- Briefly explain how a catalyst works.

Marks
2

Marks 5

- The following data were obtained for the iodide-catalysed decomposition of hydrogen peroxide, H_2O_2.

Experiment	$[I^-]$(M)	$[H_2O_2]$ (M)	Initial rate(M s^{-1})
1	0.375	0	0
2	0.375	0.235	0.000324
3	0.375	0.470	0.000657
4	0.375	0.705	0.001024
5	0.375	0.940	0.001487
6	0	0.948	0
7	0.050	0.948	0.00045
8	0.100	0.948	0.00095
9	0.150	0.948	0.00140
10	0.200	0.948	0.00193

Determine the rate law from these data.

Use the data from Experiment 10 to calculate the rate constant for this reaction.

$k =$

Iodide ion is used as a catalyst in this reaction. What is the role of a catalyst in a chemical reaction?

Marks 4

The mechanism for this reaction has been postulated to be that below.

$2NO(g) \rightleftharpoons N_2O_2(g)$ fast

$N_2O_2(g) + Cl_2 \rightarrow 2NOCl(g)$ slow

Work out the rate law expected for this mechanism and hence show that it is consistent with the experimental rate law and the chemical equation.

The reaction is exothermic. Draw the potential energy *vs* reaction coordinate diagram for this mechanism, labelling all species that can be isolated.

- Briefly describe two factors that determine whether a collision between two molecules will lead to a chemical reaction.

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