

Physics 2110 -- Problem Set #1

1. The density of solid lithium is 534 kg/m^3 . Look up the atomic mass number of naturally occurring lithium in a periodic table (such as the end page of your text). Calculate the average atomic spacing in solid lithium to three significant figures.
2. The density of solid copper is 8900 kg/m^3 . Look up the atomic mass number of naturally occurring copper. Calculate the average atomic spacing in solid copper to three significant figures.
3. The density of solid gold is $19,300 \text{ kg/m}^3$. Look up the atomic mass number of naturally occurring gold. Calculate the average atomic spacing in solid gold to three significant figures.
4. The density of liquid mercury is $13,600 \text{ kg/m}^3$. Look up the atomic mass number of naturally occurring mercury. Calculate the average atomic spacing in liquid mercury to three significant figures.
5. The density of liquid ethyl alcohol is 806 kg/m^3 . An ethyl alcohol molecule contains 2 carbons, 6 hydrogens, and 1 oxygen. What is the average mass number per atom of ethyl alcohol? Calculate the average atomic spacing in liquid ethyl alcohol to three significant figures.
6. The five previous problems represent atomic spacings in a broad range of solids and liquids. If you were asked to make a broad generalization about the atomic spacing in solids and liquids from these results what would you say?
7. Solids and liquids are very difficult to compress. The atoms are packed in them about as tightly as is possible. Atomic spacings for solids and liquids, therefore, are approximately the diameters of the respective atoms. Gases, on the other hand, can be compressed quite easily. The density of helium at room temperature and atmospheric pressure is 0.179 kg/m^3 . Calculate the atomic spacing in gaseous helium. This result is typical of many gases. If you were asked to make a generalization from these data, comparing atomic spacings in solids and liquids versus gases, what would you say?