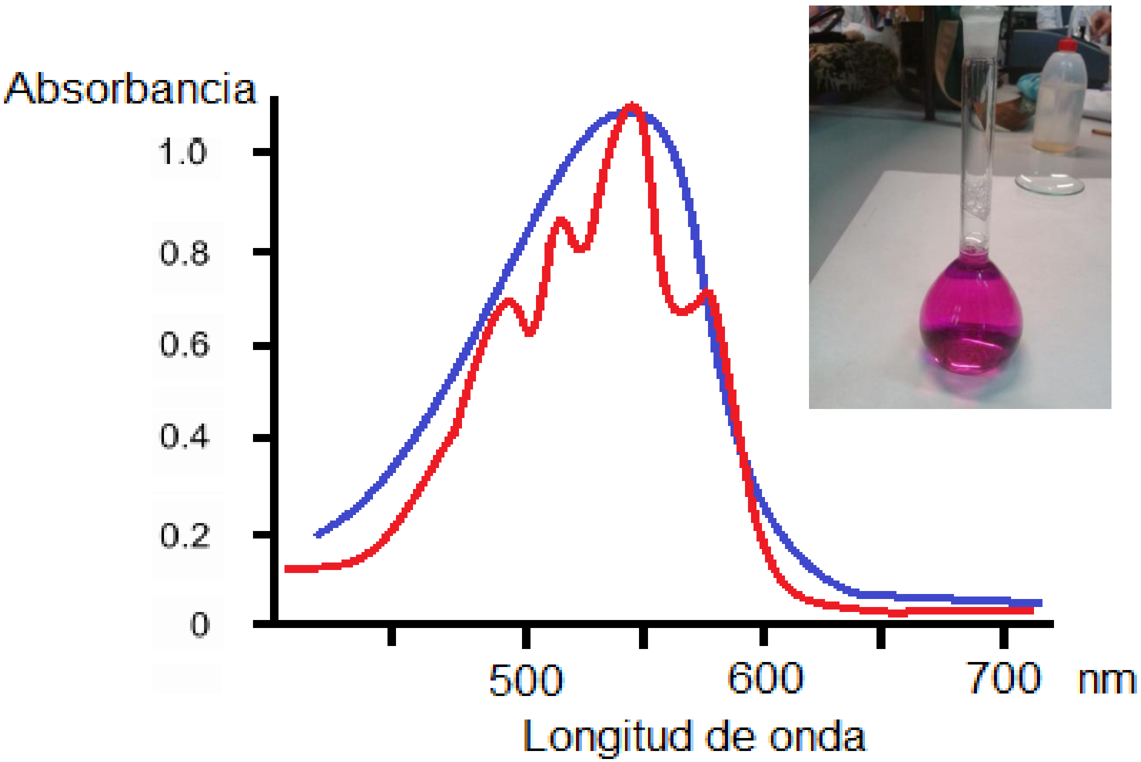
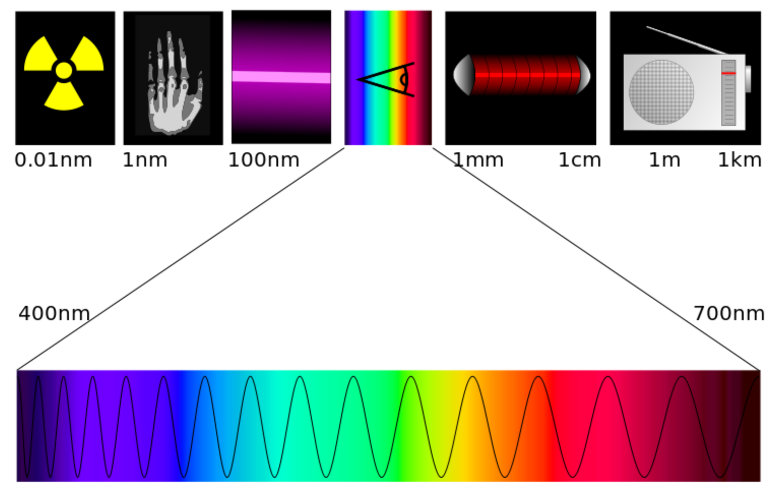
I. ZINETIKA KIMIKOA

