Open Ended Problem #2
Cold Fusion
Group work okay, Due 2/5/19 at beginning of class
(Don't be afraid to "Google" good assumptions!)

The Saint Clip

Dr. Emma Russell is a resident expert in cold fusion, and at the end of the movie "The Saint", her work pays off, and Russia is saved by the miraculous demonstration of absurd amounts of power coming from cold fusion. In this particular scene, she makes a couple of bold statements and lofty claims regarding cold fusion (i.e. the low temperature fusion of 2 deuterium nuclei at low temperature). Primarily, she claims that 1) a cubic mile of seawater contains more energy than the entire oil reserves of the planet, and 2) you can drive your car for 55,000,000 miles on a gallon of heavy water (D2O). Determine (via calculation, of course) whether or not these two claims are reasonably close to being accurate.

1) What is this problem actually asking for? (think of things we have discussed in class)

2) Draw a sketch depicting the conditions of interest (on a nuclear scale and macro scale).

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?

3) What assumptions should be made (don't include tabulated properties or numbers, this will be included in part 5)?
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 property values you will use in this problem?

6) Calculate the quantities that you listed in part 1

7) Verify your answer... Does it look reasonable?
a) What is the error on Dr. Russell's claims?
b) Perhaps she was referring to a direct mass conversion to energy (i.e. $E=mc^2$). How do her claims compare using this conversion?
c) Is this type of conversion (from part b) reasonable or realistic?
d) If the Q for fusion indicates it will readily release energy, why does fusion not occur at low temperatures (i.e. cold fusion)?