● 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?

<table>
<thead>
<tr>
<th>Top</th>
<th>8</th>
<th>no &lt;3</th>
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<tbody>
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<td>2</td>
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Outline + Intended Learning Outcomes (ILOs)

Review equations:

Energy = matter
Excess mass
Binding energy

Use equations:

Excess mass
Binding energy

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

Switch to Ipad...
Explaining Terms

- **Atomic mass**
  
  - 1 amu: $1.660540 \times 10^{-27}$ kg, 1.000 u, 931.49 MeV/c²
  
  - Neutron: $1.674929 \times 10^{-27}$ kg, 1.008664 u, 939.57 MeV/c²
  
  - Proton: $1.672623 \times 10^{-27}$ kg, 1.007276 u, 938.28 MeV/c²
  
  - Electron: $9.109390 \times 10^{-31}$ kg, 0.00054858 u, 0.511 MeV/c²

- **Excess mass**

  \[ \Delta = M - A \]

  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

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

\[ \delta = \frac{a_p}{\sqrt{A}} \]

- even-even nuclei
- even-odd, odd-even nuclei

- odd-odd nuclei

\[
\begin{array}{ccccc}
\text{a}_v & \text{a}_s & \text{a}_c & \text{a}_a & \text{a}_p \\
16 & 18 & 0.72 & 23.5 & 11 \text{ MeV} \\
\end{array}
\]
Switch to Ipad...
Using equations $x^2$  

What is the excess mass energy?

What is the binding energy?

$\text{Rf-263 mass} = 263.112540 \pm 0.000198 \text{ amu}$

$\text{Neutron mass} = 1.008665 \text{ amu}$

$\text{Proton mass} = 1.007276 \text{ amu}$

$\text{Conversion factor} = 931.49 \text{ MeV/c}^2$
Outline + Intended Learning Outcomes (ILOs)

Review equations:

- Energy = matter
- Excess mass
- Binding energy

Use equations:

- Excess mass
- Binding energy

- Be able to calculate the excess mass and binding energy for a chosen isotope.
22.01 - Recitation #2

Questions?

Piazza

Please grab a snack, get up off the sofa, look at something that isn’t a screen for ~X mins!