Subject	Year	Term
Chemistry	13	2 and 3

Topic

5.1.1 How Fast?

Content (Intent)

Prior Learning (Topic) GCSE: C6. Year 12:1.1, 1.2, 2.1 and 3.2.2 Rates

Orders, rate equations and rate constants

- Be able to use the terms: rate of reaction, order, overall order, rate constant, half-life, rate-determining step
- Be able to deduce orders from experimental data and a rate equation from orders of the form: rate = $k[A]^m[B]^n$, where m and n are 0, 1 or 2
- Calculate the rate constant, k, and related quantities, from a rate equation including determination of units

Rate graphs and orders

- Deduce from a concentration–time graph the order (0 or 1) with respect to a reactant from the shape of the graph.
- Calculate the reaction rates from the measurement of gradients **(see also 3.2.2 b).**
- Determine from a concentration–time graph of a first order reaction a measurement of constant half-life, t1/2 and from the half life, the rate constant.
- Deduce from a rate–concentration graph the order (0, 1 or 2) with respect to a reactant from the shape of the graph
- Determination of the rate constant for a first order reaction from the gradient
- Know the techniques and procedures used to investigate reaction rates by the initial rates method and by continuous monitoring, including use of colorimetry **(see also 3.2.2 e)**

Rate-determining step

- Be able to predict a rate equation that is consistent with the rate-determining step
- Be able to construct possible steps in a reaction mechanism from the rate equation and the balanced equation for the overall reaction

Effect of temperature on rate constants

- Give an explanation of the effect of temperature change on the rate of a reaction and hence the rate constant **(see 3.2.2 f–g)**
- Use the Arrhenius equation to determine E_a and A graphically using: $\ln k = -E_a/RT + \ln A$ derived from the Arrhenius equation.

Future Learning (Topic) 5.2.2 Electrode potentials 5.2.3 Enthalpy and entropy

How will knowledge and skills be taught? (Implementation)	How will your understanding be assessed & recorded (Impact)
1. Determining an order 2. Determining a rate equation by graph or data 3. Finding a rate constant 4. Rate determining step 5. Arrhenius equation	- 2 x standard homework (Grade given. Written feedback. Response expected.) -1 x end of unit test (Grade given. Verbal feedback to class and individuals.) PAGs 9 and 10

Practical work
Determining the rate equation for reaction between Mg and HCl and/or thiosulfate and HCl
PAGs 9 and 10

Written examples
Presentations
Worked through examples
Past paper question examples and answers
Explanation of how to determine an order and a rate equation from a graph or data.
Explanation of how to determine the rate constant unit and value from a graph or rate equation.
Explanation of how to suggest a feasible mechanism from rate equation and reaction equation.
Construction and use of graphs to determine a value for half life, Ea and A
Demonstrating how to use a calculator to determine A

How can parents help at home?

Look at the topic specific resources on the VLE
Use appropriate websites: MachemGuy, Allery Chemistry, Chemistry World – by Royal Society of Chemistry, ChemGuide.
Take an interest! Ask your children what they have learnt and be curious about their learning.

Helpful further reading/discussion

Reading	**Vocabulary Lists**	**Careers Links**
Text book: A level chemistry for OCR by Rob Ritchie and Dave Gent. Chapter 18 p.272-294 The Science of Everyday Life by Marty Jopson Why Chemical Reactions Happen by Keeler and Wothers	rate of reaction order overall order rate constant half-life rate-determining step exponential gradient pre-exponential factor Activation energy	Medicine Veterinary science Material science Biomedical sciences Environmental science Toxicologist Pharmacist Dentist Forensic science Patent law