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| **Lesson Number: 27.2** | | |
| **Lesson Title: Binding energy** | | |
| **Specification Reference** | | **3.8.1.6** |
| **Learning Objectives** | | |
| Appreciation that applies to all energy changes,  Simple calculations involving mass difference and binding energy.  Atomic mass unit, u  Conversion of units; 1 u = 931.5 MeV  Graph of average binding energy per nucleon against nucleon number.  Students may be expected to identify, on the plot, the regions where nuclei will release energy when undergoing fission/fusion | | |
| **Opportunities for Assessment** | | |
| Questions page 477 | | |
| **Starter:** | Slide #1 is looking to see if students can come up with the idea of binding energy by themselves | |
| **Main:** | Slide #2 outlines another profound idea that 1+1+1≠3 when putting sub-atomic particles together  Slide #3 shows how mass deficit can be calculated  Slide #4 shows the mass spectrometer that students should be familiar with – an extension exercise can be to calculate m/q for several isotopes  Slide #5 defines the atomic mass unit – A common question as to why C12 was used is because using Hydrogen is difficult due to the problems separating it from its isotope deuterium  Slide #6 introduces binding energy and stability – A common mistake for students is to forget that this is binding energy **per nucleon** and they don’t divide by the nucleon number | |
| **Plenary:** | Slide #7 is a summary | |

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| **Homework:** | Questions page 477; research binding energy and link to star life cycles | |
| **Differentiation / Extension / S&C** | | |
| Quantum tunnelling discussion and quantum effects | | |
| **Numeracy / Literacy** | | **SMSC / Fundamental British Values** |
| Use of Einstein’s formula and application to binding energy  Conversion of units to MeV | | N/A |
| **RESOURCES:** | | |
| None | | |
| **Risk Assessment** e.g. CLEAPSS card reference | | |
| None | | |
| **Working Scientifically (HSW)** | | |
| α particle tunnelling, page 476 | | |

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Slide #1 – Pixabay (Public Domain)

Slide #4 - By Devon Fyson [Public domain or Public domain], via Wikimedia Commons

Slide #6 - https://commons.wikimedia.org/wiki/File:Binding\_energy\_curve\_-\_common\_isotopes.svg (Public Domain licence)