P2. Alkohol Bentzilikoaren Oxidazioaren Zinetika





Esperimentazio Kimika Fisikoan

Open Course Ware

http://ocw.ehu.es/course/view.php?id=207

OINARRI TEORIKOA

$$5C_6H_5CH_2OH + 2MnO_4^- + 6H^+ \rightarrow 5C_6H_5CHO + 2Mn^{+2} + 8H_2O$$

$$v = k \cdot [MnO_4^-]^p \cdot [Ph-CH_2OH]^q \cdot [H^+]^r$$

$[Ph\text{-}CH_2OH]_0 \gg \rightarrow [Ph\text{-}CH_2OH] = kte$

$[H^+]_0 \gg \rightarrow [H^+] = kte$

$$\boxed{v = k' \cdot [MnO_4^-]^p}$$

non:

$$k' = k \cdot [Ph-CH_2OH]_0^q \cdot [H^+]_0^r$$

- MnO_4^- -arekiko ordena 1 bada ($p = 1$):

$$v = -\frac{1}{2}\frac{d[MnO_4^-]}{dt} = k'[MnO_4^-] \Rightarrow \boxed{\ln\frac{[MnO_4^-]_0}{[MnO_4^-]} = 2k't}$$

❖ Alkohol bentzilikoaren ordena (q):

Bi zinetika desberdinak egin non $[Ph\text{-}CH_2OH] \neq$

$[Ph\text{-}CH_2OH]_{0,I} \gg \rightarrow [Ph\text{-}CH_2OH]_I = kte$

$[H^+]_0 \gg \rightarrow [H^+] = kte$

$$v = k_I' \cdot [MnO_4^-]^p$$ non:

$$k_I' = k \cdot [Ph-CH_2OH]_{0,I}^q \cdot [H^+]_0^r$$

$[Ph\text{-}CH_2OH]_{0,II} \gg \rightarrow [Ph\text{-}CH_2OH]_{II} = kte$

$[H^+]_0 \gg \rightarrow [H^+] = kte$

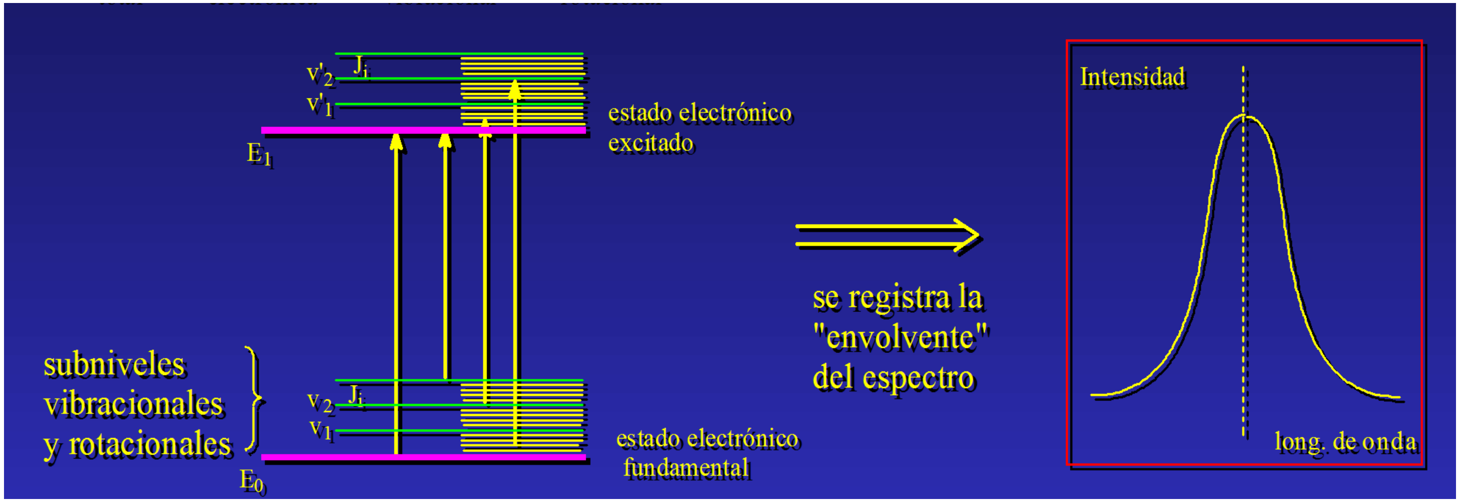
$$v = k_{II}' \cdot [MnO_4^-]^p$$ non:

