



MND Physics

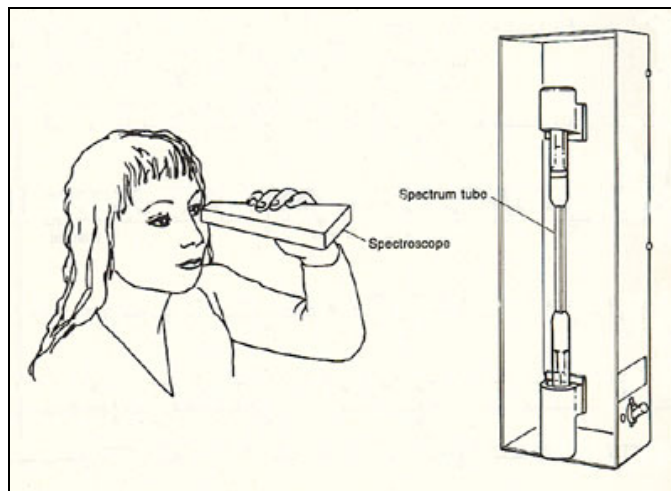
Quantum Mechanics - Atomic Spectra

When an object glows with heat, the object's atoms produce a continuous spectrum. Substances that are vaporized by heating emit light characteristic of the elements in the substance. One way to produce a spectrum is to apply a very high potential difference across a low pressure, gas filled tube. The excited electrons in the atoms give off photons as they move to lower energy levels. Some of these photons will have just the right amounts of energy such that they will be able to be detected as visible light (some photon wavelengths will be between 450nm and 700 nm).

In this lab, you will investigate the bright line spectra of several elements or compounds. By recording the observed spectral lines and comparing to known element spectra, you can identify unknown samples.

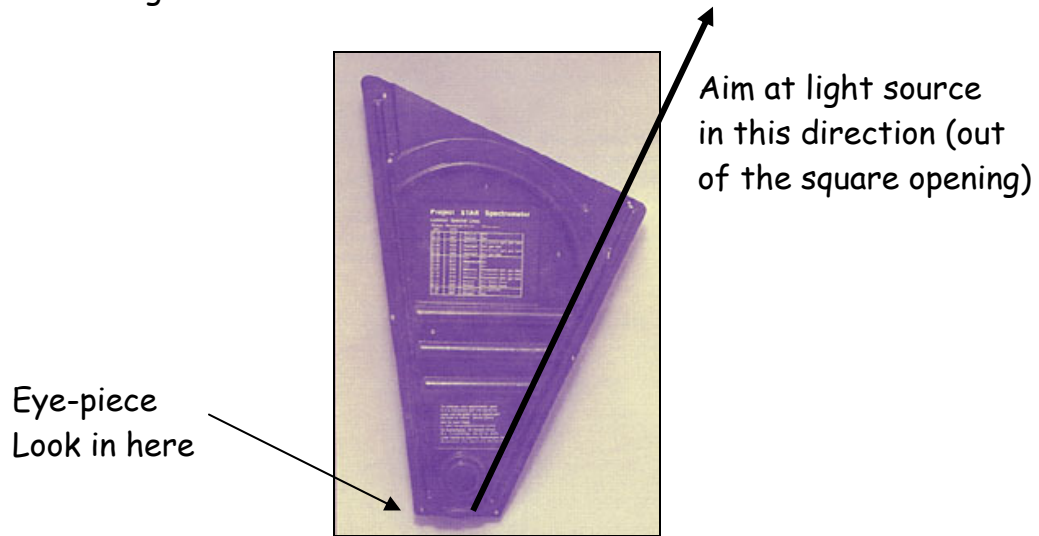
EQUIPMENT:

'Project Star' spectroscope, colored pencils, spectrum tubes, spectrum tube power supply, 40 watt incandescent lamp and socket, florescent lamp (use fixtures on ceiling of room).

