Spectroscope Activity

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Subjects(s): Physics

Topic or Unit of Study: Stars

Grade/Level: 9th grade

Time Allotment: 2 periods - 100 minutes

Objective: Build a spectroscope and observe different sources of light.

Summary: Students will follow directions to build a simple spectroscope. They will then use the spectroscope to look at various sources of light and record what they are seeing. The class will discuss their findings.

STANDARDS & ASSESSMENT

Standards:

11.A.4a Formulate hypotheses referencing prior research and knowledge

11.A.4b Conduct controlled experiments or simulations to test hypothesis

11.A.4c Collect, organize and analyze data accurately and precisely

11.A.4e Formulate alternative hypotheses to explain unexpected results

13.A.4b Assess the validity of scientific data by analyzing the results, sample set, sample size, similar previous experimentation, possible misrepresentation of data presented and potential sources of error

13.A.4d Explain how peer review helps to assure the accurate use of data and improves the scientific process

Assessment/Rubrics: Design and instructions on how to build a spectroscope, Spectroscope Activity Data Sheet, and Spectroscope Analysis sheet.

IMPLEMENTATION

Learning Context: This is the first lesson in the unit. Students will have limited background knowledge of light, specifically that white light is a mixture of all colors. They will reinforce their knowledge that white light is a mixture of all colors but will learn that not all white light is the same (ex. fluorescent light has a strong green emission line while incandescent light does not). Also, different colors of light (blue vs. red) have different colors show up in their spectra due to absorption. This will lead students into learning about the absorption lines in stars.

Procedure:

- The teacher will start by informing the students that they will be making spectroscopes to look at various light sources.
- Pass out materials (spectroscope design, tape, scissors, and CD wedges) and make the spectroscope.
- When done making the spectroscope, students will get a Spectroscope Activity Data Sheet and fill it out by looking at different light sources (light stations should be set up before class). Students will be in groups of 2-4 while completing the data sheet.
- What is happening inside the spectroscope? Diffraction. What is diffraction? Brief explanation. Lead students to the fact that different colors of light have different wavelengths and that is why the spectroscope separates them.
- The class will compare results for specific light sources and discuss why some people got different results. Lead this into how interpretation of data is important to validity in science and how peer reviews helps to assure accuracy of data.
- Spectroscope Analysis sheet for homework

Differentiated Instruction: Students with hearing or visual impairments will be placed in the front of the classroom, enabling them to hear and see the teacher's instruction better. AD/ADHD students will be placed by the teacher's desk or an easily accessible area so the teacher can make sure these students are staying on task. LD students will receive differentiated instruction on a case by case basis. The differentiated instruction will depend on what learning disability the student has and how that specific student will cope with the presented lesson. Furthermore, for

visually impaired students, the teacher will verbally explain the instructions of how to make the spectroscope if reading the instructions are a problem. If they cannot see well enough, they will not be able to see the spectrum of the light sources and thus will need to have the spectrum verbally explained to them. A larger picture representing the different spectra will be given to the student. For students having trouble with motor skills, depending on the situation, either a bigger printout of the spectroscope design or a pre-cut/pre-made spectroscope will be given to the student.

MATERIALS AND RESOURCES

Instructional Materials:

- Opaque paper with the spectroscope design and instructions printed on it
- Tape – opaque would be best
- Scissors
- Colored pencils
- CD wedges – cut to fit into spectroscopes
- Incandescent light source
- Fluorescent light source
- Blue and green light sources – could be blue and green filters on an incandescent light
- LCD computer screen set to a white background
- Access to a window – for sunlight

Resources: The information for the spectroscope construction can be found at: https://pantherfile.uwm.edu/awschwab/www/specweb.htm