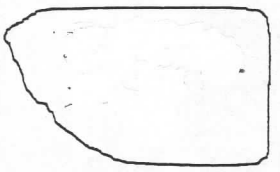
Electrostatics: Charging by Induction

In induction a charge is produced on an uncharged object without direct contact of the two objects. This can be accomplished in two ways: a) induced charge separation and b) transfer of charge to an uncharged object.

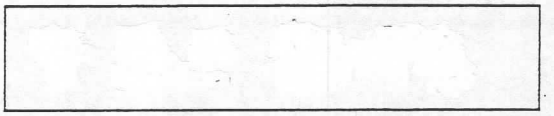
A) Induced Charge Separation:

Using + and - signs to represent positive and negative charges draw what happens to the charges on the paper and rod in each scenario:

i) The rod is far from the paper:



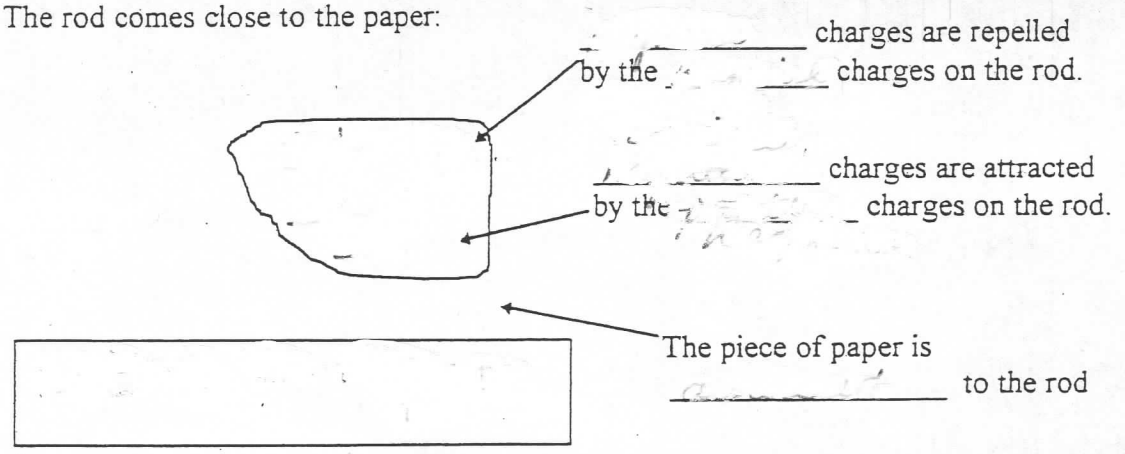
uncharged piece of paper



negatively charged rod

The charge on the paper is _____ and therefore equal numbers of positive and negative charges are spread evenly over its surface.

ii) The rod comes close to the paper:

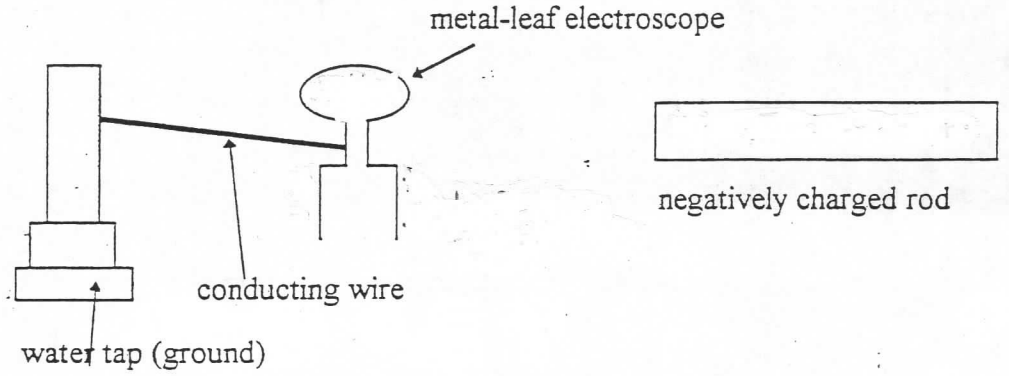


The slight movement of electric charge within the paper is called ***charge separation.*** As a result of this charge separation a _____ charge has been ***induced*** on one side of the paper. Therefore the paper ***appears*** _____ charged and is _____ to the rod even though it is still _____. When the rod is removed the charge on the paper is _____.

