



Cured.Bio



info@cured.bio

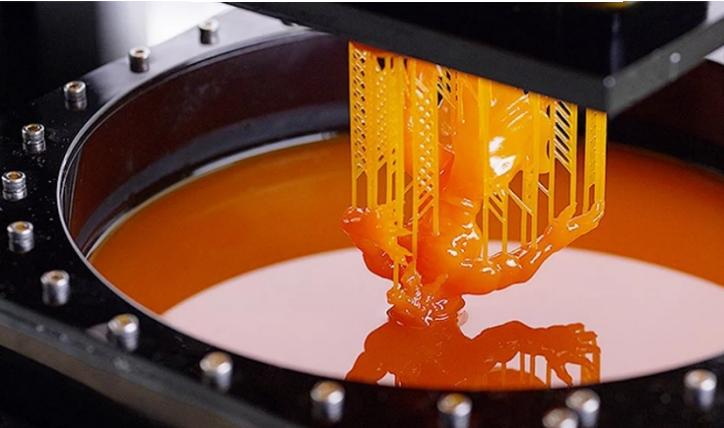
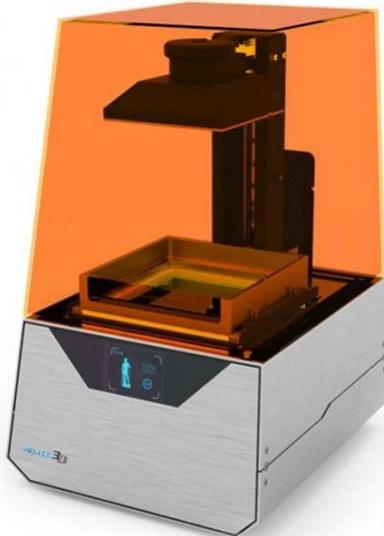
<https://github.com/curedbio>

MÒDUL 1

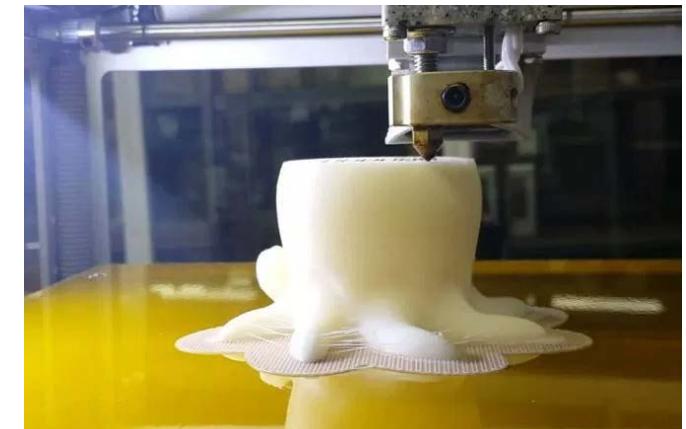
IMPRESSIÓ 3D

TIPUS IMPRESSION 3D

DLP/SLA
(Digital Light Process, resina)

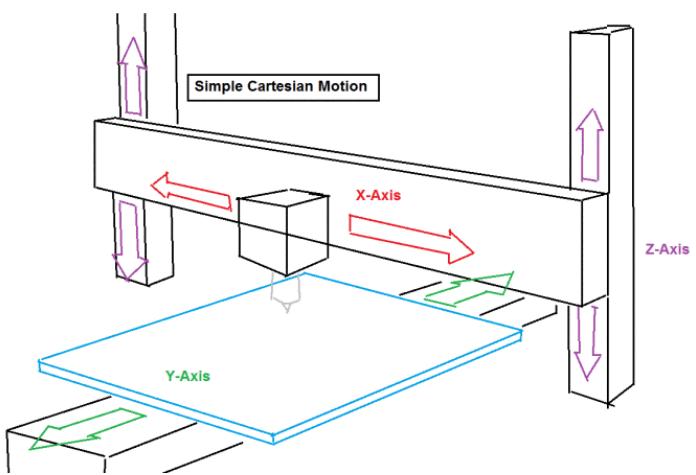
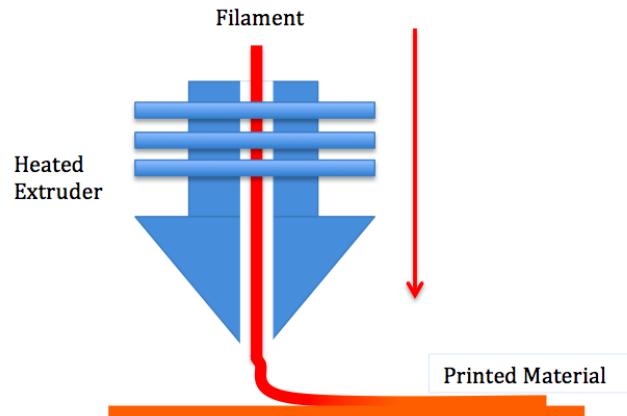
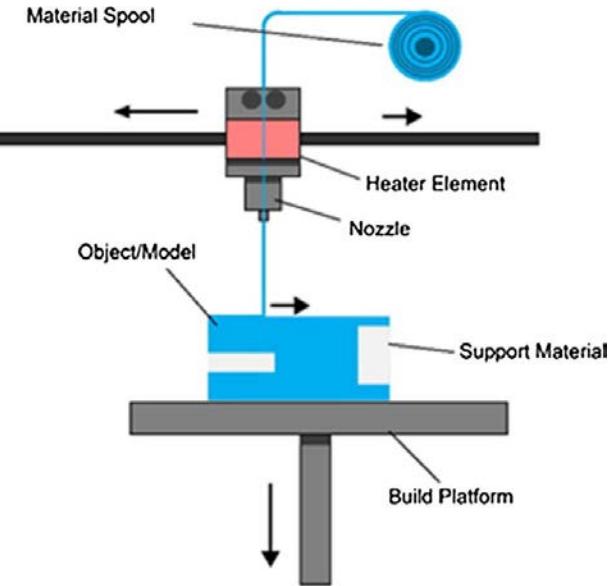


FDM
(Fused Deposition Modeling, filament)



	DLP/SLA	FDM
Resolució	+++	+
Velocitat	+++	+
Cost	+++	+

FDM



QUINA COMPRAR?

Original Prusa i3 MK3S

770 €



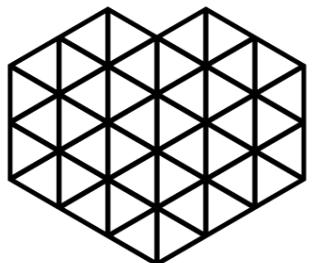
Anycubic i3 Mega

200 €



Creatlity 3D Ender-3 Pro

ON IMPRIMIR?



3D HUBS

<https://www.3dhubs.com/>

- Pressupost ràpid i gratuït
- Diferents materials/colors
- Recomanat: FDM, material PLA
(Resistència mecànica: SLA)

CNC Machining

Milling (3-, 4- & full 5-axis), turning & post-processing



Lead time

5 - 15 working days

3D Printing

FDM, SLA, SLS, MJF, DMLS & material jetting

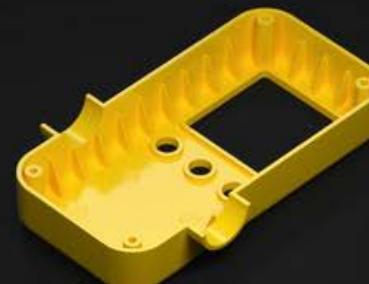


Lead time

3 - 5 working days

Injection Molding

Gas-assisted molding, overmolding, 2-part cavity molds, family molds, hard and soft tools



Lead time

14 - 40 working days

RECURSOS DIGITALS

	Thingiverse	Cults 3D	CGTrader	My Mini Factory
Tipus	Repositori		Marketplace	
Cost	Gratis		Gratis/Pagament	
# Models	+++	+	++	+

<https://github.com/Curedbio/3D-Printer>



cgtrader

<https://www.thingiverse.com/>

<https://cults3d.com/>

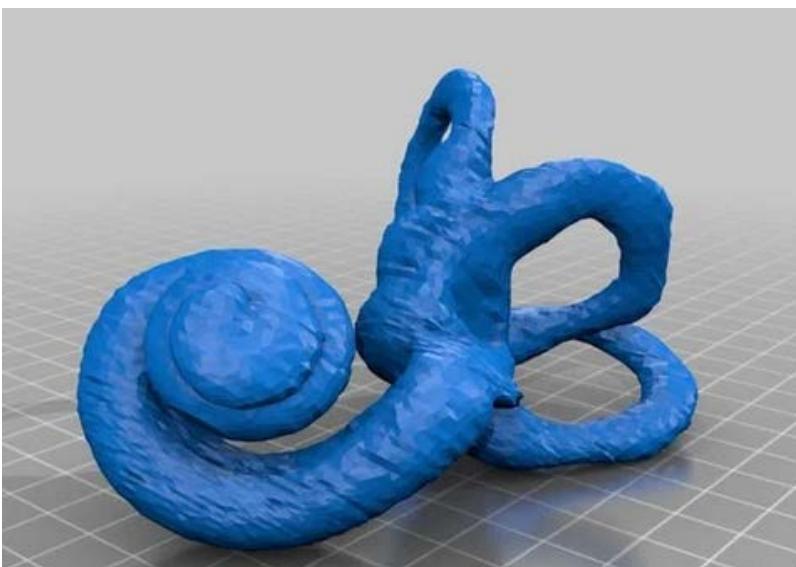
<https://www.cgtrader.com/>

<https://www.myminifactory.com/>

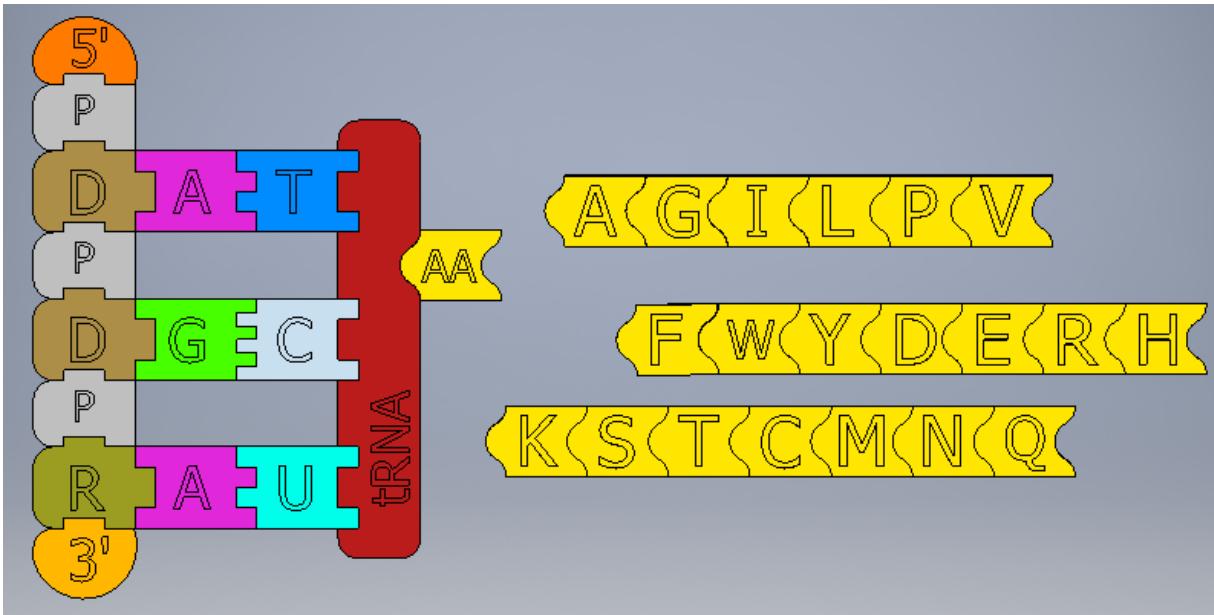


MMyMiniFactory

EXEMPLES



ADN



ID	Part	ID	Part	ID	Part
A	Adenine	D	Desoxyribose	tRNA	Transfer RNA
T	Thymine	R	Ribose	AA	Aminoacid
C	Cytosine	P	Phosphate		
G	Guanine	3'	3 end		
U	Uracil	5'	5 end		

