Niels Bohr

Explained the atomic spectrum of hydrogen

But first, a review of some physical concepts

Linear momentum:

$P = mV$

Kinetic energy:

$K = \frac{1}{2} mV^2$

But first, a review of some physical concepts

Circular Motion

You will see an animation in the lectures

ν_{rot} : **frequency of rotation (cycles/s)**

V : velocity:

$= 2\pi r\ \nu_{rot} = r\ \omega$

$\omega = 2\pi\ \nu_{rot}$

Angular velocity (radians/s)

Kinetic energy of rotating particle:

$$K = \frac{1}{2} mV^2 = \frac{1}{2} mr^2\omega^2 = \frac{1}{2} I \omega^2$$

$$I = mr^2$$

Moment of inertia

Linear	**Angular**
$K = \frac{1}{2} mV^2$	$K = \frac{1}{2} I \omega^2$
m	I
V	ω
$P = mV$	$L = I \omega$

$$K = \frac{p^2}{2m}$$

$$K = \frac{\ell^2}{2I}$$

Rotating electron:

$$\frac{e^2}{4\pi\varepsilon_\circ r^2} = \frac{mv^2}{r}$$

Bohr assumed that the angular momentum of the electron in a hydrogen atom is quantized

Bohr:

1- stationary electron orbits

2- angular momentum of the electron is quantized

$$l = mvr = n\hbar$$

$$\hbar = \frac{h}{2\pi}$$

From:

$$\frac{e^2}{4\pi\varepsilon_\circ r^2} = \frac{mv^2}{r}$$

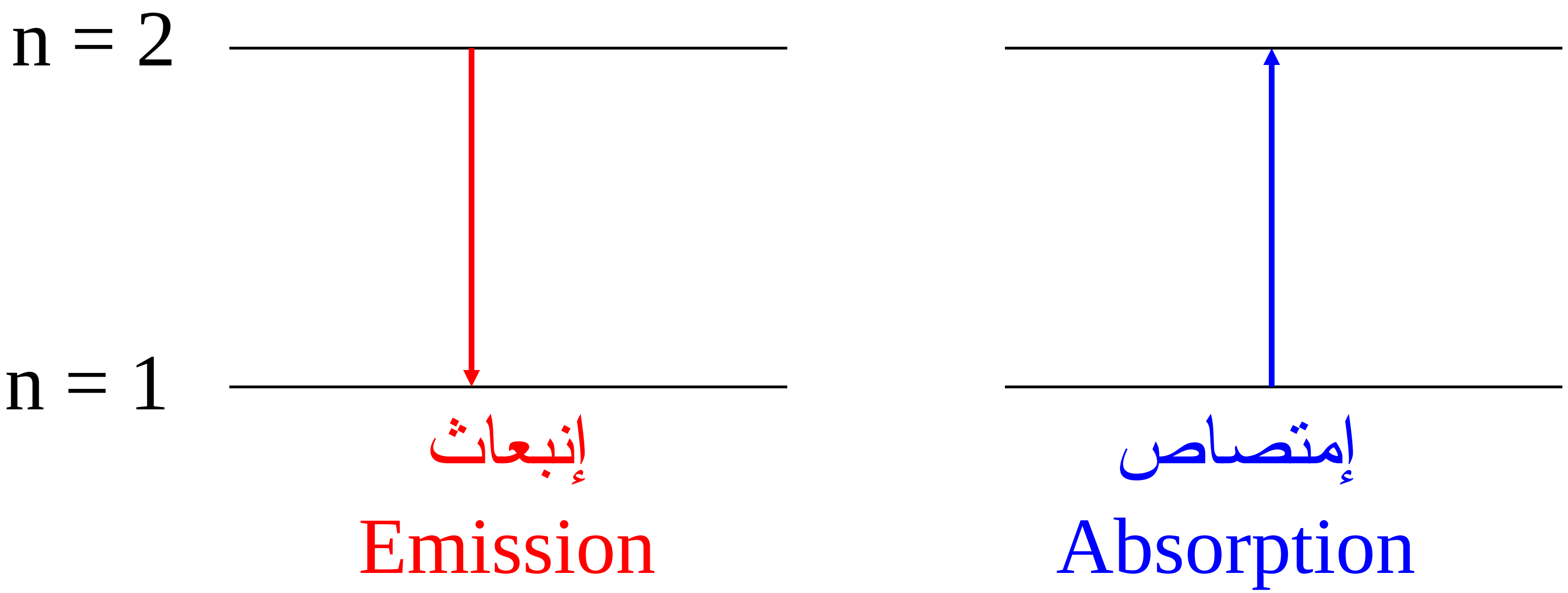
Bohr orbits:

r = 0.529Å

$$E_n = \frac{-R_H}{n^2}$$

$$n = 1, 2, 3, 4, \ldots\ldots\ldots\infty$$

$$\nu = 3.289 \times 10^{15}\, s^{-1} \left(\frac{1}{n_i^2} - \frac{1}{n_o^2} \right)$$


n = 2
n = 1
إنبعاث
Emission
إمتصاص
Absorption