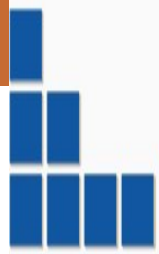
Da Mecânica Quântica à Nanotecnologia

João Penedones

Setembro, 2008



Escola de Verão de Física

U. PORTO

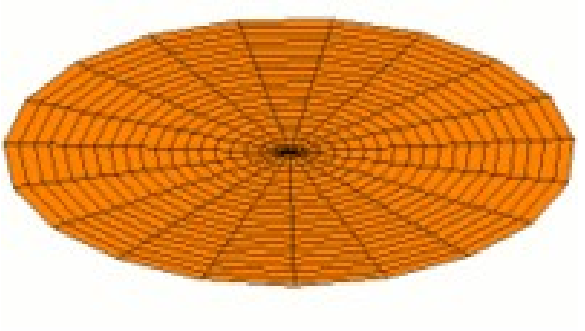
FACULDADE DE CIÊNCIAS
UNIVERSIDADE DO PORTO

Plano do Curso:

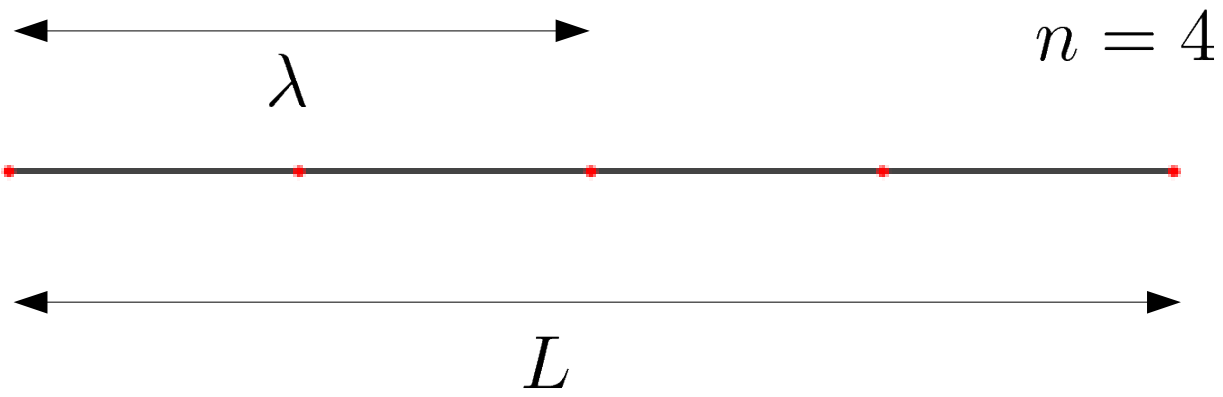
- Experiência da dupla fenda
- Mecânica Quântica em todo o lado
- Nanotecnologia
- Interpretações da Mecânica Quântica

Mecânica quântica em todo o lado

Quantificação de Energia



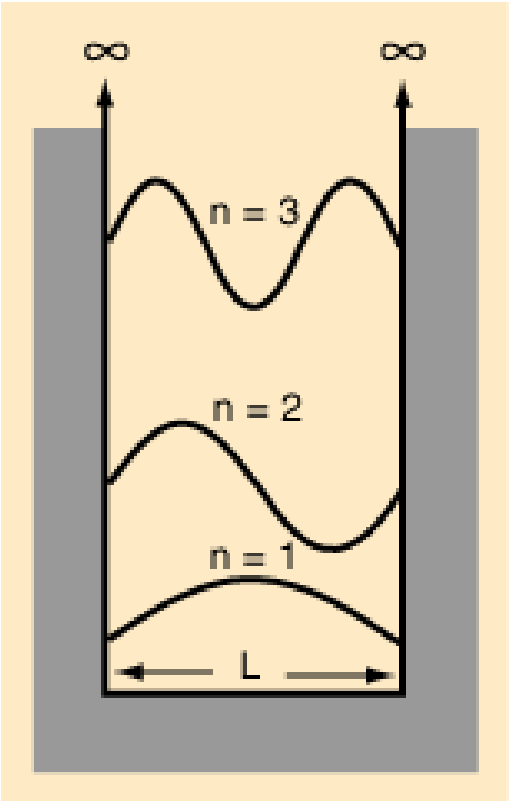
Ondas estacionárias



Electrão numa caixa

$$E = \frac{1}{2}mv^2 = \frac{p^2}{2m} = \frac{h^2}{2m\lambda^2} = \frac{h^2}{8mL^2}n^2$$

