

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 all spectra.
- **Record all angle readings (both measured and corrected) to 1 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:

 $\lambda = \text{_____ nm}$

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 ΔE for all lines that were measured and transfer all theoretical ΔE from Table 2.1.

Line Colour	Angles (degrees)		Experimental		Electron Transition	Theoretical ΔE (eV) ¹
	Measured	Corrected	Wavelength (nm)	ΔE (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 ΔE** of this coloured-line: _____
Report answer to 3 significant figures. **write colour here ↑**

$$\Delta E_{\text{exp}} = \text{_____ eV}$$

- Calculation of the **theoretical ΔE** of the same line. Report to 3 sig. figs. and in units of eV.

$$\Delta E_{\text{theo}} = \text{_____ eV}$$

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

HYDROGEN Calculations (continued):

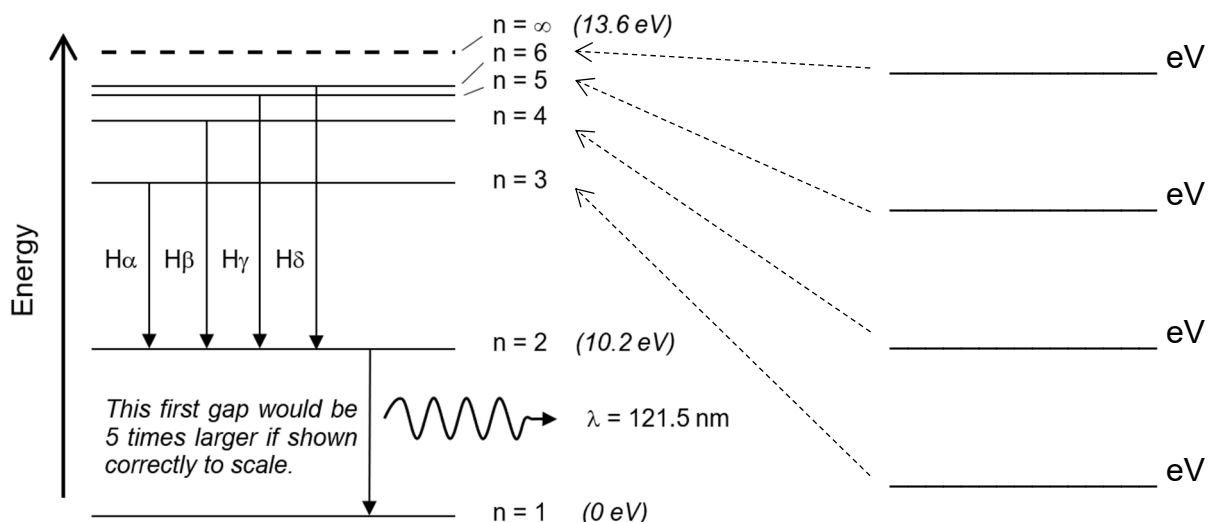
Show below a full calculation of the **theoretical wavelength** for the same emission line as chosen on page 2. The final answer should be in **nm**. Your ΔE_{theo} value (to 3 sf) must first be converted from eV to joules. Use your experimental wavelength as a “check” for your answer here.

$\lambda_{\text{theo}} = \underline{\hspace{2cm}} \text{ nm}$

Show below a full calculation of the **percent difference** between λ_{exp} and λ_{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 (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	<i>All students will use the same corrected angles shown in the next column.</i>	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	

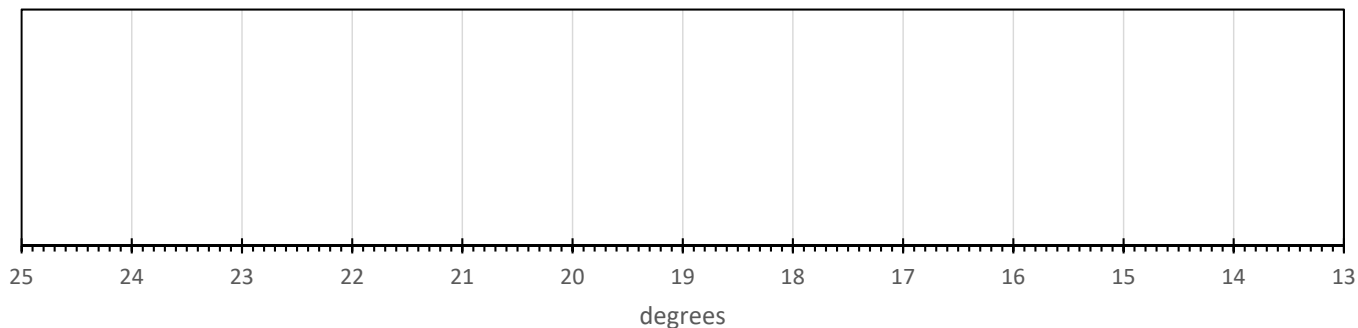
To identify which element(s) the CFL contains, list in the last column angles present in the other three spectra that are within ± 0.1 degrees to those of the CFL. Leave blank unmatched angles.

