# Report Sheet: Emission Spectroscopy CHEM 110

CAPILANO UNIVERSITY

Department of Chemistry

LAST NAME: _____ SEC # _____ LOCKER # _____

FIRST NAME: _____ DATE: _____

Record all data neatly at the appropriate location on this report sheet. Do not drop "leading zeroes". Show all calculations clearly and neatly and using the correct number of significant figures. Illegible data could impact your mark if your lab supervisor is unable to read it.

**Name of Partner**: *none – online experiment version*

- Do not record data or perform calculations in any shaded cells as these are for dim lines.
- Do not perform calculations until after raw data has been collected for <u>all</u> spectra.
- **Record all angle readings (both measured and corrected) to <u>1</u> decimal place**.
- **Report all wavelengths to the nearest whole number (0 decimal places)**.
- Most calculations do not need to be shown but provide full details for one of each type of calculation wherever requested on the report sheet.

**HELIUM emission spectrum:**

| Line Colour | Intensity | Measured Angle (degrees) | Correction Factor (+ or -) | Corrected Angle (degrees) | Experimental Wavelength (nm) |
|---|---|---|---|---|---|
| central image | bright | 0.0 | | | |
| violet | very faint | | | | |
| **VIOLET** | bright | | | | |
| blue | faint | | | | |
| blue-green | faint | | | | |
| **GREEN** | bright | | | | |
| green | very faint | | | | |
| **YELLOW** | bright | | ± = | **20.6** | |
| **RED** | medium | | | | |
| red | faint | | | | |

Using the angle measured for the **bright green** emission line of helium and Equation 5 of the lab manual, show here the calculation used to obtain the experimental wavelength of this line:

$\lambda$ = _____nm

**HYDROGEN emission spectrum:**

Record angle data in the table below and then calculate the corrected angles and experimental wavelengths, in a similar manner to page 1 and using the same correction factor. Calculate the experimental $\Delta E$ for all lines that were measured and transfer all theoretical $\Delta E$ from Table 2.1.

| Line Colour | Angles (degrees) | | Experimental | | Electron Transition | Theoretical $\Delta E$ (eV)[1] |
|---|---|---|---|---|---|---|
| | Measured | Corrected | Wavelength (nm) | $\Delta E$ (eV)[1] | | |
| central image | 0.0 | | | | | |
| violet *(if visible)* | | | | | $n_6 = \rightarrow n_2$ | |
| **INDIGO** *(blue-violet)* | | | | | $n_5 = \rightarrow n_2$ | |
| **AQUA** *(blue-green)* | | | | | $n_4 = \rightarrow n_2$ | |
| **RED** | | | | | $n_3 = \rightarrow n_2$ | |

[1] *report to 3 significant figures*

Choose one of the emission lines and show full details for the requested calculations below.

- Calculation of the **experimental $\Delta E$** of this coloured-line: _____
  *Report answer to 3 significant figures.* ***write colour here ↑***

**$\Delta E_{exp}$ = _____eV**

- Calculation of the **theoretical $\Delta E$** of the same line. *Report to 3 sig. figs. and in units of eV*.

**$\Delta E_{theo}$ = _____eV**

***Spectra of Mercury and CFL bulb are recorded on page 4.***

**HYDROGEN Calculations (continued):**

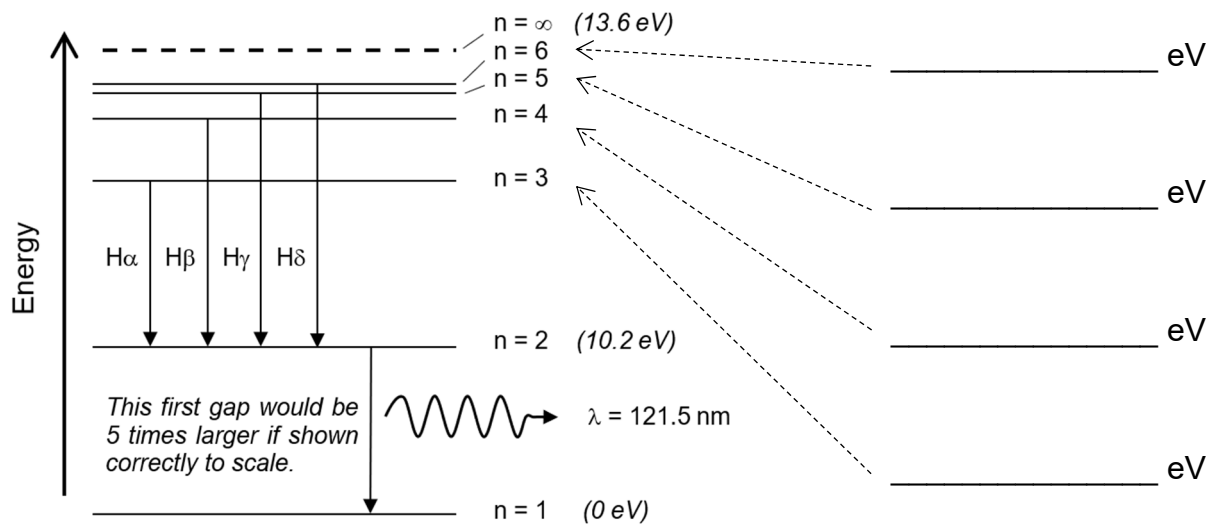
Show below a full calculation of the **theoretical wavelength** for the same emission line as chosen on page 2. The final answer should be in **nm**. Your $\Delta E_{theo}$ value (to 3 sf) must first be converted from eV to joules. Use your experimental wavelength as a "check" for your answer here.

