# Prescribed Focus Areas

| Big Idea | PFA's |
|---|---|
| Seaching for a better model | • Nature<br>• History |
| The birth of Quantum Physics | • History<br>• Nature |
| Nuclear Physics | • Implications for society and environment<br>• Applications and uses<br>• History |
| Real world applications | • Applications and uses<br>• Current issues, R&D<br>• Implications for society and environment |

# Big Idea: 1. Searching for a better model

**Statement:** Problems with the Rutherford model of the atom led to the search for a model that would better explain the observed phenomena

| Student activity | Involving knowledge of |
|---|---|
| Investigate the H Spectrum (R1) | • Structure of the Rutherford model (L1) |
| Illustrate Bohr's explanation of the Balmer series (R2) | • Significance of H spectrum in development of Bohr's model (L2)<br>• Bohr's Postulates (L3) |
| Use Bohr's equation (R3) | • Plank's quantised energy (L4)<br>• Development of mathematical model (L5) |
| Look at difficulties with the Rutherford-Bohr model (R4) | • Limitations of Bohr's model (L6) |

## Big Idea: 2. The birth of Quantum Physics

**Statement:** The limitations of classical physics gave birth to quantum physics.

| Student activity | Involving knowledge of |
|---|---|
| Solve problems and analyse information using de broglie's wave equation (R1) | • de Broglie's wave-particle duality (L1)<br>• Davisson and Germer's confirmation of de Broglie's proposal (L3)<br>• De Broglie's explanation for the stability of electron orbits in Bohr's atom (L4) |
| Investigate Heisenberg, Pauli contribution to atomic theory (R2) | • Heisenberg's uncertainty principle<br>• Pauli's spin |
| Do Electron diffraction and Taylors experiement | • Interference occurs between diffracted waves (L2) |

# Big Idea: 3. Nuclear Physics

**Statement:** The work of Chadwick and Fermi in producing artificial transmutations led to practical applications of nuclear physics

| Student activity | Involving knowledge of |
|---|---|
| Observe radiation using a cloud chamber or similar device (R1) | • Components of the nucleus (L1)<br>• Chadwick's discovery of neutron, importance of conservation laws (L2) |
| | • Contributions of electrostatic and gravitational forces between nucleons (L7)<br>• Need for the strong force (L8) |
| Do mass defect and energy calculations for transmutation and fission reactions (R2) | • What is transmutation (L3)<br>• Transmutations due to natural radioactivity (L4)<br>• Need for a neutrino, Pauli's prediction (L6) |
| | • Mass defect, Eintsein's equivalence principle (L9) |
| | • Fermi's observation of fission (L5)<br>• Fermi's demonstration of controlled chain reaction (L10)<br>• Requirments for controlled and uncontrolled chain reactions (L11) |

## Big Idea: 4. Real World Applications

**Statement:** An understanding of the nucleus has led to large science projects and many applications

| Student activity | Involving knowledge of |
|---|---|
| Assess the significance of the Manhattan project (R1) | • Basic principles of fission reactor (L1) |
| Look at isotope use in medicine, agriculture & engineering (R2) | • Medical and industrial application of isotopes (L2) |
| | • Standard model (L5)<br>• Particle accelerators to investigate the structure of matter (L4) |
| | • Neutron scattering as a probe (L3)<br>• Paul's helium microscope<br>• String theory<br>• Nanotechnology |