

SNC 1D Investigation

Be a Charge Detective Teacher Notes

Source: ON Science 9, McGraw-Hill Ryerson, 2009, p430)

Teacher Notes:

- This lab should be done after teaching charging by friction, induction and contact, and the electrostatic series.
- Wear appropriate PPE (students and teachers).
- Glass rods should be handled with care and students must be sure that their glass rods cannot roll off their counters.
- Glass rods that are chipped or cracked should not be used.
- Check to see if any students are allergic to animal fur or wool.

Time Required: 1 period

Curriculum Links:

Academic:

- E2.2: conduct investigations into the transfer of static electric charges by friction, contact, and induction, and produce labeled diagrams to explain the results
- E2.3: Predict the ability of different materials to hold or transfer electric charges, and test their predictions through inquiry

Learning Goal:

At the end of this investigation, I will be able to place materials in the proper order in the electrostatic series.

Materials Needed Per Group:

(Students should work in groups of two.)

- Pith ball electroscope
- A selection of the materials in the Table Electrostatic Series of Common Materials (Note: wood, paper, plastic wrap, a plastic compact disc case are not included in the table provided but could be added.)

Be a Charge Detective

(adapted from ON Science 9, McGraw-Hill Ryerson, 2009, p430)

INTRODUCTION:

When two different materials are rubbed together, both materials become charged by friction. The material with the stronger hold on its electrons becomes negatively charged. The material with the weaker hold on its electrons becomes positively charged. The electrostatic series in the table below lists several materials according to their ability to hold on to electrons.

Table Electrostatic Series of Some Common Materials

Material	Strength of Hold on Electrons
Glass	Weak
Human Hair	
Nylon	
Wool	
Fur	
Silk	
Cotton	
Lucite (a clear plastic)	
Rubber balloon	
Polyester	
Foam	Strong
Grocery bags (low density polyethylene)	
Ebonite (a hard form of rubber)	

ASSIGNMENT

- 1) Design and carry out an investigation to determine how to use materials from the table above to give a pith ball electroscope a known charge. Record and show all your work on the worksheet provided.
- 2) Decide how to use the charged pith ball electroscope and the laws of electric charges to infer the type of charge on a material that has an unknown charge.
- 3) Create a data table to record your observations,
- 4) Have your teacher approve your investigation method and data table.
- 5) Conduct your investigation.
- 6) Examine, review, summarize, reflect and evaluate the results of your investigation by answering the questions posed on your worksheet.

STEP 1 - INITIATE AND PLAN

Design the investigation. Include:

- ✓ a hypothesis
- ✓ a list of equipment and materials
- ✓ a step-by-step procedure
- ✓ a labelled diagram of your set up
- ✓ a list of dependent, independent, and controlled variables
- ✓ safety precautions
- ✓ a way to measure your results and record your observations

Submit your design to your teacher for approval prior to beginning your actual experiment. Your teacher will need to initial the "Checkpoint" on your worksheet.

STEP 2 - PERFORM AND RECORD

Carry out your procedure as approved by your teacher and record your results in the data table you constructed on your worksheet.

STEP 3 - ANALYZE AND INTERPRET

Examine, review, interpret, summarize, reflect and evaluate the results of your investigation by answering the questions posed on your worksheet.

"Be a Charge Detective"

SCIENTIFIC INQUIRY INVESTIGATION WORKSHEET

Use the following outline to record the steps of inquiry you use to investigate your problem.

INITIATE & PLAN	
Inquiry Title: (descriptive)	/1
Purpose/ Problem/ Question: (What is your investigation about?)	/1
Hypothesis: (If ... then ... because) If _____ Then _____. Rationale: This is hypothesized because	/3
Variables: Independent Variable:	/1
Dependent Variable:	/1
Controlled Variables:	/3

Materials: (What will you use in the lab?)	/2
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Procedure: (step-by-step) You may not need all of the spaces. If you need more space, attach a sheet or use the back.	/5
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|-----|--|
| 1. | |
| 2. | |
| 3. | |
| 4. | |
| 5. | |
| 6. | |
| 7. | |
| 8. | |
| 9. | |
| 10. | |

Diagram:

Provide a labelled diagram of your experimental set up.

Safety Precautions:

/3

/1

OBSERVATIONS:

Make a chart to record your observations as applicable. Be sure to include headings and applicable units. Use a ruler.

/3

CONFERENCE CHECK POINT: Teacher initials _____

PERFORM & RECORD

Carry out your procedure and fill in your observations in your observation chart.

/5

ANALYZE & INTERPRET

DISCUSSION:

1. Compare your electrostatic series with the electrostatic series developed by your classmates. How can you resolve differences in the order of the materials?

/3

2. Why are some materials difficult to place in an electrostatic series?

/2

3. What were some sources of error that could have occurred in your lab. How would you improve the lab for next time.

/3

CONCLUSION:

Write a sentence or two summarizing the electrical characteristics of two different materials that result in the formation of static charge when they are rubbed together.

/2

TOTAL:**/42**