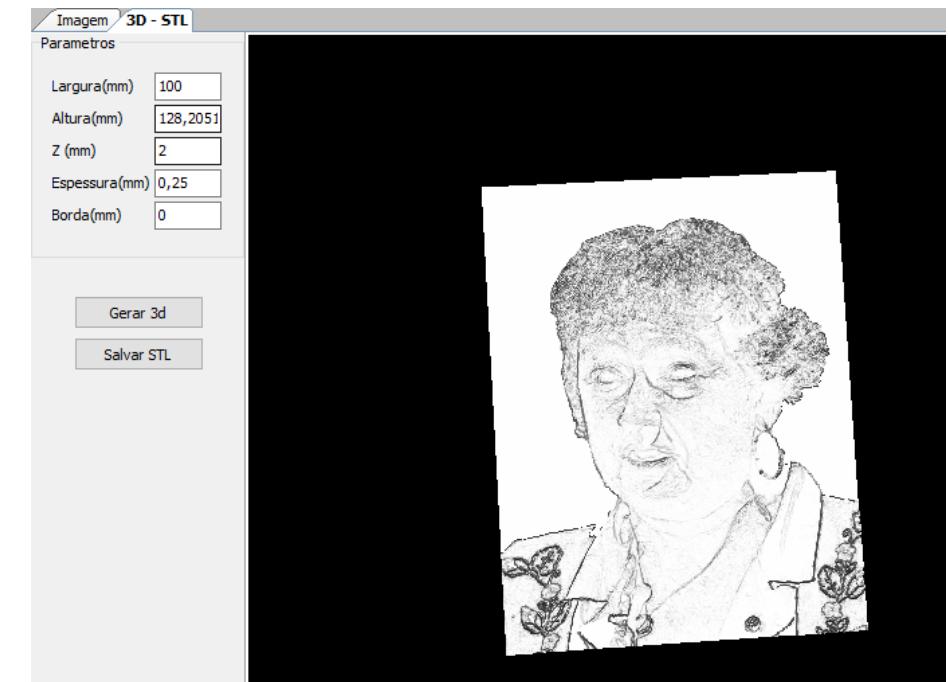
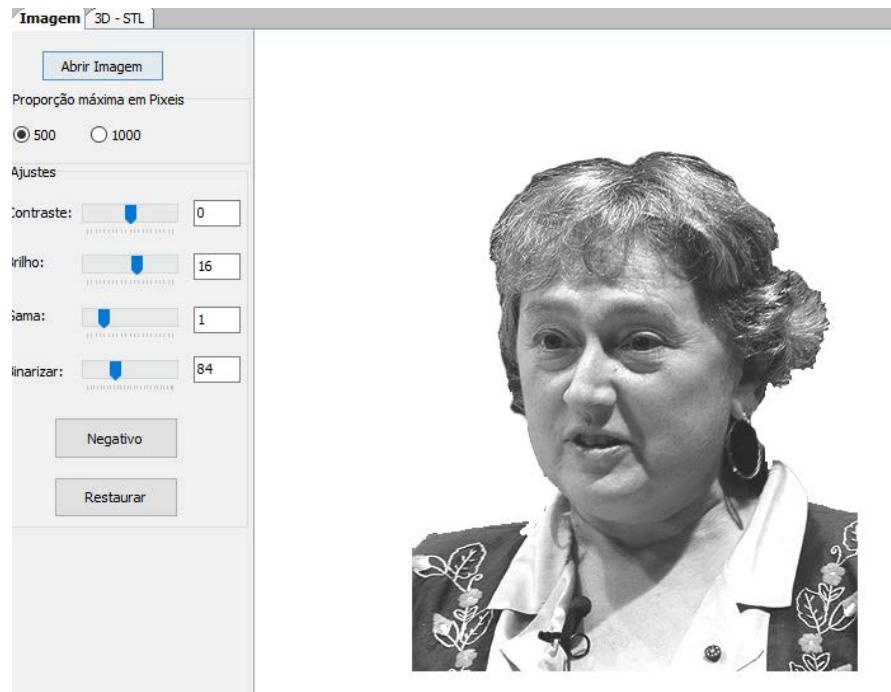
DNA as cryptography tool

DNA Codon = Aminacid

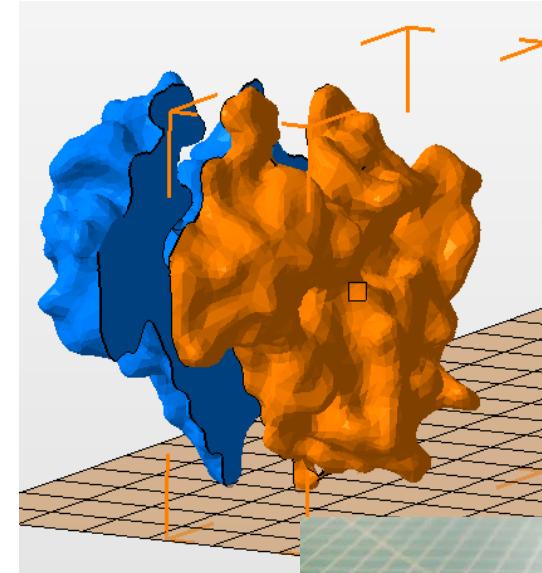
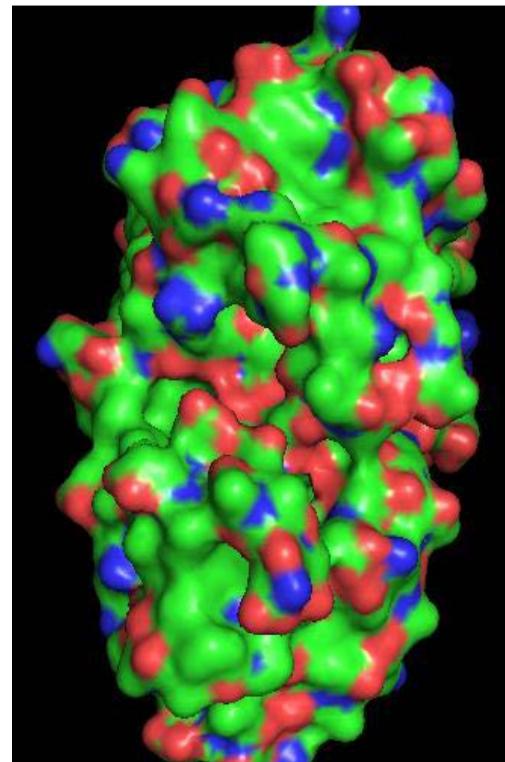
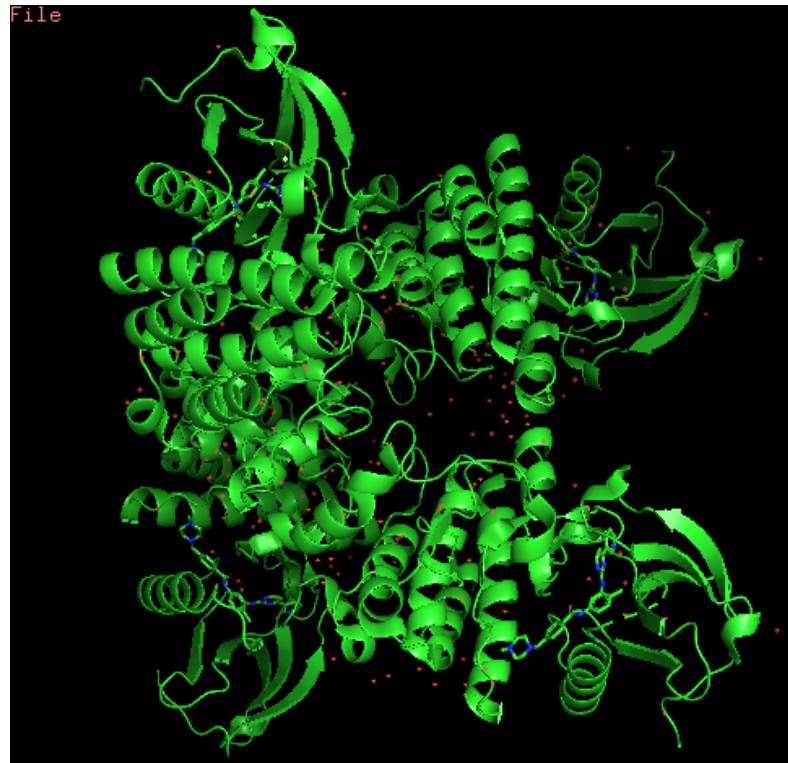
Biology rocks = CATCTGTGTATCTGTGTCGACAGCCACTGTTCATCGTGA

LITHOPHANES

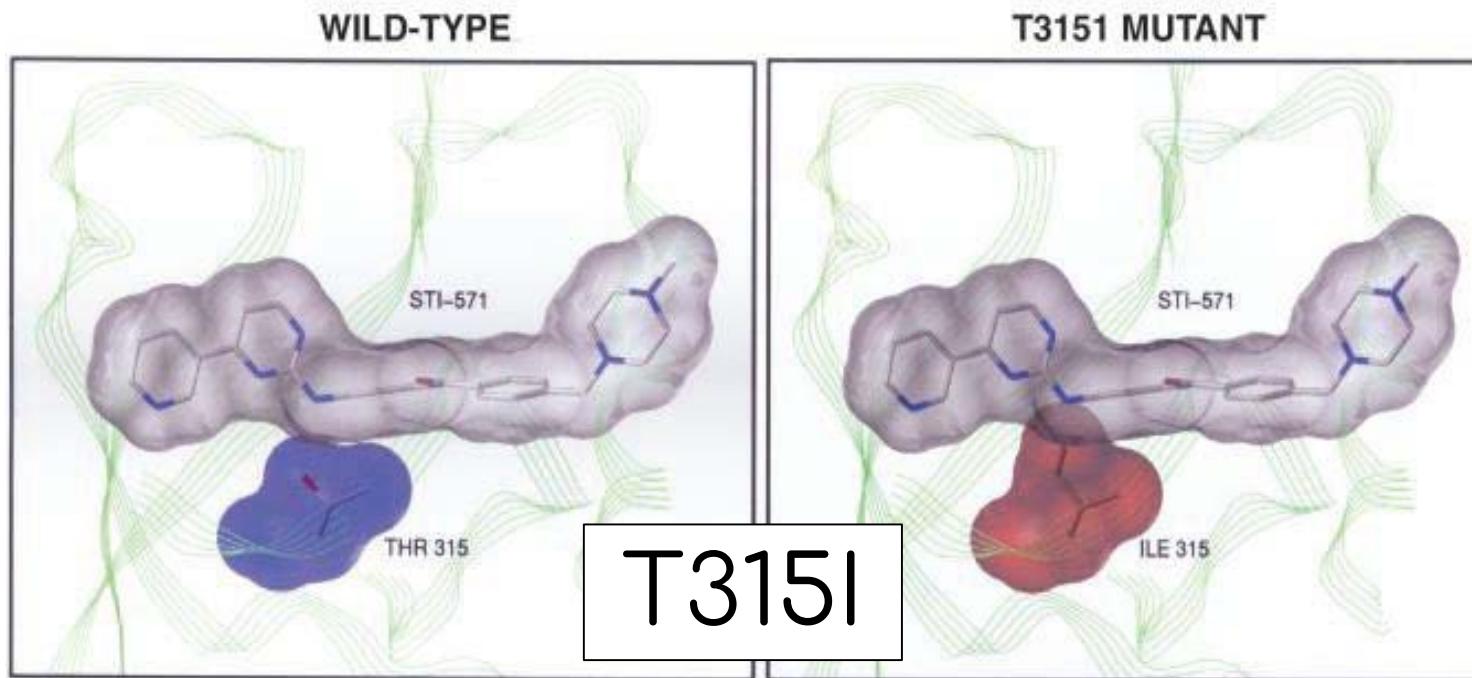
(Litofanies)



PROTEÏNES



ABL1 - GLEEVEC



- 1 [Protein Data Bank](https://www.rcsb.org/structure/2HYY)
2HYY = Wild type
2Z60 = mutant
- 2 <https://pymol.org>
- 3 AUTODESK[®]
NETFABB[®]
AUTODESK[®]
MESHMIXER[®]

MÒDUL 2

MICROSCOPIS

HISTORIA

Dinastia Chow-Foo
(1100-200 AC, Xina)

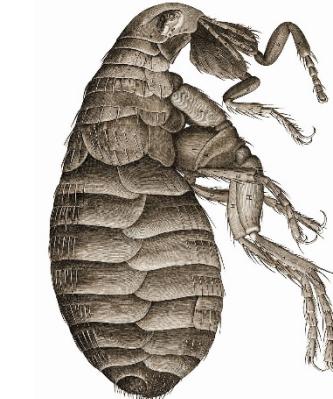
Microscopi
d'aigua

?
(1300, IT)

Ulleres

Jansen
(1590, DE)

Tub + 2 lens



Robert Hooke
(1665, DE)

Micrographia

Gallileo
(1609, Itàlia)

Segadors
(1650)

