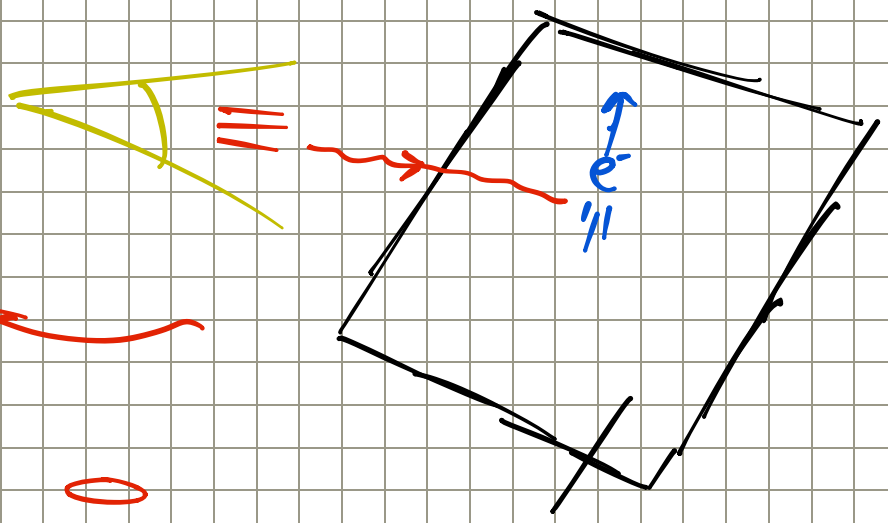
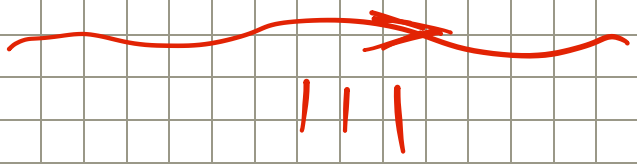
Resumen: Efecto Fotoeléctrico





$E = hf \quad E = hf \quad E = h \cdot f \quad E = h \cdot f$

$h = 6,626 \times 10^{-34}\ J.s$

$$K_{máx} = h \cdot f - \phi$$

↳ Función trabajo

"mínima energía que necesito para desprender los e^- en un material dado"

$$0 = h \cdot f_{umbral} - \phi$$

$$\Downarrow$$

$$h \cdot f_{umbral} = \phi$$

$$f_{umbral} = \frac{\phi}{h}$$

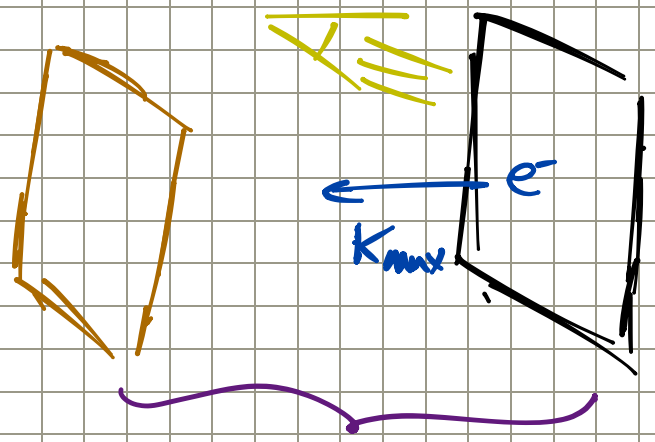
$$\Rightarrow \quad \frac{c}{\lambda_{umb}} = \frac{\phi}{h}$$

