

Plasma Ball Activity

A **plasma** is created whenever **atoms** of a gas are heated up so they are extremely hot. The atoms have so much energy that when they collide, the electrons get knocked off. Therefore, a plasma is a bunch of **electrons** and **ions**.

Plasma Ball

The plasma ball is a miniature Tesla coil. Inside the ball is a coil of wires that have a very high frequency current going through them. This means the electrons in the wires are oscillating very quickly. This shakes the atoms around the wires so hard that their electrons start to fall off and a plasma is formed! Inside the glass globe is a partial vacuum. This just means that some of the air has been sucked out. Because there is not as much air in there, it is easier to make electric sparks that can be seen.



Try This:

1. Put your hand on the plasma ball. What happens?
2. Now bring the fluorescent light tube close to the plasma ball. What happens?
3. This step requires a partner. Stand on a chair or stool and put your hand on the ball. Now have your partner hand you the light tube. What happens? Experiment with different arrangements to see how many ways you can light the bulb. **Be careful to not touch the ends of the light tube – it gets hot!**
4. Stand on the ground and try the #3 again. Does it work?
5. Put a penny on the top of the plasma ball. Carefully touch the penny with another penny. **Don't use your finger – you'll get a shock!**
6. Use a multimeter to measure the electrical potential around the ball. Place one lead on the glass and move the other one around. Record the potential at various distances, taking enough measurements to map the area around the ball. Use your measurements to sketch the electric field around the ball.

What's going on? (Teacher Notes)

1. The electrons repel each other and want to get as far away from each other as possible. They are always trying to reach the ground (because it's so big, the electrons can get very far away from each other). They can get to the ground by traveling through you.
2. The tube lights up because some of the electricity gets through the glass ball. It's enough to light up the fluorescent tube. (Also an example of how fluorescent lights use much less energy than incandescent bulbs!)
3. The electricity is going through you, into the light tube, and then through your friend into the ground.
4. It doesn't work because the electricity goes into the ground and there's not any left to light up the bulb.
5. Penny is a conductor and so electrons move easily through it. When enough electrons build up, they jump to the other penny and make a spark! The penny is acting like a capacitor.
6. The electric field should look like the field around a point charge. The students should be able to find the equipotential lines (or surfaces being that this is a 3-D experiment). You could also use these measurements to calculate out how much potential energy you need to light up the fluorescent tube.