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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, uConversion of units; 1 u = 931.5 MeVGraph 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 togetherSlide #3 shows how mass deficit can be calculatedSlide #4 shows the mass spectrometer that students should be familiar with – an extension exercise can be to calculate m/q for several isotopesSlide #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 deuteriumSlide #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 energyConversion 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)