

SNC1D PHYSICS

THE CHARACTERISTICS OF ELECTRICITY
Detecting Electric Charges
(P.404-406)

Charged Objects

What does dust on a computer screen have in common with paper on a comb? In both examples, there is attraction between objects with unlike charges.



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Charged Objects

You may have noticed a similar effect when you unpack a box containing polystyrene packing foam and the little pieces of foam stick to your skin and clothes. Polystyrene is very low on the electrostatic series and becomes charged very easily.




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Detecting Electric Charge

How do you know when an object is charged? Rather than testing whether the object sticks to something else, you can use an electroscope. An **electroscope** is a device that can be used to detect the presence of an electric charge.




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Detecting Electric Charge

ELECTROSCOPE


- ❖ device used to detect the presence of an electric charge
- ❖ two types → pith-ball and metal-leaf



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Detecting Electric Charge

A **pith-ball electroscope** is a light, metal-coated ball suspended on an insulating thread. If the ball is charged, it will be repelled by a similarly charged object and attracted to either a neutral object or an oppositely charged object.




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Detecting Electric Charge

PRACTICE

1. Assume that an object is brought near (but not touching) a charged pith ball. What are the possible outcomes if the object is:

- (a) similarly charged **repulsion**
- (b) oppositely charged **attraction**
- (c) neutral **attraction**




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Detecting Electric Charge

PRACTICE

2. Assume that an object is brought near (but not touching) a neutral pith ball. What are the possible outcomes if the object is:


- (a) positively charged **attraction**
- (b) negatively charged **attraction**
- (c) neutral **nothing**



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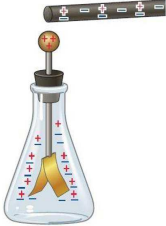
A **metal-leaf electroscope** consists of two thin metal leaves suspended from a conductive metal rod (with a metal knob at the top) in a glass container. Any charge spreads out over the entire electroscope. Since the leaves are then charged similarly, they repel one another, thus indicating the presence of a charge. The farther apart they move, the greater the charges they are carrying.



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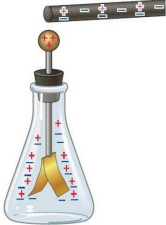
For example, when a negatively charged rod is brought near a neutral metal-leaf electroscope, the electrons in the electroscope are repelled by the rod. The electrons move down into the leaves of the electroscope. Since the leaves are now both negatively charged, they repel each other and move apart.



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When the negatively charged rod is taken away, the negative charges in the electroscope are no longer repelled, so they move back throughout the leaves, stem, and knob. The electroscope is neutral again. And since the leaves are no longer negatively charged, they drop back down.




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PRACTICE

3. Assume that a positively charged object is brought near (but not touching) a neutral metal-leaf electroscope. With the aid of a diagram(s):
 - (i) explain what will happen, and
 - (ii) show the induced charge separation that occurs on the electroscope.




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1. What would change about the way an electroscope worked if its metal knob were replaced with a plastic knob?

it would no longer work – plastic is an insulator so the electrons would not move




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2. (a) Why do the leaves of a positively charged electroscope move farther apart if a rod with the same charge is brought near?

(a) electrons are attracted upwards to the positively charged rod leaving an even greater positive charge on the leaves (causing them to repel even more)




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2. (b) Why would the leaves move closer together if the rod had the opposite charge to the electroscope?

(b) electrons would be forced down into the leaves reducing the overall positive charge on the leaves (causing them to move closer together)



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