Lens
esfèriques

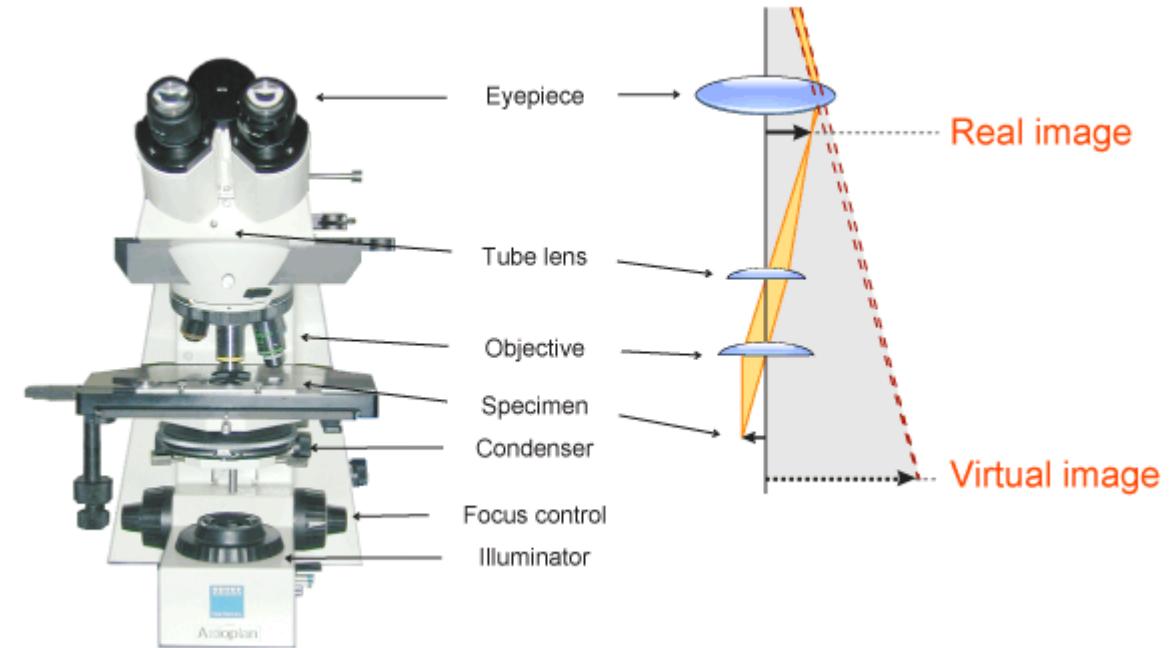
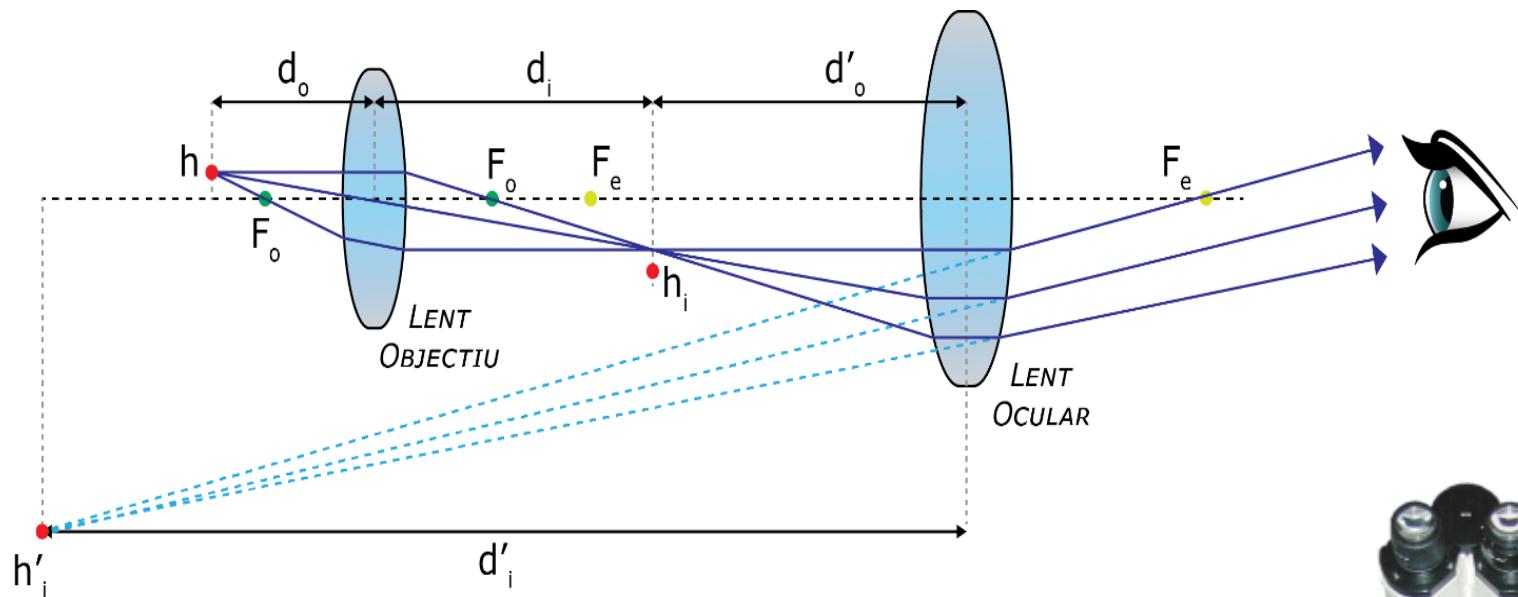
?
(350 AC, Grècia)



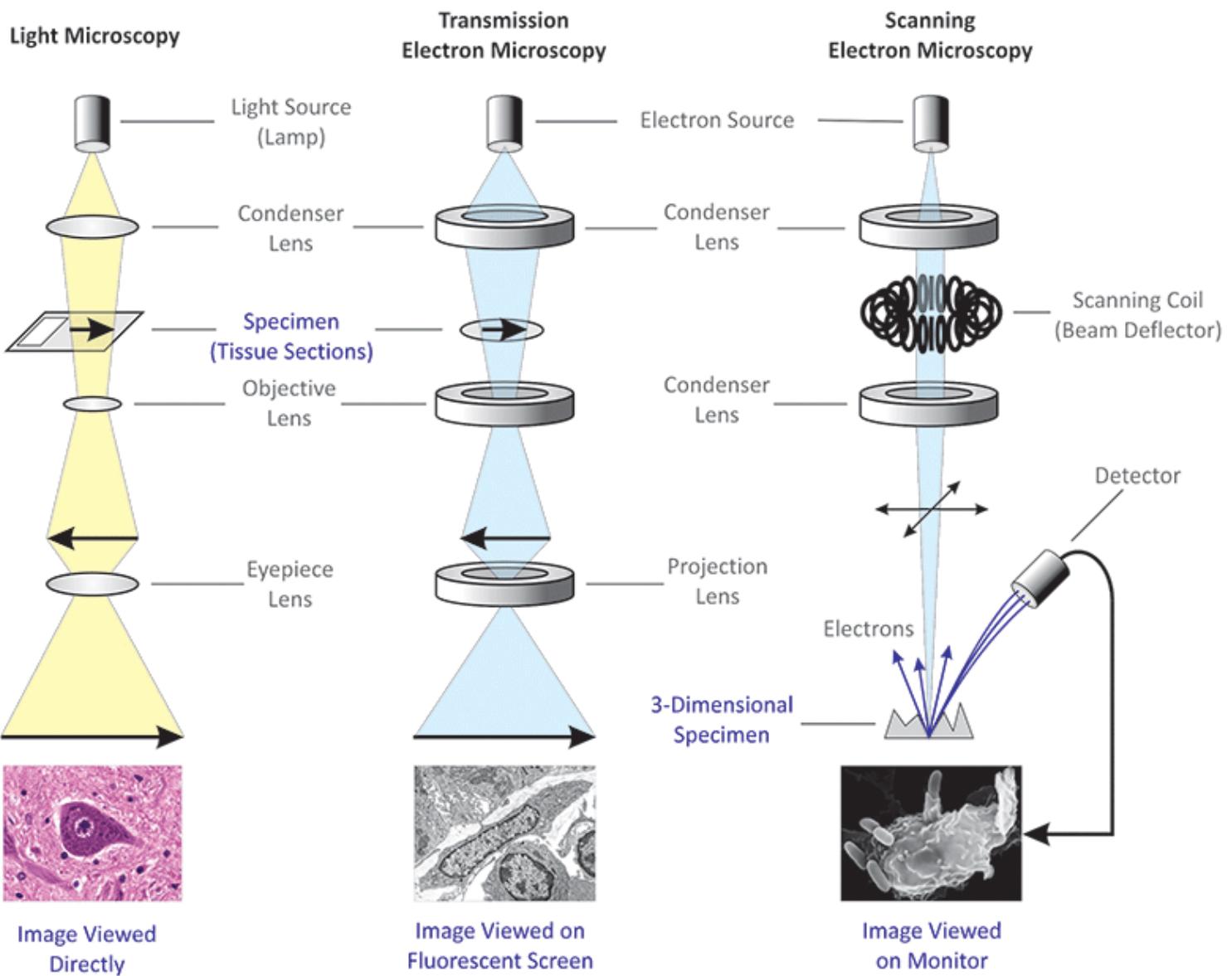
Van Leeuwenhoek
(1675, NL)

Tub + 2 lens

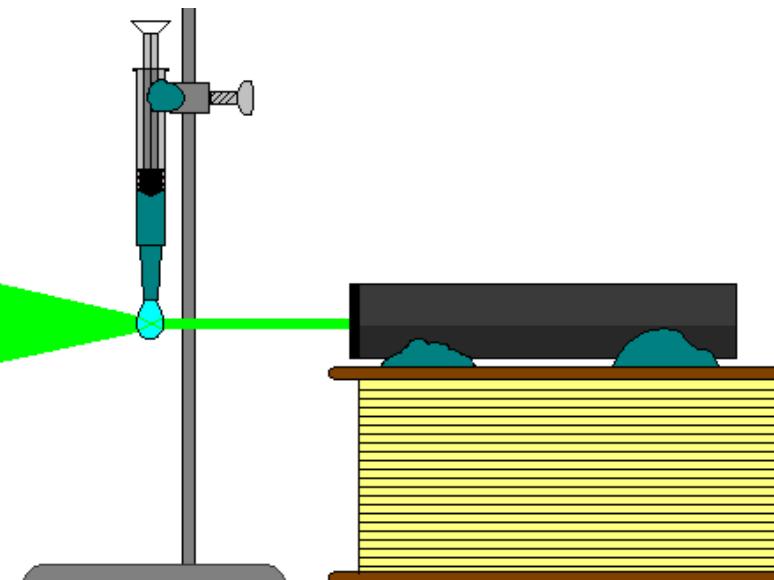
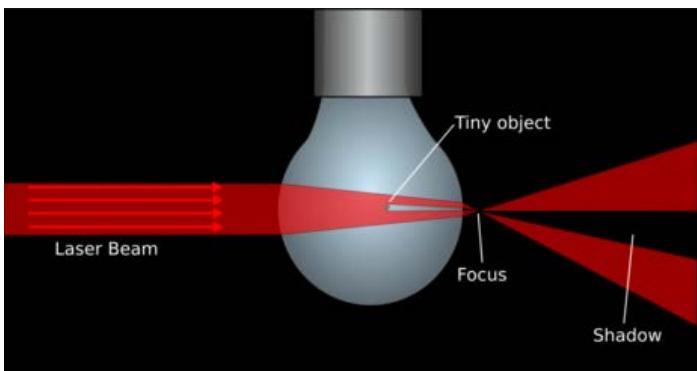
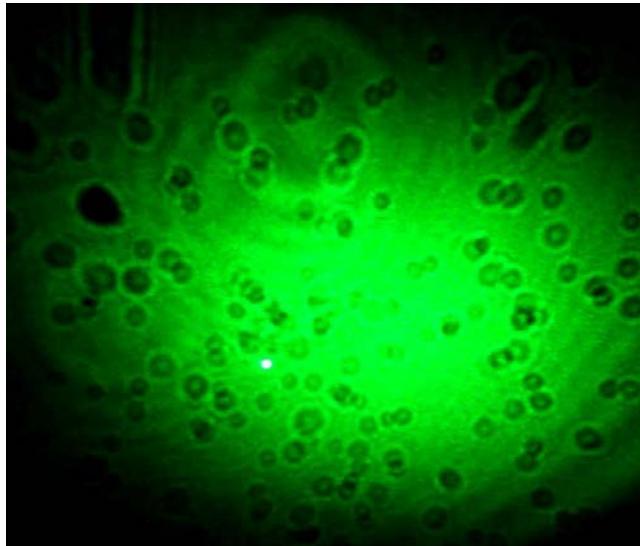
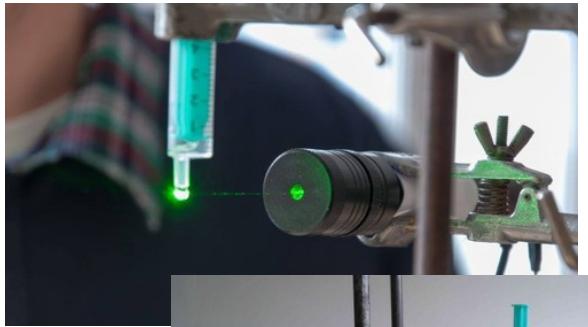
¿QUÈ ÉS UN MICROSCOPI?



