Yr13 Physics – Unit 8

MAGHULL HIGH SCHOOL – CURRICULUM MAP

	Sequence		
TOPIC (S) **Nuclear Physics**	1. Rutherford Scattering 2. α,β and γ Radiation 3. Inverse Square Law Required Practical 4. Radioactive Decay	5. Nuclear Instability 6. Nuclear Radius 7. Mass and energy	8. Induced Fission 9. Safety Aspects
Knowledge & Skills development	• How knowledge and understanding of the structure of the nucleus has changed over time • The method, observations and conclusions of Rutherford's scattering experiment • α,β and γ properties and experimental identification using simple absorption experiments; applications eg to relative hazards of exposure to humans • Background radiation; examples of its origins and experimental elimination from calculations • Inverse-square law for γ radiation: $I = k/x^2$ • Experimental verification of inverse-square law • Determination of half-life from graphical decay data including decay curves and log graphs. • Definitions and calculations involving half-life, decay constant, activity and number of nuclei • Decay modes of unstable nuclei including α, β+, β− and electron capture. • Graph of N against Z for stable nuclei and changes in N and Z caused by radioactive decay and representation in simple decay equations.	• Estimate of radius from closest approach of alpha particles and determination of radius from electron diffraction. • $R = R_0A^{1/3}$ derived from experimental data. • Simple calculations involving mass difference and binding energy • Simple calculations from nuclear masses of energy released in fission and fusion reactions • Graph of average binding energy per nucleon against nucleon number. • Fission induced by thermal neutrons; possibility of a chain reaction; critical mass. • The functions of the moderator, control rods, and coolant in a thermal nuclear reactor, as well as factors affecting the choice of materials for the moderator, control rods and coolant. Examples of materials used for these functions. • Appreciation of balance between risk and benefits in the development of nuclear power.	
Assessment / Feedback Opportunities	Exam questions – teacher assessed	Exam questions – self assessed	Extended writing task – teacher assessed	Deep marking of required practical in lab books	Topic Assessment
Cultural Capital	• •				
SMSC / Promoting British Values **(Democracy, Liberty, Rule of Law, Tolerance & Respect)**	• Appreciation of balance between risk and benefits in the development of nuclear power. • Appreciation that knowledge of the physics of nuclear energy allows society to use science to inform decision making.				

Reading opportunities	• Recommended Read: Radioactivity: A Very Short Introduction (Very Short Introductions) by Claudio Tuniz
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 Deflection, Decay, Nuclear, Nucleus, Orbit, Inverse, Exposure, Half-life, Decay Constant, Activity, Molar Mass, Decay Modes, Diffraction, Fusion, Fission, Mass Defect, Binding Energy, Moderator, Control Rods, Coolant
Digital Literacy	The use of excel to plot graphs and analyse data MSOffice365 Apps including SharePoint
Cross-Curricular Links	Numeracy/Maths – Logarithmic equations, averages (means), reading scales, graph plotting, lines of best fit, using and rearranging equations, using scientific calculators
Careers	Careers within the nuclear industry (nuclear power stations, nuclear submarines) Nuclear medicine, Medical Physicist