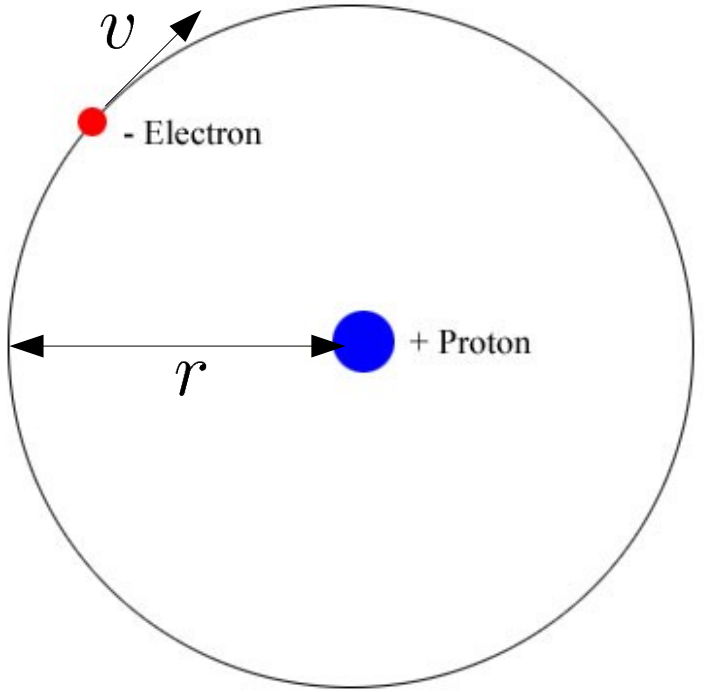
$$p = mv \qquad p = \frac{h}{\lambda} \qquad L = n\,\frac{\lambda}{2}$$



