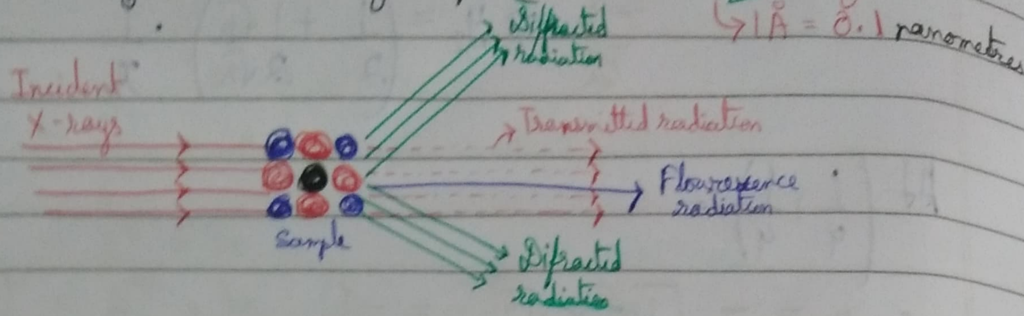
XRD:- X-Ray Diffraction

An X-ray has wavelength of $[0.1 - 100\,\text{Å}]$ range
↳ $1\,\text{Å} = 0.1$ nanometres



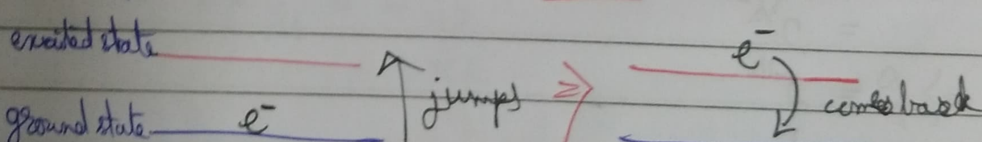
Sample → crystalline solid

Here, the Sample will absorb "some radiation"
↳ Absorbed radiation

- Here: Absorbed radiation = Incident Radiation − Transmitted Radiation

- Diffracted radiation:- Radiation deflected by sample after X-rays are incident on the Sample
This diffraction depends on atoms present in ~~sample~~ Sample

- Flowrescence radiation:- When the incident radiation goes through the Sample, then some atoms will absorb this radiation



The electrons of those atoms will go to excited state
When the electrons come down to ground state
⇓
Radiation will be emitted as a result
This emitted radiation is called Flowrescence radiation

XRD methods rely on scattering of X-rays by crystals

Use cases / Application:-

1) Identify crystal structure of any solid sample
2) Analyze physical properties (like crystal size, orientation etc)
3) Measure purity of the sample

~~XRD suggested by~~

X-Ray Diffraction was proven by Bragg

→ He stated that X-ray ~~dif~~ scattering can be considered as reflection from successive planes of atoms (in the crystal/sample)

→ However, unlike reflection of ordinary light Reflection of X-rays can only take place at "certain angle"

This certain angle is determined by the

(1) wavelength (λ) of X-ray

and

(2) Distance of the plane inside the crystal

This relation between:- (i) Wavelength (λ) of X-rays

(ii) Interplaner angles between planes (θ) and angle of reflection (θ)

↓

Bragg's equation

$$\boxed{n\lambda = 2d\sin\theta}$$

n → no. of incident x-rays

λ → wavelength of x-ray

d → distance of plane inside the crystal

θ → angle w.r.t plane on incident

Angle w.r.t to plane