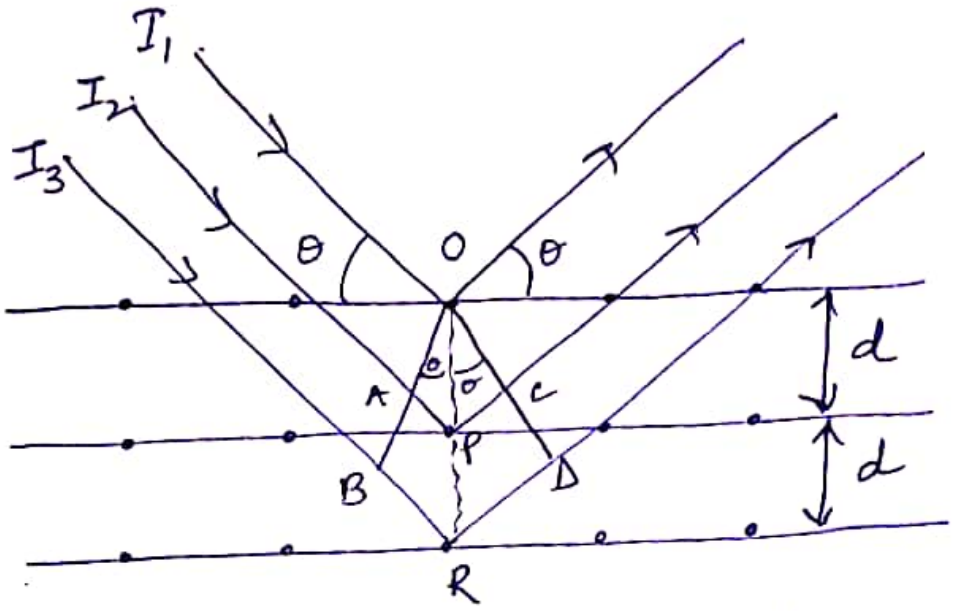
X-Ray Methods / Diffraction Dr Moni

Bragg's Law: Given by W.H. Bragg and W.L. Bragg

- X ray behaves as if they are reflected by planes of atoms in a crystal.
- When beam of X rays is allowed to fall a crystal surface at some angle θ.
- Atom acts as a source of scattered radiation of some wavelength.
- When X ray beam strikes a crystal surface at an angle θ, a portion is scattered by the layer of atoms at the surface and unscattered portion of the beam penetrates to second layer of atoms
- The spacing between layers of atom must be some as the wavelength of the radiation
- The scattering centres must be spacially distributed in a highly regular way.
- Let there be a beam of monochromatic X ray which strikes on a set of parallel and equidistant planes called lattice plane or Bragg's plane. at an angle θ.
- Scattering takes place because of interaction of the radiation with atoms located at O, P and R.



Diffraction of X-rays by crystals

- Distance $AP + PC = n\lambda$, assumed. $n = 1, 2, 3 \ldots$ order of reflection

- Scattered radiation will be phase OCD, crystal will appear to reflect the x-radiation

$$AP = PC = d \sin\theta$$

d is the interplanar distance of the crystal.

For constructive interference on the beam at an angle θ $\boxed{n\lambda = 2d\sin\theta}$ Bragg's Eq.

- minimum spacing for the reflection is $d = \lambda/2$
- $\sin\theta$ is not more than unity.

$$S\sin\theta = \frac{n\lambda}{2d}$$

only this angle condition is constructive
All other angles are destructive interference.