

Light and Color Demonstrations:

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Teacher's Guide

Goals

- To demonstrate the concepts of atoms and electronic structure
- To apply these concepts in the real world

The Demonstrations

The demonstrations are intended to strengthen the understanding of basic concepts about the atom and its electronic structure by demonstrating light energy given off by excited electrons.

Materials

- White lamp
- Red lamp
- Diffraction gratings for each student
- 3-4 UV beads for each student
- Classroom technologies:
 - Computerized presentation
 - Overhead projector

SAFETY

Do not look directly at strong light.

If you use UV lamps, use safety goggles and avoid exposure to radiation.

Lecture Notes

We will be talking about the chemistry of light, and that's because you guys are so bright.

Talk about the colors of visible light, about photons, and about how atoms can give off light.

In the ground state, the electrons are at their lowest energy level.

There's a special name for an electron that has been moved to a higher energy level—the excited state.

Summarize different possible excited states: $2S_1$, $2S_2$, etc.

The electrons will only go to the excited state if you give them energy like flame or electricity.

They will go down to the ground state, $1S_2$, as soon as possible.

This is related to light.

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Demonstration # 1—Diffraction Light

Turn on a white lamp.

What color does the lamp give off?

Give out diffraction gratings. Instruct the students to look at the light through the grating.

What colors do you see?

The white light is separated into colors.

The first scientist who actually saw this was Isaac Newton.

He was amazed because all of these colors were always in sunlight.

Turn off the white lamp and turn on a red one. Watch the light through grating.

What color do you see now?

You only see several colors, mostly red.

Discussion

Have any of you ever seen a rainbow anywhere in your house?

Any v-shaped piece of glass would have the same effect.

ROY G. BIV—the abbreviation for the colors of light.

The energy of different colors of light was measured by carefully shining them on thermometers, although most people could not tell the difference between different energies of light.

Photons are little pieces of light.

“Black light” is UV light, which you see only when it glows off different chemicals.

Demonstration # 2—UV Beads

UV beads are beads that glow when UV light shines on them.

There are chemicals inside the beads that absorb UV light from the sun and give off visible light in various colors.

Teaching Tips From Mr. DeGennaro

Try to give the students an understanding of different kinds of light and different colors

This should help the students understand what they've learned about atoms and how electrons move within atoms.

References: Links

<http://scifun.chem.wisc.edu/chemweek/fallcolr/fallcolr.html>

The chemistry of autumn leaf colors.

References: Readings

Trupp, T. (2001) “Putting UV-Sensitive Beads to the Test,” *Journal of Chemical Education*, Vol. 78, No. 5, p: 648A.

Anthony, G. (1997) “Housing Electrons: Relating Quantum Numbers, Energy Levels, and Electron Configuration,” *Journal of Chemical Education*, Vol. 74, p: 709.