YEAR 13 CHEMISTRY

MAGHULL HIGH SCHOOL – CURRICULUM MAP

Unit: **Thermodynamics and Rates** **LESSONS**	1. Born-Haber Cycles 2. Gibbs free-energy and entropy change 3. Rate equations	4. Determination of rate equation 5. Required practical 7 (initial rate method)	6. Required practical 7 (continuous rate method) 7. Equilibrium constant Kp for homogeneous systems
Knowledge & Skills Development	• Definitions of enthalpy of formation, ionisation energy, enthalpy of atomisation, bond enthalpy, electron affinity. • Construct Born–Haber cycles to calculate lattice enthalpies using these enthalpy changes • Construct Born–Haber cycles to calculate one of the other enthalpy changes • Compare lattice enthalpies from Born–Haber cycles with those from calculations based on a perfect ionic model to provide evidence for covalent character in ionic compounds. • define the term enthalpy of hydration • Perform calculations of an enthalpy change using these cycles. • Calculate entropy changes from absolute entropy values • Use the relationship $\Delta G = \Delta H – T\Delta S$ to determine how ΔG varies with temperature • Use the relationship $\Delta G = \Delta H – T\Delta S$ to determine the temperature at which a reaction becomes feasible • 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 $–Ea/R$	• 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 • Derive partial pressure from mole fraction and total pressure • Construct an expression for Kp for a homogeneous system in equilibrium • Perform calculations involving Kp • Predict the qualitative effects of changes in temperature and pressure on the position of equilibrium • Predict the qualitative effects of changes in temperature on the value of Kp • Understand that, whilst a catalyst can affect the rate of attainment of an equilibrium, it does not affect the value of the equilibrium constant.

Assessment / Feedback Opportunities	**Formative Assessment** Teacher questioning Quizzes Exam style questions	**Summative assessment** End of topic assessment Exam questions in future end of topic assessments to assess recall
Key Vocabulary	Independent Variable, Dependent Variable, Control Variables, Method, Conclusion, Precaution, Evaluation, Reliable, Precision, Valid, Anomaly, Describe, Explain, Compare, Analyse, Calculate, Suggest, Absolute, Uncertainty, Error Kinetics, concentration equilibria constant, pressure equilibria constant, borne-haber, enthalpy, lattice dissociation, ionisation energy, electron affinity, entropy, exothermic, endothermic	
Literacy/Reading Opportunities	Subject specific vocabulary introduced before reading of related texts Word etymology from Latin and Greek roots Reading of simple and complex sentences, paragraphs, articles Scientific writing including structuring methods, comparisons and evaluations	
Cross Curricular Themes	Numeracy/Maths – averages (means), reading scales, graph plotting, lines of best fit, using and rearranging equations, using scientific calculators, significant figures	
Personal Development (Including British Values, RSE, Citizenship)	None	
Career Opportunities	Chemical Engineering, Drug Development, Pharmacy, Forensic Scientist, Food Scientist, Environmental Consultant	