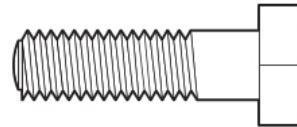
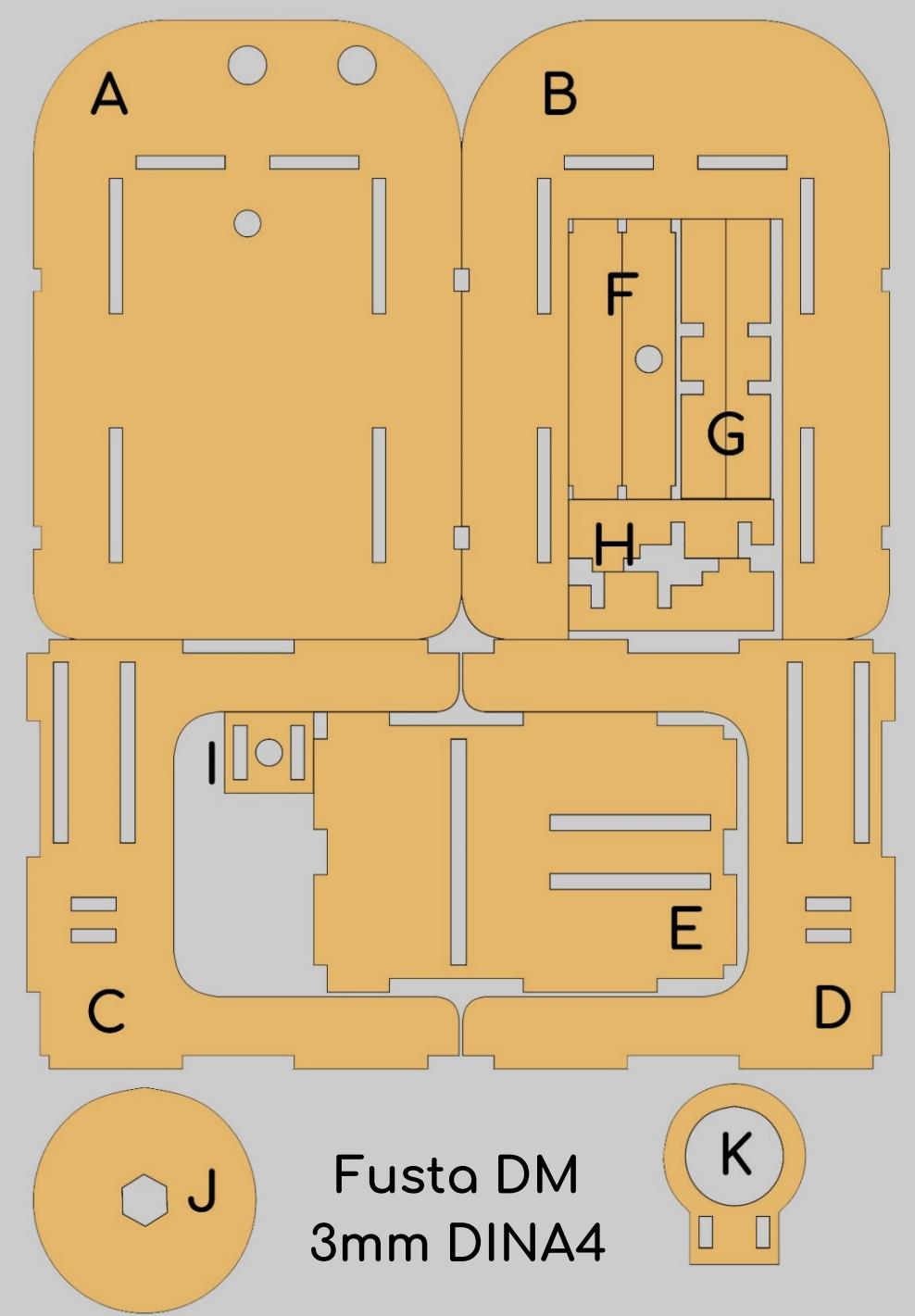
TIPUS



“MICROSCOPI” LASER



ENSAMBLATGE



M6*60mm
hexagonal



Femella
M5



Lent

MATERIALS

SERVEI ESTACIÓ

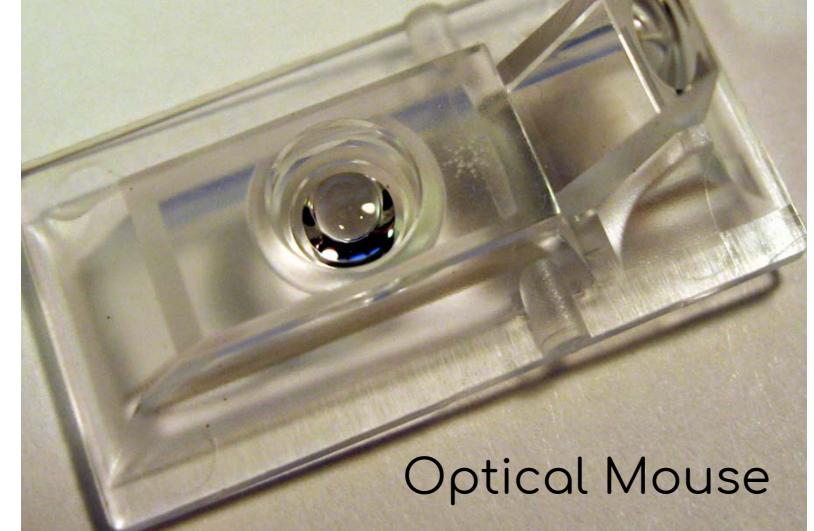
SERVEI TALL LÀSER



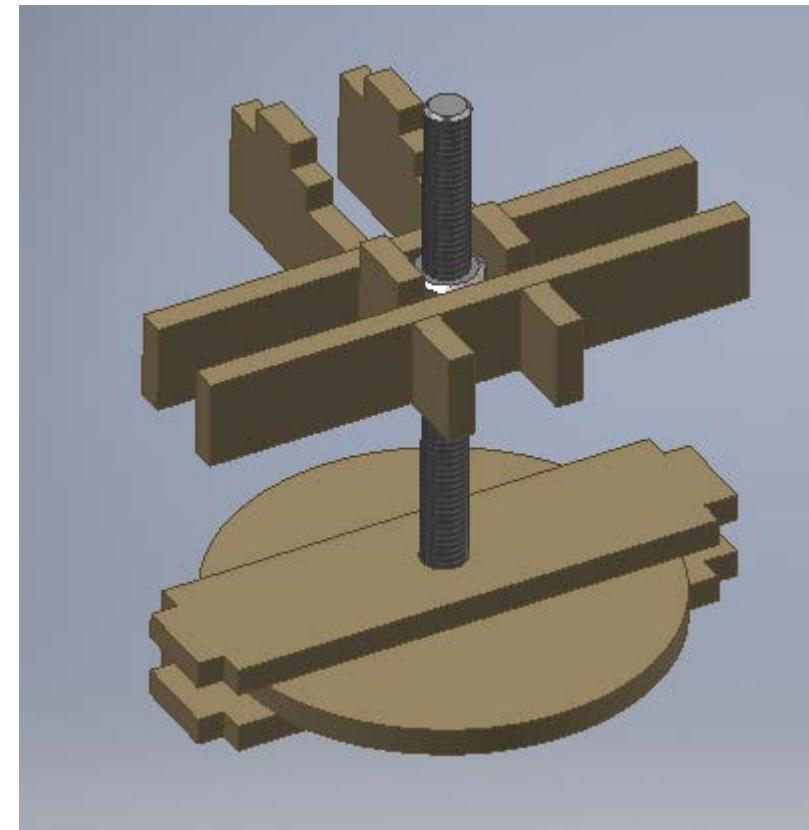
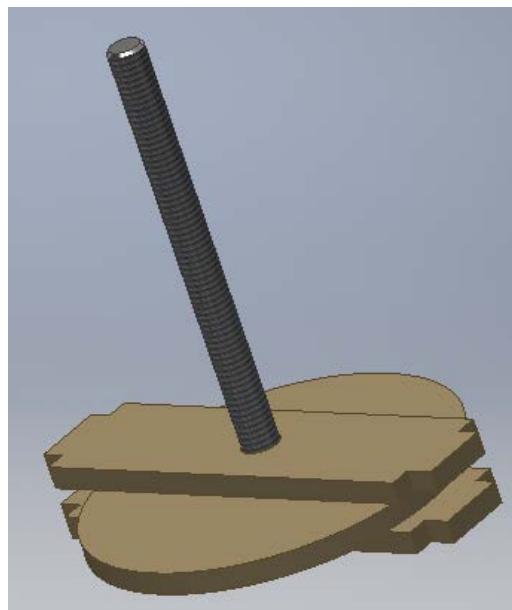
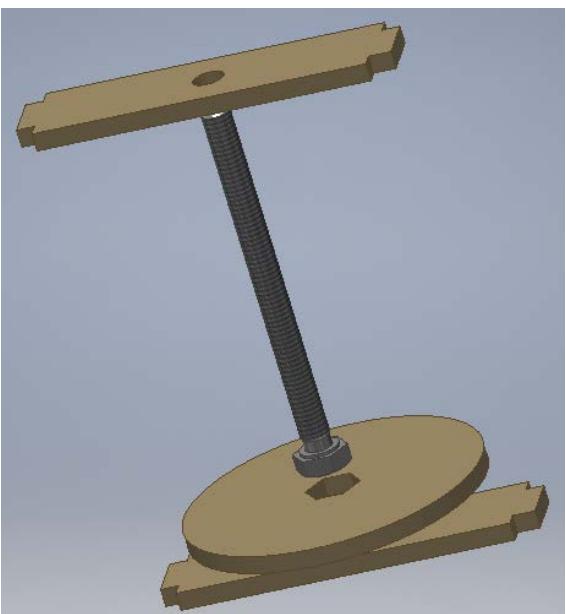
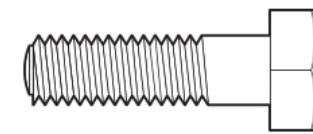
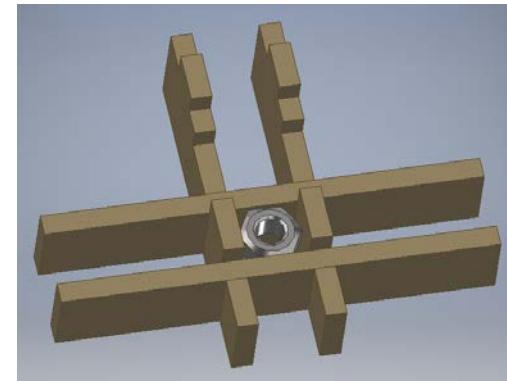
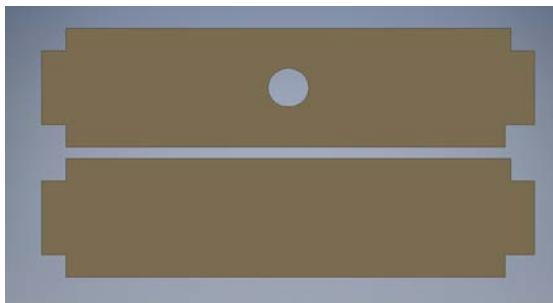
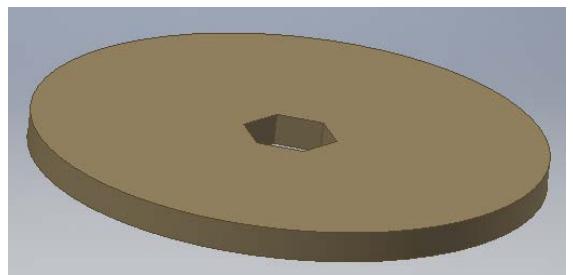
LENS

