*Except where noted, all answers can be found in* ***PASCO (Franck-Hertz Experiment EX 5561****) write-up.*

**Introduction**

1) Below you will find a link to the ‘award ceremony speech’ for the 1925 Nobel prize in Physics which was awarded to Franck and Hertz.

<https://www.nobelprize.org/prizes/physics/1925/ceremony-speech/>

Please take a look at and briefly summarize why the prize was awarded to the pair (in particular the last 3 paragraphs are the relevant parts)

**How it works**

2) In this experiment it is stressed that “When an electron has sufficient energy to excite one of argon’s outer orbital electrons and has an inelastic collision with an argon atom, the electron loses a specific amount of kinetic energy.”

This implies that the electrons will have an elastic collision up until a certain energy. Compare the difference between an elastic collision and an inelastic collision (in particular mechanical energy) and how it relates to this experiment. Keep it simple.

Below is a YouTube video on the experiment with a very good simulation on the electron collisions starting at 4:46 minute mark.

<https://www.youtube.com/watch?v=Jckgt5X9p60>

**Principle of the Experiment**

3) This experiment also uses a ‘sensitive pico-ammeter (Current Amplifier)”.

You might ask why is an amplifier used instead of a very sensitive ammeter? Since the internal resistance of a low current ammeter is correspondingly high, they introduce a large voltage drop and thus “to avoid such large voltage drops, picoammeters and electrometers use a high gain amplifier with negative feedback for the input stage.”

It’s generally easier to amplify a low current signal instead of measuring it with a picoammeter.

Using the website below what are the 4 main “Characteristics of an Ideal Current Amplifier”?

<https://www.electronicshub.org/current-amplifiers-and-buffers/>

4) Utilizing figure 2 of PASCO writeup the answer the following

# a) Why are the excitation voltages called “resonance voltages”? Remember the resonance demo the you observed on the first day of lab. You can also simply look up the “What conditions are necessary to produce resonance in an object”?

# b) Why does the current not return to zero in the valleys of plot? This is also answered in the video in question # 2.

# Setup

# 5) There is a caution on page 5 of procedure, What does it say and why do you think it occurs (an educated guess is fine-don’t spend too much time on this part).