

Neon Wand

P6-3360



BACKGROUND:

For use with any Van de Graaff Generator, the Neon Wand demonstrates the ionization of a gas in an electrostatic field.

INSTRUCTIONS:

Hold the wand by the insulating handle. Bring it near a running Van de Graaff Generator, and observe the tube lighting up. (Darken the room for a more dramatic demonstration.)

WARNING:

Be sure to keep hands well away from the generator, to avoid shocks.

EXPLANATION:

Neon is commonly used in lighting applications because it ionizes easily. When the tube of neon gas is brought into the strong electrostatic field near the generator, the field energizes the electrons on the gas atoms. That is, the electrons gain energy and come out of their atomic orbitals, leaving positively charged neon ions. When a free electron comes near a neon ion, it can “fall” into orbit again, creating a neutral particle and releasing energy in the form of light.

The color of the light is characteristic of neon and its energy levels. Different colors can be created by using different gases or by adding impurities to the neon.

Note that electricity is not flowing through the tube. The tube is simply placed in a strong electrostatic field, and that alone ionizes the neon.

ADDITIONAL INFORMATION:

This demonstration is a good way to introduce students to the state of matter known as plasma. A plasma is composed of ionized particles and free electrons.

Let students view the lighted tube through a diffraction grating or rainbow glasses. They will see distinctive spectral lines corresponding to the wavelengths produced by electrons entering specific energy levels.

