N_2O_5]}{dt}$

D. `-2d[[N_2O_5]]/dt

Answer: C

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7. Unit of rate constant for zero order reaction is

A. $molL^{-1}s^{-1}$

B. $mol^{-1}Ls^{-1}$

C. s^{-1}

D. $mol^{-2}L^2S^{-1}$

Answer: A

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8. Rate of a reaction can be expressed by Arrhenius equation as $k = Ae^{-\frac{E_a}{RT}}$. In this equation , E_a represents:

A. The total energy of reacting molecules at a temparature T

B. The frictions of molecules with energy greater than activation energy of the reaction

C. The energy above which all the colliding molecules will react

D. The energy below which the colliding molecules will not react.

Answer: C

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9. Rate constant of a reaction depends upon:

A. Temparature

B. Initial concentration of the reaction

C. Time of reaction

D. Extent of reaction

Answer: A

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10. The role of a catalyst in a chemical reaction is to change:

A. Enthalpy of a reaction

B. Nature of products

C. Activation energy

D. Equilibrium constant.

Answer: C

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11. The units of rate constant for first order equation.

A. conc.$time^{-1}$

B. time. $conc^{-1}$

C. $time^{-1}$

D. $time^{-1}.conc^{-1}$

Answer: C

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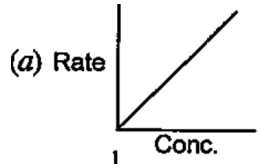
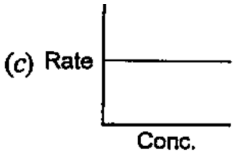
12. Which of the following graphs corresponds to first order reaction:

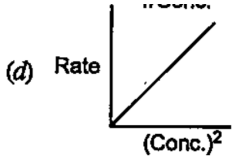
A. 

B.

C.



D.



Answer: A

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13. Rate constant of a reaction depends upon:

A. temparature

B. time

C. initial concentration

D. None of these.

Answer: A

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14. Arrhenius equation is

A. $k = Ae^{-\frac{E_a}{RT}}$

B. $k = Ae^{\frac{E_a}{RT}}$

C. $k = e^{\frac{E_a}{RT}}$

D. $k = -Ae^{\frac{E_a}{RT}}$

Answer: B

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15. The chemical reactions in which the reactants require high amount of activation energy are generally

A. slow

B. fast

C. Instantaneous

D. None of these.

Answer: A

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16. Which of the following does not influence the reaction rate?

A. Nature of reactants

B. Conc. Of reactants

C. Temparature of the reaction

D. Molecularity of the reaction

Answer: D

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17. A reaction was found to be of second order with respect to concentration of carbon

monoxide . If the concentration of carbon monoxide is doubled, the rate of reaction will :

A. triple

B. increase by a factor of 4

C. double

D. remain unchanged

Answer: B

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18. The value of k for a reaction is $2.96 \times 10^{30} s^{-1}$, what is the order of the reaction?

A. Zero

B. 3

C. 2

D. 1

Answer: D

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19. The units of rate constant for first order equation.

A. $mol^{-1}litres^{-1}$

B. $mollitre^{-2}s^{-1}$

C. s^{-1}

D. $mollitre^{-1}s^{-1}$.

Answer: A

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20. The rate constant of a reaction has same units as the rate of reaction. The reaction is of .....

A. Third order

B. second order

C. First order

D. Zero order

Answer: D

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21. The rate constant of a reaction has s^{-1} units. The reaction is of .....

A. Third order

B. Second order

C. First order

D. Zero order

Answer: C

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22. The rate constant of reaction is 3×10^{-3} $atm^{-2}\,\sec^{-1}$. The order of reaction is

A. 1

B. 2

C. 3

D. 0

Answer: B

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23. The order of a single step reaction can be

A. 0

B. whole number

C. fraction

D. integer,fraction,zero

Answer:

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24. The molecularity of a reaction can never be a fraction.

