

1. (5 pts) What physically generates each of the five terms in the liquid drop model?
2. (5 pts) Use ideas from the shell model to explain why ${}^{42}_{20}\text{Ca}$ and ${}^{44}_{20}\text{Ca}$ are very stable.
3. (5 pts) Use ideas from the shell model to explain why ${}^{40}_{20}\text{Ca}$ is *extremely* stable.
4. (5 pts) Use ideas from the shell model to explain why ${}^{48}_{20}\text{Ca}$ is stable even though it is fairly neutron rich and therefore falls a bit below the island of stability.
5. (5 pts) Use ideas from the shell model to explain why ${}^{41}_{20}\text{Ca}$ is not stable even though the isotopes on either side, ${}^{40}_{20}\text{Ca}$ and ${}^{42}_{20}\text{Ca}$, *are* stable.
6. (5 pts) The exchange particles for the weak force are the W^\pm particles (which have a mass of $81 \text{ GeV}/c^2$) and the Z^0 particle (which has a mass of $91 \text{ GeV}/c^2$). What would you expect the range of the weak force to be (order of magnitude)?

Extra problems I recommend you work (not to be turned in)

- Calculate the binding energy predicted by the liquid drop model for Iron-56.
- The theoretical exchange particle for gravity is known as the graviton. Real gravitons have never been detected. If you did detect one, what mass should it have?