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Modern Physics

Hand Notes For JEE Mains, Advance, NEET UG, Class 11 & 12 etc…

Hand Notes

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'MODERN PHYSICS'

[1] → Atomic Str.
[2] → Photoelectric effect. [P.E.E]
[3] → Matter Waves
[4] → Nuclear Physics
[5] → Radioactivity
[6] → X- Ray.
[7] → Positive Ray
[8] → Electronics
[9] → COMMUNICATION System.

Photoelectric Effect

** (कोई उपकरण नहीं bounded e⁻ होता P.E.E)

2016 AIIMS → Emmision of e⁻ take place from metal surface When sufficient high freq light fall upon it called P.E.E.

* Discovered by → Heartz (NCERT)
* Law of P.E.E → Linard & Milliken
* Final Explanation → Eienstein.

[1] → A/C to plank quantum theory Radiation transfer its energy in form of small pockets. Min energy pockets called photon
* photon transfer 100% energy to single electron (e⁻). If it is sufficient to Remove the e⁻ come out from metal surface otherwise photon is absorbed.

properties of photon.

|1| → photon move in straight line with velocity of light.

$c_0 = 3 \times 10^8$ m/sec

$c_M = \frac{c_0}{\mu_m}$ $(c_M \leq c_0)$ $(\mu_m \geq 1)$

$v \propto \lambda$

* Frequency of photon remain unchange with medium.

* |2| → It is a neutral particle ($q_{ph} = 0$).

** |3| → Mass of photon
- * Rest Mass = 0 $(m_0)_{ph}$
- Relative Mass = $m_R = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}} = \frac{0}{0}$ => NOT define
- Effective Mass = $m_{eff} = \frac{h}{c\lambda} \propto 1/\lambda$

|a| → Eg → λ_{max} → VIBGYOR → λ_{min} ; $\lambda \uparrow$, $m_{eff} \downarrow$

|b| → $\lambda_{U.V} <$ visible

$m_{eff} \Rightarrow$ U.V > visible.

|4|→ Energy of photon →

$$E = h\nu = \frac{hc}{\lambda} = \frac{12400}{\lambda(A^\circ)}\ ev$$

$$\lambda_{ph} = \frac{12400}{E_{ph}(ev)}\ A^\circ$$

NOTE → * In a Reflection freq, velo, Wavelength & energy of one photon Remain same but total energy may change.

* Penetration power (P.P)

$\lambda \uparrow, U \downarrow, E_{ph} \downarrow, P.P \downarrow$

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	γ-ray	X-ray	U.V Rays	VISIBLE	I.R	M.W	R.W
→ Wavelength	$< 0.01A$	$0.01A^\circ - 100A^\circ$	$100A^\circ - 3800A^\circ$	$3800A^\circ - 7800A^\circ$	$7800A - 10^6A$	$> 10^6A$	
Energy Range →	$> 1.2Mev$ ⇓ Mega e-volt order	$1.24ev - 124kev$ ⇓ Kelo e-volt order	$3.1ev - 124kev$	$1.3ev - 3.1ev$	$0.012ev - 1.3ev$	$< 0.124ev$	

ev order

NOTE → * Left to Right mass of photon ↓.
* P.E.E not possible from Infra, Radio Wave, Microwave.

|5|→ Momentum of photon → Momentum = mass × velocity

$$p = \frac{h}{\lambda} = \frac{E_{ph}}{c}$$

|6|→ Intensity [I] → Energy transfered per unit time, per unit area.

Energy of Radiation = $N_{ph}(h\nu)$

$$I = \frac{E}{At} = \frac{P}{A}$$

P → power of Radiation source
A → Area in Which radiation distributed
t → time

NOTE → Intensity of Radiation only depend on power of Radiation source & distance from Radiation source. It is indepen from color of Radiation, Freq & Wavelenth of Radiation.

|a|→ point source / spherical source → $I = \frac{P}{A} = \frac{P}{4\pi r^2} \propto \frac{1}{r^2}$

$r \uparrow, I \downarrow$ $\quad a = \frac{1}{r}$

|b|→ Linear / cyllindrical source → $I = \frac{P}{A} = \frac{P}{2\pi rL} \propto \frac{1}{r}$

$r \uparrow, I \downarrow$ $\quad a = \frac{1}{\sqrt{r}}$

NOTE → If Nature of source is not define consider point source.

|7|→ No. of photon incident or, Imident per unit time →

$$I = \frac{E}{At}, \quad \frac{N_{ph}}{t} = n_{ph}$$

$$n_{ph} = \frac{IA}{h\nu} = \frac{IA\lambda}{hc} = \frac{P\lambda}{hc}$$