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Breaking An Electron

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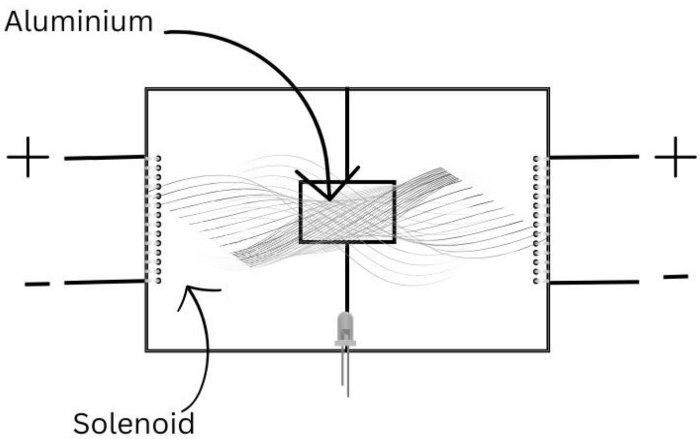
Abstract

An electron is a subatomic particle with a negative charge and is a medium for electricity to travel. An electron, being a *stable* particle, cannot be broken down; but the results shown in this experiment show otherwise. We can break an isolated electron by bombarding alpha radiation and beta radiation with the help of electricity. We also use photoelectric effect to isolate the electron. But due to no financial aid, we replaced the alpha and beta radiation with electromagnetic radiation.

Keywords*:* 80.

Method and Materials Required

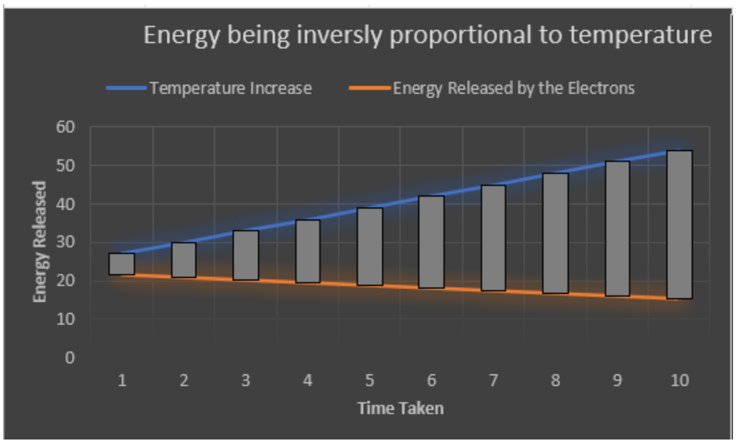
This experiment does not require radioactive elements as we use electromagnetic radiation as it is easier to perform the experiment practically anywhere; for this experiment, we require a thin metal foil, preferably aluminum foil as it does not show any properties of magnetism, a red, blue and white bulb, a small container (2.5 to 3 inches), some strings, four 9-volt batteries (18 volts for each electromagnet). Keep in mind that we used easily available materials so that it can be easier for other people to perform this experiment.



We take a container and make holes for the copper wires to be exposed and connected to the 18 volts of two 9v batteries connected in series. Keep in mind that the positive and negative terminals should match that of the diagram shown above.

We take a small piece of the aluminum foil and hang it at the center (perpendicular to the coils) with the help of some strings. We place one or two bulbs parallel to the foil so that photoelectric effect can take place which is very crucial for this experiment.

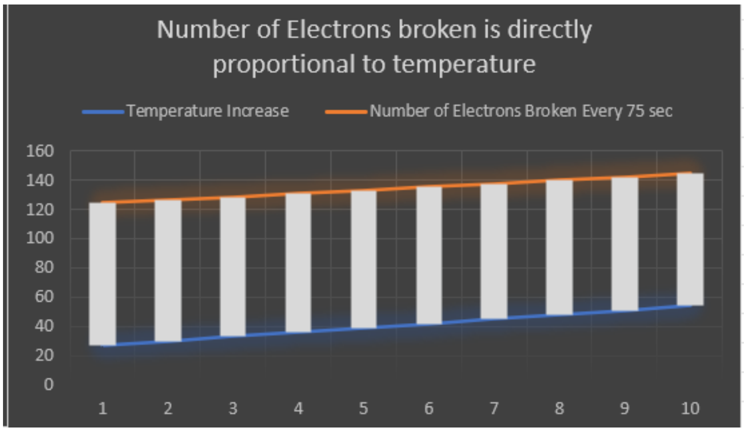
Results



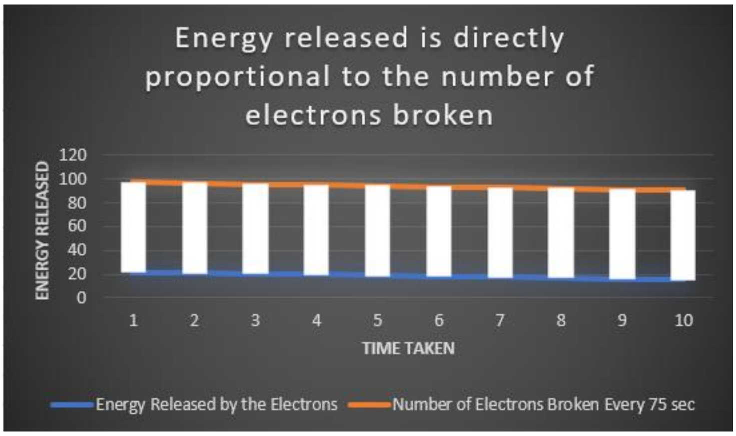
After turning on the circuit we observed a slight, barely visible curling at the edges of the foil when we shined a red light. It took a total of 1 minute 15 seconds or 75 seconds for the coil to start curling, we also observed that the batteries overheated (3 degree Celsius) at the same exact time of 75 seconds.

When we shined a blue light on the foil, we observed little to no change both in the aluminum foil and the batteries. After another 75 seconds, the batteries overheated again (3 degree Celsius), and the aluminum foil curled again.

We also see in the given graph that the energy released by the electrons is inversely proportional to the temperature increase.



When we graph the number of electrons broken every 75 sec and the temperature increase, we see that the number of electrons broken is dependent on the temperature increase. In another graph, we see that the energy released by the electrons is also dependent on the number of electrons broken.



Graph 1:

Work function of Aluminum= 4.2ev

Temperature increase every 75 seconds= +3

Total energy= 10.164 (round to 10)

Voltage= 18v

$$\text{Energy released by electrons} = \frac{\text{Total Energy} - \text{Temperature increase}}{\text{Work function} + \text{voltage}}$$

Graph 2:

Work function of Aluminum= 4.2ev

Temperature increase every 75 seconds= +3

Total energy= 10.164 (round to 10)

Voltage= 18v

$$\text{Number of electrons broken per minute} = \frac{\text{Energy released by electrons} + \text{Total Energy}}{\text{Temperature increase} + 60}$$

Graph 3:

Work function of Aluminum= 4.2ev

Temperature increase every 75 seconds= +3

Total energy= 10.164 (round to 10)

Voltage= 18v

$$\text{Number of electrons broken per minute} = \frac{\text{Energy released by electrons} + \text{Total Energy}}{\text{Temperature increase} + 60}$$

$$\text{Energy released by electrons} = \frac{\text{Total Energy} - \text{Temperature increase}}{\text{Work function} + \text{voltage}}$$