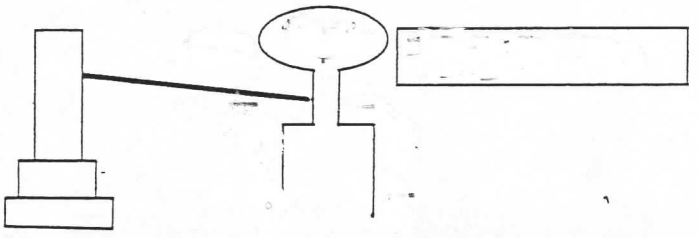
B) Charging Uncharged Objects by Induction:

Using + and - signs to represent positive and negative charges draw what happens to the charges on the electroscope and rod in each scenario:

i) The rod is far from the electroscope:

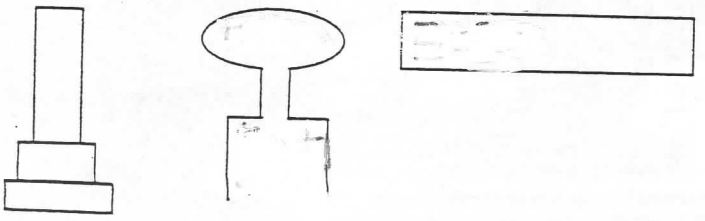


ii) The rod approaches the electroscope:



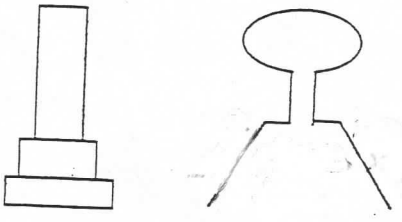
Electrons are _____ from the electroscope along the conducting wire

iii) The conducting wire is removed



When the wire is removed the electroscope is _____ charged but the electrons remain in the leaves since they are _____ by the rod

iv) The rod is removed



The _____ are redistributed but the electroscope remains _____ charged and therefore the leaves _____ one another. In this case a ***permanent*** charge is induced on the uncharged object

The induced charge is always _____ to that of the charged object producing the charge

Name: _____

9.9 Charging by Induction

In this investigation, you will study the two different methods of charging objects by induction. You will also develop your understanding of making and testing predictions.

Question:

How can we determine the kind of charge induced on a neutral object when it is approached by a charged object?

Hypothesis:

We can determine the kind of charge induced on a neutral object when it is approached by a charged object by: _____

_____

Observations:

	Procedure	Observations
2.	Bring negatively charged polyethylene strip toward and away from the electroscope several times.	a) Diagram when negative strip is far from electroscope. b) Diagram when negative strip is close to electroscope. Charge on the electroscope: _____
3.	Bring a positively charged acetate strip toward and away from the electroscope several times.	a) Diagram when positive strip is far from electroscope. b) Diagram when positive strip is close to electroscope. Charge on the electroscope: _____

Name: _____

	Procedure	Observations
4. - 5.	Attach a wire conductor from the rod of the electroscope to a water tap	a) Diagram when negative strip is far from electroscope.
	Bring a negatively charged polyethylene strip near the electroscope.	b) Diagram when negative strip is close to electroscope.
	Remove the wire conductor from the rod.	c) Diagram when conductor is removed.
	Remove the charged strip.	d) Diagram when negative strip is far from electroscope.
6. - 7.	Explain how you will test the charge on your electroscope after steps 4 and 5. Determine the charge on your electroscope.	Procedure for testing the charge on your electroscope. Charge on the electroscope: _____

Analysis and Communication:

1. Using diagrams predict what will happen if you repeat steps 4 and 5 with a positively charged acetate strip. Your prediction should include **four** separate diagrams.
2. Read pages 282 to 283 and answer questions 3 to 9.
3. Read pages 286 to 287 and answer questions 2 and 3