

Read pp. 701-702 in your text

Practice Problems: Use data on Chart B when needed!!!! $1 \text{ MeV} = 9.6483 \times 10^{10} \text{ J/mol}$

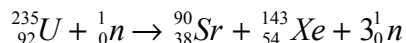
- 1) Suppose ${}^7_3\text{Li}$ is made from its separate p, n and e.
 - a) Write out the balanced equation for the reaction.
 - b) Calculate the initial mass of the separate p, n and e, in amu. (Use masses on Chart B.)
 - c) Calculate the mass defect for the formation of one atom of ${}^7_3\text{Li}$. Given: mass of ${}^7_3\text{Li} = 7.001600 \text{ amu}$
 - d) Calculate the energy released, in J/atom, when one atom of ${}^7_3\text{Li}$ is formed. (First, find mass in kg.)
 - e) Calculate the energy released, in J/mol, when a mole of ${}^7_3\text{Li}$ is formed.
 - f) Calculate the mass defect of ${}^7_3\text{Li}$ in MeV/nucleon (use the conversion factor above).

- 2) Suppose this fusion reaction takes place to form one atom of ${}^4_2\text{He}$. **Rxn:** ${}^2_1\text{H} + {}^3_1\text{H} \rightarrow {}^4_2\text{He} + {}^1_0\text{n}$
 - a) Calculate the initial mass (reactants) for the reaction above, in amu.
Givens: mass of ${}^2_1\text{H} = 2.01410 \text{ amu}$, mass of ${}^3_1\text{H} = 3.01605 \text{ amu}$,
 - b) Calculate the final mass for the reaction above. mass of ${}^4_2\text{He} = 4.00260 \text{ amu}$ (${}^1_0\text{n}$ mass is on Chart B)
 - c) Calculate the mass defect for the reaction above, in amu.

d) Calculate the amount of energy produced by this reaction, in J/atom of ${}^4_2\text{He}$. (Remember- you need mass defect in kg.)

e) Calculate the energy produced, in MJ/mol of ${}^4_2\text{He}$.

3) Given the fission of one atom of ${}^{235}_{92}\text{U}$ takes place as shown here:



Givens: mass of ${}^{235}_{92}\text{U} = 235.0439 \text{ amu}$ mass of ${}^{90}_{38}\text{Sr} = 89.8869 \text{ amu}$ mass of ${}^{143}_{54}\text{Xe} = 142.9351 \text{ amu}$

a) Calculate the mass defect for the above reaction, in amu and kg

b) Calculate the energy released for one mol of ${}^{235}_{92}\text{U}$, in J/mol.

c) Calculate the energy released for one kg of ${}^{235}_{92}\text{U}$. (In comparison, 1 kg of TNT releases $4.184 \times 10^6 \text{ J}$)

4) Fe-56 is one of the most stable nuclei known. The mass of one atom of ${}^{56}_{26}\text{Fe}$ is 55.934939 amu.

a) Determine the mass defect for the formation of one atom of ${}^{56}_{26}\text{Fe}$, in amu.

b) Determine the energy released by the formation of one mol of ${}^{56}_{26}\text{Fe}$, in J/mol

c) Determine the energy released (mass defect) by formation of ${}^{56}_{26}\text{Fe}$, in MeV/nucleon

Answers: 1b) 7.0581338 amu; 1c) 0.0565338 amu 1d) 8.45 $\times 10^{-12}$ J/atom; 1e) 5.09 $\times 10^{12}$ J/mol; 1f) 7.53 MeV/nucleon; 2a) 5.03015 amu; 2b) 5.011265 amu; 1c) 0.018885 amu; 1d) 2.82 $\times 10^{-12}$ J/atom; 1e) 1.70 $\times 10^{12}$ J/mol; 3a) 0.20457 amu; 3.3969 $\times 10^{-28}$ kg; 3b) 1.84 $\times 10^{13}$ J/mol; 3c) 7.83 $\times 10^{13}$ J/kg; 4a) 0.528451 amu; 4b) 4.76 $\times 10^{13}$ J/mol; 4c) 8.80 MeV/nucleon