O Átomo de Hidrogénio

Força eléctrica = Força centrípeta

$$k\frac{e^2}{r^2} = m\frac{v^2}{r}$$



Relação de De Broglie

$$p = mv = \frac{h}{\lambda}$$

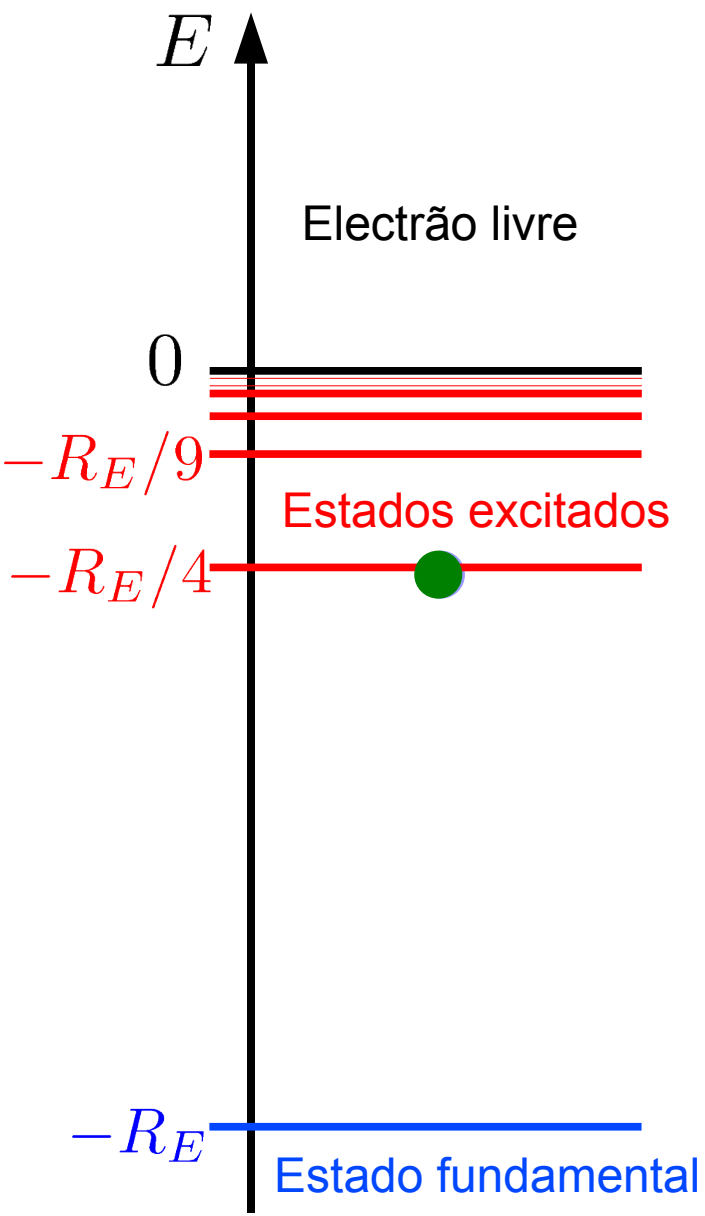
Condição de estacionaridade

$$2\pi r = n\lambda$$

Quantificação de energia

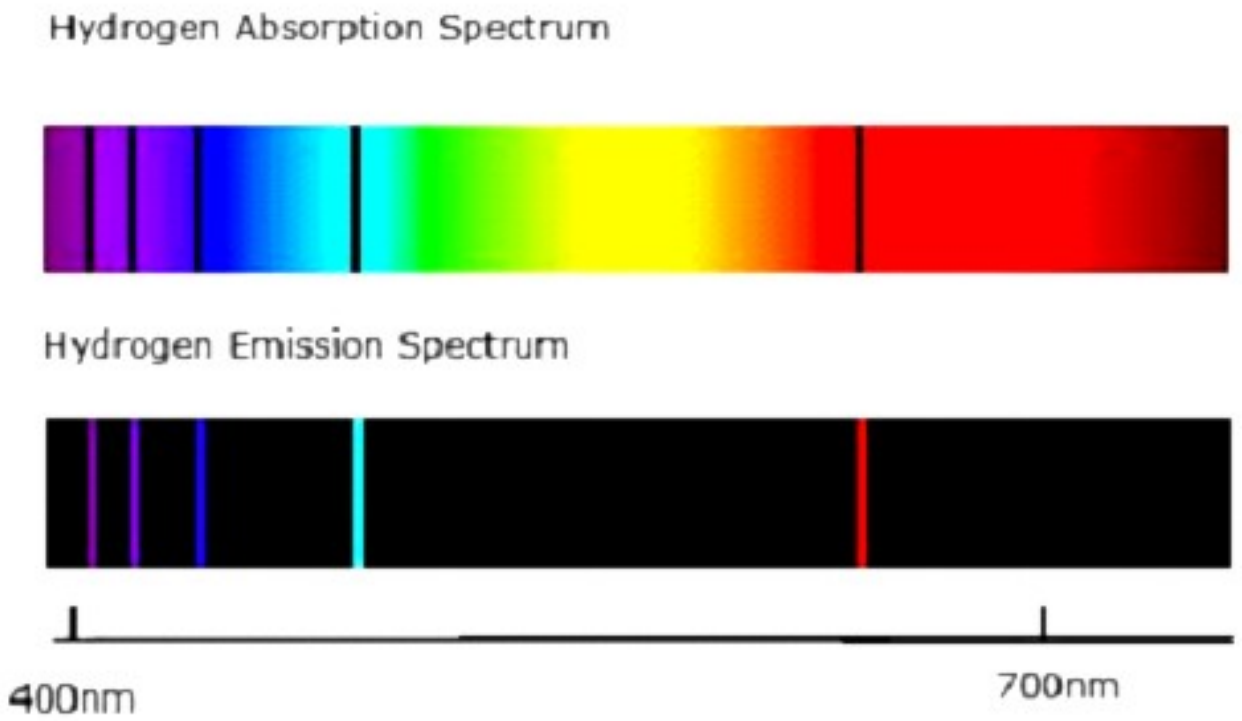
$$E = \frac{1}{2}mv^2 - k\frac{e^2}{r} = -\frac{R_E}{n^2}\ , \qquad R_E = \frac{2\pi^2 k^2 e^4 m}{h^2} = 13,6\,eV$$

