

Interactive computer marked assessment: mathematics help for chemistry students

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Aims

- To investigate the use of interactive computer-marked assignments (iCMAs) by third level chemistry undergraduate students to practise their mathematics.
- To use targeted feedback as implemented in the "Openmark"¹ system to help students improve their mathematical skills.

¹see www.open.ac.uk/openmarkexamples

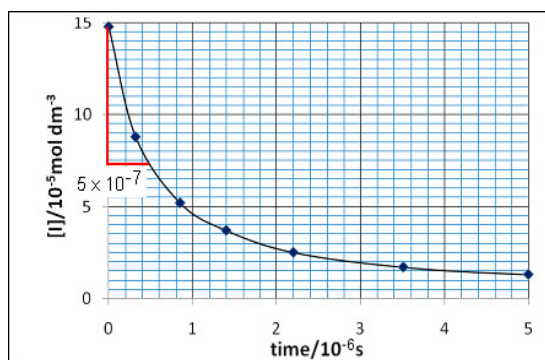
Method

Each iCMA involves about 10 questions and works through the analysis of a set of data from chemical kinetics. Student reaction to the questions was investigated using a questionnaire and by watching students attempt the questions using the on-line real-time collaboration system, Elluminate *live*²

²see www.illuminate.com

Example of feedback for an incorrect answer

If the student gets the answer wrong twice, we use the graph in addition to written feedback to explain the method.



Your answer is still incorrect.

To help we have now completed the first calculation for you.

To estimate the half-life when the concentration is $14.8 \times 10^{-5} \text{ mol dm}^{-3}$, calculate half the initial concentration,

$$\frac{[I^*]_0}{2} = \frac{14.8 \times 10^{-5} \text{ mol dm}^{-3}}{2} = 7.4 \times 10^{-5} \text{ mol dm}^{-3}$$

Use the graph to find the time taken for the $[I^*]$ to fall from $14.8 \times 10^{-5} \text{ mol dm}^{-3}$ to $7.4 \times 10^{-5} \text{ mol dm}^{-3}$. This will be the half-life for a concentration of $14.8 \times 10^{-5} \text{ mol dm}^{-3}$.

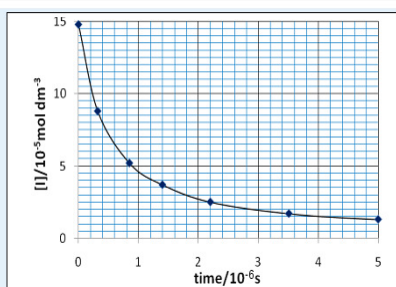
We know that when $[I^*] = 14.8 \times 10^{-5} \text{ mol dm}^{-3}$ $t = 0 \text{ s}$ and reading from the graph when $[I^*] = 7.4 \times 10^{-5} \text{ mol dm}^{-3}$, $t = 0.5 \times 10^{-6} \text{ s}$.

So the half life for $[I^*] = 14.8 \times 10^{-5} \text{ mol dm}^{-3}$ is $0.5 \times 10^{-6} \text{ s} - 0 \text{ s} = 0.5 \times 10^{-6} \text{ s}$.

Example Question

In this question the student has the choice between looking at a graph or a table of the data.

Question 2 (of 11) • You have 4 attempts.



Click the buttons to change between the graph and table of data

Complete the table by entering answers to 1 significant figure.

Table 1.1 Estimated half-lives starting from different concentrations of I^*

$[I^*]/10^{-5} \text{ mol dm}^{-3}$	Estimated half-life/s
14.8	<input type="text"/>
7.4	<input type="text"/>
3.6	<input type="text"/>

Superscript (†)
 Superscript (†)
 Superscript (†)

Findings

30 out of 31 students who responded to the questionnaire found the questions useful.

Some recognised the iCMAs as practice for maths, commenting "good maths practice" and "learned no new chemistry". Others, however, considered it as chemical kinetics; "it is very useful assuming that we were doing this topic in class and it is still fresh in my head".

Instant feedback was appreciated; "instant feedback encourages further working and to think about the problem logically", "some people deliberately give wrong answers so as to gain more feedback for each question." and "OK, finally yes, that's what I did".

Students recognised the iCMAs provide a different approach to learning, "They provide an alternative way to revise and highlight areas that I am not very good in."