

## Inquiry Question

**How does a photocopier create an image? How does it transfer this image to a new sheet of paper to make a "copy"? What does this have to do with static electricity?**

**Name:** \_\_\_\_\_

**Date:** \_\_\_\_\_

We have all seen photocopiers. They are incredibly complex machines with many moving parts. But how do they work at the most basic level? What does this machine have to do with static electricity?

A photocopier uses the principles of electrostatic attraction to create an image. Using tape, plastic, and talcum powder, students will attempt to recreate this process manually.



### General Instructions

In this experiment, we will examine the properties of static electricity and learn how to create a charged object.

#### Materials you'll need:

- Your course notes
- The internet
- a flat piece of clear or dark plastic (acrylic) at least 1/16 inches thick. You can find this at your local hardware store.
- talcum powder
- a rag
- clear sticky tape (avoid SCOTCH 3M Magic brand as this seems to have some anti-static properties)

#### Procedure:

- Peel off a strip of tape, discharge it between fingers, fold a tab at one end, and stick it securely over the surface of the plastic. Create some sort of picture with your tape (could be your initials for example).
- Put down some newspaper so you don't get talcum powder all over, then sprinkle talcum powder on the rag and rub it into the rag. This will become your source of dust (called "toner")
- Now peel the tape off the plastic, then shake the rag to make a cloud of talcum powder dust in the air near the plastic. The charged area on the plastic surface will attract the powder, and a "charge image" will appear. If your plastic was clear, try holding it against a dark background to make the white powder more visible. (This experiment works best when humidity is fairly low)

#### Ideas and Hints

- this experiment works best when the humidity is low.
- avoid SCOTCH 3M Magic brand as this seems to have some anti-static properties
- perform this experiment outside or in a garage as the dust can be messy (stay clear of computers etc as they will attract the powder)
- film the final step where the tape is peeled and the dust from the rag is attracted to these spots. Film is slow motion if you can.

**Project submission:**

- Upload your completed work to the Physics project drop box if you chose to submit online.
- You can either submit photos/video of your project (along with an explanation and/or steps of construction) or, if you can drop-in to the school, you can present it to your teacher in-person.
- Be sure to carefully organize any data collected so that any other student or teacher could reproduce your experiment and achieve the same results.

**Project Timing:**

- In its most basic form, this project will take the average student 2 hours. Locating all of the materials needed may vary.

**Inquiry Questions and Experimental Design:**

1. Can you identify the "photocopier parts" that are represented in your experiment?
2. Watch the video you shot of your photocopier in action as the dust settles in (slow motion works best). Describe, in as much detail as you can, how the dust moves.
3. Research: What is "Powder coating"? Discuss how this process of painting is similar to how a photocopy is generated.
4. Can you come up with another example of something that utilizes the same principles as your photocopier?