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25. Unit of rate constant for a second order reaction are L $mol^{-1}s^{-1}$.

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26. The molecularity of a reaction can never be a fraction.

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27. Order of a reaction can be zero.

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28. Molecularity of a reaction cannot be zero.

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29. The half life period of a zero order reaction is independent of initial concentration

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30. In a multistep reaction, the fastest step is the rate determining step.

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31. A catalyst always increases the rate of reaction.

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32. Rate of a zero order reaction slowly decreases with the progress of a the reaction.

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33. Express the instantenus rate of the reaction

`N_2(g) + 3H_2(g) rarr 2NH_3(g)'

In terms of various reactants and products.

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34. Define Instantaneous rate of reaction and rate constant' (or specific rate constant), What Is the difference between the two ?

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35. Find the units of rate constant of reaction

In solution as well as in gaseous phase for :

Zero order reaction.

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36. Find the units of rate constant of reaction

In solution as well as in gaseous phase for :

First order reaction.

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37. Find the units of rate constant of reaction

In solution as well as in gaseous phase for :

Second order reaction.

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38. Find the units of rate constant of reaction

In solution as well as in gaseous phase for :

Third order reaction.

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39. Explain the rate law.

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40. Define order of a reaction

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41. Give four characteristics of rate constant.

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42. Can order of a reaction be fractional ? Give an example.

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43. Give one example of zero order reaction.

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44. Define molecularity of a reaction.

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45. Define average rate of an reaction.

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46. For the reaction

$2H_2(g) + 2NO(g) \rightarrow N_2(g) + 2H_2O(g)$

the proposed mechanism is as followed

(i) `2NO(g) (ii)

$N_2O_2(g) + H_2(g) \rightarrow N_2O(g) + H_2O(g)$

$N_2O(g) + H_2(g) \rightarrow N_2(g) + H_2O(g)$

If the second step is the rate determining step

then what Is the molecularity of the reaction

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47. For the reaction

$2H_2(g) + 2NO(g) \rightarrow N_2(g) + 2H_2O(g)$

the proposed mechanism is as followed

(i) `2NO(g) (ii)

$N_2O_2(g) + H_2(g) \rightarrow N_2O(g) + H_2O(g)$

$N_2O(g) + H_2(g) \rightarrow N_2(g) + H_2O(g)$

If the second step is the rate determining step

then what IS the order or the reaction ?

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48. for the reaction

$2H_2(g) + 2NO(g) \rightarrow N_2(g) + 2H_2O(g)$

the proposed mechanism is as followed < br>

(i) `2NO(g) (ii)

$N_2O_2(g) + H_2(g) \rightarrow N_2O(g) + H_2O(g)$

$N_2O(g) + H_2(g) \rightarrow N_2(g) + H_2O(g)$

If the second step is the rate determining step then What is the rate law for the reaction?

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49. What is difference between order of reaction and molecularity of reaction ?

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50. Define zero order reaction. Derive integrated rate equation for rate constant of a

zero order reaction.

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51. Derive an expression for half life period of a zero order reaction.

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52. Derive the integrated rate equation for the rate constant for a first order reaction. What would be units of the first order rate constant,

if the concentration is expressed in moles per litre and time to seconds ? Also give graphical representation of integrated rate law equation.

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53. Show that for a first order reaction, the time taken to complete half of the change is Independent of the initial concentration of the reactant.

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54. Derive an expression for half life period of a zero order reaction.

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55. Explain with suitable example how the molecularity of a reaction Is different from the order of reaction ?

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56. What are pseudochemical or pseudo-order reactions ? Give one example.

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57. Define threshold energy and activation energy. How are they related?

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58. What Is activated complex ?

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59. What is temperature coefficient of a reaction ? Why temperature coefficient for most of the reactions at room temperature is nearly two ?

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60. What is Arrhenius equation to describe the effect of temperature on rate of a reaction ?