$$c = \lambda \cdot f$$

$$f = \frac{c}{\lambda}$$

$$\Downarrow$$

$$\lambda_{umb} = \frac{ch}{\phi}$$



$$K_{máx} = q_e \cdot V_s$$

$V_s \Rightarrow E_s = q_e \cdot V_s$

$E_s = K_{máx}$

Ejercicio 6.2.1: $1\,Å$ ___ $1 \times 10^{-10}\,m$

Tenemos: $\lambda = 2500\,Å = 2500 \times 10^{-10}\,m$

$\phi = 2.21\,eV$

$\rightarrow 1\,eV$ ___ $1{,}6 \times 10^{-19}\,J$

$\Rightarrow K_{máx} = h \cdot f - \phi$

$K_{máx} = \frac{h \cdot c}{\lambda} - \phi$

$= 4{,}4 \times 10^{-19}\,J$

$c = \lambda \cdot f$

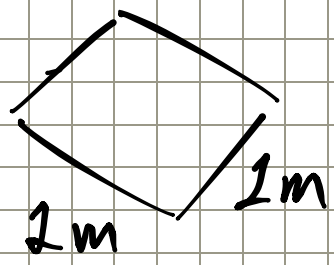
$\Rightarrow f = \frac{c}{\lambda}$

$c = 3 \times 10^8\,m/s$

parte b: $[I] = \frac{W}{m^2} = \frac{J}{s \cdot m^2}$

$$I = 2{,}10 \ W/m^2$$

$$N \cdot h \cdot f = 2\,J$$



$$N = \frac{2}{h \cdot f}$$

$$\Rightarrow N_e = \frac{2{,}10}{\frac{h \cdot c}{\lambda}} = \frac{2 \cdot \lambda}{h \cdot c} = 2{,}5 \times 10^{18}$$

Ejercicio 6.2.2: $\lambda_{umbral} = 6000\ \text{Å} = 6000 \times 10^{-10}\ m$

Queremos λ / $V_s = 2{,}5\ V$

$$\Rightarrow \lambda_{umb} = \frac{c \cdot h}{\phi} \Rightarrow \phi = \frac{ch}{\lambda_{umb}}$$

$$\phi = \frac{c \cdot h}{6000 \times 10^{-10}}$$

Por otro lado: $K_{max} = h \cdot f - \phi$

$$K_{máx} = \frac{h \cdot c}{\lambda} - \phi$$

$$\Rightarrow \lambda = \frac{h \cdot c}{K_{máx} + \phi}$$

Si $V_s = 2{,}5 \Rightarrow K_{máx} = q_e \cdot V_s$

$$\lambda = \frac{h \cdot c}{q_e \cdot V_s + \phi} \quad \text{con } \phi = \frac{hc}{\lambda_{umb}}$$

$$\boxed{\lambda = \frac{h \cdot c}{q_e V_s + \frac{hc}{\lambda_{umb}}}}$$

Resumen: De Broglie

Partículas $P = m \cdot v \rightsquigarrow \boxed{\lambda_B = \frac{h}{P} = \frac{h}{m \cdot v}}$

$E = h \cdot f \rightsquigarrow \boxed{f = \frac{E}{h}}$

Ejercicio 6.2.8:

Tenemos $v = 80 \text{ km/h}$

$m_{Aut} = 1000 \text{ kg}$

$$\lambda_{átomo} = \frac{h}{m \cdot v} = 1{,}78 \times 10^{-8} \text{ m}$$

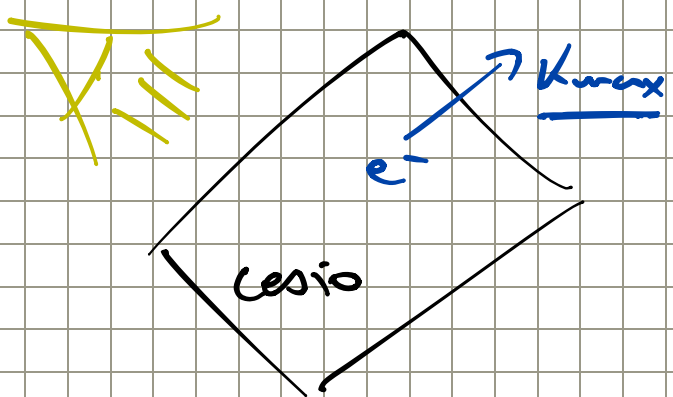
$$m_{H} = 1{,}67 \times 10^{-27} \text{ kg}$$

$$\lambda_{Auto} = \frac{h}{m \cdot v} = \frac{6{,}626 \times 10^{-34}}{1000 \cdot 22{,}22} = 2{,}98 \times 10^{-38}$$

Ejercicio 6.2.11:

$\lambda = 400 \text{ nm} = 400 \times 10^{-9} \text{ m}$

$\phi = 2{,}14 \text{ eV}$



$K_{máx} = h \cdot f - \phi$

$K_{máx} = \frac{h \cdot c}{\lambda} - \phi$

$c = \lambda \cdot f \Rightarrow f = \frac{c}{\lambda}$

$K_{max} = \frac{1}{2} m_e \cdot v^2 = \frac{h \cdot c}{\lambda} - \phi$ ⟸

$\Rightarrow v = \sqrt{\frac{2}{m_e}\left(\frac{hc}{\lambda} - \phi\right)} = \ldots$

$\Rightarrow \lambda_B = \frac{h}{m_e \cdot v} = 1{,}25 \times 10^{-9}\ m$

→ joules!

Recordar que $f_{umbral} = \frac{\phi}{h} = 5{,}17 \times 10^{14}\ Hz$

$E = h \cdot f$ $\qquad f \propto \lambda^{-1}$