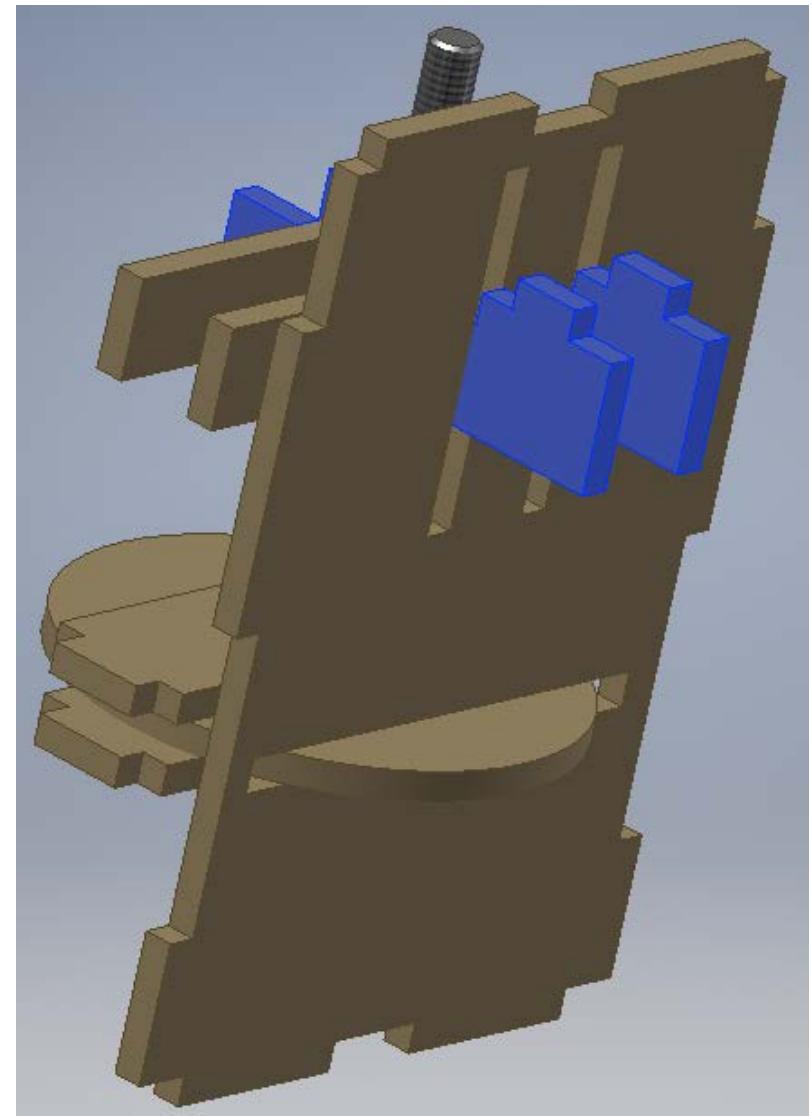
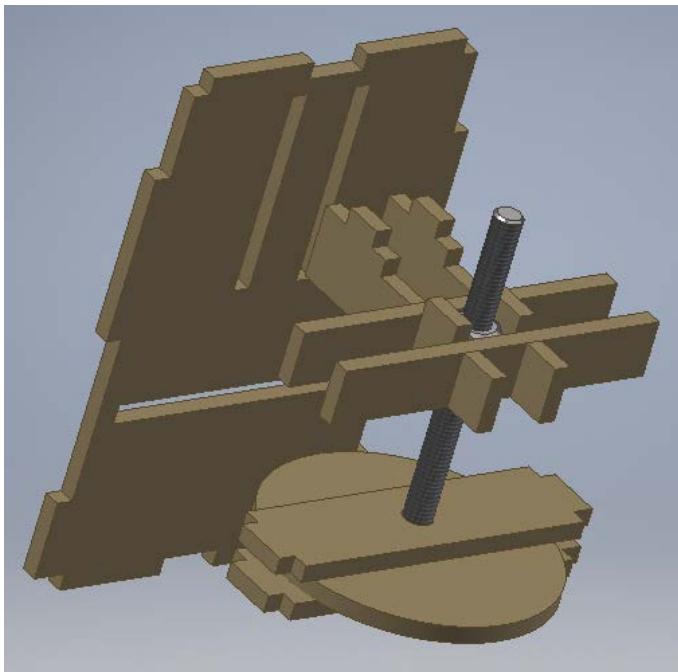
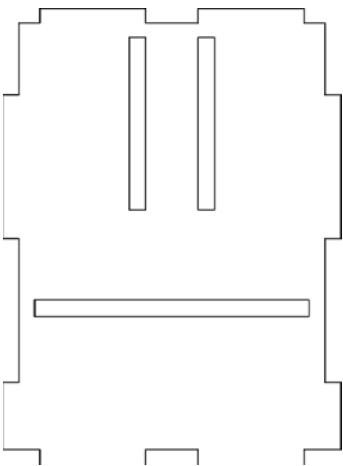


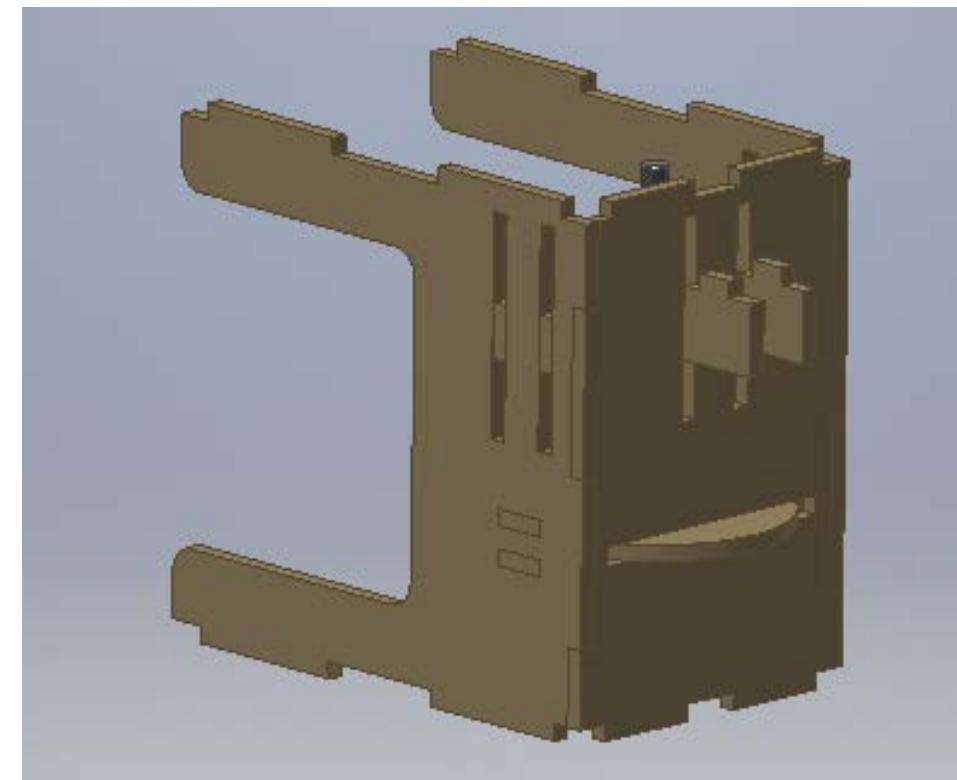
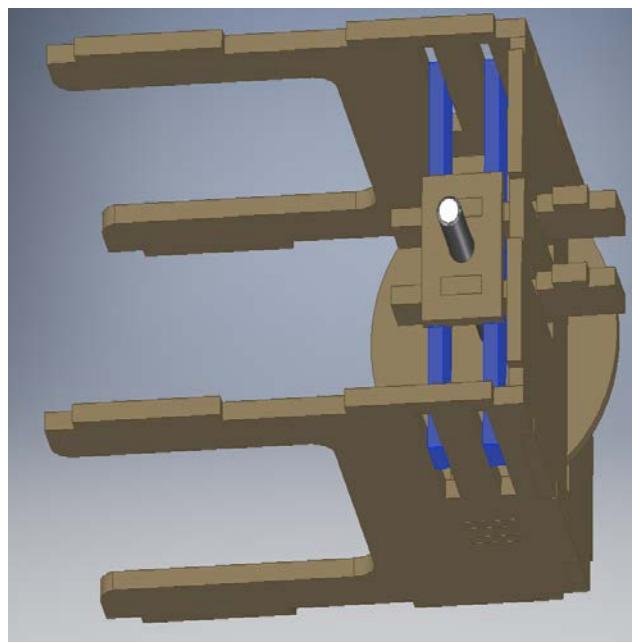
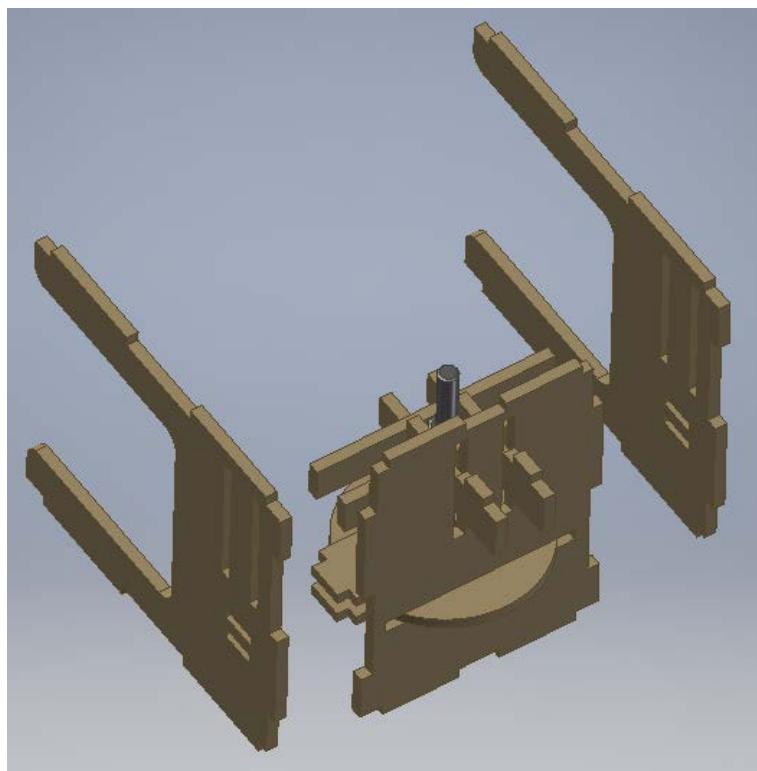
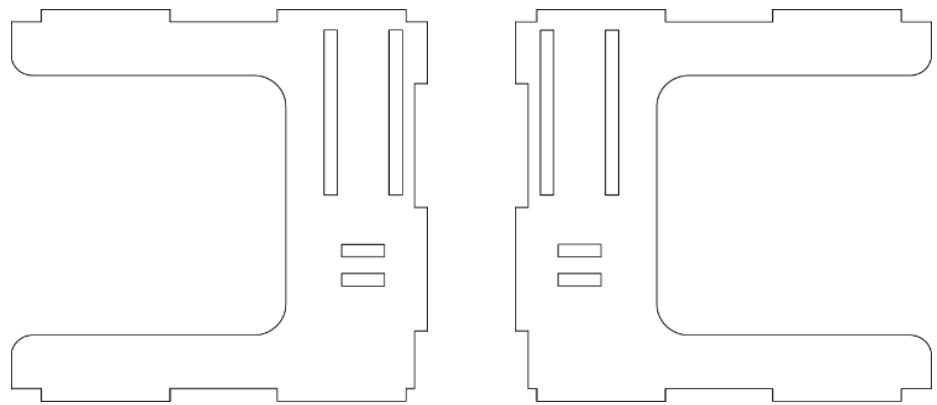
Laser Pointer

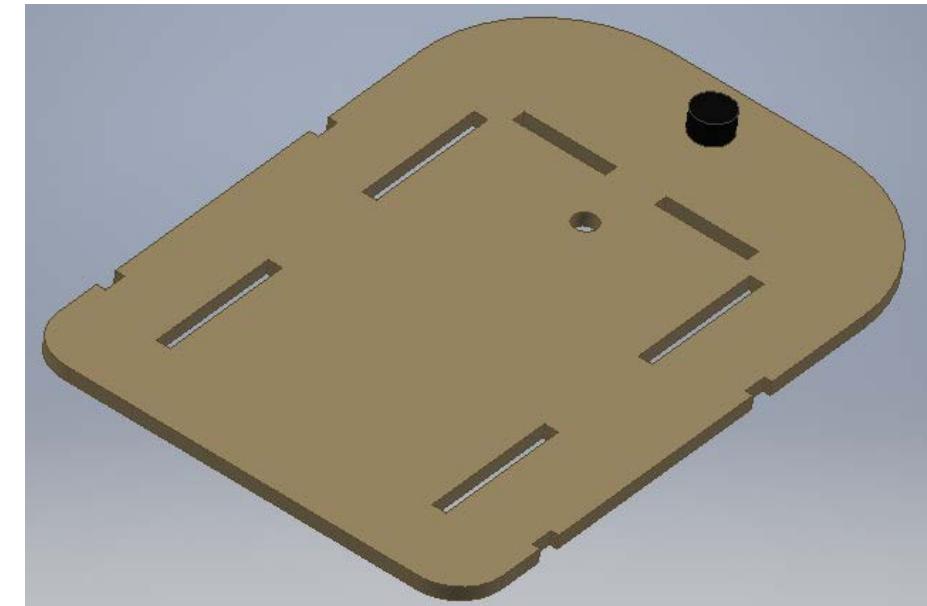
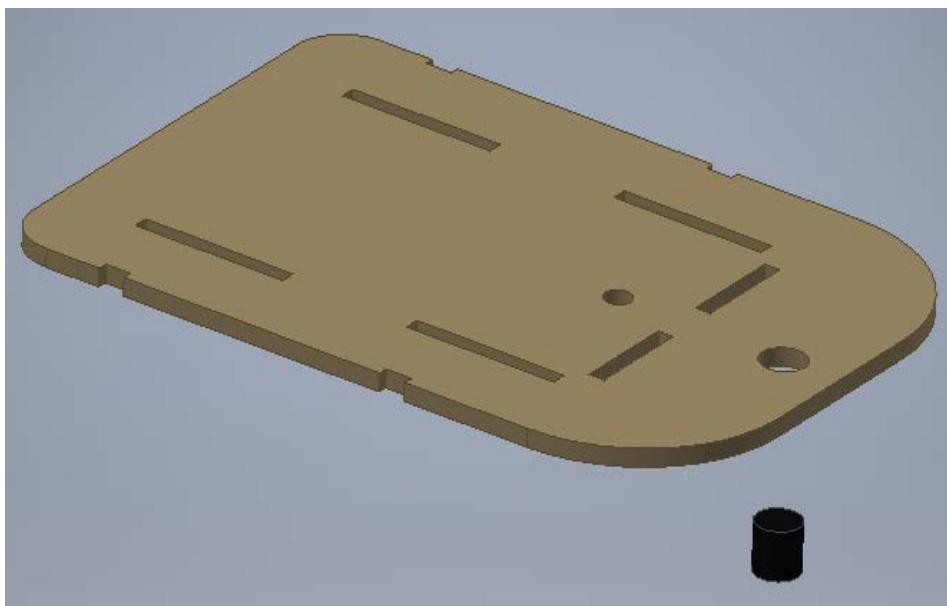


