



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Caroline M. Swinehart	Project Number 22411
Project Title What Is the Effect of Magnetism on the Ionization of Gas Plasma?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My goal was to learn if the presence of a magnetic field at the anode or the cathode of a tube containing a rarefied noble gas would affect the voltage at which the gas would ionize. If this ionization potential were to be lowered by a magnetic field, it would allow for a more efficient or easier to initiate form of electric lighting.</p> <p>Methods/Materials Direct current, high voltage electricity was passed through low pressure neon gas in an enclosed Pyrex glass tube. The initiation voltage of ionization was recorded using a voltmeter with a high voltage probe. Readings were taken each of three ways: with no magnet present for a baseline value or control, with a magnet at the cathode, and with a magnet at the anode.</p> <p>Results I discovered that a magnet placed at the cathode increased the voltage needed to initiate ionization relative to the baseline voltage. The magnet placed at the anode had a minimal effect.</p> <p>Conclusions/Discussion It was hoped that placing a magnet at the electrodes would decrease the ionization potential needed to initiate ionization. Most modern forms of electric lighting, including fluorescent lighting, street lighting, and sign lighting, are made from gas plasmas. If I could lower the ionization potential of gas plasmas, it would make it easier to initiate these forms of lighting and make them easier and more economical to produce. However, the opposite effect was found, as the anode magnet had only a very small effect and the cathode magnet made ionization much more difficult to achieve.</p>	
Summary Statement In searching for an easier and more economical way of producing plasma lighting, I studied the effects of magnetism on the initiation voltage of the ionization of neon.	
Help Received Used equipment in father's laboratory and received his supervision on safe use of high voltage and vacuum equipment; Father gave guidance on measurement of voltage.	