How can it be used to calculate the activation energy of a reaction ?

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61. How is rate constant of a reaction related to its activation energy?

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62. Explain the effect of catalyst on the rate of reaction with diagram.

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63. Define collision frequency. Write short note on collision theory of chemical reactions.

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64. State the order with respect to each reactant and overall order for the following reaction :

$$H_2O_2 + 3I^- + 2H^+ \rightarrow 2H_2O + I_3^-(aq)$$

Rate=$K[H_2O_2]\left[I^-\right]$

What are the units of rate constant?

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65. State the order with respect to each reactant and overall order for the following reaction :

$H_2O_2 + 3I^- + 2H^+ \rightarrow 2H_2O + I_3^-(aq)$

Rate=$K[H_2O_2]\left[I^-\right]$

What are the units of rate constant?

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66. The decomposition of hydrogen peroxide has been found to be first order

The rate constant has beem found to be $1.01 \times 10^{-2}\ \text{min}^{-1}$. Calculate the rate of reaction when $[H_2O_2] = 0.4 mol L^{-1}$

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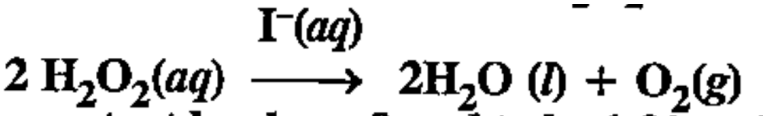
67. The decomposition of H_2O_2, in the presence of Iodide ion has been found to be

first order in H_2O_2 .

The rate constant has been found to be $1.01 \times 10^{-2}\ \text{min}^{-1}$. What concentration of H_2O_2 would give rate of `1.12 xx 10^-2 mol L^-1 min^-1?



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68. The decomposition of N_2O_5 in carbon tetrachloride solution has been found to be first order with respect to N_2O_5 with rate

constant, $k - 6.2 \times 10^{-4} s6 - 1$

$$N_2O_5(G) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$$

Calculate the rate of reaction when

$$[N_2O_5] = 2.50 mol L^{-1}$$

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69. The decomposition of N_2O_5 in carbon tetrachloride solution has been found to be first order with respect to N_2O_5 with rate constant, $k = 6.2 \times 10^{-4} s^{-1}$

$$N_2O_5(G) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$$

What concentration of N_2O_5 would give a rate of $4.2 \times 10^{-3} molL^{-1}s^{-1}$?

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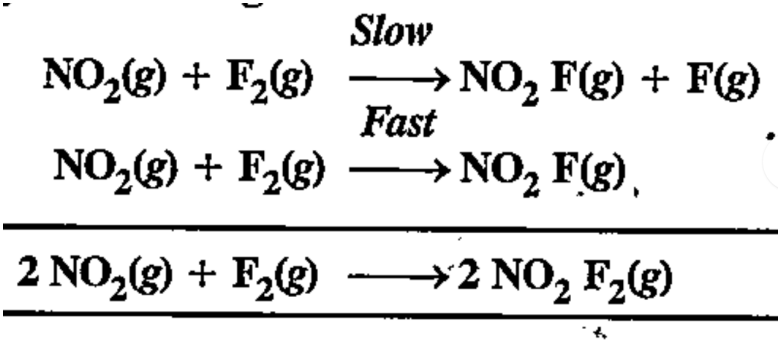
70. Reaction between NO_2 and F_2 to give NO_2F takes place by the following mechanism:

Write the rate expression and order of the

reaction. What is the unit of rate constant ?



