Meden School Curriculum Planning							
Subject	Chemistry	**Year Group**	13	**Sequence No.**		**Topic**	3.1.9 Rate Equations

Retrieval	Core Knowledge	Student Thinking
What do teachers need to **retrieve** from students before they start teaching **new content**?	What **specific ambitious knowledge** do teachers need to teach students in this sequence of learning?	What real life examples can be applied to this sequence of learning to **development of our students thinking, encouraging them to see the inequalities around them** and 'do something about them!'
GCSE C6 Rates. Methods for determining rate. GCSE Science and Maths Drawing tangents	**3.1.9.1 Rate Equations** The rate of a chemical reaction is related to the concentration of reactants by a rate equation of the form: Rate = k[A]m [B]n where m and n are the orders of reaction with respect to reactants A and B and k is the rate constant. The orders m and n are restricted to the values 0, 1, and 2. The rate constant k varies with temperature as shown by the equation: k = Ae–Ea/RT where A is a constant, known as the Arrhenius constant, Ea is the activation energy and T is the temperature in K. Students should be able to: • define the terms order of reaction and rate constant • perform calculations using the rate equation • explain the qualitative effect of changes in temperature on the rate constant k • perform calculations using the equation k = Ae–Ea/RT • understand that the equation k = Ae–Ea/RT can be rearranged into the form ln k = –Ea /RT + ln A and know how to use this rearranged equation with experimental data to plot a straight line graph with slope –Ea/R These equations and the gas constant, R, will be given when required.	This unit strongly links to mathematical knowledge and concepts runs across the two subjects. Careers: chemical engineering and product production employment roles link to this unit. The new emphasis on green chemistry requires chemists to rethink chemistry and chemical production.

	Students use given rate data and deduce a rate equation, then use some of the data to calculate the rate constant including units. Rate equations could be given and students asked to calculate rate constant or rate. Students use a graph of concentration–time and calculate the rate constant of a zero-order reaction by determination of the gradient. **3.1.9.2 Determination of the Rate Equation** The rate equation is an experimentally determined relationship. The orders with respect to reactants can provide information about the mechanism of a reaction. Students should be able to: • use concentration–time graphs to deduce the rate of a reaction • use initial concentration–time data to deduce the initial rate of a reaction • use rate–concentration data or graphs to deduce the order (0, 1 or 2) with respect to a reactant • derive the rate equation for a reaction from the orders with respect to each of the reactants • use the orders with respect to reactants to provide information about the rate determining/limiting step of a reaction. **Required practical 7** Measuring the rate of reaction: • by an initial rate method • by a continuous monitoring method. Students could determine the order of reaction for a reactant in the iodine clock reaction. Students could be given data to plot and interpret in terms of order with respect to a reactant. Alternatively, students could just be given appropriate graphs and asked to derive order(s). Students calculate the rate constant of a zero-order reaction by determining the gradient of a concentration–time graph. Students plot concentration–time graphs from collected or supplied data and draw an appropriate best-fit curve. Students draw tangents to such curves to deduce rates at different times.	