

Charge, fields and sparks

Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Lab

Name: _____ Date: _____ Class: _____

How does the amount of charge on a plastic strip depend on how many times you rub it? In this lab you charge a strip, hold it over tissue-paper bits and count how many it lifts, then analyse the pattern.

Level: Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** GCSE P2, HS-PS2-4

Aim

To investigate how the number of rubbing strokes affects the amount of charge on a plastic strip, using the number of tissue-paper bits it lifts as a measure.

Equipment

- Strip of polythene (a strip cut from a clean carrier bag, or a plastic ruler)
- Woollen cloth or dry paper towel
- Tissue paper cut into 5 mm squares (about 30 pieces)
- Tray or flat plate
- Ruler
- Notebook and pencil

Safety

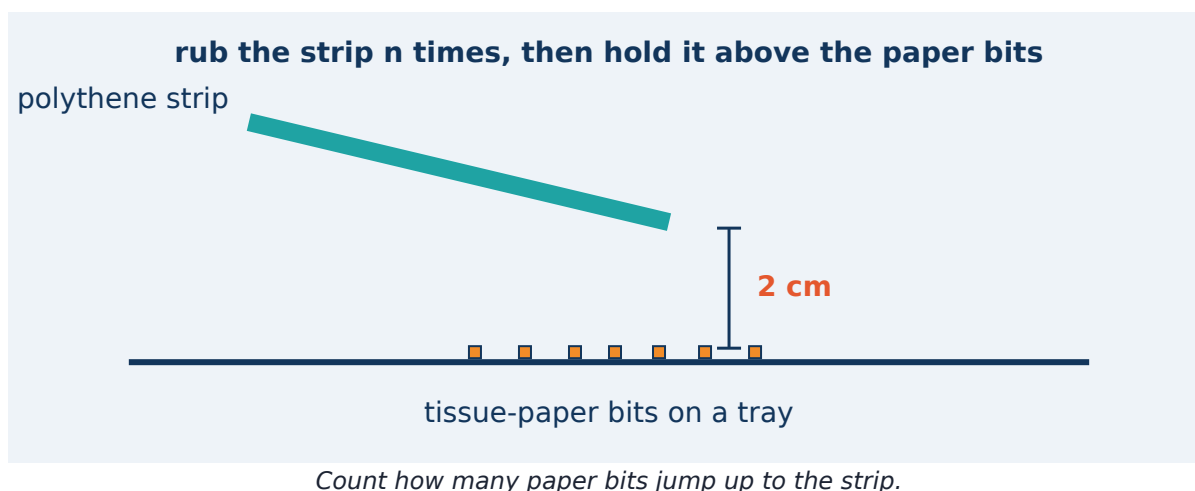
Safety

Work away from water, electric sockets and flammable liquids. Use a dry room because damp air lets charge leak away. Brush the paper off your hands before touching your face.

Method

1. Spread the same 30 paper bits on the tray each time.
2. Wipe the strip clean and rub it along the cloth 10 times in one direction only, always at the same speed.
3. Hold the strip 2 cm above the paper bits, without touching them, for 5 seconds.
4. Count how many bits are lifted and stick to the strip.
5. Touch the strip with your hand to remove its charge, then repeat the test two more times with 10 rubs.

6. Repeat the whole procedure for 20, 30, 40 and 50 rubs.



Results

Sample measurements (number of paper bits lifted):

Number of rubs	Trial 1	Trial 2	Trial 3	Mean
10	2	3	2	2.3
20	5	4	6	5.0
30	8	9	8	8.3
40	11	10	12	11.0
50	12	12	13	12.3

Analysis questions

Question 1 Plot the graph

Plot the mean number of bits (y-axis) against the number of rubs (x-axis) and draw a smooth curve.

Question 2 Describe the trend

Describe how the number of bits lifted changes as the number of rubs increases.

Question 3 Why it levels off

Suggest why the increase slows down at a large number of rubs.

Question 4 Control variables

Name three variables that were controlled and explain why.

Question 5 Humidity

Predict the effect of doing the lab on a rainy, humid day and explain it.

Question 6 Reliability

Use the spread of repeat readings to comment on reliability.

Question 7 Improvement

Suggest one improvement to make the measure of charge more precise.