~ Atomic spectra and qualitative Spectral analysis ~

Rad Emilian-Antonia

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Summary

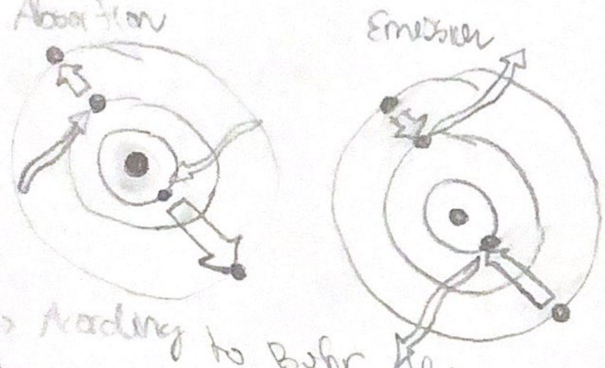
→ the aim of this laboratory is:

→ to observe the discrete spectra of two gases and to compare with the continuous spectrum of the natural light;

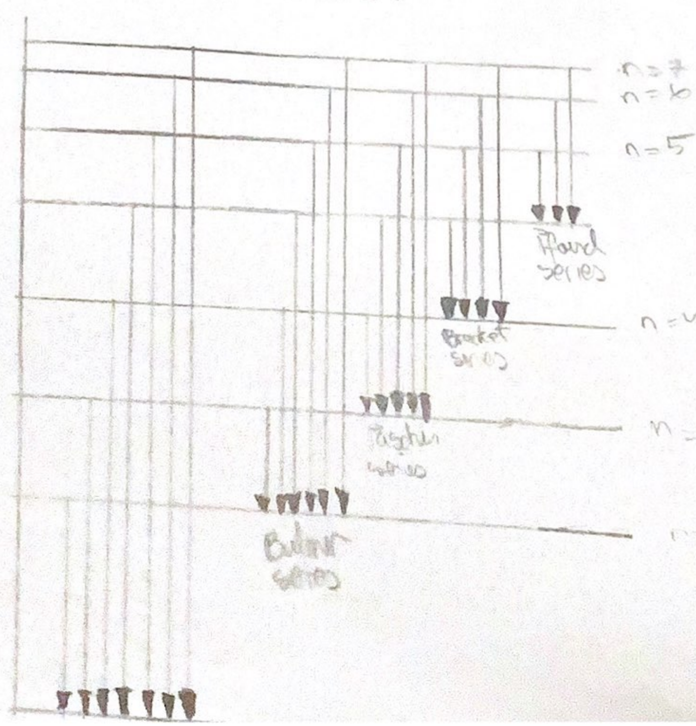
→ to calibrate a spectroscope;

→ to use the calibration curve for the determination of mercury spectral lines wavelenght

→ The different amounts of energy that an atomic electron is allowed are called energy levels. When an electron has the smallest allowed amount of energy, it occupies the lowest energy level. This level is called ground state.



→ According to Bohr, the energy of an orbiting electron is an atom is the kinetic energy of the electron and the potential energy resulting from the coulombian atraction force between the electron and nucleus.



-> Enestein demonstrates that the light photon has a certain energy. Bohr postulated that a photon can be absorbed only if the energy of the photon is equal with the difference in the energy of the atomic electron levels

$$h\nu = E_{excited} - E_{ground} \quad (1)$$

-> When the electron makes the transition to the ground state, a photon is emitted (Fig 1). The enery of the photon is equal to the energy difference the excited and the ground states. (Lymann series Fig 2)

-> The puzzle of the electron's positions and motion around the nucleus in atom was clarified by studying the light emitted by atoms. The set of wave lenghts of light emitted by an atom is called emission spectrum of that atom

When a body is heated it becomes incandescent.

Data : Neon							
wave lenght λ[A]	6402	6143	5945	5852	5400	5330	5330
line position [div]	660	590	595	580	575	540	532
line color	bright red	red orange	orange	yellow	bright green	soft green	~~bright~~ green

Data: Mercury		
color	line position	wave lenght
Violet	405	4100
Blue	432	4400
Green	542	5600
Dark green	575	5800

$E = 6{,}626\cdot10^{-34}\cdot\frac{3\cdot10^{8}}{4100\cdot10^{-10}} = 4{,}8\cdot10^{-29}$

$E = 4{,}5\cdot10^{-29}$ J

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Violet: $4{,}8\cdot10^{-19} : 1{,}6\cdot10^{-19} = 3\,eV$

Blue : $4{,}5\cdot10^{-19} : 1{,}6\cdot10^{-19} = 2{,}8\,eV$

Green : $3{,}5\cdot10^{-19} : 1{,}6\cdot10^{-19} = 2{,}18\,eV$

Dark Green: $3{,}3\cdot10^{-19} : 1{,}6\cdot10^{-19} = 2{,}06\,eV$

✓

Lab 4

Atomic Spectra

Lab 3

$$\frac{E = h \cdot \nu}{\text{photon}} = J \cdot s \cdot \frac{1}{s} = J \quad , \quad 1eV = 1{,}6 \cdot 10^{-19}\,J$$

$$h = 6{,}626 \cdot 10^{-34}\ J \cdot s \quad , \quad c = 3 \cdot 10^{8}\ \frac{m}{s}$$

Ne, Hg

$$\mathring{A} = 10^{-10}\ m$$

speed of light

$$\nu = \frac{c}{\lambda} = \frac{m/s}{\cancel{m}} = \frac{1}{s}$$

λ 700nm 400nm

FT-iR

UV

E =