11/1/2019

$c = \nu\lambda$, $\nu = c/\lambda$

$$E_{photon} = \underbrace{h}_{\text{~~Pla~~ Planck's constant}}\overset{\text{freq}}{\nu} = \frac{h\overset{\text{speed of light}}{c}}{\underbrace{\lambda}_{\text{wavelength.}}}$$

as $\lambda\uparrow$, $E\downarrow$

and $\lambda\downarrow$, $E\uparrow$

ex: Q: What is the E of a blu ray photon?
405nm

$$E = h\nu = \frac{hc}{\lambda} = \frac{6.626\times10^{-34}\,J\cdot\cancel{s} \times 3.00\times10^{8}\,\cancel{m}/\cancel{s}}{405\times10^{-9}\,\cancel{m}}$$

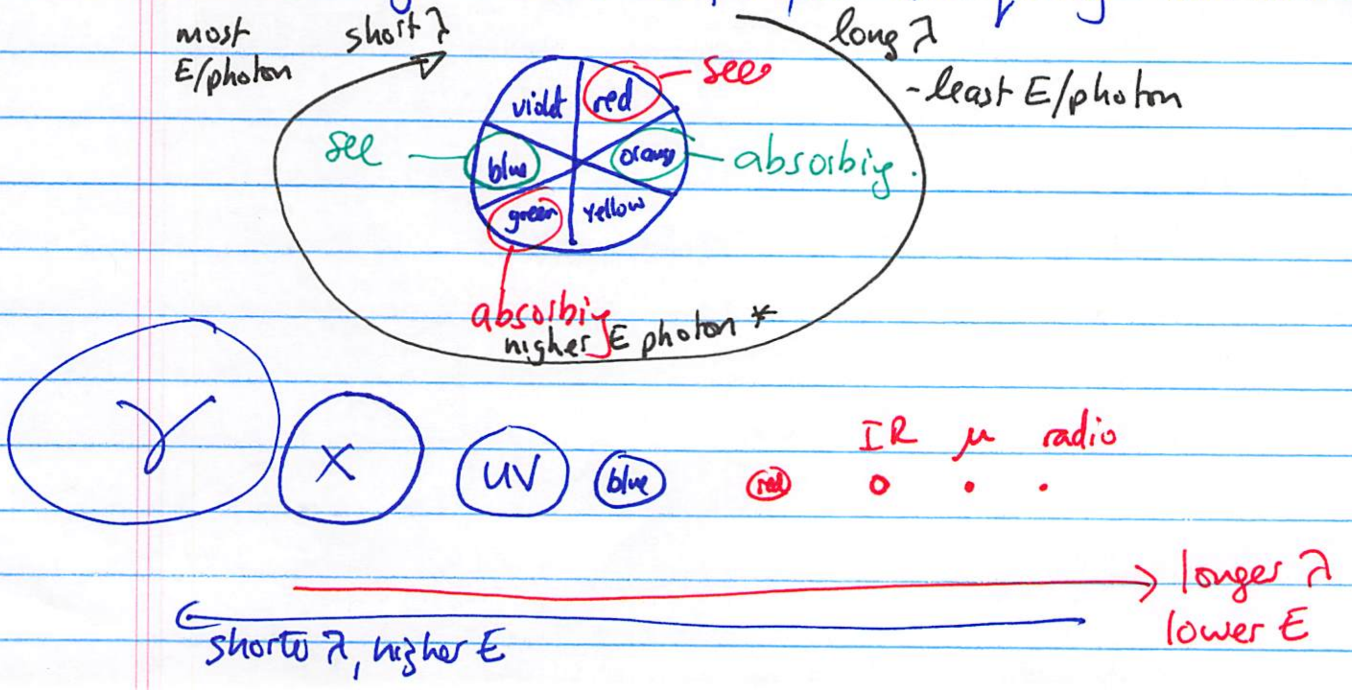
$$= 4.91\times10^{-19}\,J$$

CD uses λ = 780nm (IR)

