

Prelab Notes: Measuring Atomic Emission Spectra

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Safety Concerns

- **High Voltage:** Avoid touching metal connectors on the emission lamps while they are powered. Lamps can become hot during use, so allow them to cool before handling.
- **Spectrometer Use:** Do not point the spectrometer at bright or hazardous light sources, such as the sun, to prevent eye damage.
- **Hygiene:** Wear gloves or wash your hands before and after using the spectrometer, as they are not sanitized between uses.

Part I: Measuring the Atomic Emission Spectra

Using the Handheld Spectrometer

Setup

- **Hold** the narrow end (ocular window) close to your eye.
- **Point** the wider end with the incident slit toward the light source.
- **Adjust** distances for a clear view of the emission spectrum on the internal scale.

Reading Wavelengths

- **Wavelength scale** is marked every 10 nm; numbers indicate every 100 nm (e.g., “4” represents 400 nm).
- **Align** the center of each spectral line with the scale above it.
- **Estimate** wavelengths between markings as accurately as possible.

Procedure Steps

1. Observing a Non-Atomic Light Source

- **Action:** Use the spectrometer to observe an everyday light source (e.g., overhead lab lights).
- **Qualitative Description:**

Describe the observed spectrum:

- **Questions:**

How does this spectrum differ from atomic emission spectra?

2. Observing the Hydrogen Emission Spectrum

- **Action:**

- Turn on the hydrogen lamp.
- Use the spectrometer to observe hydrogen's emission lines.
- Shield the spectrometer from other light sources if needed.

- **Ensure:**

- Only hydrogen spectral lines are observed (ask to turn off overhead lights if necessary).

- **Data Recording:**

Record the color and measured wavelength of each visible emission line.

Color	Measured Wavelength (nm)	Observations

Note any variations in brightness or width of the lines.

3. Group Discussion and Data Comparison

- **Action:**

- Compare your observed wavelengths with group members.
- Discuss any discrepancies and possible reasons.

- **Data Table:**

Color	Your Measurement (nm)	Member 1 (nm)	Member 2 (nm)	Average Wavelength (nm)

Calculate the average wavelength for each line.

4. Observing Another Atomic Emission Lamp

- **Action:**

- Choose a second atomic lamp (e.g., helium, neon).
- Repeat steps similar to those for hydrogen.

• **Element Observed:** _____

• **Data Recording:**

Color	Measured Wavelength (nm)	Observations

• **Group Data Comparison:**

Color	Your Measurement (nm)	Member 1 (nm)	Member 2 (nm)	Average Wavelength (nm)

5. Final Steps

- **Action:**
 - Turn off all emission lamps when finished.
 - Return the spectrometer to the instructor.
 - Obtain the post-lab assignment.

Expected Wavelengths for Hydrogen Balmer Series

Transitions where $n_f = 2$ and $n_i > 2$:

Transition ($n_i \rightarrow n_f$)	Expected Wavelength (nm)
$3 \rightarrow 2$	656.3
$4 \rightarrow 2$	486.1
$5 \rightarrow 2$	434.0
$6 \rightarrow 2$	410.2

Use these values to help identify the observed spectral lines.

Space for Calculations and Additional Observations

Calculations

Additional Observations

Note: Ensure all measurements include proper units and significant figures based on the spectrometer's scale markings.