Teacher Reference

Introduction:
In this exercise, students determine experimentally the dielectric coefficient for three different materials.

Experimental goals:
After completing this experiment, students will be able to determine the dielectric coefficient of a material experimentally.

Equipment:
- Variable capacitor
- Digital multimeter
- Capacitance Tester (short leads that plug into multimeter)
- Masonite dielectric
- Plastic dielectric
- Paper dielectric

Keywords:
Capacitance, parallel plate capacitor, dielectric, dielectric constant

Notes:
Caution students to move about the lab as little as possible, since their movements can affect other student’s readings. Readings should be taken with all group members standing away from the apparatus.

Answers:
The first question is a bit of a trick. There is no “best” material, only the material best suited for the task. Paper has a high dielectric constant, but do you want to use it where it might get wet? In high-humidity situations, it might be best to use plastic even though it has a lower dielectric constant because plastic does not absorb water.

The advantage of using a dielectric in capacitors is that you can make the capacitor smaller for the same capacitance. The dielectric also serves as a physical spacer between the “plates”, so the “plates” can be rolled up in a spiral without worrying about the plates touching each other.

The capacitance tester leads are short to minimize the capacitance of the leads themselves. This reduces the error in the measurement.