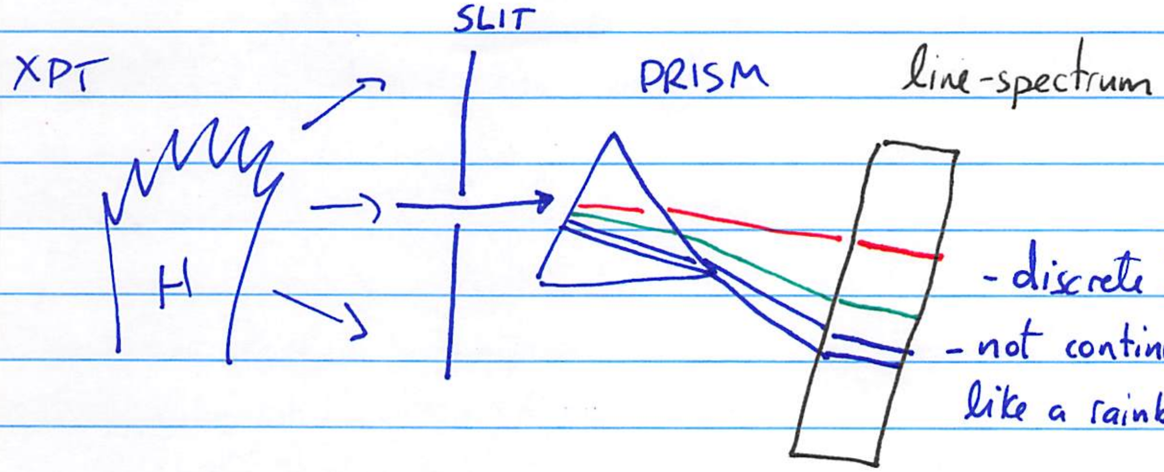
less E!

$$E_{photon} = \frac{hc}{\lambda} = 2.55\times10^{-19}\,J$$

US flag: Red stripes fade more quickly than blue area!



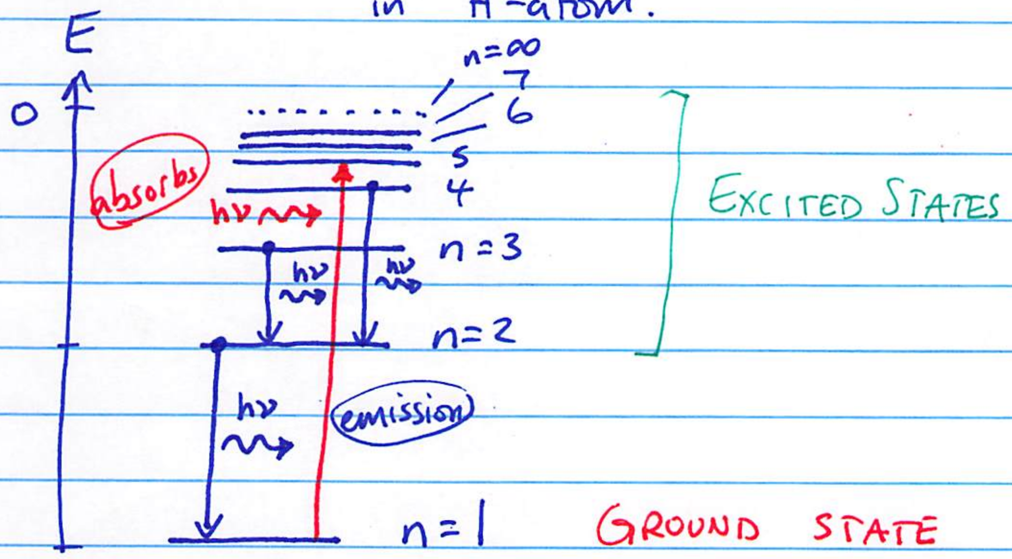
Bohr model of atom



- discrete λ
- not continous like a rainbow.

WHY?

Bohr : e^- can only have certain E in H-atom.



transition $n=2 \rightarrow n=1$: large ΔE ~ UV photon

$3 \rightarrow 2$: RED

$4 \rightarrow 2$: GREEN

$5 \rightarrow 2$: BLUE

$6 \rightarrow 2$: VIOLET/BLUE

$7 \rightarrow 2$ ULTRAVIOLET

} can see w/ 👁

Bohr calculated E levels! (used Quantum Mechanics)

Rydberg constant for H.

$$E_n = \frac{-R_H}{n^2}$$ $n = 1, 2, 3, \ldots$

$R_H = 2 \cdot 18 \times 10^{-18}$ J