Homework #9 Physics 107
Ch. 15 C: 2, 4, 14, 24 11/22/06
P: 2, 3

C2. The electric force will be stronger than the strong force, because the nuclei of atoms in a solid can be about an atom's distance apart - if the strong force were stronger, then the atoms in a solid would be pulled together and wouldn't be arranged in a regular structure (as we know they are).

4. From the periodic table, we know Sr has 38 protons and H has 1 proton. To find the number of neutrons we have to consider the number attatched to the element symbol. That number tells the total number of protons plus neutrons in the nucleus. So for ^{90}Sr there are $90 - 38 = 52$ neutrons and for ^{3}H there are $3 - 1 = 2$ neutrons.

14. No. A hydrogen nucleus only has one proton, so it does not have enough protons to emit an alpha particle, which contains 2 protons.

24. 12,000 yrs. is two half-lives of ^{14}C. Each half life decreases the amount of radioactive material by half. after 1 half-life: 0.5 (1g) left
after 2 half-lives: 0.5 (0.5 (1g)) = 0.25g left

P 2. Looking at the graph in fig 15.10, we see that it takes about 4.25 half-lives to get to 5% by estimating where 5% crosses the blue line. The horizontal axis is written for ^{14}C, so we have to use the table to find the half-life for ^{131}I. In the table it states that ^{131}I has a half-life of 8 days. So it will take $(4.25)(8\text{ days}) \approx 34$ days until only 5% remains.

4. The ratio is only 70% of its original value in living organisms. This means 70% of the original radioactive material in the cloth remains. Using figure 14.10, we find that for ^{14}C it takes about half a half-life to get to 70% or about 3,000 yrs.

Or (depending on if you got the assignment in class or online)

3. According to fig 15.10, the radioactivity drops to 20% of its original value after about 2.25 half-lives. Table 15.1 says that the half-life of ^{14}C is about 6000 yrs, so the age of the ax handle is about $6000 \times 2.25 = 13,500$ yrs.