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| **YEAR 2022-2023 First TERM**  **‘An ambitious curriculum that meets the needs of all’**  **Medium Term Planning - Topic: Particle Physics** | |
| **Curriculum Intent** | **In addition to working further on objectives from Year 12 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: energy, mass, annihilation, conversion, energy levels,**  **Vocabulary Tier 3: positron, muon, neutrino, antineutrino, hadron, lepton, strong nuclear force, quarks, pair production.**  **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:**  The students learn about particle physicists which is also followed up with a trip to CERN. |
| **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:  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | ***Lesson Objectives*** | | 1. To know about the Plum Pudding Model & Rutherford Model | | 2. To understand and explain the SNF | | 3. To explain the properties of the atom. | |  | | 1. To know the masses and charges of protons, neutron and electrons. | | 2. To know the definition of an ion and isotope. | | 3. To know how to calculate specific charge. | |  | | 1. To know and explain the four fundamental forces. | | 2. To understand alpha and beta decay. | | 3. To know why the beta particles have a range of energies. | | 4. To know about particles and antiparticles. | | 5. To introduce the eV. | |  | | 1. To know the conversion from eV and MeV to J. | | 2. To know that the photon is a packet of wave energy. | | 3. To know and calculate pair production. | | 4. To know and calculate annihilation. | |  | | 1. To apply the knowledge of pair production and annihilation to calculations. | | 2. To define exchange particles. | | 3. To draw Feynman diagrams for beta decay. | |  | | 1. To know & draw the Feynman Diagram for all decays. | | 2. To introduce the Particle Zoo | |  | | 1. To know the properties of Hadrons, baryons and mesons. | | 2. To understand that hadrons are made of quarks. | | 3. To know which particles are strange | | 4. To know the properties of leptons. | |  | | 1. To know the Baryon, Lepton, Charge and Strangeness of all the particles. | | 2. To determine if the equations can satify the conservation laws. | | 3. To know when strangeness is conserved. | |  | | 1. To know the charges and baryon numbers of quarks. | | 2. To calculate the quark structure of particles given their properties. | |  | | 1. To know how to draw Feynman Diagrams using quarks. | | 2. To apply the quark information to exam questions. | |  | | 1. To know & describe how electrons move up and down in energy levels. | | 2. To know the energy levels are quoted in MeV and how to convert them to J. | |  * Red denotes interleaving; aspects of knowledge covered previously. |
| **Learning Outcomes (Knowledge)** |
| **Current learning to be developed in the future within:** | Students will explore this topic further in nuclear physics topic in Year 13. |
| **Assessment** | Refer to assessment maps for formative and summative assessment opportunities. |
| **Impact** | Attainment and Progress – Refer to assessment results / data review documentation. |