O Átomo de Hidrogénio

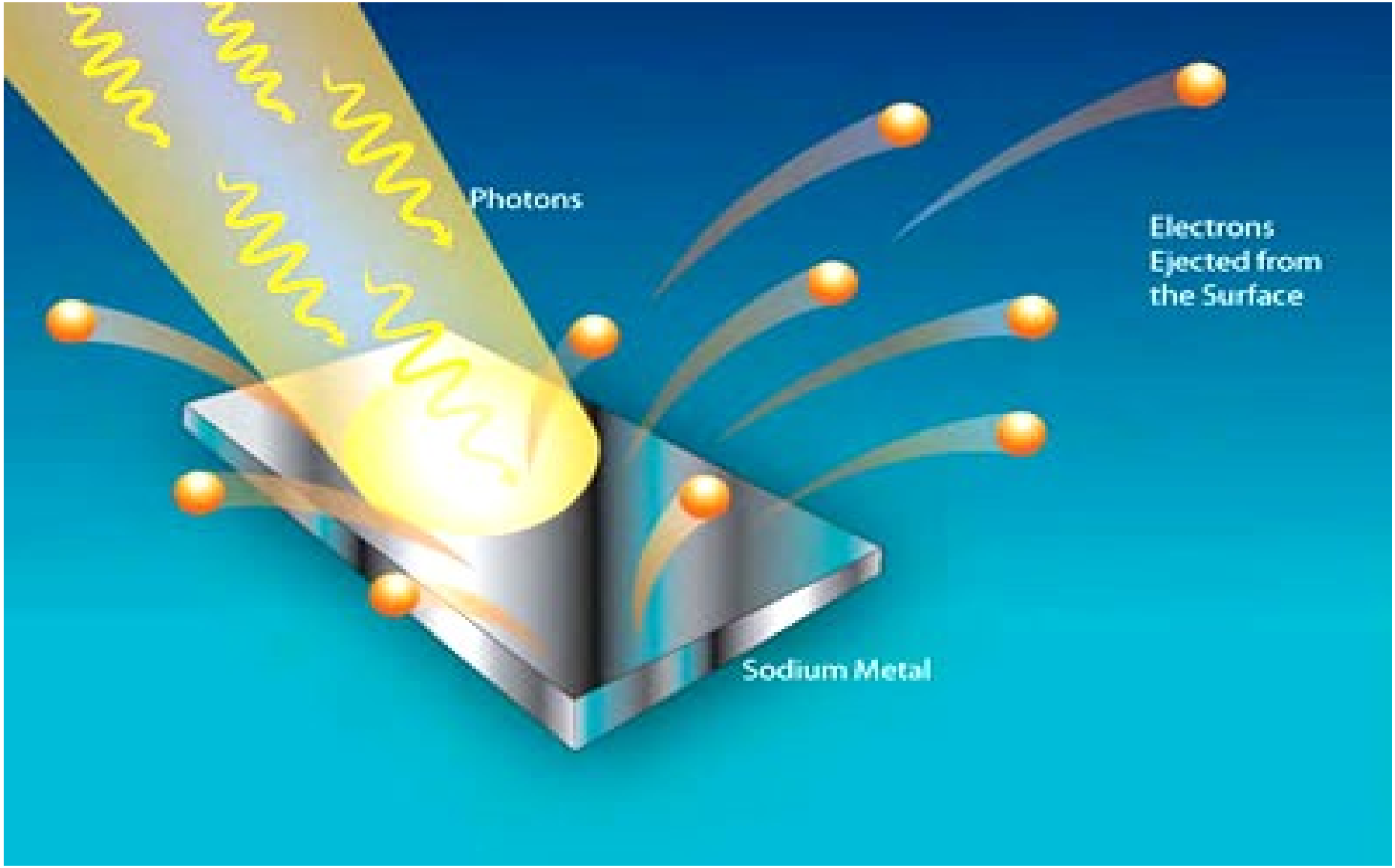


Energia do fotão

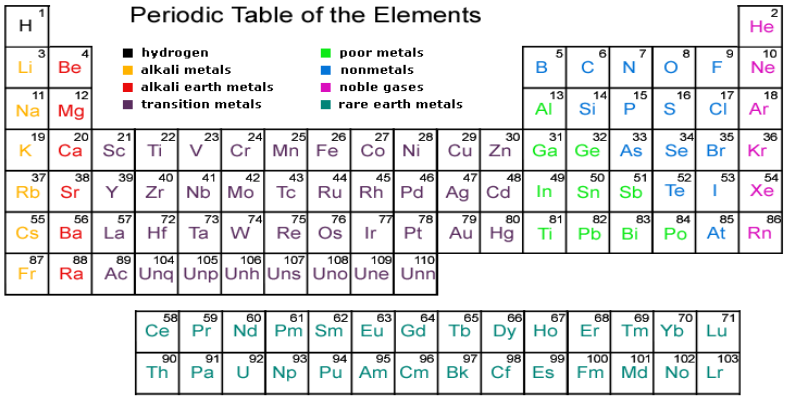
$$E_{\text{fotao}} = -\Delta E_{\text{electrao}}$$



