



Electric Fields – Practical

Tracing Electric Fields **TEACHER GUIDE**

Equipment: High voltage power supply (e.g. a Van de Graaff generator), large glass/plastic dish (e.g. a petri dish), vegetable oil, semolina (or grass seeds), aluminium foil and wires to make electrodes.

Note that point electrodes can be fashioned out of wire and plate electrodes can be fashioned out of foil. A high voltage supply is required for this experiment otherwise the current will become too large.

Tasks for students:

- 1) Determine the electric field inside a circular electrode.
- 2) How does a circular electrode affect the electric field produced by an electrode placed within? How does this relate to a Faraday cage?
- 3) If you were stopped on the side of a road near a large tree, changing a flat tire on your car and a violent thunderstorm broke out, where would it be safest to shelter yourself? Link this with what you have investigated in the first two questions.
- 4) Make at least 5 different combinations of irregularly shaped electrodes and repeat the experiment with them. Once again, before determining the electric field, first draw your prediction.
- 5) Compare electric fields with gravitational fields. What do they have in common? If we had removed the semolina/seeds from the oil before doing these experiments, would we have known any electric field had been produced? Compare this with a gravitational field.



MeriSTEM PHYSICS: Electromagnetism

The electric field created by a charge and in this case by the electrodes permeates space and awaits the presence of another charge so it can exert a force on the charge. A gravitational field does the same but with masses. One difference is that the direction of the force depends on the signs of the charges in an electric field whereas there are no 'negative' mass equivalents in a gravitational field. We constantly see the effects of a gravitational field because all objects in our everyday life have mass and are affected by the Earth's gravitational field. The electric fields in this experiment are only visible because of the presence of the semolina so electric fields are subtler in this sense but even if we could not see the electric field affecting anything, it would still exist the same way the Earth's gravitational field is always present.



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Tracing Electric Fields **STUDENT INSTRUCTIONS**

You will investigate the fields created by electrodes of different shapes.

Fill your dish with oil to a depth of about 0.5cm and evenly distribute a small layer of semolina over the surface. Create two plate-shaped electrodes out of foil and place them close together in the oil such that they are parallel. Connect the positive and negative terminals of the power source to the electrodes. Before turning on the power and supplying about 3000V, draw a diagram of the setup and draw your prediction of the electric field lines that will be created. Now turn on the power supply and observe the electric field pattern created. Draw a diagram of the electric field and compare it with your prediction.

Repeat the above process with a circular electrode and a point electrode placed in the centre. Repeat this again with a point electrode and a plate electrode. Now try two concentric circle electrodes. Consult your teacher for further activities.