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Question 1: Electric cars; Question 2: Chicken poop

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2020

WINTER MEETING JANUARY 18-21 ORLANDO, FL

Data Chart

Conductor	Current	Voltage +/- 1V
None (open)	0	5 V
Wire (shorted)	220 mA	1 V
100 ohms	30 mA	3 V
One hand – limp	2 μ A	4 V
One hand – tight	5 μ A	4 V
One hand – wet	40 μ A	4 V
Both hands	Similar results	Similar results

Used against a plasma globe and $E=hf$ for diodes demonstration

It is interesting to note that a plasma globe will activate the Energy Stick (Fig. 4). This will work in either direction because plasma globes supply an alternating voltage. Inside of the Energy Stick are three diodes—red, green, and blue. As the Energy Stick is brought near the plasma globe, these will turn on one at a time. The red one first, then the green, followed very closely by the blue. This demonstrates that more voltage or energy is required to create red light than blue light. This is a lesson in modern physics and consistent with

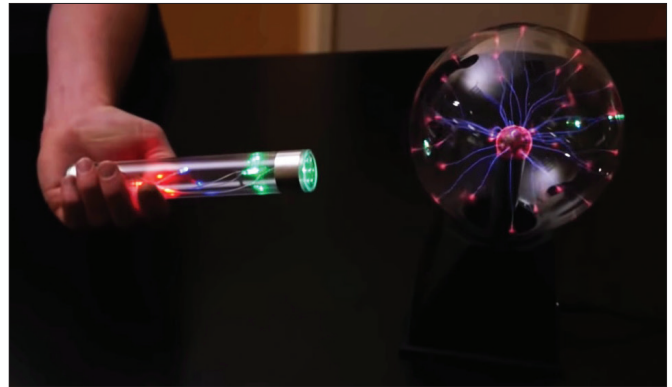


Fig 4. The plasma globe can substitute as a partner’s hand, completing the circuit, not with a conducting path, but with an electric field filling space. Bring the stick slowly toward the globe and predict which diode will turn on first.

the Planck-Einstein photon energy formula $E = hf$. (It is also possible to get this same demonstration with no plasma globe by simply gently touching the metal, but this is hard to do.) While you have the plasma globe out, it also can be shown that the electric field is radial by turning the Energy Stick; it will turn off unless aligned with the field (at some positions).

Reference

1. Thanks to Lisa Taylor for this demo.

Fermi Questions

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● **Question 1: Electric cars**

How much more electrical energy will the United States need to generate if everyone drives electric cars?

● **Question 2: Chicken poop**

How much chicken excrement is produced in the United States every year?

Look for the answers online at tpt.aapt.org under “Browse,” at the very end of the current issue.

Question suggestions are always welcome!

For more Fermi questions and answers, see *Guesstimation 2.0: Solving Today's Problems on the Back of a Napkin*, by Lawrence Weinstein (Princeton University Press, 2012).

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