Open Ended Problem #5

Captain America

Group work okay, Due 10/18/23 at beginning of class

(Don't be afraid to "Google" for reasonable assumptions; just provide references!)

Hell hath no fury…

I don't even think I need to finish that quote… in fact, after watching this clip last night with no context, my wife said "so what did he do to make her so mad?" Anyway, this clip provides us with most of the information we have on vibranium, the most commonly referenced supermetal in the universe. Lucky for you as material scientists, you have most of what you need to define the characteristics of vibranium. Please define, characterize, and quantify the thermophysical and tensile/compressive properties of vibranium. Be careful to use first the information provided in this scene, and then make APPROPRIATE assumptions (justified by references where needed) and computations for the rest of the needed information.

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

2) Draw sketches or plots that indicate the actual problem and vibranium properties of interest.

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 are the thermophysical and tensile/compressive properties of vibranium?

7) Verify your answer... Does it look reasonable? Anything odd about the calculation?

a) How does the answer change if one of your key assumptions in part 4 a is modified by +/- 50% or diametrically opposed? (if it's not a quantified assumption, change it so that is considerably different… e.g. if you assumed that the bullets took the vibranium to the edge of elastic deformation, now assume that they only represented ½ of the elastic deformation region)
b) Does this change have a large impact on the properties of vibranium?
c) Chose the second most important (in your view) assumption from 4 a and either oppose this assumption or change this assumption by +/- 50%?
d) What are some realistic challenges or problems that exist for vibranium in terms of its stated behavior by Stark versus your calculations?