

22.01 - Recitation #2

- Please grab a snack, get up off the sofa, look at something that isn't a screen for 5 mins!
- Please turn on your video (if possible) and mute yourself.
- These slides are at:
bit.ly/2201Rec2
- PollEv.com/charleshirst189

Binding energy, Excess Mass, Semi Empirical Mass Formula. Any questions?

Top

8



no <3

2



Why do we need to write masses up to 8 significant digits, if the amu-to-MeV/c² coefficient is up to 6 significant digits?

New

2

Why do we need to write masses up to 8 significant digits, if the amu-to-MeV/c² coefficient is up to 6 significant digits?

8

no <3

Outline + Intended Learning Outcomes (ILOs)

Review equations:

Energy = matter

Excess mass

Binding energy

- Be able to calculate the excess mass and binding energy for a chosen isotope.

Use equations:

Excess mass

Binding energy

Review equations

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Explaining Terms

• <u>Atomic mass</u>	1 amu	1.660540×10^{-27} kg	1.000 u	931.49 MeV/c ²
	neutron	1.674929×10^{-27} kg	1.008664 u	939.57 MeV/c ²
	proton	1.672623×10^{-27} kg	1.007276 u	938.28 MeV/c ²
• <u>Excess mass</u>	electron	9.109390×10^{-31} kg	0.00054858 u	0.511 MeV/c ²

1 AMU = 931.49 MeV

$$\Delta = M - A$$

What does “excess mass” really mean?

- Binding energy

$$B(A, Z) \equiv [ZM_H + NM_n - M(A, Z)]c^2$$

Semi-Empirical Mass Formula

$$B(A, Z) = a_v A - a_s A^{2/3} - a_c \frac{Z(Z-1)}{A^{1/3}} - a_a \frac{(N-Z)^2}{A} + \delta \quad (4.10)$$

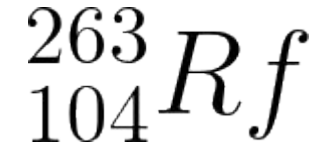
a_v	a_s	a_c	a_a	a_p	$\delta = a_p/\sqrt{A}$	even-even nuclei
					$= 0$	even-odd, odd-even nuclei
16	18	0.72	23.5	11	$= -a_p/\sqrt{A}$	odd-odd nuclei

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Using equations x2



What is the excess mass energy?

Rf-263 mass = 263.112540 ± 0.000198 amu

Neutron mass = 1.008665 amu

Proton mass = 1.007276 amu

What is the binding energy?

Conversion factor = $931.49 \text{ MeV}/c^2$

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Questions?

Piazza

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22.01 Introduction to Nuclear Engineering and Ionizing Radiation

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