

Filtering Away Lab

Teacher's Guide

Topic:

Light and Color

The following information is provided to the student:

Question:

What is the result of looking at various light colors through colored filters and what strategy could be used for predicting such results?

Purpose:

To observe the effect which various filters and combinations of filters have upon the incident light and to describe a useful strategy for predicting the results.

A complete lab write-up includes a Title, a Purpose, a Data section, a Conclusion/Discussion of Results. The Data section should include the provided table of observations. The Conclusion/Discussion should include a thorough discussion of a strategy used to predict what the result will be when a specific filter is used to filter a specific color of incident light.

URL: <http://www.physicsclassroom.com/lab/light/filters.cfm>

Materials Required:

Computer; set of colored filters or gels - red, green, blue, cyan, magenta, yellow; slide with 7 colored numbers (<http://www.physicsclassroom.com/lab/light/filters.cfm>).

Description of Procedure:

Students go to the web page indicated above. They observe the color of each number and record their observation. Students then cover each number with a colored filter and observe the appearance. They record their observations using words such as "no change", "little change", "darker", "less red", "much less red", "changed to green", etc. They repeat the procedure for each combination of colored number and colored filter.

Alternative Materials and Procedure:

If a class set of the six filters is not available, but the classroom is equipped with a computer and LCD projection capabilities, then the lab could be done just as effectively and certainly more efficiently as a demonstration lab. Darken the room and project the numbers onto a screen in the front of the room. In a systematic manner, hold a filter over each number and give students an opportunity to observe, discuss with one another and record their observations of the appearance. Repeat for all the combinations of filters and numbers. Once the Data table is completed, students ponder their observations in an effort to identify patterns. They then describe a strategy which could be used to predict the appearance of any given colored number when viewed through any colored filter. The strategy should be general enough to work for any combination of number and color; yet it should include enough detail that a person could use the strategy and make a successful prediction.

Safety Concern:

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There is always a higher than usual level of risk associated with working in a science lab. Teachers should be aware of this and take the necessary precautions to insure that the working environment is as safe as possible. Student *horseplay* and off-task behaviors should not be tolerated.

Suggestions, Precautions, Notes:

1. The colored numbers found in the Shockwave movie at <http://www.physicsclassroom.com/lab/light/filters.cfm> can be displayed with a white or with a black background. It is useful to toggle the background between white and black.
2. There is nothing particularly special about the provided slide at the indicated web page. Your own slide could easily be made using Microsoft PowerPoint or a similar tool.
3. The most unique part of the lab is the wording of the Purpose. Students must develop a strategy that would be capable of predicting which light colors would pass through various combinations of filters. Students are not asked to find the *answers*; they are asked to find the strategy.

Auxiliary Materials:

The following page is provided to the student for completion and inclusion in the Data section of their lab notebook.

| | | Appearance of Number | | | | | | |
|-----------------|---------|----------------------|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Color of Filter | None | | | | | | | |
| | Red | | | | | | | |
| | Green | | | | | | | |
| | Blue | | | | | | | |
| | Cyan | | | | | | | |
| | Magenta | | | | | | | |
| | Yellow | | | | | | | |

Scoring Rubric:

| L9. Filtering Away Lab | Score |
|---|---------|
| ___ Included, labeled and organized all parts of the lab report. | ___/___ |
| ___ Data section includes the provided table of observations; observations are meaningful and reasonably accurate. | |
| ___ Conclusion/Discussion includes a thorough discussion of the strategy used to predict the result of any given incident color on any given filter. Logic is | |

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| clearly presented. Discussion centers around the strategy (not the answers). Discussion elaborates on the topic, is accurate, not vague nor ambiguous. Discussion reveals understanding. | |
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Connections to The Physics Classroom Tutorial:

The following readings are a suitable accompaniment to this lab:

<http://www.physicsclassroom.com/Class/light/u12l2c.cfm>

<http://www.physicsclassroom.com/Class/light/u12l2d.cfm>

<http://www.physicsclassroom.com/Class/light/u12l2e.cfm>

Connections to Minds on Physics Internet Modules:

Sublevel 8 of the Light and Color module is a suitable accompaniment to this lab:

<http://www.physicsclassroom.com/mop/module.cfm>