Homework Week 0

*Due Friday Sept 27th at 5pm*

1. Send an email

Compose an email to the instructor (Ethan Minot) and the teaching assistant (Kelby Hahn):

- ethan.minot@oregonstate.edu,
- petekelb@oregonstate.edu.

The email should include

- a list of the physics, math, chemistry, and nuclear engineering course numbers that you have completed,
- something about PH315 that you are looking forward to,
- any concerns you have about PH315,
- what name you would like to be called and what pronoun you use.

2. Nuclear energy question (*upload your answer to Gradescope*)
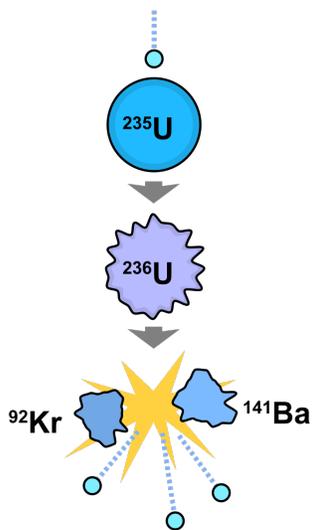
The fission (splitting) of one atom of uranium-235 gives off energy of approximately 3×10^{-11} J. This energy goes into heating the reactor core of a nuclear power plant. A typical nuclear power plant splits about 10 pounds of uranium-235 each day. (10 pounds of uranium-235 is turned in barium, krypton and other by-products). The atomic weight of uranium-235 is indicated by its name: 235 g/mol. The heat from fission is converted to electrical energy with an efficiency fraction of 0.3 (i.e. 0.3 J of electrical energy per 1 J of heat energy). At what rate is electrical energy produced? Give your answer in Joules per second (i.e. Watts).

Sense-making: Find a meaningful comparison between your answer and something familiar to you that is also measured in Joules per second.

Detailed instructions for writing up your answer to question 2

You will be graded on

(i) how you explain your logic,

(ii) how you keep track of the units being used to express various quantities,

(iii) whether you get an answer that is the correct order of magnitude.

To explain the logical steps in your solution, you must write some brief sentences. For example, "First I calculate how many uranium-235 atoms correspond to a mass of

10 pounds." Look to your text books for guidance on how physicists use words to explain the steps of a calculation.

Quantities are always expressed as a multiple of some unit of measurement, for example 3×10^{-11} Joules. Some quantities have composite units of measurement, such as 235 g/mol. When multiplying quantities, the units are always part of the equation.

I encourage you use round number and mental arithmetic. This exercise is a quantitative sketch, not an exact analysis.

Express numbers with an appropriate number of decimal places. If the question provides numbers with 2 decimal places, your answer should be a number with ≤ 2 decimal places. (An answer with > 2 decimal places would mislead the reader about the precision of your analysis).

Use scientific notation, such as 1.6×10^{-19}. **Do not** use E-notation, such as 1.6E-19. E-notation is only used in the context of computer programing.

For additional extra guidance on this type of question, see two short videos made by the instructor:
https://media.oregonstate.edu/media/t/0_pay9ftjz
https://media.oregonstate.edu/media/t/0_48aucv3m