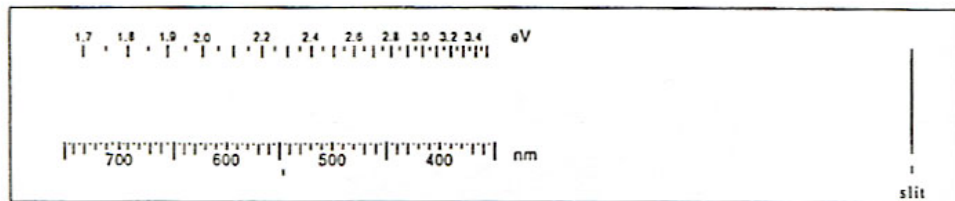


PROCEDURE:

1. Hold the spectrometer so that the printed side is face up. Notice the small square opening on the right hand front side of the spectrometer; the square opening contains a slit that the source light needs to enter. Line this square opening up with the source you are examining.



2. Hold the spectrometer so that one eye is next to the lens and the other eye closed. Facing the windows, practice looking into the spectrometer; you should see the scale illustrated below off to the left hand side of the inside of the spectrometer:



3. Now look at an illuminated incandescent light bulb through the spectrometer. Aim the square opening on the front right hand side at the illuminated bulb. You should see a continuous spectrum of light. Draw what you see in one of the data tables provided.

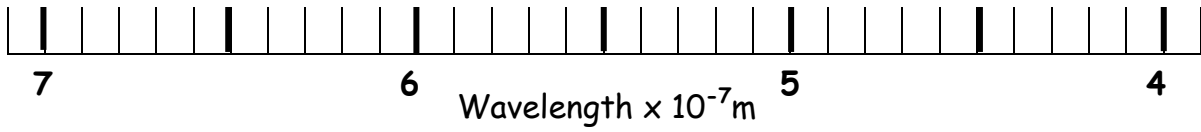
4. Look at a fluorescent lamp through the spectrometer. Draw the spectrum you see. This spectrum should include several bright colored vertical lines. Make sure to include these lines in your drawing taking care to place them accurately according to the values observed in the spectrometer.
5. Turn on the power supply. **CAUTION: HIGH VOLTAGE-HIGH HEAT!** Aim the square opening of your spectroscope directly at the spectrum tube. While looking into the lens, very slowly move your spectrometer to the left and right to insure the brightest possible view of spectral lines. You should be able to see the color of the tube in the internal slit on the left hand side.
6. View each tube carefully with your spectroscope. Draw the spectrum or lines observed for each tube. Take care to note in your drawing the relative brightness of each line. You can indicate relative brightness by the height of the line you draw (example: the taller the line, the more intense it was in the spectroscope).
7. After all drawings are complete, refer to the "Spectral Guide for Elements" provided by Mr. Peppercorn on the day of your lab. Match your drawings with the spectra of known elements and identify the unknowns.

QUESTIONS:

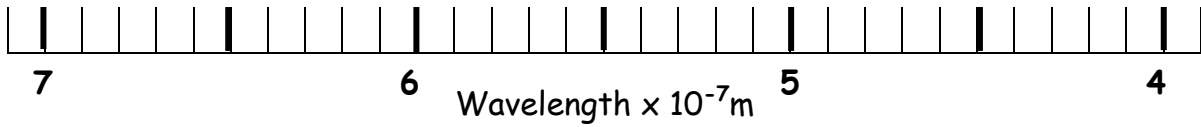
1. Compare the overall color of the spectrum tube (as it looks with the naked eye) to the colored lines you observed through the spectroscope. Why are they different?
2. Examine the fluorescent light spectrum. What other spectrum has equivalent lines? What element (among others) can you conclude is contained in fluorescent light bulbs?
3. Describe the uses of a spectroscope in astronomy.

NOTE: An extra data sheet is provided in case you need to re-do a drawing.

