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**LANGDON PARK SIXTH FORM**

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| **Subject: Physics** | **Year: Y13** | **Topic: 3.8.1 Nuclear Energy** |

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| ***What and Why*** “How do we obtain energy from the atom? What holds the nucleus in the atom together? What are the uses of nuclear fission and nuclear fusion? What are the safety features in Nuclear Power Stations and how is radioactive waste disposed of safely?” |

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| **Key terms**  Alpha decay  Annihilation  Beta decay  Binding energy  Chain reaction  Control rods | Coolant  Critical mass  Electron capture  Energy  Half-life  Heat exchanger  Mass defect | Moderator  Nuclear fission  Nuclear fusion  Nuclear instability  Nucleon  Nucleus  Pair production | Radioactive waste  Reactor core  Spent fuel  Strong nuclear force  Thermal neutrons |

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| **Specification point** | **Pre-reading** | **Application and Assessment (date)** | **Home learning** | **Extension – Cultural Capital and Reading** |
| **3.8.1.5:** I can estimate the radius from closest approach of alpha particles and know typical values of the nuclear radius. I can derive from experimental data. I can derive the equation for nuclear density and describe the graph of intensity against angle for electron diffraction by a nucleus.  **3.8.1.6**: I can use and calculate the mass defect and binding energy of a nucleus.  I can define the atomic mass unit,  I can calculate from nuclear masses of energy released in fission and fusion reactions.  Draw and interpret graph of average binding energy per nucleon against nucleon number.  **3.8.1.7:** I can explain fission induced by thermal neutrons; possibility of a chain reaction; and critical mass. I know the functions of the moderator, control rods, and coolant in a thermal nuclear reactor.  **3.8.1.8:**  I am aware of the Fuel used, remote handling of fuel, shielding, emergency shut-down and radioactive storage. | Use the Oxford AQA A2 textbook p.202 to 214. Look at other textbooks in the library for alternative ideas, explanations and diagrams.  **YouTube Videos:**  (1) [Physics - Nuclear Fission reaction explained - Physics](https://www.youtube.com/watch?v=mBdVK4cqiFs)  (2) [What Happens To Nuclear Waste?](https://www.youtube.com/watch?v=imsRLscqTW0)    **Websites:**  <https://www.cyberphysics.co.uk/topics/nuclear/basic_revision.html>  <https://www.s-cool.co.uk/a-level/physics/nuclear-energy/revise-it/fusion-and-fission> | **Practicals:**  (1) Demonstration: Rutherford scattering  (2) Observe ionizing radiation in a cloud chamber  **Assessment**:  Minitest on Nuclear Energy (2th week Feb)  Multiple choice test on Radioactivity and Nuclear Energy (3rd week Feb) | (1) Recall the meanings of the key terms  (2) Sketch graphs with values for (i) Binding energy per nucleon v atomic mass and (ii) electron scattering | (1) What was the Manhattan  Project?  (2) What is the research on  possible fusion reactors?  **Reading:**  Manhattan Project: The Birth  of the Atomic Bomb in the  Words of Its Creators,  Eyewitnesses, and Historians  By Cynthia C. Kelly |

**Pre-assessment content review**

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| I feel secure in | I need to focus on | My action plan |

**Pre-assessment skills review**

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| I feel secure in | I need to focus on | My action plan |

**Post-assessment review**

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| Weaknesses in content knowledge | Skills I need to focus on | My action plan |
| Retest / review – teacher and student comment | | |

**Revision planning**

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| Spec point | Notes complete | Revision materials | Past paper Qs | Timed conditions |
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