Aim: To determine the wavelengths of different colours in mercury spectrum by plane diffraction grating.

Apparatus: Spectrometer, grating, Hg- source, etc.

Theory: Plane diffraction grating is an assembly of multiple slits which are very closely packed in such a way that the width of the slits and inter distance between the slits is comparable and is of the order of the wavelength of light for which the grating is to be used. When collimated beam of white light from the Hg source pass through the grating diffraction occurs and the angle through which the light is diffracted depends on the wavelength of light hence different colours are diffracted at different angle and one gets a spectrum. Due to multiple diffraction one get not one but several orders on either sides of the central maximum. The white image of the slit is known as zero order spectrum. Coloured spectras also appear on either side of the zero order or central maximum and are called first order spectrum,

second order spectrum etc. The angle through which light is diffracted can be ascertained by the following relationship

$$d \sin \theta = n \lambda$$

Where **d** is the grating element, n the order of the spectrum and λ is the wavelength of light. In our expt. we will find the angle of diffraction θ for different colours of first and second order spectra and will calculate the wavelength λ.

Method:

1. Adjust the spectrometer for receiving parallel beam of light from the Hg source. Ensure that the width of the slit is narrow enough.

2. Place the grating on the prism table and arrange it perpendicular to the light beam coming out of the collimator.

3. Bring the telescope exactly opposite to that of collimator in such a way that the central image of the slit passed through the grating coincides with

the earlier position of the telescope (when adjusted for obtaining direct slit.).

4. Then move the telescope slowly to one side and identify the colours of the first order spectrum. Place the cross wires on different colours and note the window readings α.

5. After taking readings of the notified colours move to second order spectrum and repeat the procedure.

6. Then move the telescope to other side of the central maximum and repeat earlier ~~to~~ two steps and note down the readings as α'.

7. Calculate remaining data, calculate d as under

$$d = 2.54 / 15000 = \quad \text{cm.}$$

8. Notify your results.

Observations:

Observation Table:

Order of the spectrum . n	Colour of light	Spectro meter reading		Angular spread ∠ 2θ= α~α'	Angle of diffraction θ	Sin θ	Wavelength λ cm
		α	α'				
1	Blue						
1	P.green						
1	Yellow-1						
1	Yellow-2						
2	Blue						
2	P.green						
2	Yellow-1						
2	Yellow-2						

Note: don't write colour

Optical Set up: