

Object : Measurement of wavelength of mercury source spectrum by constant deviation spectrograph and calibration of drum.

Apparatus Required : Constant deviation spectrometer, mercury lamp or the light source for which the wavelength of light emitted from it is known, convex lens, reading lens and reading lamps.

Description of the Apparatus : Constant deviation spectrometer—Fig. 24 shows the constant deviation spectrometer. Just like an ordinary spectrometer, it also consists of a collimator, a prism table and a telescope. Collimator and telescope are rigidly attached to the base such that they are mutually perpendicular.

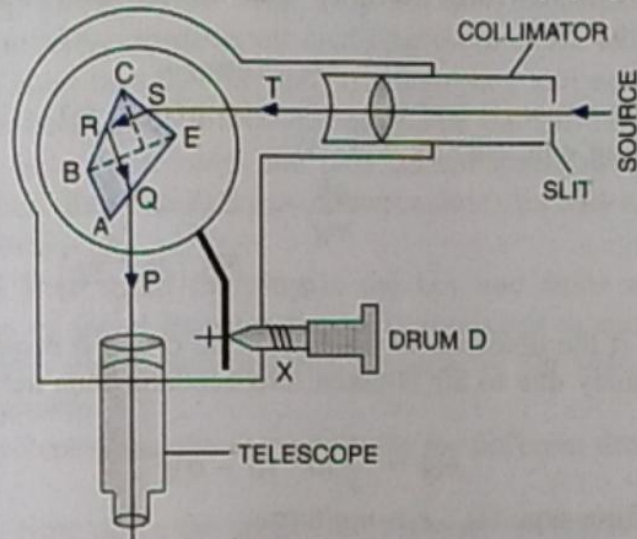


Fig. 24. Constant deviation spectrometer

Prism table is in the middle of the two, which is provided with a specially designed glass prism ABCE. The prism deviates the incident light ray through a constant angle ($= 90^\circ$). The prism table can be rotated with the help of a drum D, so as to change the angle of incidence of the light falling on the prism from the collimator. The collimator and the telescope always remain fixed in their positions. The constant deviation prism ABCE is shown in Fig. 25. If A is joined with C and a normal BD is drawn from B on AC, the entire prism gets divided into three right angled prisms. Prisms ABD and ACE both are of $60^\circ\text{-}30^\circ$ and the prism DCB is of $45^\circ\text{-}45^\circ$.

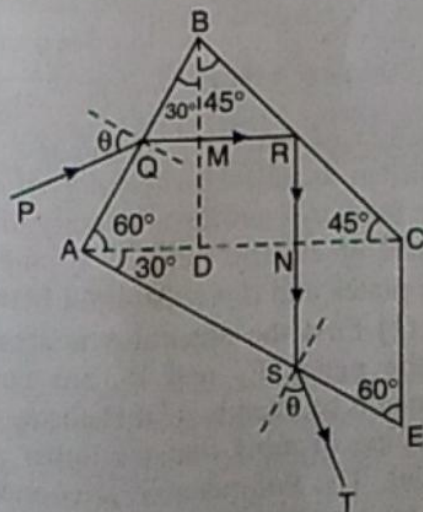


Fig. 25. Prism

Procedure : (1) First the slit of the collimator is made as narrow as possible.

(2) Then the eye lens of the eyepiece of telescope is moved to and fro such that cross wires are clearly seen. One of the cross wires is made vertical.

(3) The given mercury light source is illuminated and light from it is focused on the slit of the collimator through a convex lens. For this, the convex lens is placed between the source and the slit and its position is adjusted such that the entire light gets focused on the slit of the collimator.

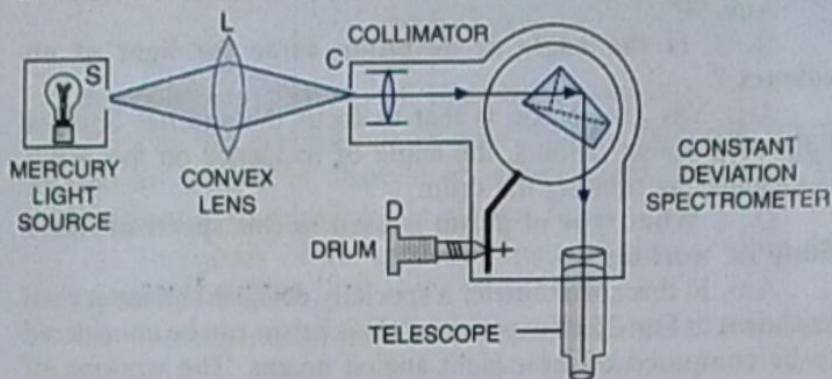


Fig. 26

(4) Then the drum is gently rotated in one direction and seeing through the telescope the spectrum is brought in the field of view.

(5) Now a sharp spectrum is obtained by adjusting the collimator and telescope with their rack and pinion arrangement.

(6) The drum is rotated gently in one direction and the vertical cross wire is made to coincide with the mercury green line. At this stage, the position of pointer on the drum is noted.

(7) Then rotating the drum in the same direction, the vertical cross wire is made to coincide with the different colour line of mercury spectrum and again the position of pointer on the drum is noted.

Observations : For the source of light (mercury).

S. No.	Colour of spectral line	Reading on the drum of the spectrometer λ' (in \AA)	Standard wavelength λ (in \AA)
1.			
2.			
3.			
4.			

Graph : From the above observation table, d graph is plotted taking λ' on X-axis and λ on Y-axis and a best fit straight line is drawn. This gives the calibration curve for the drum of constant deviation spectrometer.

Result : The graph represents the calibration curve of the drum of the constant deviation spectrometer.

Precautions : (1) The prism of the spectrometer should not be touched with hand.

(2) To avoid backlash error, the drum should always be rotated gently in one direction.

(3) The slit of the collimator should be vertical and as narrow as possible.

(4) A strong beam of light must be made incident on the slit.