$$k_{II}' = k \cdot [Ph-CH_2OH]_{0,II}^q \cdot [H^+]_0^r$$

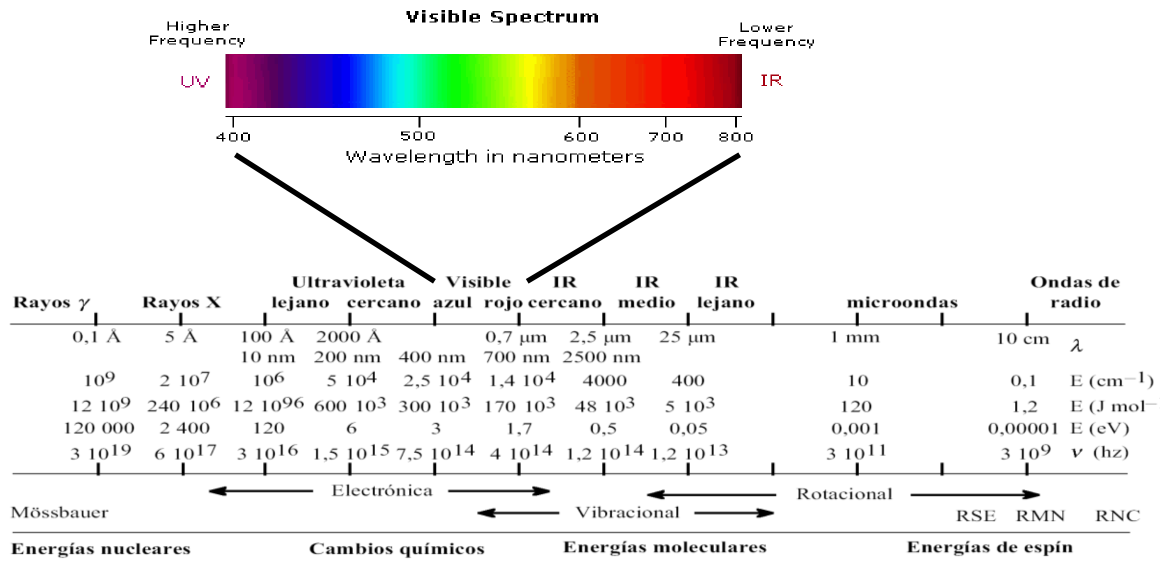
$$\boxed{\frac{k_I'}{k_{II}'} = \left(\frac{[Ph-CH_2OH]_{0,I}}{[Ph-CH_2OH]_{o,II}} \right)^q}$$

❖ Abiadura-konstantea (k): Suposatu H^+-rekiko ordena (r) 1 dela

Permanganatoaren kontzentrazioaren aldaketa denboran zehar jarraitzeko **metodo fisikoa => espektroskopia** (argiaren xurgapena.