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

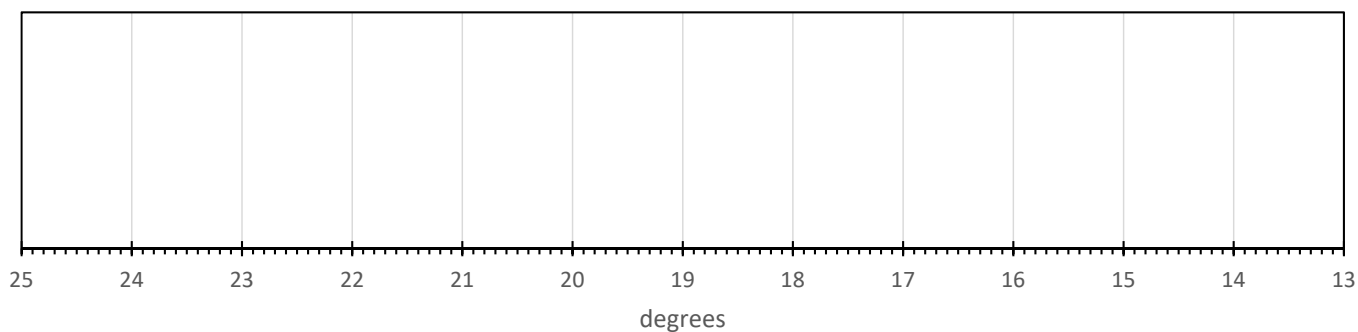
Attach pages 5 and 6 to the back of this report when finished.

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:**

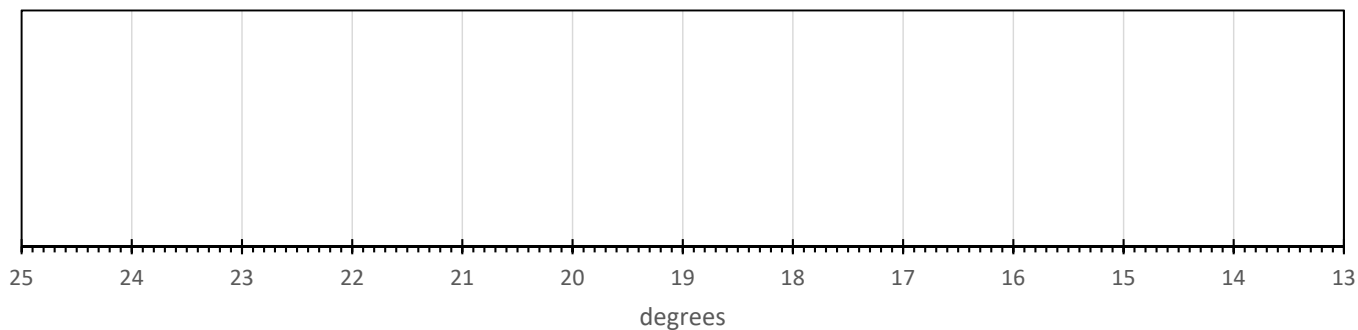
Helium:



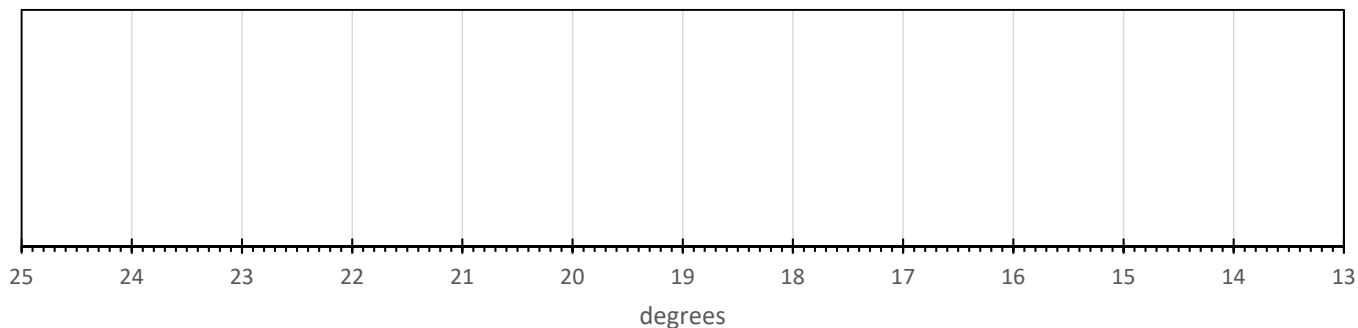
Hydrogen:



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.*
