Open Ended Problem #2
The Core
Group work okay, Due 9/20/23 at beginning of class
(Don't be afraid to "Google" for reasonable assumptions; just provide references!)

Unobtanium

I'm fairly certain that this movie won awards for the worst "move science" ever. The plot and characters didn't help it much. Either way, this movie involves people traveling to the core of the earth to avert disaster, and they do so by using "unobtainium" to build a heat-impervious vehicle. This material is supposedly a tungsten/titanium (WTi) matrix that includes crystals inserted throughout. Assuming the scientist's claims are real regarding the heat absorbing properties, this would be amazing (read that as unrealistic) stuff! Let's evaluate some properties, shall we? We won't worry about the crystals, but I want you to evaluate the matrix. What is the likely unit cell type for this matrix? (keep in mind similar unit cells form matrixes much more easily than different unit cells) What would be the APF for the Ti and W crystals? What would you predict the overall density to be?

1) What is this problem actually asking for? What is the final value you are being asked to find?

2) Draw a sketch that indicates the actual problem.

3) a) What physical laws apply to this problem?
   b) Indicate equations, correlations, and/or formulae that can model these laws.
   c) What are the potential limitations of these equations?

4) What assumptions should be made to utilize the equations/correlations/formulae listed in part 3b?
   a) List ALL the assumptions that you need to in order to solve the problem.

   b) Justify your assumptions (**references**, reasoning, judgment, common sense, etc.)

5) What are the physical properties (list assumed or referenced values) used in this problem?

6) What is the crystal structure of this WTi matrix? What is the APF for each metal? What is the density of this matrix material?

7) Verify your answer... Does it look reasonable? Anything odd about the calculation?
   a) How does the density of this crystal compare with other crystal densities?
   b) How does this APF compare with other metal densities?
   c) What would embedded crystals actually do to this matrix?
   d) Finally, knowing what you do about bonds, can you think of a way that increased energy would stabilize the bond? How likely is this?