

# PLASMA BALL

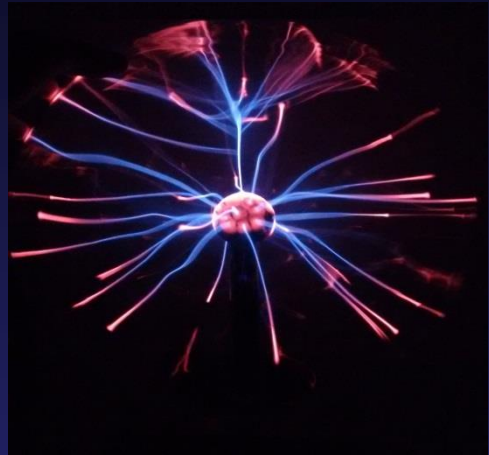
## What to do

1. Turn the knob on the front to change the voltage
2. Touch the plasma ball and watch how the plasma tendrils behave

## WHAT IS PLASMA?

A plasma is an ionised gas. It shares many properties with gas, but the presence of free electric charges allows the plasma to respond to both magnetic and electric fields. This property of plasmas creates a slew of exotic and interesting effects that are unobserved in other forms of matter.

Plasmas exist at a range of strengths, temperatures and sizes. Examples of plasmas include the solar wind, interstellar gas, the Sun, flames, and lightning. The plasma ball here produces plasma, and is useful for highlighting some of the interesting effects.



## PLASMA GENERATION

A plasma ball consists of a glass sphere filled with various noble gases. At the centre is a small conducting sphere with internal electronics which generate a very strong, high frequency voltage (typically 35 kHz and 2-5 kV). The very strong voltage at the centre tugs on the electrons (or nuclei, depending on whether the voltage is at that moment positive or negative) until the electron is ripped from the atom. This process generates an electric current through the gas - i.e., a plasma! Ions and electrons are constantly being ripped free and recombining. This, along with thermal radiation, produces the observed glow of the plasma.

## MOVING TENDRILS

The plasma formed in the ball causes the gas to heat. This, in turn, causes thermal convection which lifts the tendrils towards the top. Eventually, the top of the globe gets too crowded and the excess of charges on the central sphere choose to form a new tendril leading somewhere else.

## CONTACT

When you touch the plasma ball, you are decreasing the total resistance where you touch it. Therefore, current will preferentially flow towards the contact point, and a very bright, strong plasma tendril will be formed. The hot gas causes the tendril arm to rise. Eventually, this gets long enough so that it breaks, and reforms.

