



INTERMEDIATE

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.

2016 AIIMS Photoelectric Effect

→ Emission of e^- take place from metal surface
When sufficient high freq. light fall upon it. called P.E.E.

** (सुदो उच्चतर तरंग bounded e^- उत्पन्न P.E.E.)

- * Discovered by → Hertz (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.
 $c_0 = 3 \times 10^8 \text{ m/sec}$

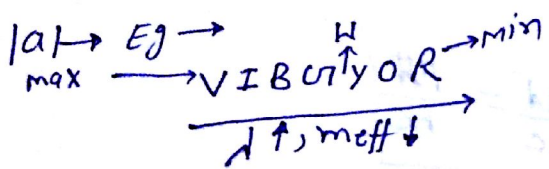
$$\boxed{c_m = \frac{c_0}{\mu_m}} \quad \begin{matrix} (c_m \leq c_0) \\ (\mu_m \geq 1) \end{matrix}$$

$$\boxed{v \propto d}$$

* Frequency of photon remain unchange with medium.

* [2] → It is a neutral particle ($q_{ph} = 0$).
 * Rest mass = 0 (m_0) ph.

** [3] → Mass of photon → $\begin{cases} \text{Relative mass} = m_r = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{0}{0} \Rightarrow \text{NOT define} \\ \text{Effective mass} = m_{eff} = \frac{h}{\lambda} \propto \frac{1}{\lambda} \end{cases}$



[b] → $\lambda \cdot \nu < \text{visible}$
 $m_{eff} \Rightarrow \lambda \cdot \nu > \text{visible}$

14) → Energy of photon →

$$E = h\nu = \frac{hc}{\lambda} = \frac{12400}{\lambda(\text{\AA})} \text{ eV}$$

$$\lambda_{ph} = \frac{12400}{E_{ph}(\text{eV})} \text{\AA}$$

* Penetration power (P.P)

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

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

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	Y-ray	X-ray	U.V RAYS	VISIBLE	I.R	M.W	R.W
→ Wavelength	$< 0.01 \text{\AA}$	$0.01 \text{\AA} - 100 \text{\AA}$	$100 \text{\AA} - 3800 \text{\AA}$	$3800 \text{\AA} - 7800 \text{\AA}$	$7800 \text{\AA} - 10^6 \text{\AA}$	$> 10^6 \text{\AA}$	
Energy Range	$> 1.24 \text{ MeV}$	$1.24 \text{ eV} - 124 \text{ KeV}$	$3.1 \text{ eV} - 124 \text{ KeV}$	$1.3 \text{ eV} - 3.7 \text{ eV}$	$0.012 \text{ eV} - 1.8 \text{ eV}$	$< 0.124 \text{ eV}$	
	↓ mega e-volt order	↓ kilo e-volt order	ev order				

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

15) → Momentum of photon → Momentum = mass × velocity

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

16) → Intensity [I] → Energy transferred per unit time, per unit area.
Energy of Radiation = $N_{ph}(h\nu)$
 $I = \frac{E}{A \cdot t} = \frac{P}{A}$ → Power of Radiation Source
→ Area in which radiation distributed

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

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

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

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

17) → No. of photon incident or, incident per unit time →

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

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