Meet Gala.

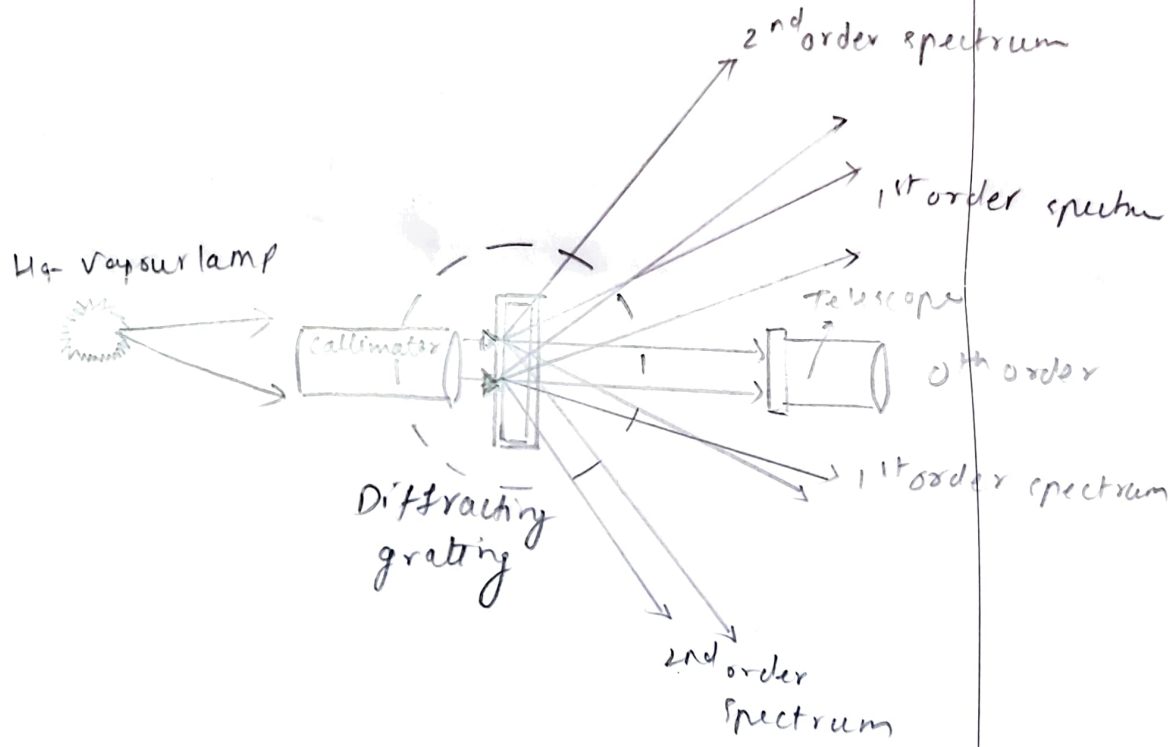
K. J. SOMAIYA COLLEGE OF ENGINEERING
(A Constituent college of Somaiya Vidyavihar University)

SOMAIYA VIDYAVIHAR UNIVERSITY
K J Somaiya College of Engineering

Expt. No		Hg-Spectrum		Date:	
Batch:	A3	Roll No:	1601012105		
				(Marks & Signature of Faculty I/c)	

Aim:	To determine wavelengths of different spectral lines (colours) emitted from a mercury vapour lamp (Hg-source)
Apparatus:	Spectrometer, Hg-vapour lamp, diffraction grating

Diagram:



Procedure

1) Level the spectrometer, prism table, collimator and telescope. Illuminate collimator-slit with Mercury source. Bring telescope in line with collimator and focus it on the illuminated slit. The slit must be sufficiently narrow.
2) Adjust the eyepiece of the telescope so that the crosswire is distinctly visible and vertical crosswire is coinciding with the sharp image of the slit. Mount diffraction grating on prism table, perpendicular to incident light (i.e. to the collimator). Lock prism table.

3) Move telescope to one side of the incident direction (say, to the left) until you see the first order spectrum. Spectral lines will be visible in the order from violet to red from the incident direction i.e. white line. Focus on the bright-coloured violet/blue spectral line. Adjust the vertical crosswire so that it coincides with the violet/blue line. If required, fix telescope & use its fine motion for this adjustment. Note down readings in both the windows.
4) After violet/blue, release the telescope and move it further to get green line. Follow the same procedure as in step 3. Repeat the same for one of the yellow lines and brightest red line from the spectrum.
5) Now take the telescope to the right side of the incident direction and follow the procedure of steps 3 and 4.
6) The angle 2θ for a particular spectral line is the difference between its readings on the LHS and RHS of incident direction from the same window.

Observations:

L. C. of Spectrometer: 1

Spectral line	Spectrometer reading						θ
	On left side of collimator			On right side of collimator			
	Window 1			Window 1			
	MSR	VSR	TR	MSR	VSR	TR	
Violet/Blue	344°30'	22	344°52'	15°	0	15°	15°4'
Green	340°	24	340°24'	19°	20	19°20'	19°28'
Yellow	339°30'	13	339°43'	20°	0	20°	20°8'
Red	338°	28	338°28'	21°	15	21°15'	21°23'

Formula:

$\theta = \frac{1}{2}[(LW1 \sim RW2)]$

($\sim$ means difference i.e greater - smaller)

$\lambda = \frac{\sin\theta}{mN}$

Symbols:

θ = Angle of diffraction ~~LR~~

LR : Left and Right side of incident direction

W1 : window 1

λ = Wavelength of spectral line

m : Order of diffraction max.

N : No. of lines/cm of grating.

Data:

Number of lines/unit length of the grating N	5905 l/cm

Calculations: (m = 1)

For voilet light, $\theta = \frac{360 - 329°52'}{2} = \frac{36'8'}{2} = 15°4'$

Similarly, for green light → $\theta = 19°23'$
yellow light → $\theta = 20°28'$
Red light → $\theta = 21°23'$

Violet/Blue

$\lambda = \frac{\sin(15.067)}{5905}$

$\lambda = 4.402 \times 10^{-5}$ cm

$\lambda = 4402$ A°

Green:

$\lambda = \frac{\sin(19.467)}{5905}$

$\lambda = 5.54 \times 10^{-5}$ cm

$\lambda = 5544$ A°

Yellow

$\lambda = \frac{\sin(20.133)}{5905}$

$\lambda = 5.828 \times 10^{-5}$ cm

$\lambda = 5828$ A°

Red

$\lambda = \frac{\sin(21.383)}{5905}$

$\lambda = 6.174 \times 10^{-5}$ cm

$\lambda = 6174$ A°

Result:
Wavelengths of spectral lines (in Å) from Hg-source:
(Round-off to nearest integer value)

1) Violet/Blue: 4402 A°

2) Green: 5544 A°

3) Yellow: 5828 A°

4) Red: 6174 A°

Further Work:
Use of diffraction grating in spectrophotometer