

PHYS 3650L - Modern Physics Laboratory

Laboratory Advanced Sheet

The Emission Spectra

1. Objectives. The objective of this laboratory is to identify an unknown gas by studying its emission spectrum.

2. Theory.

If a large voltage is applied across a sealed tube filled with a low-pressure gas, the gas will emit electromagnetic radiation characteristic to the individual gas atoms. The resulting emission spectrum consists of a collection of well-defined lines which is unique for a particular atom. By studying the emission spectrum of an unknown gas it is possible to reliably identify it.

3. Apparatus and experimental procedures.

a. Equipment.

- 1) Spectrometer.
- 2) Diffraction grating.
- 3) Several gas tubes.

b. Experimental setup. To be provided by the student.

c. Capabilities. To be provided by the student.

d. Procedures. Detailed instructions are provided in paragraph 4 below.

4. Requirements.

a. In the laboratory.

1) Your instructor will introduce you to the equipment to be used in the experiment.

2) Measurements to determine the angles of diffraction will be made for three different lines in the spectrum of hydrogen.

3) Your instructor will discuss methods to be used to prepare your data for plotting using the Microsoft Excel™ spreadsheet program.

b. After the laboratory. The items listed below will be turned in at the beginning of the next laboratory period. A complete laboratory report is **not** required for this experiment.

Para 3. Apparatus and experimental procedures.

1) Provide a figure of the experimental apparatus (para 3b).

2) Provide descriptions of the capabilities of equipment used in the experiment (para 3c).

Para 4. Data. Data tables are included at Annex A for recording measurements taken in the laboratory. A copy of these tables must be included with the lab report. Provide the items listed below in your report in the form a Microsoft Excel™ spreadsheet showing data, calculations and graphs. The spreadsheet will include:

1) For each gas tube: a table with columns for line color, measured angle of diffraction to the right, angle of diffraction to the left, mean angle of refraction, and calculated wavelength.

Para 5. Results and Conclusions.

a. Results.

1) A statement identifying the unknown gases.

b. Conclusions.

1) Make a conclusion about the ability of the technique based on the emission spectra to identify the unknown gases.

2) Describe the sources of error in the experiment.

Annex A
Data

1. Diffraction grating constant.

a = _____m

2. Angle of diffraction, 1st order.

a. Unknown gas tube 1.

Line (Color)	Diffraction Angle (degrees/minutes)	
	Right	Left

b. Unknown gas tube 2.

Line (Color)	Diffraction Angle (degrees/minutes)	
	Right	Left

c. Unknown gas tube 3.

Line (Color)	Diffraction Angle (degrees/minutes)	
	Right	Left