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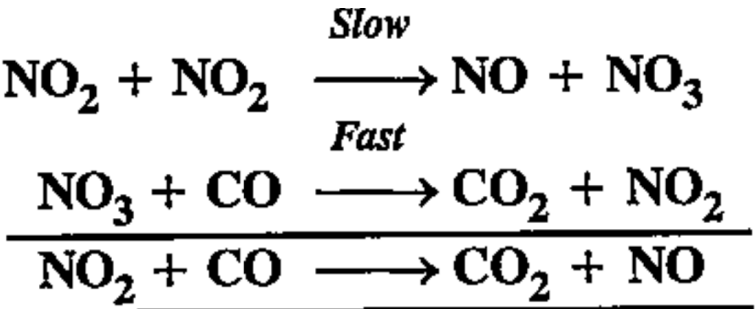
71. Reaction between NO_2 and CO to give CO_2 and NO takes place by the following mechanism:

Write the rate expression and order of the

reaction. What is the unit of rate constant ?



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72. Thermal decomposition of dinitrogen penta oxide takes place by the following mechanism:

Write the rate expression and order of

reaction. What is the unit of rate constant ?

$$N_2O_5 \xrightarrow{Slow} NO_2 + NO_3$$

$$N_2O_5 + NO_3 \xrightarrow{Fast} 3\,NO_2 + O_2$$

$$2\,N_2O_5 \longrightarrow 4\,NO_2 + O_2$$

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73. The half-life for radioactive decay of $.^{14}C$ is 5730 years. An archaeological artifact contented wood that has only 80% of the $.^{14}C$ found in living tree. Estimate the age of the sample.

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

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75. 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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76. Show that the time required for 99% completion of a first order reaction In twice the time required for the completion of 90%.

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77. A first order reaction takes 40 min for 30% completion. Calculate $t_{\frac{1}{2}}$.

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78. A first order reaction is 20% complete in the 10 minutes. Calculate the time period for 75% completion of the reaction.

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79. The rate constant for a first order reaction is $80s^{-1}$. How much time will it take to reduce the concentration of the reactants to $\frac{1}{18^{th}}$ of Its initial value ?

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80. The rate constant for a first order reaction Is 90 s^{-1} .How much time will it take to reduce the concentration of the reactant to $\frac{1}{20^{th}}$ of its Initial value ?

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81. First order reaction is found to have rate constant, $k = 5.5 \times 10^{-14} s^{-1}$. Find the half life to the reaction.

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82. Calculate two third life of a first order reaction having $k = 5.48 \times 10^{-14} s^{-1}$.

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83. Find the half life period of first order reaction whose rate constant, $k = 4.93 \times 10^{-4} s^{-1}$.

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84. The half life period for a reaction of first order is 2.31×10^3 min. How long will it take for $\frac{1}{5^{th}}$ of the reactants to be left behind.

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85. The rate constant for a first order reaction is 3.0×10^{-4} $\overset{-1}{\text{min}}$. How long will It take for $\frac{1}{5^{th}}$ of the reactants to be left behind ?

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86. Calculate the time required for the completion of 90% of a reaction of first order kinetics, $t_{\frac{1}{2}} = 44.1$ minutes.

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87. The decomposition of A into product has value of k as $4.5 \times 10^3 s^{-1}$ at 10°C and energy of activation 60 kJ mol^{-1}. At what temperature would k be $1.5 \times 10^4 s^{-1}$?

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88. The rate of the chemical reaction doubles for an increase of 10 K In absolute temperature from 298 K. Calculate E_a .

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89. The rate constant for a first order reaction becomes six times when the temperature is raised from 350 K to 400 K. Calculate activation energy for the reaction.

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90. For a decomposition reaction, the values of rate constants, k at two different temperatures are given below :

$k_1 = 2.15 \times 10^{-7} Lmol^{-1}s^{-1}$ at 650K

$k_2 = 2.39 \times 10^{-7} Lmol^{-1}s^{-1}$ at 700K

calculate activation energy for the reaction.

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91. The rate constants of a reaction at 300 and 320 K are $0.0231s^{-1}$ and $0.0693s^{-1}$ respectively. Calculate the value of activation energy of the reaction. [R=8.314J $K^{-1}mol^{-1}$, $\log 3 = 0.4771$]

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