Homework 3 **ENGR 130, AU 23**

Submit your solution for Question 1 as a pdf file. Question 2 will be submitted through MATLAB Grader, but you will also submit your solutions for Questions 2 and 3 as a single .m file. Follow all instructions in the Assignment Submission Guide posted in the Canvas Resources area. Failure to do so will result in a reduced (or possibly zero) grade.

Question 1 (3 points)

You will work through the next third of the MATLAB Onramp. Allow 40 minutes for completion. Complete this problem as follows:

- Access the MATLAB Onramp course here: https://matlabacademy.mathworks.com/ Your previous work will be saved.
- Watch the Course Description video
- Work through the next five modules:
  - Indexing into and Modifying Arrays
  - Array Calculations
  - Calling Functions
  - Obtaining Help
  - Plotting Data
- Upload to Canvas a screenshot verifying completion of these modules. Make sure your name is included in the screenshot.

Question 2 (4.5 points)

Go to the assignment HW3 – MATLAB Grader and complete the assignment that is linked there. Before beginning work on this problem, read the Working with MATLAB Grader document in the Canvas Resources area. Include a copy of the code you submit to MATLAB Grader in your submission to Canvas.

Question 3 (10 points + 2 for commenting and style)

Engineers in a variety of disciplines might work on projects on such a small scale that quantum mechanical properties must be taken into account. This means that sometimes they must conduct their analysis treating particles as waves. As part of this analysis, they calculate the deBroglie wavelength for the particles. This is done according to the following relationship:

$$\lambda = \frac{h}{mv}$$

Where λ is the deBroglie wavelength, h is Planck's constant (6.626×10^{-34} J s), m is the particle's mass, and v is the particle's speed.

A group of engineers is designing a process where high-speed particles are going to be directed into a container to start a chemical reaction. Their company has several different devices to choose from for generating and delivering these particles.

Device 1 produces protons with a speed of 2.7×10^4 m/s
Device 2 produces protons with a speed of 4.3×10^5 m/s
Device 3 produces neutrons with a speed of 1.5×10^4 m/s
Device 4 produces neutrons with a speed of 3.6×10^5 m/s
Device 5 produces alpha particles with a speed of 8.6×10^5 m/s

Write a MATLAB script that

- stores the values provided above in two vectors, one for the mass, and one for the speed. The first element in each vector should correspond to Device 1, the second element to Device 2, etc.
- computes the deBroglie wavelengths in nm and stores them in one vector. The calculation for all five devices MUST be in ONE line of code, using vector math.
- finds the minimum and average deBroglie wavelengths in the set and prints them to the screen, following the format below.
- asks the user to enter the number of the device they would like to know all of the details for, then prints that device's information to the screen, following the exact format below.

```
The minimum possible deBroglie wavelength is #.#### nm.

For this set, the average deBroglie wavelength is #.#### nm.

What is the number of the device that you would like to know about? #

Here are the details for device #:
  Mass of particle: #.##E-## kg
  Speed of particle: ###.## km/s
  deBroglie wavelength: #.#### nm
```