

A level Chemistry A

H432/01 Periodic table, elements and physical chemistry

Question Set 10

1. (a)*

This question is about reaction rates.

Aqueous iron(III) ions, $\text{Fe}^{3+}(\text{aq})$, react with aqueous iodide ions, $\text{I}^{-}(\text{aq})$, as shown below.



A student carries out three experiments to investigate how different concentrations of $\text{Fe}^{3+}(\text{aq})$ and $\text{I}^{-}(\text{aq})$ affect the initial rate of this reaction. The results are shown below.

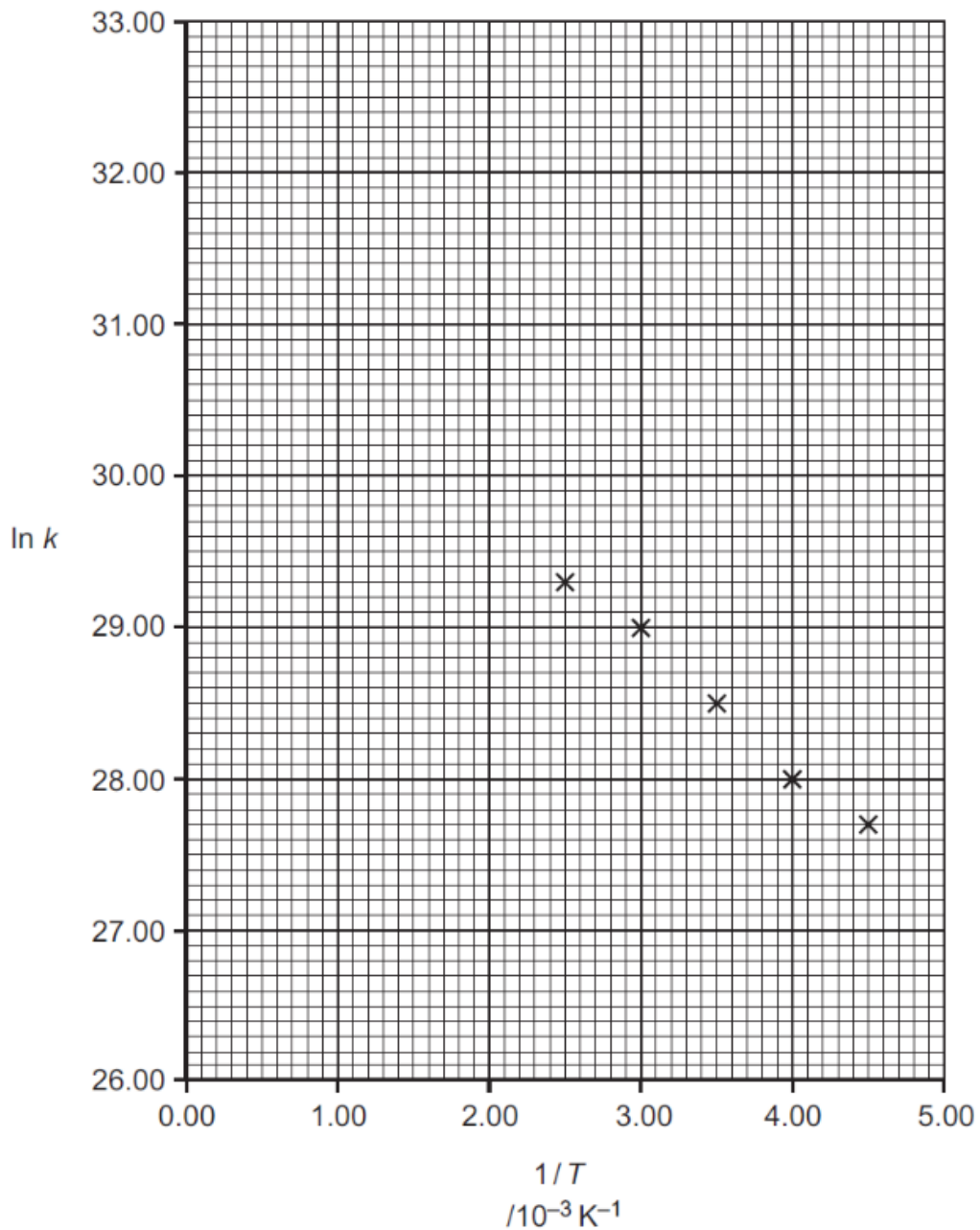
Experiment	$[\text{Fe}^{3+}(\text{aq})]$ / mol dm^{-3}	$[\text{I}^{-}(\text{aq})]$ / mol dm^{-3}	Initial rate / $\text{mol dm}^{-3} \text{s}^{-1}$
1	4.00×10^{-2}	3.00×10^{-2}	8.10×10^{-4}
2	8.00×10^{-2}	3.00×10^{-2}	1.62×10^{-3}
3	4.00×10^{-2}	6.00×10^{-2}	3.24×10^{-3}

Determine the rate constant and a possible two-step mechanism for this reaction that are consistent with these results.

[6]

(b) (i) A student carries out an investigation to find the activation energy, E_a , and the pre-exponential factor, A , of a reaction.

The student determines the rate constant, k , at different temperatures, T . The student then plots a graph of $\ln k$ against $1/T$ as shown below.



Draw a best-fit straight line and calculate the activation energy, in J mol^{-1} . Give your answer to **three** significant figures.

Show your working.

activation energy, $E_a = + \dots \text{ J mol}^{-1}$

[3]

- (ii) Use the graph to calculate the value of the pre-exponential factor, A .

Show your working.

pre-exponential factor, $A =$

[2]

Total Marks for Question Set 10: 11

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