

To determine the wavelength of various lines in the spectrum of mercury vapor lamp using diffraction grating.

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Observations and Calculations :-

Grating element $(b+d) = \frac{2.54}{\text{No. of lines per inch on grating}} = \frac{2.54}{12500} = 0.0002032$

Now, $(b+d) \sin \theta = n \lambda$ $n=1$ $\Rightarrow \lambda = (b+d) \sin \theta$

Colour	Veruier	Telescope on left	Telescope on Right	2θ	θ (Degree)	λ (cm)
Violet	V ₁	215.58	192.09	23.49	11.415	4.02×10^{-5}
	V ₂	32.75	10.58	22.19		
Indigo	V ₁	216	191.225	24.775	12.15	4.27×10^{-5}
	V ₂	33.63	9.82	23.81		
Blue	V ₁	217.5	188.51	28.99	14.408	5.06×10^{-5}
	V ₂	35.65	7.0008	28.642		
Green	V ₁	219.09	187.53	31.56	15.79	5.53×10^{-5}
	V ₂	37.24	5.58	31.6		
Yellow	V ₁	220.55	186.51	34.04	16.94	5.92×10^{-5}
	V ₂	38.32	4.67	33.75		
Orange	V ₁	220.57	186.008	34.562	17.22	6.01×10^{-5}
	V ₂	38.325	4	34.325		
Red	V ₁	221.64	185.083	36.557	18.02	6.28×10^{-5}
	V ₂	39.041	3.516	35.525		

Aim :- To determine the wavelength of various lines in the spectrum of mercury vapour lamp.

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Apparatus :- A spectrometer, plane diffraction grating, mercury lamp and spirit level.

Theory :- When light from a mercury vapour lamp falls on a grating, it suffers diffraction. The maxima of different orders are obtained in the directions satisfying the relation $(a+b)\sin\theta = \pm n\lambda$. The direction of these maxima depends upon the wavelength of light used. With light from mercury lamp in each order spectrum, several coloured lines are seen corresponding to the emission lines of mercury.

Precautions and Sources of Error :-

1. All adjustments of the spectrometer must be correctly done.
2. The rulings of the grating must be vertical.
3. The grating should always be handled by the edges and the faces should not be touched with the hand.
4. The slit should be as narrow as permissible and parallel to the rulings of the grating.

While taking readings of the telescope, the turn-table



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should be clamped and vice versa.

6. Readings should be taken in both the viewers to eliminate the error due to non-coincidence of the centre of the graduated scale with the axis of rotation of the spectrometer. alllabexperiments.com



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