MnO_4^- koloredun konposatu bakarra → argi ikuskorra xurgatzen du

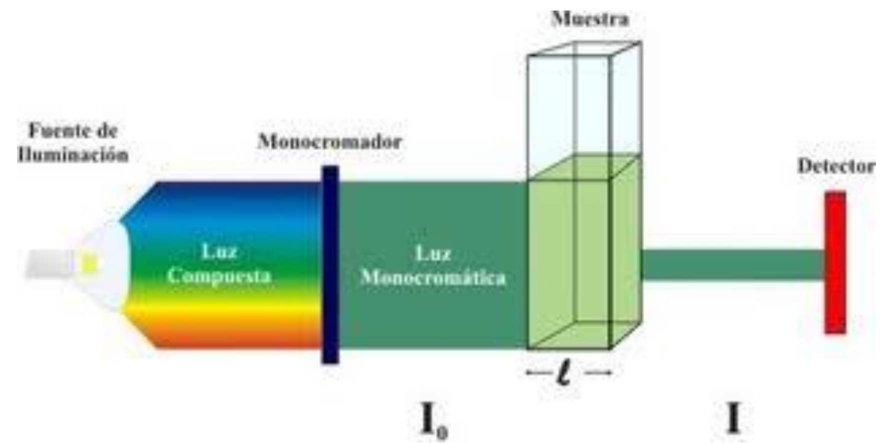


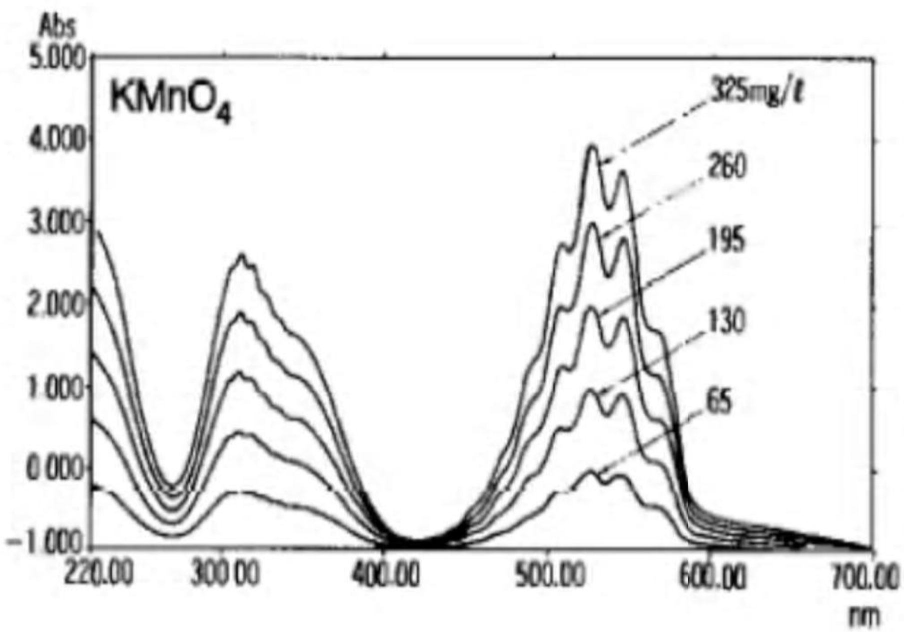
Lambert-Beer legea

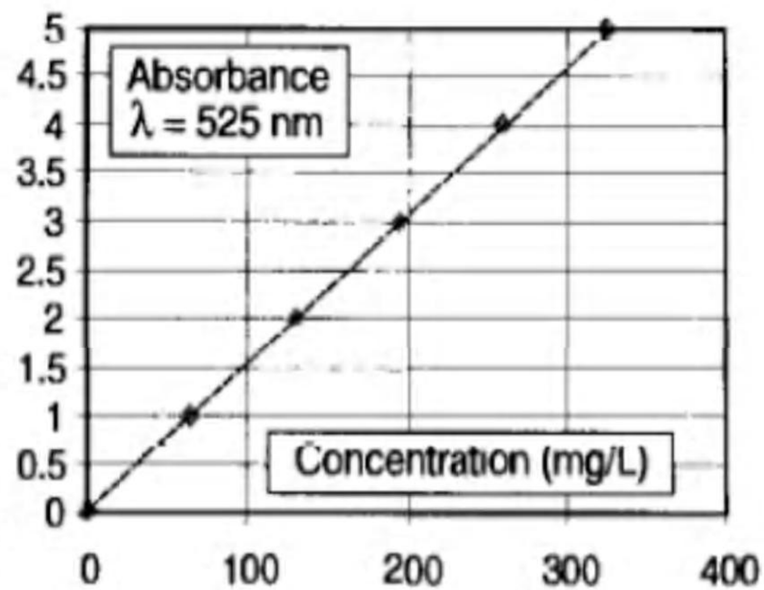
$$A(\lambda) = \log\left(\frac{1}{T}\right) = \log\left(\frac{I_0}{I}\right) = \varepsilon(\lambda)\cdot l \cdot c$$

- A(λ) – uhin-luzera bakoitzaren laginak absorbatzen duena
- ε(λ) – absortzio molarra (konposatuaren arabera, $M^{-1}\cdot cm^{-1}$)
- c – kontzentrazioa (permanganato)
- l – bide optikoa (upelatxoaren luzera, 1 cm)

