

Name:

Date:

Class:

# Scaling Activity Sheet

## Simple Light and Pattern Activity for Lower Grades (2-6)

Students explore how light creates patterns by blocking some areas and letting light shine on others. This activity models how engineers make tiny patterns on semiconductors using paper and sunlight instead.

### Materials:

- Sunprint paper (or UV-sensitive paper)
- Leaves, paper shapes, or cutouts to use as masks
- Clear plastic sheet or zipper bag to hold items in place (optional)
- Water in a shallow tray or bucket
- Access to sunlight (outdoors or sunny window)
- Stopwatch or clock

### Student Learning Goals:

- Create a patterned picture using sunlight and shapes.
- See how covering parts of the paper blocks light to make patterns.
- Understand that the amount of time in the sun changes how dark or clear the pattern looks.
- Connect this to how engineers use light to make electronics.

### Step-by-Step Instructions:

1. Give each student a piece of sunprint paper.
2. Have them place leaves, paper cutouts, or objects on the paper. These block the light, like a mask. If outside, use a clear plastic sheet to keep objects from blowing away.
3. Place the prepared paper in the sun.
4. Start a timer. Some students can leave theirs in the sun for 1 minute, others for 3 or 5 minutes to compare what happens.
5. Bring the papers inside.
6. Rinse the papers in water to stop the reaction and reveal the design.
7. Have students look at their patterns.
8. Have students answer the following questions:
  - Where did the light hit the paper?
  - What happened where the paper was covered?
  - How did the amount of time in the sun change the result?

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### **Design Your Own Photolithography Experiment (Older/Advanced Students)**

Students create and conduct their own experiments using UV gel nail polish to test ideas related to photolithography concepts such as masking, exposure time, wavelength, and pattern resolution. They then analyze their results and connect findings to the myth/fact statements.

#### ***Step 1: Review and Choose a Question***

Give students the myth/fact statements (or a simplified list) and ask them to choose one or two statements they want to investigate further with the UV gel polish and UV light. For example:

- How does changing exposure time affect how well the gel hardens?
- Does the shape or size of the mask affect the sharpness of the pattern?
- Does changing the distance between the UV light and the polish affect the pattern quality?
- How does mask material (opaque vs. translucent) influence polymerization?

#### ***Step 2: Plan the Experiment***

Students answer these planning questions in their engineering notebook.

- What is your experiment question?
- What variable will you change (independent variable)?
- What will you keep the same (controlled variables)?
- What will you measure or observe (dependent variable)?
- What materials do you need?
- What steps will you follow?

#### ***Step 3: Conduct the Experiment***

Students perform their experiment carefully, recording:

- Observations about how the gel polish polymerizes (hardens) or patterns form.
- Any differences they see based on their variable changes (e.g., longer exposure = harder polish).
- Take photos or make sketches if possible.

#### ***Step 4: Analyze and Conclude***

Students write or discuss:

- What did you find out?
- How does your result support or refute the myth or fact statement you tested?
- Use vocabulary such as photoresist, polymerization, mask, ultraviolet light, exposure time, and resolution in your explanation.
- What would you change to improve your experiment?

#### ***Step 5: Share Your Results***

Have students present their experiments and conclusions to the class. Encourage questions and discussion about why certain results happened.