Reaction Kinetics - 2022 June A2 Chemistry 9701

1. June/2022/Paper_41/No.2(c)

(c) Manganese(IV) oxide, MnO_2, acts as a heterogeneous catalyst in the decomposition of hydrogen peroxide, H_2O_2.

(i) Explain what is meant by a heterogeneous catalyst.

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..... [1]

(ii) Describe the mode of action of a heterogeneous catalyst in a reaction.

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..... [3]

2. June/2022/Paper_41/No.3(a, b)

(a) The rate of reaction between 2-chloro-2-methylpropane, $(CH_3)_3CCl$, and methanol is investigated. When a large excess of methanol is used, the overall reaction is first order.

$$(CH_3)_3CCl + CH_3OH \rightarrow (CH_3)_3COCH_3 + HCl$$

Fig. 3.1 shows the results obtained.

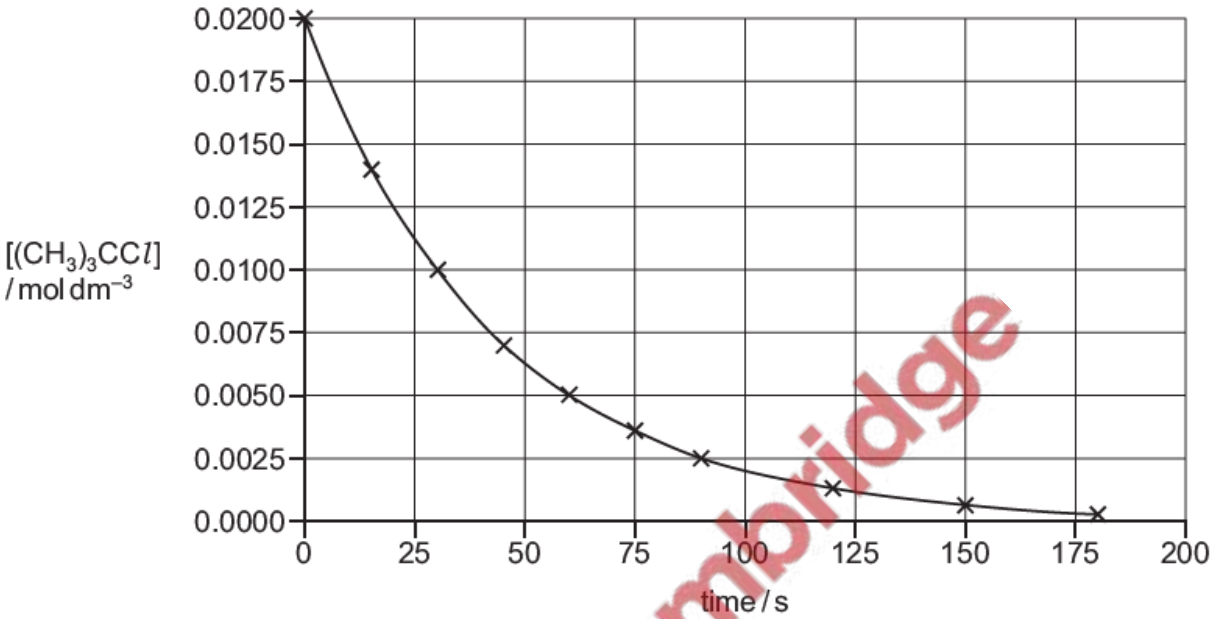

Fig. 3.1

(i) Use the graph to determine the rate of reaction at 40 s. Show all your working.

rate = ... mol dm^{-3} s^{-1} [1]

(ii) Use the graph to show that the overall reaction is first order. Explain your answer.

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..... [2]

(b) In a different reaction, which is also a first order reaction, 75% of the reactant is consumed in 320 s.

Calculate the rate constant, k, for this reaction. State the units for k.

k = ... units = ... [2]