**$\lambda_{theo}$ = _____nm**

Show below a full calculation of the **percent difference** between $\lambda_{exp}$ and $\lambda_{theo}$ of this line, as per Eqn 6 of the manual, and report the final answer to **2** decimal places:

**% difference = _____**

Complete the diagram below by calculating, to **2** decimal places, the **experimentally**-determined energy values ($\mathbf{E_n}$) for each level whose hydrogen emission line you measured (use Equation 4).



**MERCURY emission spectrum:**

| Line Colour | Intensity | Angle (degrees) | |
|---|---|---|---|
| | | Measured | Corrected |
| central image | bright | 0.0 | |
| violet | very faint | | |
| violet | faint | | |
| **VIOLET** | bright | | |
| green | medium | | |
| green | medium | | |
| **GREEN** | bright | | |
| **YELLOW** | bright | | |
| **YELLOW** | bright | | |
| red | very faint | | |
| red | very faint | | |

**CFL Bulb spectrum:**

| Line Colour | Intensity | Angle (degrees) | | Matching Corrected Angles in Other Lamps |
|---|---|---|---|---|
| | | Measured | Corrected | |
| central image | bright | 0.0 | | |
| **VIOLET / BLUE** | bright | ***All students will use the same corrected angles shown in the next column.*** | **15.2** | |
| **AQUA** *right-edge of blurry band* | bright | | **17.0** | |
| **GREEN** *slightly blurry line* | bright | | **19.0** | |
| **GREEN** *crisp line* | bright | | **19.2** | |
| **YELLOW** *thin crisp double line* | medium | | **20.3** | |
| **YELLOW** *thin crisp double line* | medium | | **20.4** | |
| **ORANGE** *fairly crisp line* | bright | | **21.5** | |
| **RED** *fairly crisp line* | medium | | **22.3** | |

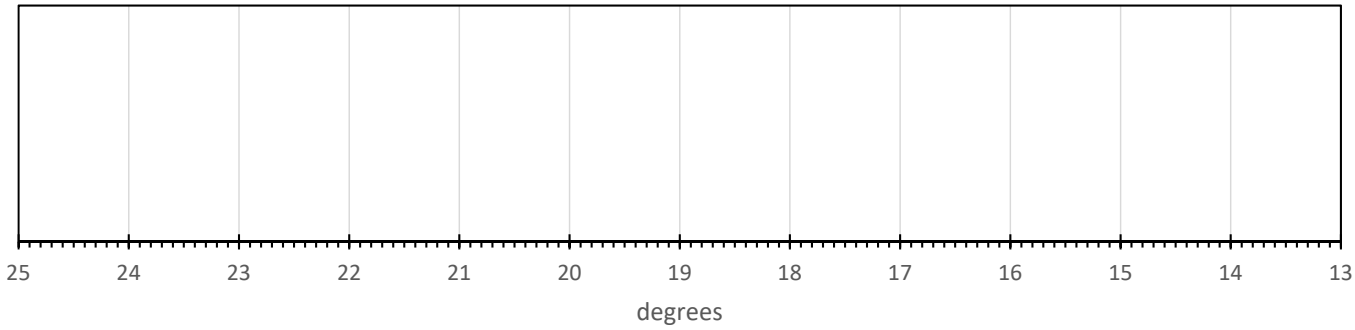
To identify which element(s) the CFL contains, list in the last column angles present in the other three spectra that are within ± 0.1 degrees to those of the CFL. Leave blank unmatched angles.

