

Friction Rod Kit

P6-1600



BACKGROUND:

The contents of this kit have been chosen according to their positions in the Triboelectric Series. The Triboelectric Series is a list of materials, ordered according to their tendency to become positively or negatively charged. (The name comes from the Greek for “rubbing,” *tribos*.) By using one material that tends to give up electrons (and become positive) with one that tends to acquire electrons (and become negative) charge transfer is simple to achieve.

CONTENTS:

Glass Rod
Hard Rubber Rod
Silk Flannel Pad
Fur Pad
Bubble Wrap

RECOMMENDED ACCESSORIES:

Electroscope

RELATED PRODUCTS:

Glass Rod (P6-1601)

Hard Rubber Rod (P6-1602)

Silk Flannel Cloth (P6-1603)

Fur Pad (P6-1604)

Electroscope (P6-1156). Flask-form electroscope with aluminum leaves.

Triboelectric Series (selected materials)

Becomes More Positive (+)

- Human skin
- Leather
- Rabbit's fur +++
- Glass
- Nylon
- Wool Lead
- Cat's fur +
- Silk
- Aluminum
- Cotton
- Amber
- Acrylic -
- Polystyrene
- Rubber balloon
- Hard rubber
- Acetate, Rayon
- Synthetic rubber
- Polyester
- Styrene (Styrofoam)
- Plastic wrap ---
- Polypropylene Vinyl (PVC)
- Silicone rubber
- Ebonite

Becomes More Negative (-)

INSTRUCTIONS & EXPERIMENTS:

Some textbooks suggest rubbing glass rods with silk to produce a positive charge on the glass rod. Since the Triboelectric Series (see chart above) places silk only slightly below glass, rubbing silk on glass produces minimal charge separation. On the other hand, the chart predicts better results when glass is rubbed with bubble wrap. Both silk and bubble wrap are included for you to try.

Rub the rubber rod with the fur pad. The following charges result: **Rubber: Negative; Fur: Positive.** Rub the glass rod with the bubble wrap. The following charges result: **Glass: Positive; bubble wrap: Negative.** The way in which charge transfers from one material to another can be determined by consulting a Triboelectric Series Chart. **Note:** Static electricity demonstrations work better in dry air. Dry air is a better electrical insulator than moist air. On humid days, the experiments described here may not work.

BASIC ATTRACTION AND REPULSION:

1. Suspend one rubber rod with fishing line so that it is balanced horizontally and can turn around its center (fishing line is preferred because it will allow the rod to hang still without twisting). Bring each rod near it and show that there is no force.
2. Rub the suspended rod with the fur. Rub the glass rod with the bubble wrap and bring it near the suspended rod. Observe the attraction.
3. Rub a second rubber rod with fur. Bring it near the suspended rod and observe the repulsion.
4. Conclusions: Like charges repel, and opposites attract. Ben Franklin decided that the charge on the rubber rod would be called “negative”, and that on the glass rod would be “positive”.

ELECTROSCOPE—CHARGING BY CONDUCTION AND INDUCTION:

1. Rub the glass rod with the bubble wrap to produce a positive charge on the rod. Touch the glass rod to the top knob of an electroscope and observe the results (leaves separate). Touching transfers charge giving the electroscope a net positive charge.
2. Rub the glass rod again, and touch the positive charged electroscope again. Observe the results (leaves separate further).
3. Rub the rubber rod with fur to produce a negative charge on the rod. Touch the negatively charged rod to the positively charged electroscope and observe the results (leaves get closer together).
4. Discharge the electroscope by touching it with your finger (leaves hang straight down).
5. Bring a negatively charged rod near (not touching) the electroscope. Momentarily touch the knob with your finger while still holding the negative rod near the electroscope and observe (leaves will separate, then drop when the knob is touched).
6. Remove your fingers from the electroscope then move the charged rod away from the electroscope and observe (leaves separate).
7. Determine the polarity of the charge on the electroscope using the procedure in #2-3 above (positive).