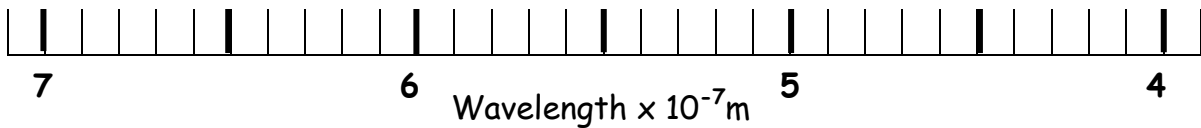
DATA:



Element/Compound: _____ Station #: _____

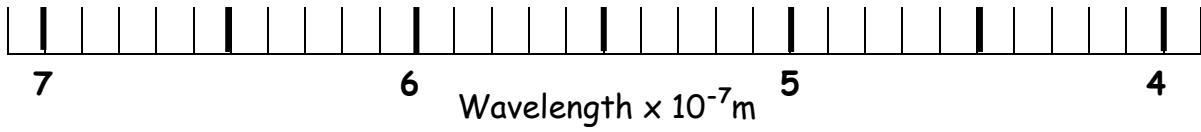


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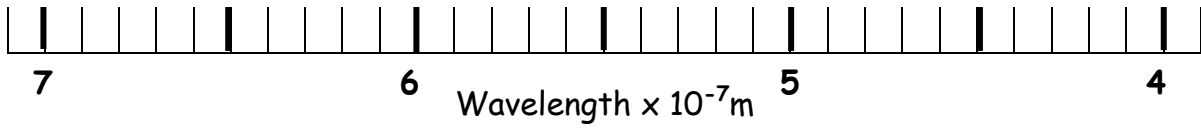


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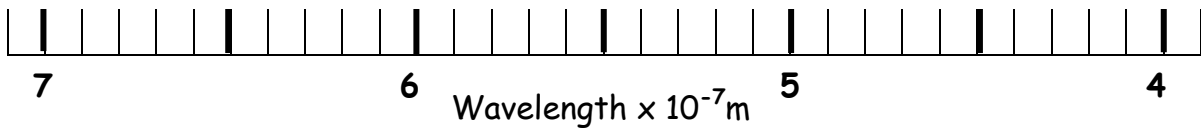
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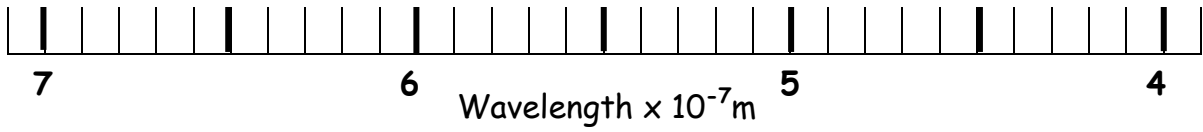


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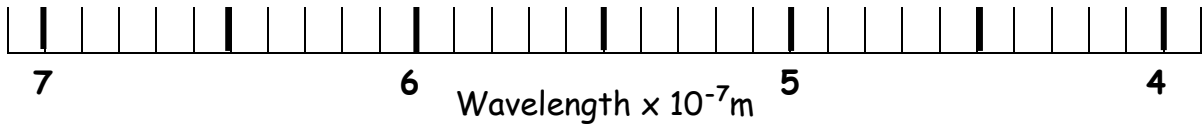


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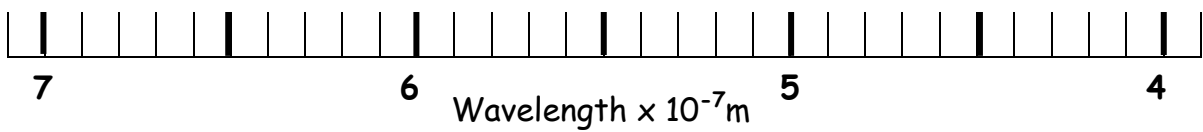
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