The CFL Bulb likely contains the following element(s): _____

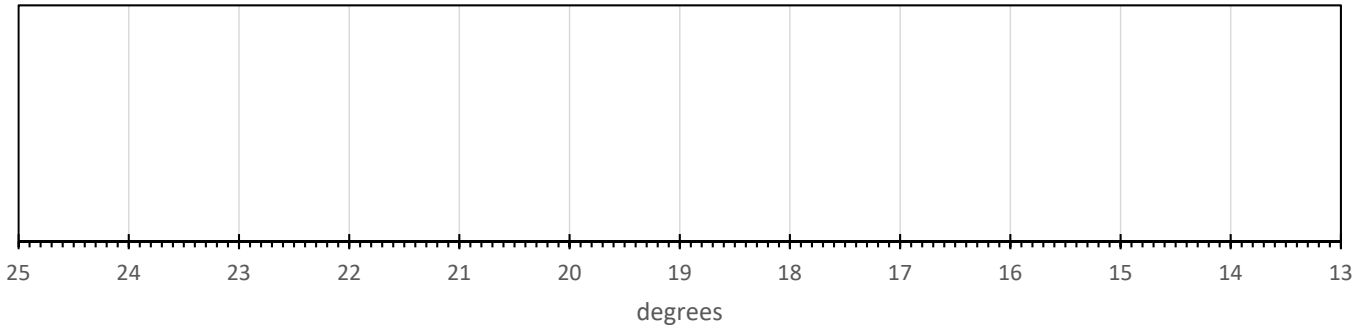
**Attach pages 5 and 6 to the back of this report when finished.**

Use coloured pencils to draw the lines measured for your various emission spectra. Use your corrected-angle data. **Staple this page to the back of your lab report:**

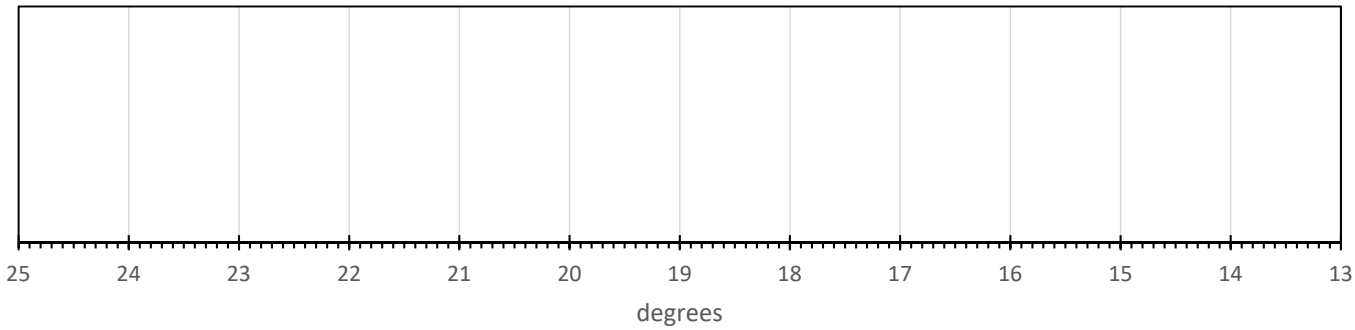
**Helium:**



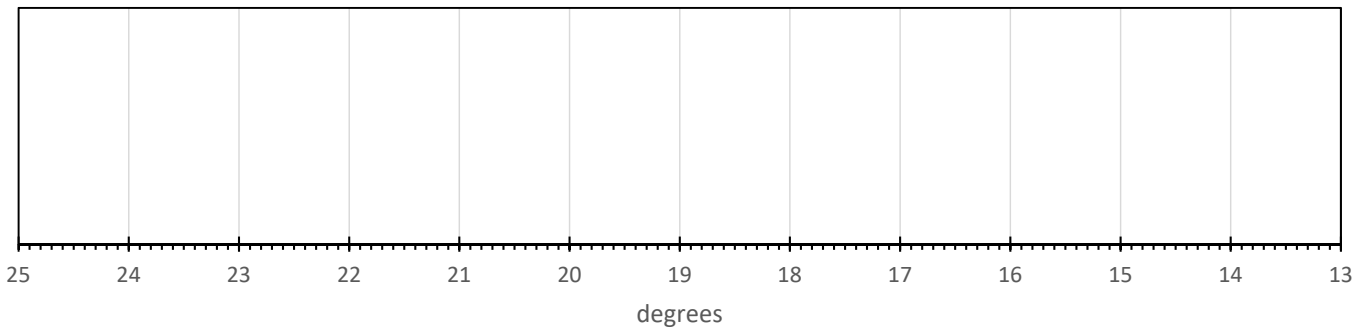

**Hydrogen:**




**Mercury:**




**CFL Bulb:**




***CONTINUED ON NEXT PAGE →***

**Questions** ***please keep your answers as short as possible***

Why do the helium and mercury spectra contain more emission lines than that of hydrogen?

Why, from a biological perspective, do green emission lines appear to be so bright compared to all of the other colours' lines? *You might need to do a bit of online research to answer this.*