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| **Before** | **Objectives** | **After** |
|  | **96 Use** the terms nucleon number (mass number) and proton number (atomic number) |  |
|  | **97 Describe** how large-angle alpha particle scattering gives evidence for a nuclear atom |  |
|  | **98 Recall** that electrons are released in the process of thermionic emission and **explain** how they can be accelerated by electric and magnetic fields |  |
|  | **99 Explain** the role of electric and magnetic fields in particle accelerators (linac and cyclotron) and detectors (general principles of ionisation and deflection only) |  |
|  | **100 Recognise** and **use** the expression *r* = *p*/*BQ* for a charged particle in a magnetic field |  |
|  | **101 Recall** and **use** the fact that charge, energy and momentum are always conserved in interactions between particles and hence interpret records of particle tracks |  |
|  | **102 Explain** why high energies are required to break particles into their constituents and to see fine structure |  |
|  | **103 Recognise** and **use** the expression Δ*E* = *c2*Δ*m* in situations involving the creation and annihilation of matter and  antimatter particles |  |
|  | **104 Use** the non-SI units MeV and GeV (energy) and MeV/c2, GeV/c2 (mass) and atomic mass unit u, and **convert** between these and SI units |  |
|  | **105** Be **aware** of relativistic effects and that these need to be taken into account at speeds near that of light (use of relativistic equations not required) |  |
|  | **106 Recall** that in the standard quark-lepton model each particle has a corresponding antiparticle, that baryons (eg neutrons and protons) are made from three quarks, and mesons (eg pions) from a quark and an antiquark, and that the symmetry of the model predicted the top and bottom quark |  |
|  | **107 Write** and **interpret** equations using standard nuclear notation and standard particle symbols (eg π+, e-) |  |
|  | **108 Use** de Broglie’s wave equation λ= *h*/*p* |  |