

1. Consider aluminum (Al), molybdenum (Mo), tungsten (W), and lead (Pb) atoms.
 Their atomic masses are:
 Al: 25.986892 amu
 Mo: 97.905408amu
 W: 183.950933 amu
 Pb: 203.973029 amu
 - (i) Find the atomic mass number and number of neutrons for each atom.
 - (ii) Find the number of electrons per gram for each element.
 - (iii) Calculate the binding energy per nucleon for each nuclei.
 - (iv) Find the principal quantum number for the outer most electron in each atom for the ground state.
 - (v) Calculate the $K\alpha_1$, $K\alpha_2$, $K\beta_1$, $K\beta_2$, $L\alpha_1$, $L\alpha_2$, $L\beta_1$, $L\beta_2$ for each of the atoms.
 - (vi) Calculate the wavelengths and frequencies of the $K\alpha_1$ and $L\alpha_1$ fluorescence photons.
 - (vii) What are the approximate radii for each nucleus?
2. What are the four different forces in nature? Which of the forces is responsible for holding the nucleons together in a nucleus?
3. What combination of quarks make up a proton and what combination of quarks make up a neutron?
4. For an energy of 1 MeV, what is the equivalent mass?
5. Calculate the number of atoms in 1 g of ^{241}Am . What is the activity of 1g of ^{241}Am (half-life=432.7years)?
6. How much time is required before a 10 mCi sample of $^{99\text{m}}\text{Tc}$ ($T_{1/2}=6.0$ hours) and a 25 mCi sample of $^{113\text{m}}\text{In}$ ($T_{1/2}=1.7$ hours) possess equal activities?
7. Is the atomic energy level transition $N_{II} \rightarrow L_{II}$ allowed? Explain.