Tutor Marked Assignment

Make sure you know how to complete and send in your TMA and PT3 form: detailed instructions are given in the booklet *Completing TMA and CMA forms.*

This assignment is made up of four questions. For each question, the following Table indicates:

when you should attempt the question;

the percentage of the total marks for this assignment allocated to the question;

the box number on the Assignment Form in which your tutor will indicate the marks that you obtain for the question.

| Question number	When to attempt it	Percentage of total marks	Box No. on Assignment Form
1	after completing Book 5 Part 1	40	1
2	after completing Book 5 Parts 1 and 2	20	2
3	after completing Book 5 Part 2	20	3
4	after completing Book 5 Part 3	20	4

Question 1

This question carries 40 per cent of the marks for this assignment, and tests Learning Outcomes 1, 2, 3, 4, 6, 7, 9, 10, 13, 15, 16, 19 and 22 of Book 5 Part 1.

You will need to use the Kinetics Toolkit on the Book 5 CD-ROM for this question.

You should also note that marks will be specifically awarded for including, as appropriate, the correct units in your answer.

The reaction between aquopentaamminecobalt(III) ions, $\{Co(NH_3)_5(H_2O)\}^{3+}$*, and thiocyanate ions, NCS^-, under certain conditions in aqueous solution at 70 °C has the following time-independent stoichiometry:

$$\{Co(NH_3)_5(H_2O)\}^{3+} + NCS^- = \{Co(NH_3)_5(NCS)\}^{2+} + H_2O \qquad (1)$$
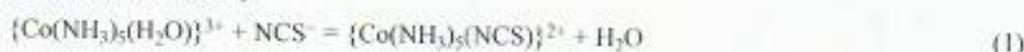
The results of a chemical kinetics investigation, in which the concentration of $\{Co(NH_3)_5(H_2O)\}^{3+}$ was measured over a *limited* time period at 70 °C, are given in Table 1 overleaf (more information about this investigation is given in part (b) of this question).

(a) (*3 marks*) Suggest a plausible rate equation for Reaction 1.

(b) (*4 marks*) The results given in Table 1 are for a kinetic investigation in which the initial concentration of NCS^- was $[NCS^-]_0 = 0.20 \ mol \ dm^{-3}$. Explain why this information allows you to simplify the plausible rate equation that you suggested in part (a), and give the form of the simplified, or pseudo-order, rate equation in your answer.

* As indicated in Book 4, metal complexes such as this are designated by square brackets, [ ]. However, as such brackets are used in Book 5 to denote 'concentration of', we have used braces instead for clarity.

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