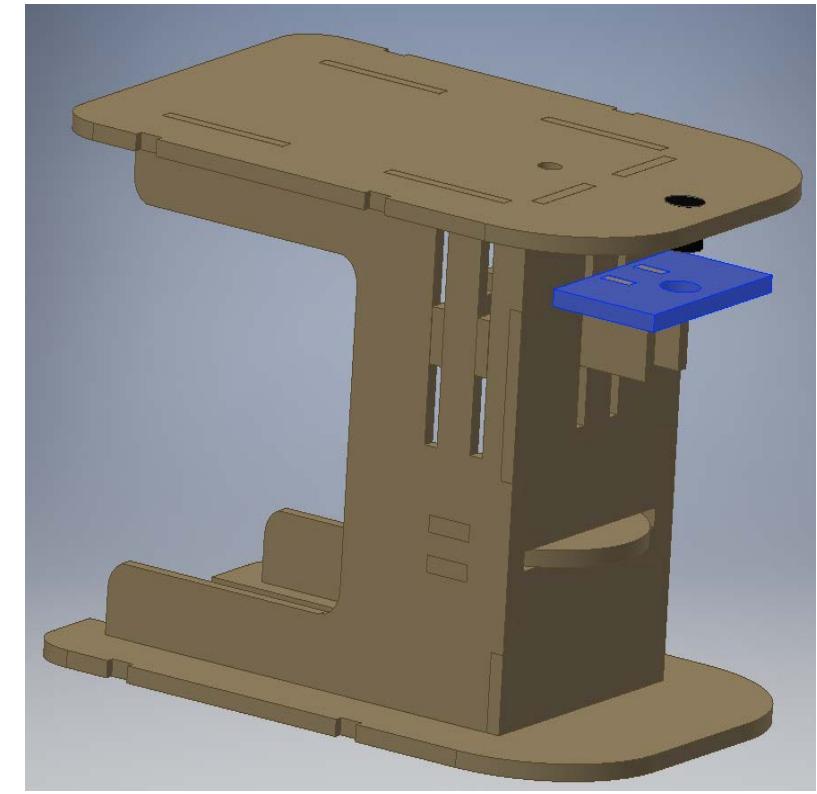
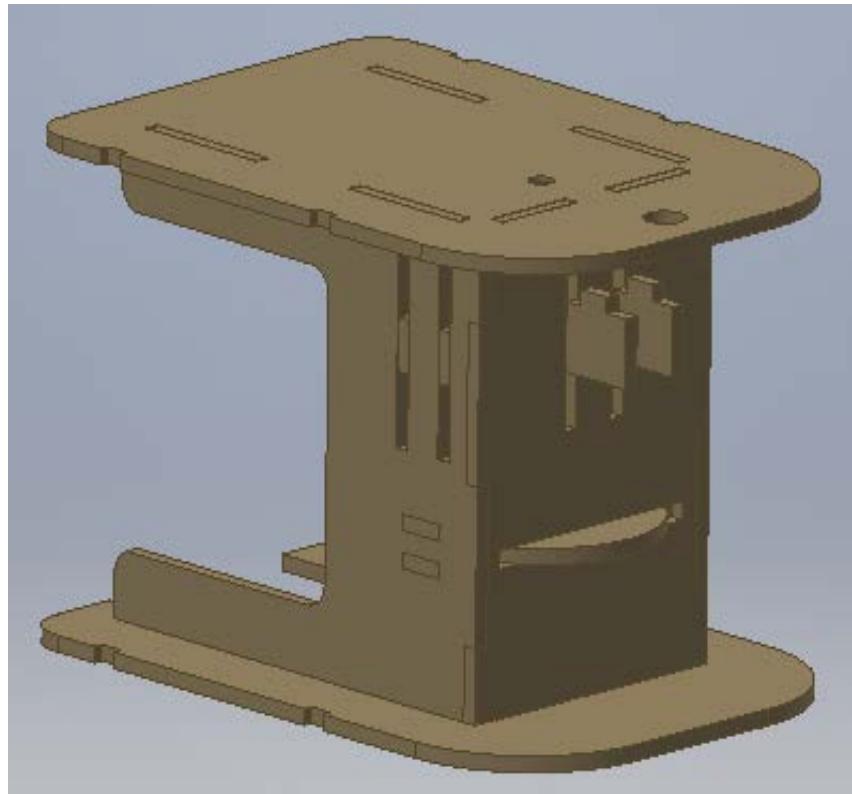
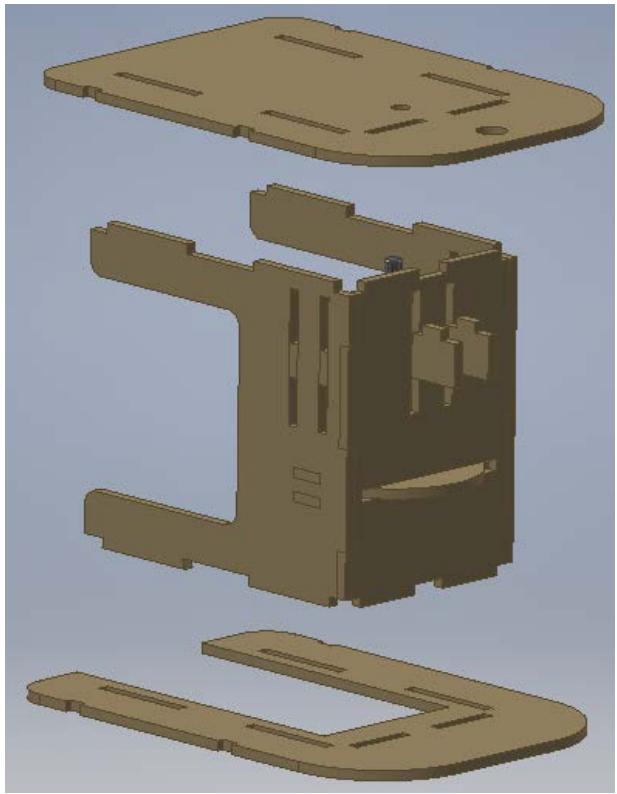
DVD

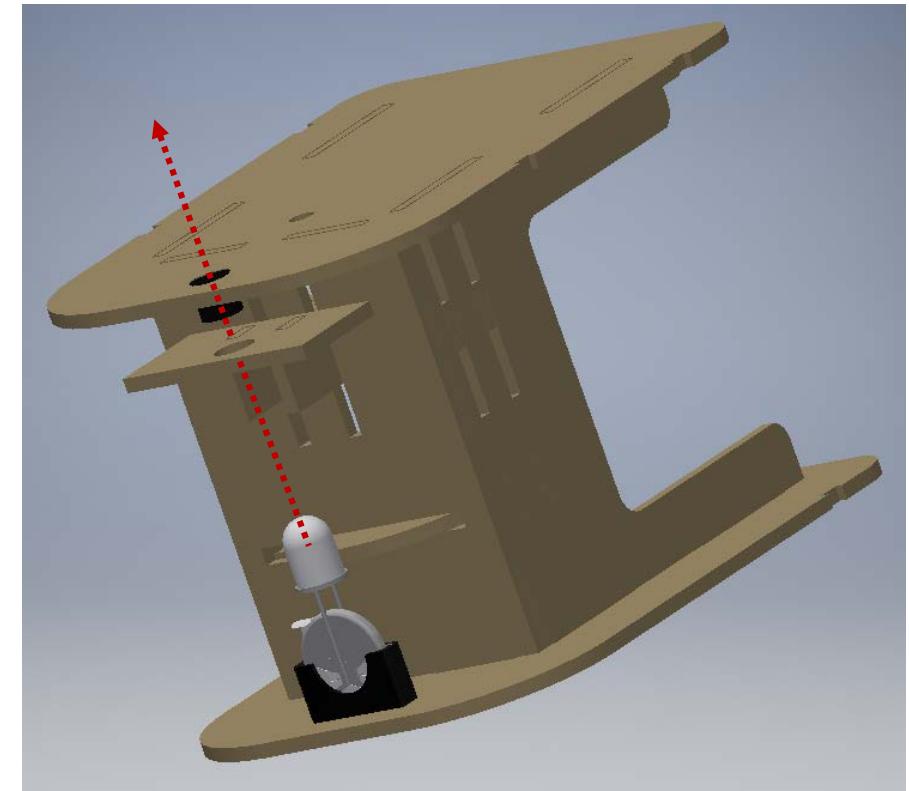
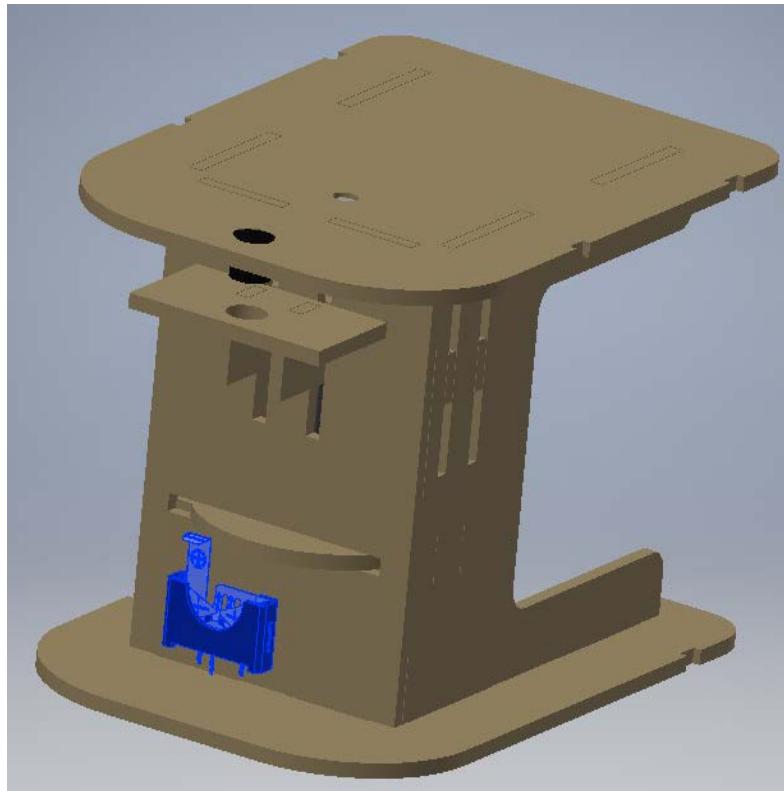
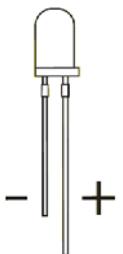
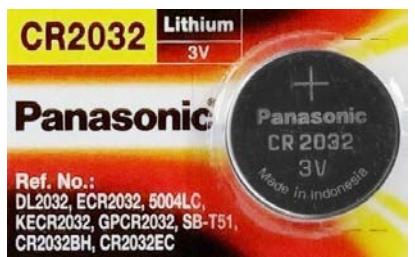






