|  |
| --- |
| **Lesson Number: 26.9** |
| **Lesson Title: Nuclear Radius** |
| **Specification Reference** | **3.8.1.5** |
| **Learning Objectives** |
| Estimate of radius from closest approach of alpha particles and determination of radius from electron diffraction.Knowledge of typical values for nuclear radius.Students will need to be familiar with the Coulomb equation for the closest approach estimate.Dependence of radius on nucleon number:  derived from experimental data.Interpretation of equation as evidence for constant density of nuclear material.Calculation of nuclear density.Students should be familiar with the graph of intensity against angle for electron diffraction by a nucleus. |
| **Opportunities for Assessment** |
| Question page 467 |
| **Starter:** | Slide #1 introduces the topic and is an interesting discussion point – can we “see” individual atoms? What are their sizes compared to the wavelength of visible light? |
| **Main:** | Slide #2 explains how Coulomb’s law can be used to estimate the diameter of a nucleusSlides #3 - #4 link back to the work in Year 1 on diffraction and de Broglie waves and some time should be spent recapping these topics.Slide #5 simply states the formula to use for calculating radius from nuclear angle; a full derivation of this is given in the course book on page 467 – The use of a computer room and spreadsheet here can make an interesting lesson for pupils to explore this relationshipSlide #6 explains atomic density and why it is a constant for all atoms; links nicely to astrophysics and a common calculation to show the human race can fit within a sugar cube |
| **Plenary:** | Slide #7 is a summary |

|  |  |
| --- | --- |
| **Homework:** | Question page 467; research Neutron stars |
| **Differentiation / Extension / S&C** |
| Use of spreadsheet to find the correlation between nuclear number and nuclear radius |
| **Numeracy / Literacy** | **SMSC / Fundamental British Values** |
| Formula use and derivation | N/A |
| **RESOURCES:** |
| Optional – Computer room |
| **Risk Assessment** e.g. CLEAPSS card reference |
| None |
| **Working Scientifically (HSW)** |
| N/A |

Pictures courtesy of:

Slide #1 – Pixabay (Public Domain)

Slide #4 – Wikipedia (Public Domain)

Slide #6 - By Uwe Hermann (http://hermann-uwe.de/photoblog/sugar) [CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0)], via Wikimedia Commons