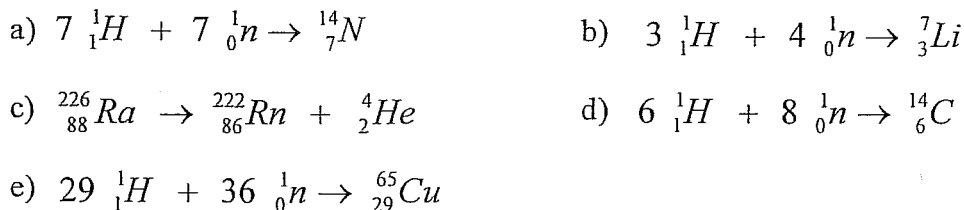


## Energy/Mass and half-Life Problems

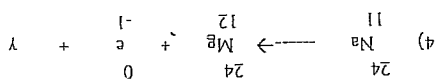
Given:	mass (H) = 1.00728	mass (Li-7) = 7.01601
	mass (n) = 1.00867	mass (N-14) = 14.00307
	mass (He) = 4.00150	mass (Rn-222) = 222.01753
	mass (C-14) = 14.08539	mass (Ra-226) = 226.02536
	mass (Cu-65) = 64.955	

1. Calculate the binding energy for each of the following reactions:



2. Textbook Questions:

3. Oxygen-20 has a half-life of 14 s. If we start with a 64 g sample, what mass of oxygen-20 will remain after 56 seconds?
4. Cobalt-60 is used in cancer treatment. If three-quarters of a sample of cobalt-60 decays in 10.5 years, what is the half-life of the isotope?
  
17. Why are radioactive isotopes with short half-lives unlikely to occur naturally?
  
25. Iodine-132 is used in the treatment of thyroid conditions. It has a half-life of 2.33 hours. How much of an 8.0 mg sample of this isotope would remain after 9.32 hours?
26. The half-life of fermium-253 is 4.5 days. If you start with 1.00 g of this isotope, how much would remain after 45 days?
  
3. The half-life of iodine-131 is 8 days. If you have 1 mol of I-131 atoms today, how many atoms will remain in the sample in:
  - a) 8 days from now
  - b) 16 days from now
  
4. Sodium-24 decays by the loss of beta particles and gamma rays. Write the equation for this transmutation process.



- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>3) 1) <math>3.01 \times 10^{23}</math> atoms</li> <li>11) <math>1.50 \times 10^{23}</math> atoms</li> </ol> | <ol style="list-style-type: none"> <li>e) <math>5.11 \times 10^{13}</math> J</li> <li>d) <math>2.49 \times 10^{12}</math> J</li> <li>c) <math>5.70 \times 10^{11}</math> J</li> <li>b) <math>3.65 \times 10^{12}</math> J</li> <li>a) <math>9.77 \times 10^{12}</math> J</li> </ol> |
| <ol style="list-style-type: none"> <li>25. 0.5 mg</li> <li>26. <math>9.8 \times 10^{-4}</math> grams</li> </ol>                                    | <ol style="list-style-type: none"> <li>3. 4 g</li> <li>4. 5.25 years</li> <li>17. Radioactive isotopes with very short half-lives are not found in nature because they have already decayed long ago.</li> </ol>  |