DAY 26

Homework Assignment

1. Identify the following nuclei and write out their symbol using proper notation:

   a) Z = 74, N = 108

   b) 42 protons, 98 nucleons

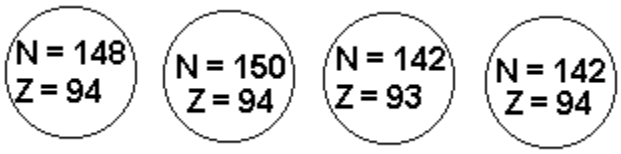
   c) 20 neutrons, 19 protons

2. How many protons and neutrons are in the following nuclei? Give their chemical name (i.e. “Hydrogen”, “Iron”, etc.)

   a) $^{84}_{36}\mathrm{Kr}$

   b) $^{48}_{22}\mathrm{Ti}$

3. Which of the nuclei pictured below is not Plutonium? Explain your answer.



4. Plot each on the stability chart of N vs. Z. Which would you expect to be unstable and for what reason?

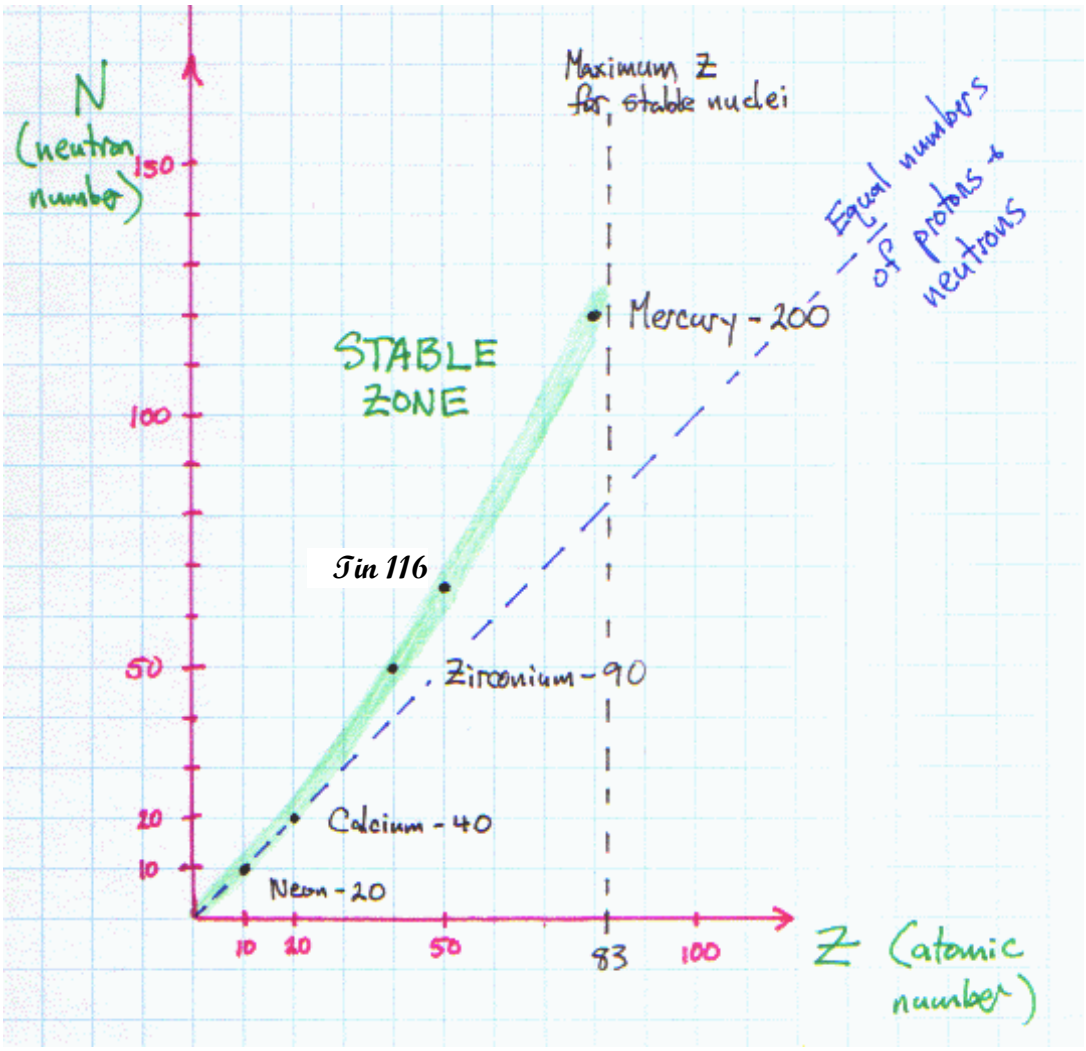
   a) $^{127}_{53}\mathrm{I}$

   b) $^{14}_{8}\mathrm{O}$

   c) $^{15}_{6}\mathrm{C}$

   d) $^{228}_{88}\mathrm{Ra}$

   e) $^{28}_{14}\mathrm{Si}$



5. Carbon-14 undergoes β^- decay. Write out the reaction equation and determine the daughter that is formed.

6. Helium-5 decays by ejecting a neutron. Write out the reaction for this, and discuss whether this might be considered a form of α decay.

7. Sodium-23 is stable. Sodium-22 and Sodium-24 are not. What types of decay would you expect Sodium-22 and Sodium-24 to undergo, and why?

8. Plutonium-239 undergoes α decay, followed by the emission of a γ-ray. Write out the reaction(s) for this.

9. Carbon-11 decays via either ε or β^+ decay. Write out the reaction equations for both cases.

10. A radioactive tracer with a half-life of 3 hours is injected into a patient. What percentage of the original dosage will still be in the patient's blood stream 24 hours later?

11. Uranium-238 has a half life of 4.5 billion years. If the Earth was formed 4 billion years ago and the sun will die and incinerate the Earth 6 billion years from now, how much of the Uranium that was originally in the Earth will be gone by the time the Earth is incinerated?

12. According to the topic summary, you can "find the relationship between λ and $T_{1/2}$". Do just that -- derive the equation

$$\lambda = \frac{\ln 2}{T_{1/2}}$$