CHE 112 - Homework - Ch 20b

OER 20.1 **Nuclear Stability** Score: _____/35

Name: _____ Date: _____

[3 pt] 1. Explain how protons can exist in the nucleus despite the obvious proton-proton repulsion that should occur because they have the same charge.

[6 pt] 2. What is meant by the term "band of stability" (or "belt of stability")? Why do nuclide's that are "neutron-rich" (above the band) emit β particles while nuclide's that are "neutron-poor" (below the band) emit α particles, positrons or undergo electron capture. Use nuclear reaction to illustrate how each type of decay works.

(a) Band of Stability:

(b) Neutron Rich Decay (include an example for β-emission):

(c) Neutron Poor Decay (include an example for α-emission, positron-emission and electron capture):

[4 pt] 3. Of the two isotopes of Iodine, ^{136}I and ^{122}I, one decays by β emission and one by positron emission. Which is which? Explain. Additionally write a complete and balanced reaction for each decay.

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[8 pt] 4. Write the balanced nuclear equations for the following processes:

(a) Alpha emission of ^{157}Re

(b) Electron capture of ^{138}Sm

(c) Beta emission of ^{188}W

(d) Positron emission of ^{165}Ta

[4 pt] 5. Are the following reactions examples of: Alpha emission, Electron capture, Beta emission, or Positron emission?

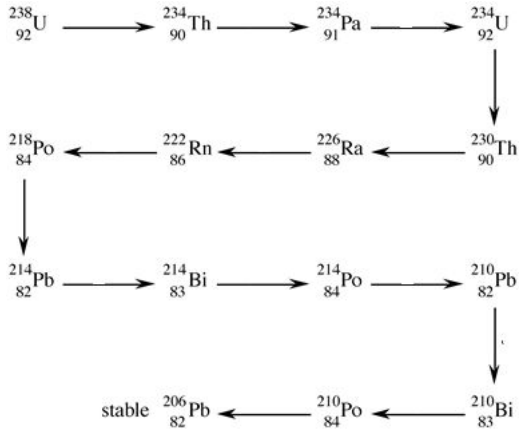
(a) $^{157}\text{Eu} \longrightarrow {}^{157}\text{Gd} + {}^{0}_{-1}\text{e}$ 5(a) _____

(b) $^{126}\text{Ba} + {}^{0}_{-1}\text{e} \longrightarrow {}^{126}\text{Cs}$ 5(b) _____

(c) $^{146}\text{Sm} \longrightarrow {}^{142}\text{Nd} + {}^{4}_{2}\text{He}$ 5(c) _____

(d) $^{125}\text{Ba} \longrightarrow {}^{125}\text{Cs} + {}^{0}_{1}\text{e}$ 5(d) _____

[5 pt] 6. Identify the decay process that occurred in each of the following steps in the decay chain of Uranium.



[5 pt] 7. Radon-222 decays via 3 alpha emissions and 2 beta emissions. Draw the decay chain (just show the major elements produced (not the emission products).