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| **YEAR 2022-2023 Second TERM**  **‘An ambitious curriculum that meets the needs of all’**  **Medium Term Planning - Topic: Nuclear Physics** | |
| **Curriculum Intent** | **In addition to working further on objectives from Year 13 Nuclear Physics, pupils will be taught, following National Curriculum guidelines, the following this term:** |
| **Skills/Assessment Objective Links** |
| **Spiritual, moral, social, and cultural development** | **SMSC:**  Listening to each other and valuing each person’s contributions in discussions, working together in lessons to problem solve and achieve a shared goal. Learning about different scientists and learning how their understanding of the world evolved.  **PSHE/British Values:**  Working together in practical and problem-solving work. The practical work in this section requires two people to work together to take the measurements whilst holding the equipment in place.  **Skills Builder:** development of practical skills through the numerous practical activities. |
| **Numeracy** | Constant numerical development in every lesson. Measuring skills, graph skills, problem solving. Exam questions build on topics with mechanics components frequently brought in. |
| **Literacy** | **Vocabulary Tier 2: radius, nucleus, alpha, beta, gamma, decay constant, half life, stability, mass defect, fission and fusion, nuclear reactor.**  **Vocabulary Tier 3: isotropic, uniform, inverse square law, exponential decay, decay probability, N-Z graph, control rods, fuel rods, moderator, thermal neutrons.**  **Reading:** Reading of the booklet and questions. Students need to be able to read the methods for practical lessons and ensure they complete them in the right order, using the right equipment.  **Writing:** Students are exposed to a number of questions, both numerical and short and long written answers. Students need to be able to write in a concise way whilst using the key words.  **Oracy:** Class discussions are incredibly important in physics where students regularly participate in class discussion to discuss abstract concepts. Students need to be able to express their understanding of concepts and theories. |
| **Becoming future ready** | **Careers/Employability:**  Working in nuclear medicine, radioactivity, power stations. |
| **Adaptation** | Throughout this topic, quality first teaching will provide differentiation:  **By product:**  different learners are asked different questions, different level of detailed responses are expected and the level of scaffolding for the problem solving questions are varied.  **By resource:**   All booklets are the same, however, extra scaffolding and extension may be provided from the new Kerboodle resources.  **By Intervention**: by providing different levels of supervision and support  **By Progressive Questioning:** exploring pupils’ understanding through interactive dialogue.  **By Grouping:** according to prior attainment, gender, social preference, preferred learning style.  **By Task:**Pupils should be involved in the identification of targets which are meaningful to them and in the selection of an appropriate task from the given range.  **By Offering Optional Activities:** In class or as homework, to extend learning.  This QFT/SEND provision will be explicit within the lesson-by-lesson schemes of work. |
| **QFT/SEND Provision** |
| **Implementation**  **Curriculum Delivery** | * To be able to:  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | Recall prior knowledge of particle physics and atomic structure using exam questions. | | Recall the Rutherford model of the nucleus. | | To explain in detail the experiment to find the nucleus. | | To know the findings and conclusions of the experiment. | | To find the distance of closest approach of the alpha particles | | To know the description and uses of alpha, beta and gamma. | | To see the demo of the practical to reduce/stop alpha, beta and gamma. | | To know and calculate gamma rays following the inverse square law. | | To know and calculate activity. | | To know and apply the decay constant | | To define and apply half life. | | To use and rearrange the decay equation. | | To apply the decay equation to count rate, numbers and activity. | | To apply the decay equations to y = mx +c to the decay equation and analyse the graph. | | To know how carbon dating works and the issues around it. | | To know, draw and explain the N-Z Graph | | To complete the decay equations for alpha, beta and gamma. | | To explain nuclear excited states. | | To know and calculate the nuclear radius. | | To understand the use of radioisotopes in medicine. | | To calculate the density of a nucleus. | | To know and use the atomic mass unit, u. | | To define and calculate the nuclear binding energy. | | To draw and use the graph for BE per nucleon. | | To apply the nuclear binding energy and mass defect to exam questions. | | To explain the requirements for fusion. | | To explain how induced fission takes place. | | To describe and explain the components of a nuclear reactor. | | | |  |  * Red denotes interleaving; aspects of knowledge covered previously. |
| **Learning Outcomes (Knowledge)** |
| **Current learning to be developed in the future within:** |  |
| **Assessment** | Refer to assessment maps for formative and summative assessment opportunities. |
| **Impact** | Attainment and Progress – Refer to assessment results / data review documentation. |

