Gauss' Law

Apparatus

van de Graaff generator, metal can, plastic or foam cup, large polystyrene beads

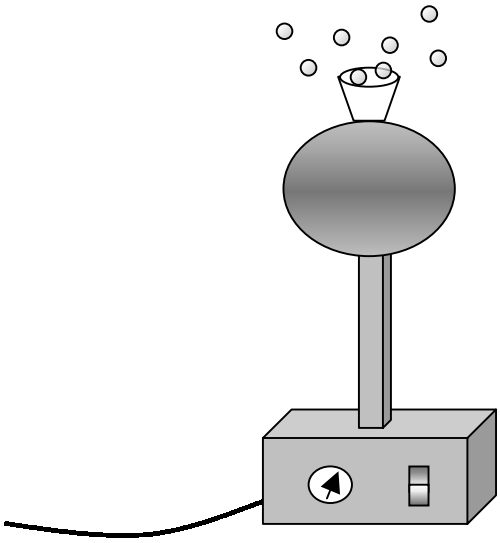
Note- large beads that can be easily found and picked up are best, small ones can be very messy.

Action

The students place the metal can on the generator and fill it with beads. They then turn on the generator. They repeat this with the plastic or foam cup. They should then pick up the beads and put them back in the cup.

The Physics

When the generator is turned on the metal can becomes charged. On a conductor all the charge goes to the outside of the conductor. There is zero field inside and so the balls inside do not become charged. The metal can is a Faraday cage. When the plastic cup is placed on the generator, the balls fly out. The plastic is an insulator, so the charge does not flow easily to the outer surface. There is an electric field inside the cup. The balls inside become charged and repel each other, and they are light enough to fly apart and out of the container.



Accompanying sheet

Gauss' Law

Fill the metal can with polystyrene balls and place it on the generator.
Now turn the generator on. Explain what happens.

Remove the metal can and replace it with the plastic one.
Explain what happens this time when you turn the generator on.

Please pick up the balls and put them away when you are done!