FREQUENTLY ASKED QUESTIONS

February 6, 2003

Administrative Questions

Do we have anything to hand in this week?

No, not this week.

When will the web page be up? Will homework be posted there?

The web page should be up soon. Yes, homework and other course info will be posted there.

What's the lab check-off procedure?

This should get clarified soon in lecture and on the web.

Can we find a bigger room?

If we still have a lot of people in the room after a week or so, I can request a bigger one, but they may not be able to find one.

Content Questions

In the lecture demo with the plexiglass rod, rabbit fur and tinsel, why did the tinsel flare out when charged, as opposed to doing something else?

The negative charge added to the tinsel when the rod touches it spreads out everywhere in the tinsel (the tinsel is a conductor, meaning that charges can flow freely). The extra negative charges repel each other and try to get as far away from each other as possible... so the strands of the tinsel flare out to get as far away from each other as they can.

In the lecture demo, after the rod touches the tinsel and the tinsel gets charged negative, does the rod become neutral, or does it stay

negatively charged ?

No, it doesn't become neutral. When the rod touches the tinsel, the charge spreads out between the rod and the tinsel (the charges try to get as far away from each other as they can). Some is left on the rod, so the rod remains negatively charged.

I'm a bit confused about how induction works...

When a charged object approaches a neutral conductor (like an elephant), the like charges flee as far away as they can and the different ones come as close as they can to the charged object. The unlike charges are closer than the like ones, so the unlike ones exert a stronger attractive force than the repulsive force of the like charges (we'll talk quantitatively about dependence of force on distance in a bit, when we do Coulomb's Law). So overall there's an attraction. So, if two objects attract, they could be *either* two unlike charges, *or* a charged object and a neutral one – there's an ambiguity. See also text, p. 548.

What exactly is a pith ball?

Pith is a substance that comes from the stems of plants– it's light and takes charge easily. The modern equivalent would be styrofoam.

Can you clarify the elephant example? Why can't you determine the elephant charge by charging one pith ball positive, and another negative, then holding them up to the elephant?

Yes, you could: let's look at the three possible cases. First, suppose the elephant is positive. The positive ball will repel and the negative one will attract. Suppose the elephant is neutral: both balls will be attracted, by induction. Suppose the elephant is negative: the negative ball will repel and the positive one will attract.

This is equivalent to charging up the pith ball with the elephant's charge and comparing it to the second pith ball (mostly I wanted to point out that if there's attraction with a charged object, the object could be neutral *or* oppositely charged.)

Why an elephant?

The Sparkly Frog was busy.

If movement of charge is movement of electrons, how can we talk about positive charges moving?

In our microscopic picture, positive charges are relatively stationary inside nuclei of atoms, and in most familiar situations the mobile charge carriers in the flow of charge tend to be electrons (noe that you *could* have positive charges moving: for instance in a beam of protons). *From our point of view*, movement of negative charges in one direction is *equivalent* to movement of positive charges in the opposite direction: *both situations lead to exactly the same separation of charges*. We'll discuss this idea in more detail later when we talk about currents.

What causes the differences between materials in the triboelectric sequence? How come some materials donate electrons more easily than others?

The short answer is "chemistry" and the details are really beyond the scope of this course... some materials have a atomic/molecular structure such that electrons can jump out more easily; other materials have electrons that are bound more tightly.

Why would rubbing cause transfer of charge when the materials are neutral anyway to begin with?

Actually what rubbing does is increase the area of contact between the materials. More area of contact gives more atoms/molecules a chance to grab electrons from neighbors, if they are so inclined.

Other

What happened to the Sparkly Frog?

The Sparkly Frog's contract covers appearances in lectures only. However

occasionally he may make a guest appearance in recitations.

Tidbits

Here's a link with the triboelectric sequence, which I think is not in your textbook:

`http://www.physics.usyd.edu.au/teach_res/db/d0006a.htm`