Espektrofotometroa





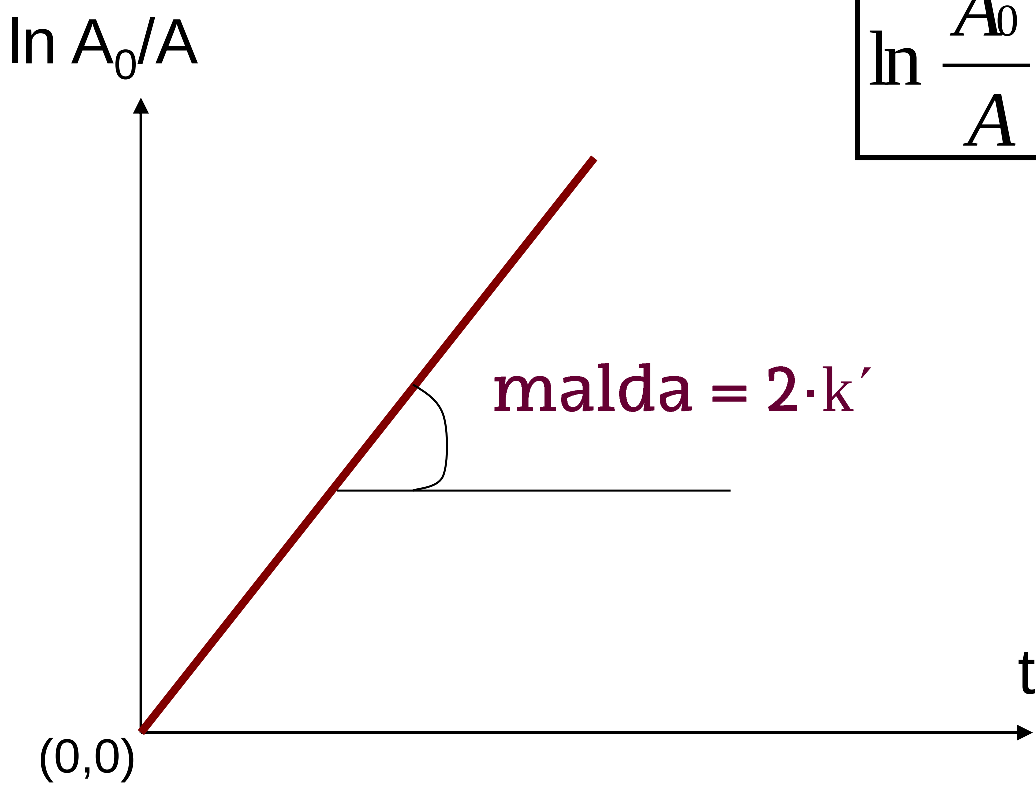


Hasieran: $c_0 = [MnO_4^-]_0 \rightarrow A_0 = \varepsilon \cdot l \cdot [MnO_4^-]_0$

t denboran: $c = [MnO_4^-] \rightarrow A = \varepsilon \cdot l \cdot [MnO_4^-]$

$$\ln \frac{[MnO_4^-]_0}{[MnO_4^-]} = 2k´t$$

$$\boxed{\ln \frac{A_0}{A} = 2k´t}$$



PROZEDURA

❖ Disoluzioen prestaketa:

- 100 cm^3 $KMnO_4$ 4×10^{-4} M (diluzioz) → espektroa eta A_0

- Zinetika I (1D): 100 cm^3

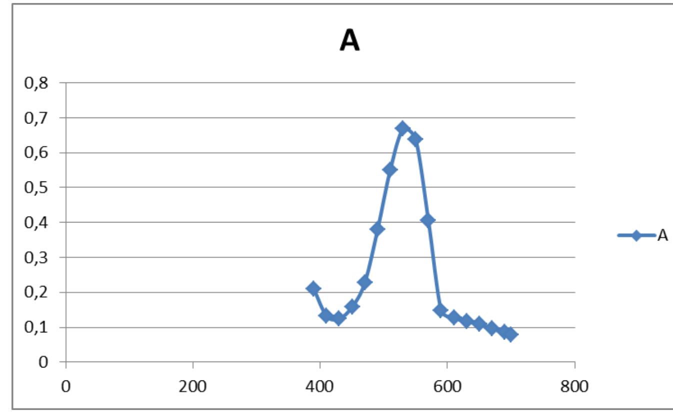
  $Ph\text{-}CH_2OH$
  $HClO_4$
  HAz 12 cm^3 → M^{+2} MnO_2 (koloredun) ez bihurtzeko

- Zinetika II (2D): 100 cm^3

  $Ph\text{-}CH_2OH$ ≠
  HClO4 =
  HAz 12 cm^3

❖ Uhin luzera hautaketa:

- Espektrofotometroaren zeroa doitu ura erabiliz (A = 0)
- $KMnO_4$ 4×10^{-4} M disoluzioaren espektroa neurtu (A vs λ)



- Aukeratu maximoaren uhin-luzera (errore txikiago)
- Determinatu A_0

❖ Erreakzioaren zinetika:

- 1D disoluziotik 90 cm^3 hartu eta bota gainean 10 cm^3 $KMnO_4$ 4×10^{-3} M (t = 0)
- Neurtu absorbantzia upelatxoan 2 minuturo (30 minututan) λ_{max}
- Errepikatu berdin 2D disoluzioarekin