ELECTROSTATICS - Electrostatic Induction


Purpose: Explain operation of the electroferous, we will use it for Gauss's Law demonstrations.

Equipment: Electroferous complete with metal plate with insulated handle, plastic base and fur. Two pith balls hanging from threads. Shadow project pith balls.

Procedure:
- Explain operation of electroferous with HB transparency
- Rub plastic with fur, put metal plate on it (charges induced), short it with finger (leaving net charge on plate), and then lift (charged) plate away. (Assumes leaky shoes and floor.)
- Charge pith balls; see them bounce around and repel each other - like 2 kittens playing.
- Shadow projected pith balls quite dramatic.
- Can charge an object to high potential by repeatedly charging plate and touching it to the object.
- [Why doesn't charge flow off plate onto plastic? Not so obvious. Our plate does not have insulator coating on lower side. Possibly because most of plate not in direct contact with plastic.]

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[Diagram: METAL PLASTIC]

OUCH!

BIG INDUCED CHARGE

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Pick balls should be squirrel, so that the threads do not get tangled up!
It consists of a hard-rubber plate and a somewhat smaller metal disk with an insulating handle.

We rub the hard rubber plate (Fig. 10.1) with amber, which charges it negatively. Then we place the plate (2) and touch the metal disk so as to "ground" it (6). When we touch the plate (2), it is positively charged (3), and it emits the disk, a Leyden Jar can be strongly charged with an electrophorus by repeating this process again and again.

![Diagram showing the process of charging a Leyden Jar with an electrophorus.]

**Figure 10.1.** An electrophorus produces electricity by induction.

When the metal disk is placed on the negatively charged plate, the electrons are repelled from the lower surface of the disk next to the plate. The disk, being a layer of insulating varnish or imperfect contact, is not charged by induction. When we touch the metal disk, the electrons on the top surface of the disk which is in contact with the hand, are collected. By this process the disk becomes positively charged, and the rubber plate is charged negatively in proportion to the number of charges on the disk. This is because the energy comes from the hand that lifts the disk.