Name: ______________________

Spectral Detective - Making Your Own Spectroscope

Problem
How can you identify a specific type of light bulb?

Prelab Questions
1. When scientists look at stars that are hundreds (or more) light years away, they can determine what chemical elements can be found in that star. How do you think that a scientist can do this even though the star is too far away for a spaceship to reach?

2. We are now going to watch a short video: NASA Launchpad: Neon Lights – Spectroscopy in Action
At the conclusion of the video, re-answer the above question.

Materials
- Cereal box
- Aluminum foil
- CD
- Tape
- Ruler
- Protractor
- Scissors
- Marker
- Colored pencils
- Various types of light bulbs

Safety
- Always wear safety goggles when using tools in the lab.
- Never look directly into the sun with the spectroscope.
- Wash your hands thoroughly before leaving the lab.
- Follow your teacher’s instructions for clean-up and disposal of unused scraps of boxes and foil.

Procedure
1. Watch this Build Your Own Spectroscope video
2. The video should serve as an overview for how to make your own spectroscope, and what the final spectroscope should look like.
3. To begin making your own spectroscope, carefully follow the instructions on the handout “Directions: How to Construct a Homemade Spectroscope.”
4. Once your Spectroscope has been constructed, point the spectroscope’s slit at the first light bulb, and look through the viewing window.
5. While looking through the viewing window of the spectroscope, adjust the angle that you are holding the spectroscope and the CD until you see a clear spectrum (rainbow).
6. Record the type of light bulb in the data table below.
7. If available, use a phone, iPod, or iPad to take a picture of the spectrum.
8. Sketch the spectrum in the data table below using colored pencils.
9. Compare the picture to the spectra on the “Light Bulb Spectra Sheet.” Look for the closest match.
10. Determine which known spectrum matches the type of light bulb and record its letter on the data table below.
11. Repeat for the other light bulbs.

Data

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<thead>
<tr>
<th>Light Bulb Type</th>
<th>Spectrum Sketch</th>
<th>Known Spectrum Letter</th>
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Analysis

1. How can you identify a specific type of light bulb if you are unsure of the type of bulb? Write your response in CER (claim, evidence, reasoning) form.
2. Take your spectroscope outside and look at the sky (DO NOT LOOK DIRECTLY AT THE SUN). You should see a rainbow in your spectroscope much like you would see on a rainy day. What light bulb most closely matches the spectrum of the sun? Explain why it matches better than the other light bulbs.

3. Some things, such as clothing, look different under different types of light bulbs. Using what you have observed with the spectroscope, why might this be so?

Conclusion
Write a conclusion paragraph that meets the following criteria: answer the initial problem, summarize the experiment, discuss any problems that were encountered, and suggest other experiment ideas.

Design Challenge
- Choose at least one aspect of the spectroscope to improve.
- Possible ideas:
  - Make the spectroscope more portable.
  - Reduce the amount of ambient (extra) light that enters the spectroscope.
  - Make the spectrum more sharp and clear (focused).
  - Have the spectroscope use fewer materials.
  - Make it easier to take a picture using the spectroscope.
  - Improve any other problems that you encountered.
- Build it and test it. Make any additional changes/modifications.
- Write a set of directions to build the new spectroscope.