Name(s): _____ _____

_____ _____

Date: _____ Course/Section: _____

Grade: _____

Introduction to Spectroscopy

Objectives:

Students will learn how a spectrum reveals the different frequencies in a light source, and how analyzing a spectrum can reveal information about the nature of a source.

Checklist:

- ☐ **Complete the pre-lab quiz with your team (if required).**
- ☐ **Compile a list of resources you expect to use in the lab.**
- ☐ **Work with your team to complete the lab exercises and activities.**
- ☐ **Record your results and mark which resources you used.**
- ☐ **Share and discuss your results with the rest of the class.**
- ☐ **Determine if your team's answers are reasonable.**
- ☐ **Submit an observation request for next week (if required).**

Pre-Lab Quiz

Record your group's answers to each question, along with your reasoning. These concepts will be relevant later in this lab exercise.

1.
2.
3.
4.

Part 1: Visible Light

1. Fill in the table below that summarizes the colors of the lights in the black box. The table should include the bulb, the range in wavelength (λ), and the peak wavelength, λ_{peak} .

Blub	Color	λ_{range}	λ_{peak}	Sketch of spectrum
1				
2				
3				
4				
5				
6				

2. Draw and label the Electromagnetic spectrum from 100 nm~1000nm. Indicate the location of each bulb on it. What type of bulb is bulb #6, and why does it not appear to light up?

3. Why is the range in wavelength for white light so large?

Part 2: Color and Temperature

1. Draw the spectrum of each bulb. How do the spectra differ between these types of bulbs?

2. Turn on each bulb and describe the resulting light in terms of color, intensity, and anything else you notice that appears unusual using the provided diffraction glasses.

LED	
Fluorescent	
Incandescent	

3. Record the peak wavelength of the incandescent bulb and calculate the temperature of the bulb using Wien's Law. Show you work.

4. Compare your answer in Question 3 to the temperature of the Sun.

Part 3: Analyzing Emission Spectra

1. Observe the spectrum of the hydrogen and helium samples in the spectrum tube carousel. Record the wavelength and rank them based on how strong they are.

	λ_{peak}	Relative Strength Compared to Strongest Line
Hydrogen		
Helium		

2. Draw the entire spectrum for neon and argon, then label the strongest lines for each.

3. Why is neon orange and argon purple?

4. Sketch the spectra of nitrogen, carbon dioxide, and air and label the strongest lines. There are more lines than you need to write down, but it will be useful later if you have some quantitative data.

Nitrogen
Carbon Dioxide
Air

5. Describe how you can determine if there is carbon dioxide and nitrogen in the sample of air. From your spectra, is there carbon dioxide and nitrogen in air?