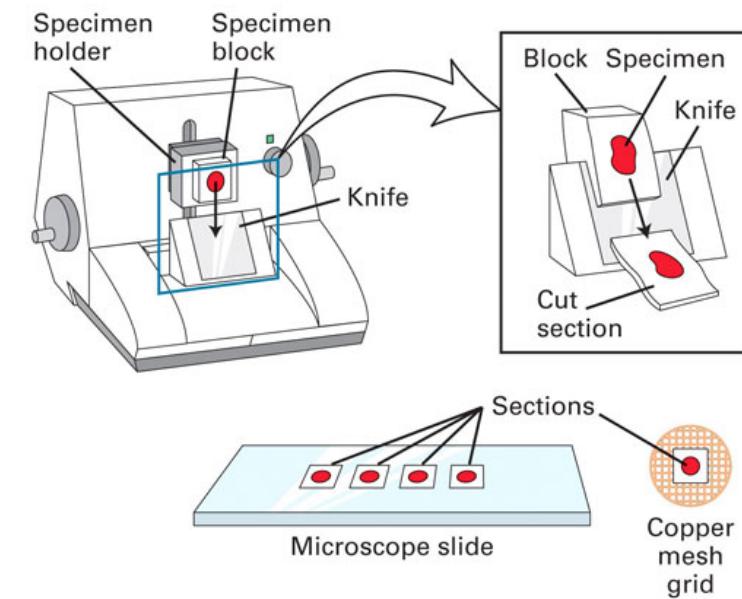
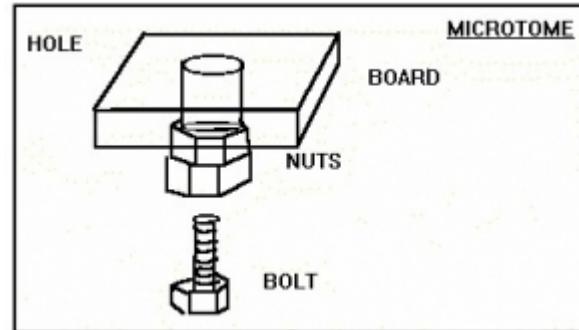
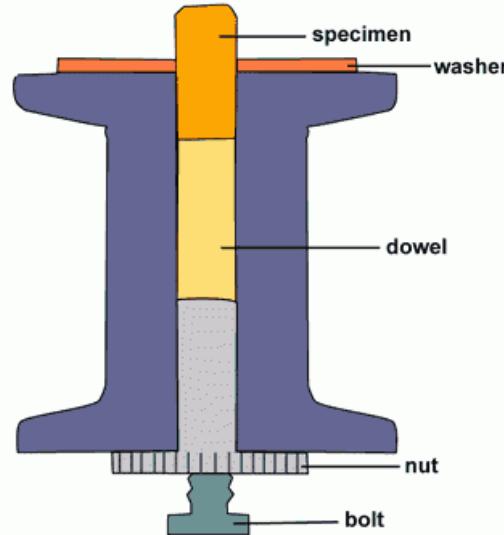
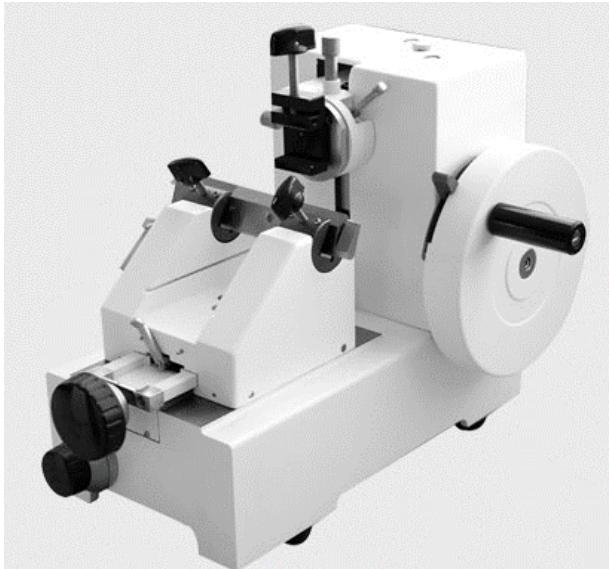




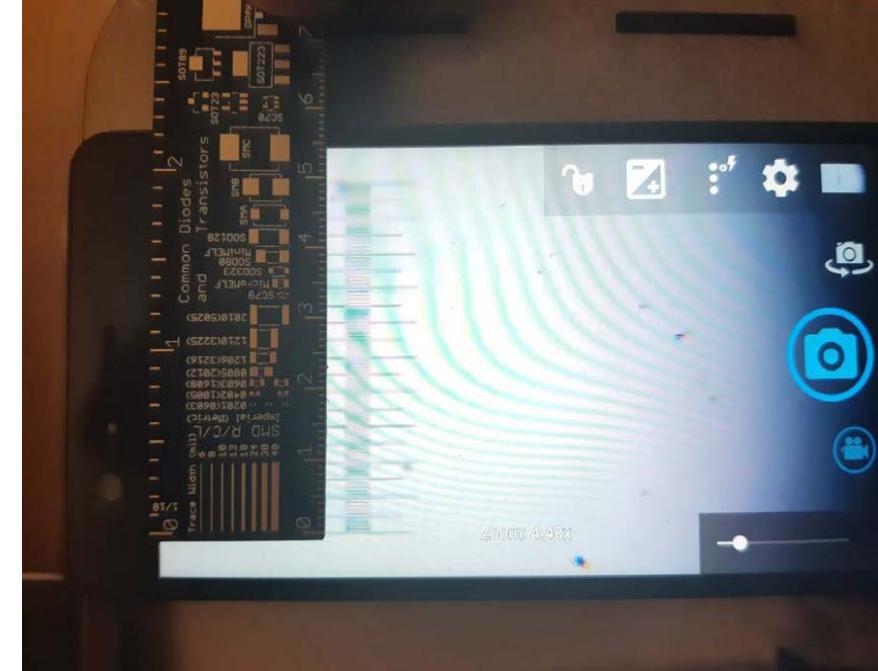
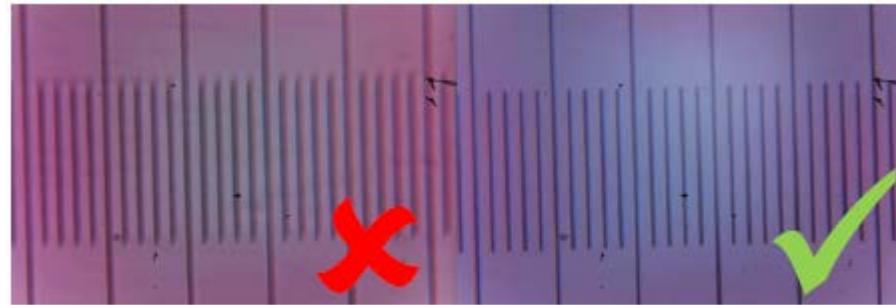
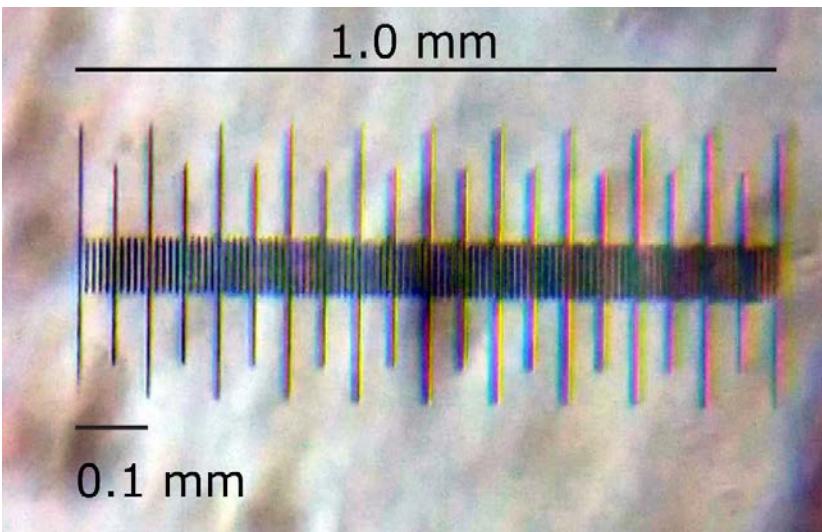
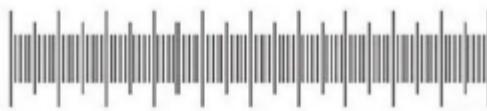
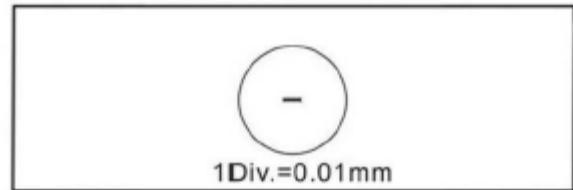


PREPARACIONES HISTOLÒGIQUES

MICROTOM

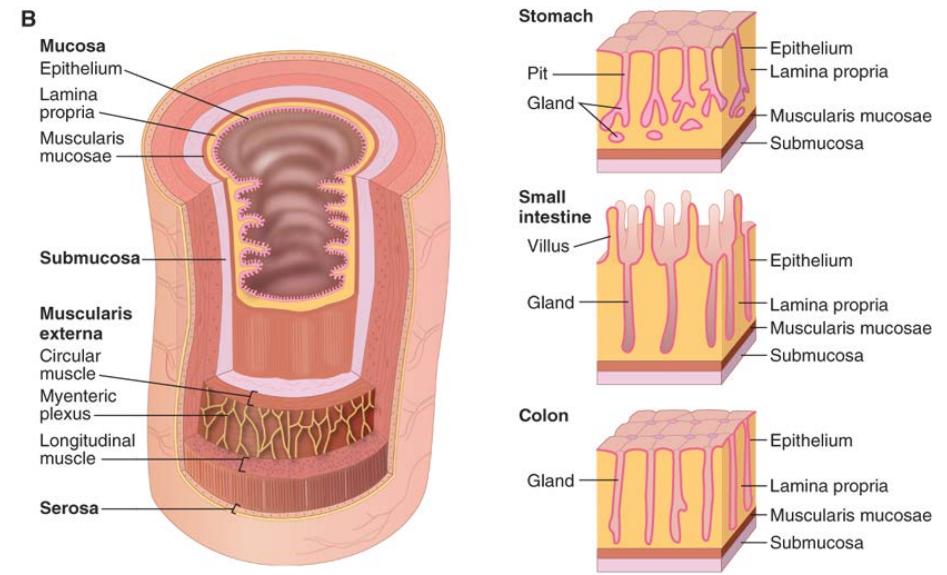
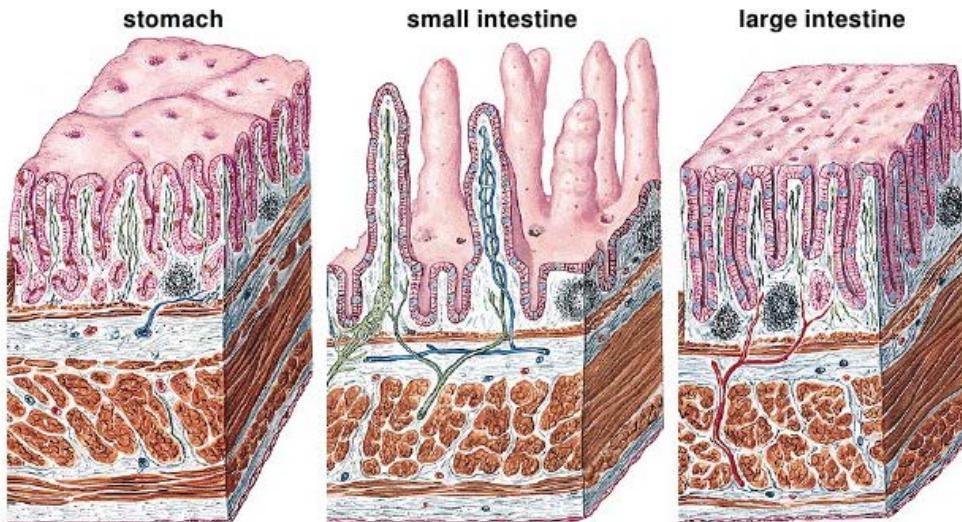
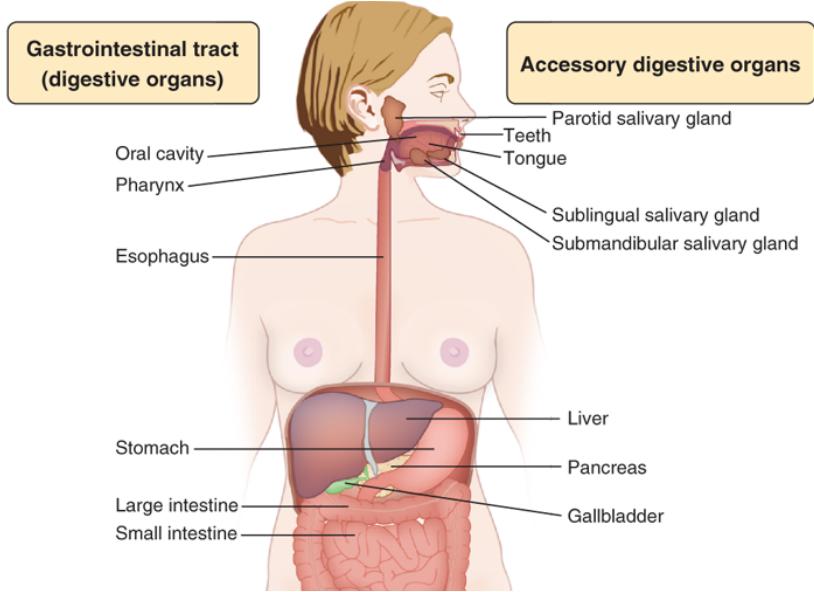


