HOMESCHOOL SCIENCE EXPERIMENT

OBSERVING POLARIZED LIGHT WITH POLARIZING FILTERS

Name: _____ **Date:** _____ **Experiment #:** _____

QUESTION

How do polarizing filters affect light when they are rotated relative to each other?

HYPOTHESIS

If I rotate one polarizing filter relative to the other, then I predict that

_____

_____

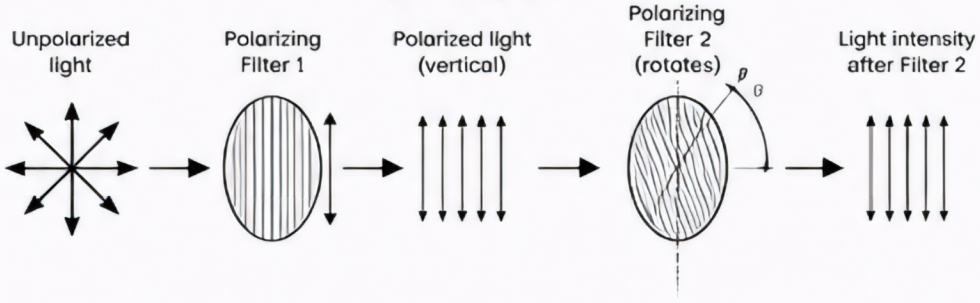
MATERIALS

- **2 polarizing filters (linear polarizers)**
- **Light source (lamp or bright window)**
- White paper (or screen)
- Tape (optional)
- Protractor (optional)
- Pencil
- **Notebook**

BACKGROUND

Light waves vibrate in many directions perpendicular to their direction of travel. A polarizing filter allows light waves vibrating in only one direction to pass through. This is called polarized light. When a second polarizer is placed in the path of polarized light, the amount **of light that passes depends on the** angle between the two filters. **When the filters are aligned, the maximum light passes. When they are perpendicular (at 90°), almost no light passes.**

HOW IT WORKS



The transmitted light follows Malus's Law: $I = I_0 \cos^2(\theta)$

where θ is the angle between the filters.

PROCEDURE

1. Hold one polarizing filter up to the light source.
2. Hold the second polarizing filter behind the first one.
3. View the light passing through the filters onto a white paper or screen.
4. Rotate the second filter. Observe how the brightness changes.
5. Record your observations in the data table below.
   (Optional: Use a prrotractor to measure the angle between the filters.)

OBSERVATIONS

Describe what you see as you rotate the second filter.

_____

_____

_____

_____

DATA TABLE

Angle between filters (θ)	**0°**	**15°**	**30°**	**45°**	**60°**	**75°**	**90°**
Observed brightness (0 = dark, 5 = brightest)							
Notes							

CONCLUSION

1. What happened to the brightness as the angle increased?

   _____

2. At what angle was the light the dimmest?

   _____

3. How did your results compare to your hypothesis?

   _____

THINK FURTHER

1. Why do you think the light is almost completely blocked at 90°?

   _____

2. Where in real life might polarizing filters be useful?

   _____

3. Can you think of ways to test this experiment further?

   _____

⚠ **SAFETY FIRST:** Do not look directly at the sun or very bright lights. Use adult supervision when using lamps or electrical devices.