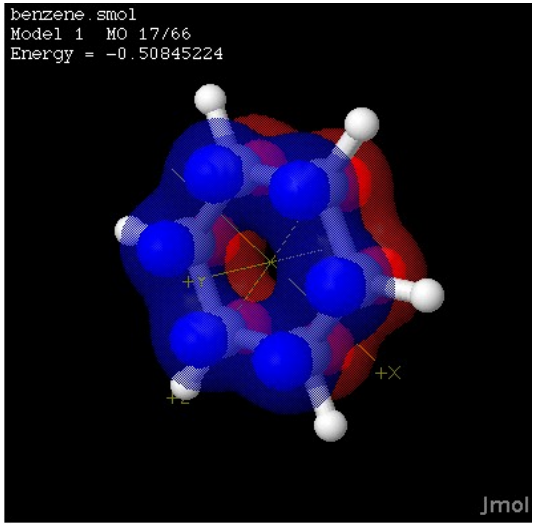
O Efeito fotoelectrico



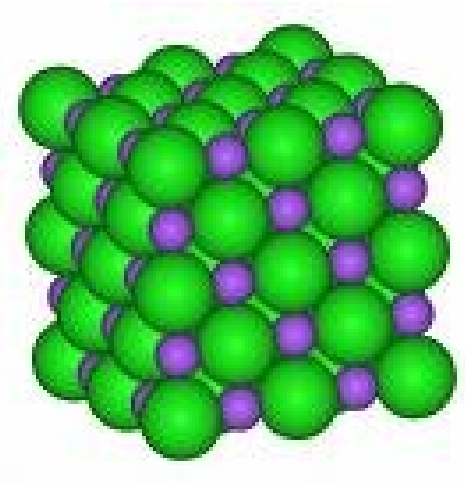
Átomos



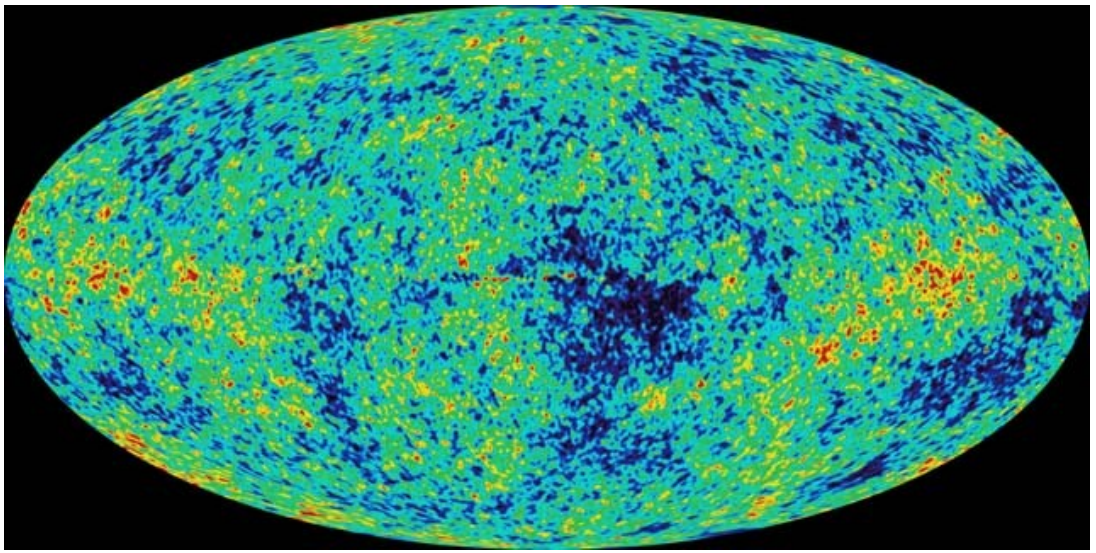
Moléculas



Sólidos



Big-Bang



Partículas Elementares