Q1. A diffraction grating used at normal incidence gives a yellow line (λ =6000A^0)in a certain spectral order superimposed on a blue line (λ =4800A^0) of next higher order. If the angle of diffraction is sin^{-1}(3/4) calculate the grating element.

Given:- λ_1=6000A^0=6x10^{-5} cm; λ_2=4800A^0=4.8 x 10^{-5}cm ; $\theta = \sin^{-1}\left(\frac{3}{4}\right)$

Formula:- $(a+b)\sin\theta = n\lambda$; n=1,2,3,4 .....

Solution:- for given $(a+b)$ and θ ; n α 1/ λ

$$(a+b)\sin\theta = n\ \lambda_1$$
$$(a+b)\sin\theta = (n+1)\ \lambda_2$$
$$n\,\lambda_1 = (n+1)\,\lambda_2$$
$$\frac{\lambda_1}{\lambda_2} = 1 + \frac{1}{n}$$

Therefore, $n = 4$

$$(a+b) = \frac{n\lambda_1}{\sin\theta} = \frac{4\times 6\text{x}\ 10^{-5}}{\frac{3}{4}} = 32 \text{ x } 10^{-5} \text{ cm}$$

Ans:- The grating element is 3.2 x 10^{-4} cm .