AUGMENTS

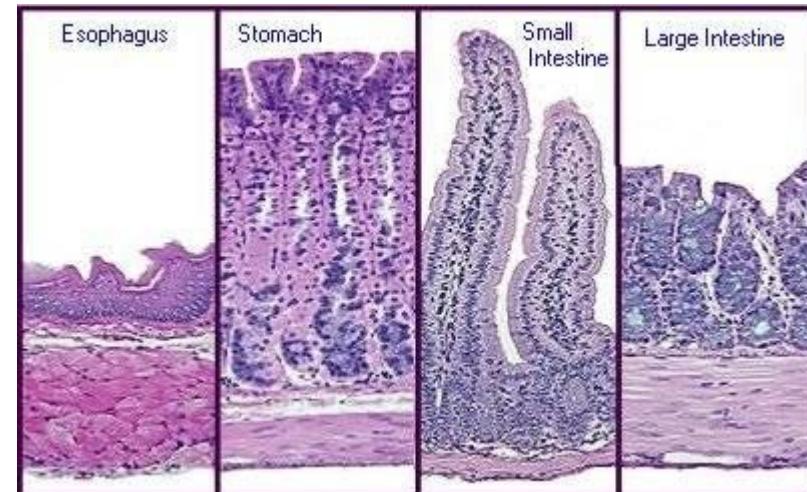


$$Magnificació = \frac{\text{Mida imatge}}{\text{Mida real}} = \frac{50 \text{ mm} * \frac{1000 \mu\text{m}}{1 \text{ mm}}}{1 \text{ mm} * \frac{1000 \mu\text{m}}{1 \text{ mm}}} = \frac{50000 \mu\text{m}}{1000 \mu\text{m}} = 50x$$

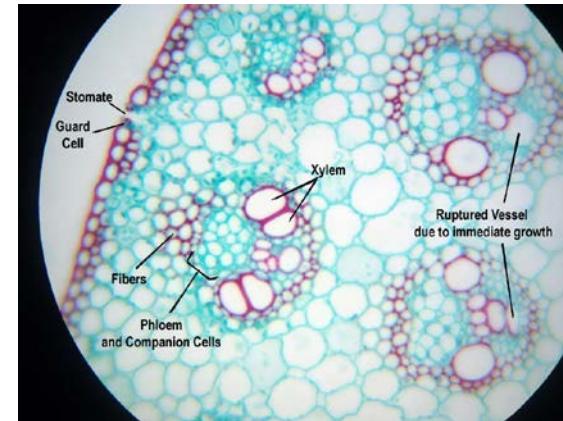
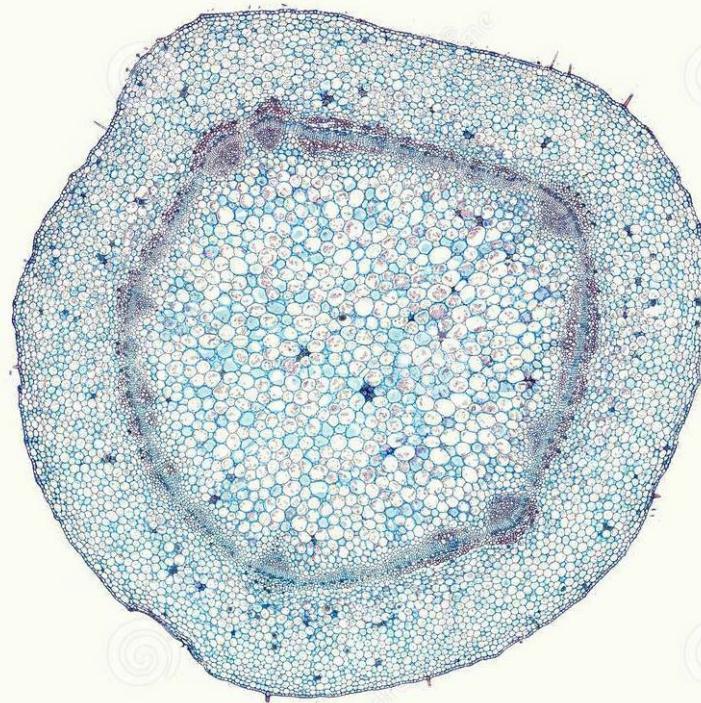
APARELL DIGESTIU



Source: Rick Ash, David A. Morton, Sheryl A. Scott
The Big Picture: Histology
www.accessbiomedicscience.mhmedical.com
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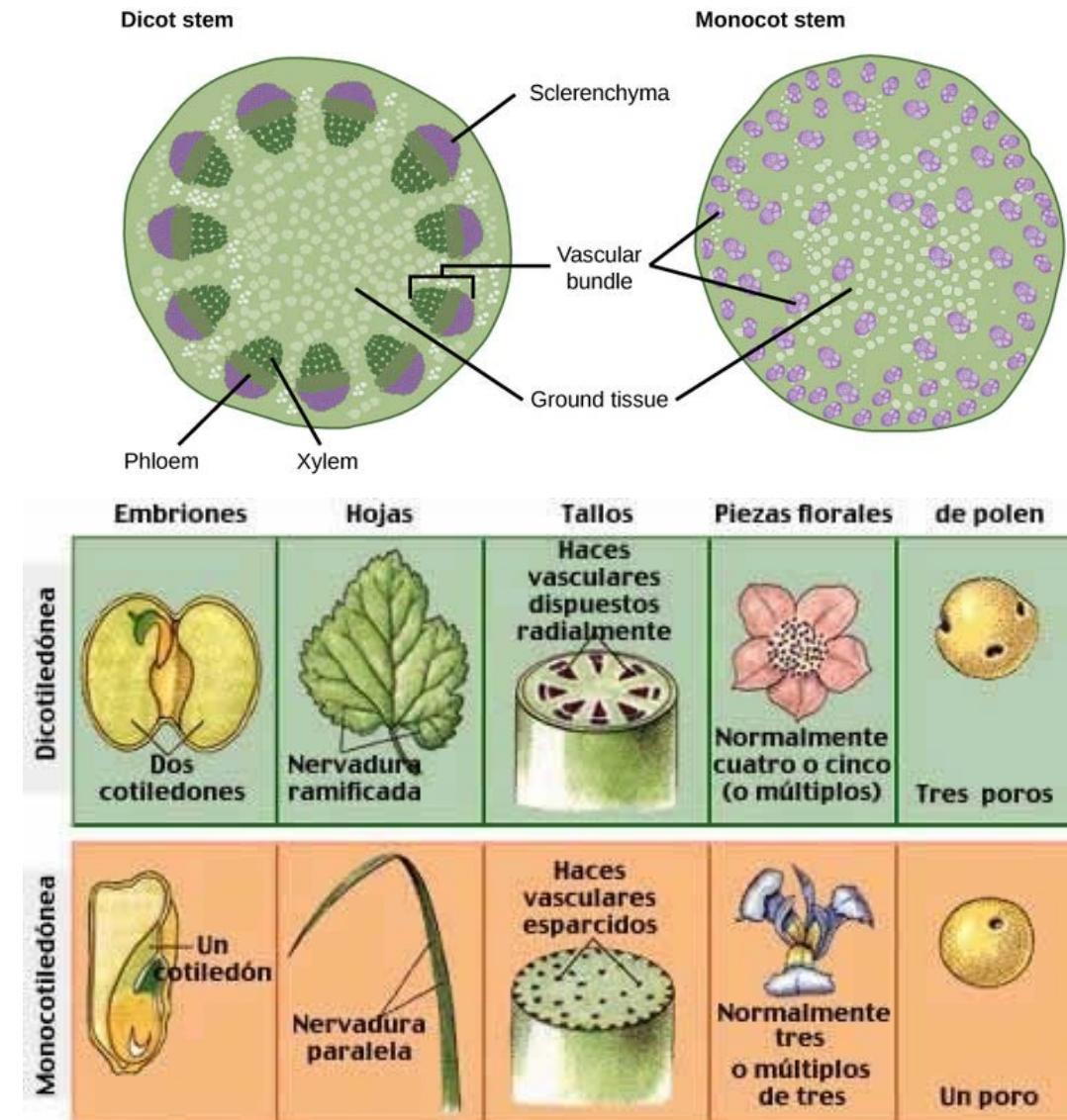


SISTEMA VASCULAR PLANTES

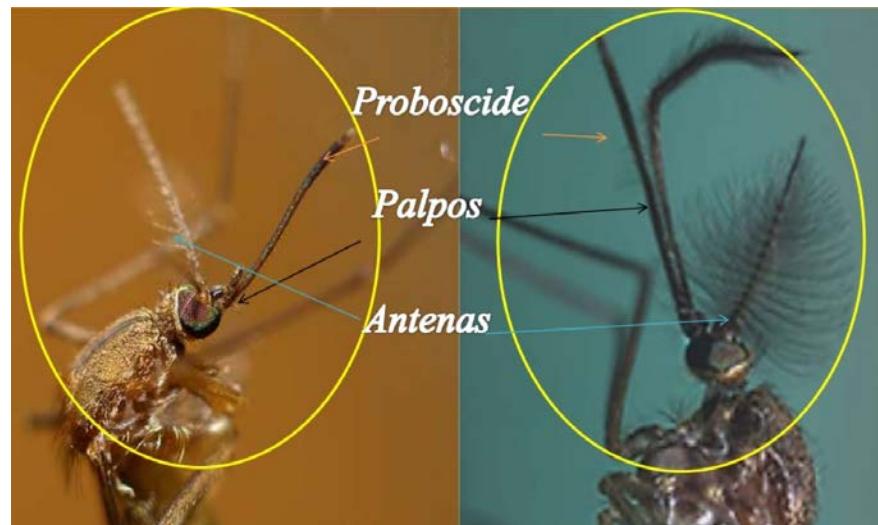
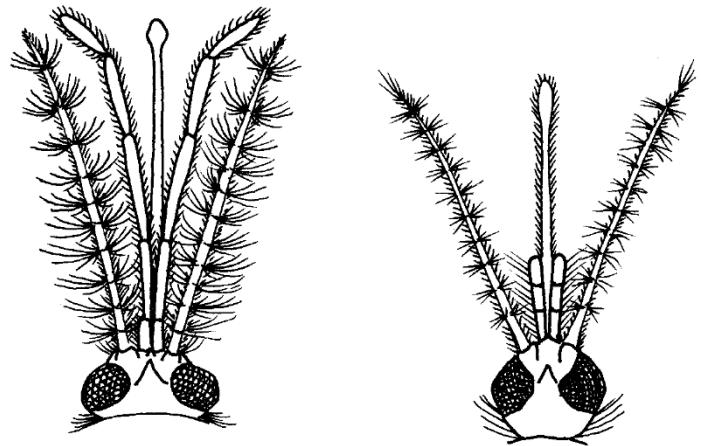


Xilema: Conduete per conduir la saba de l'arrel cap amunt de la planta.
(unidireccional, capil·laritat)

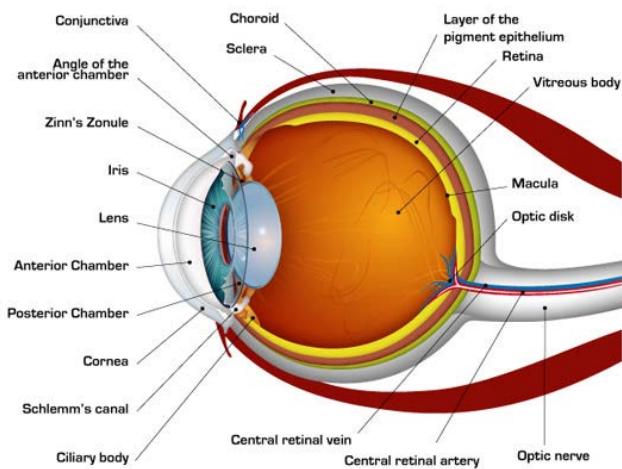
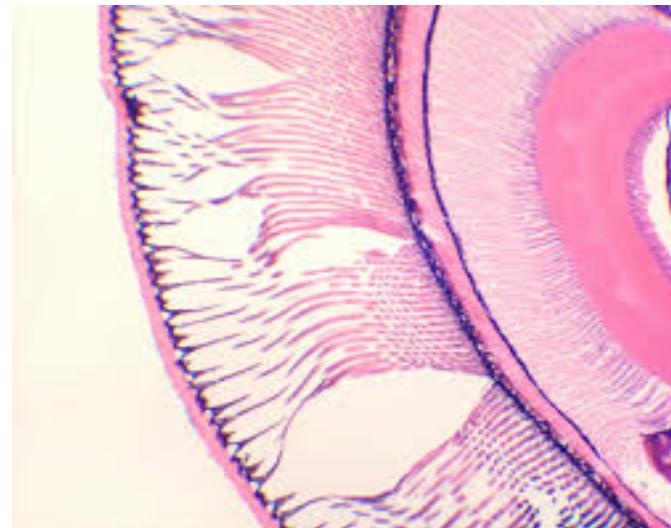
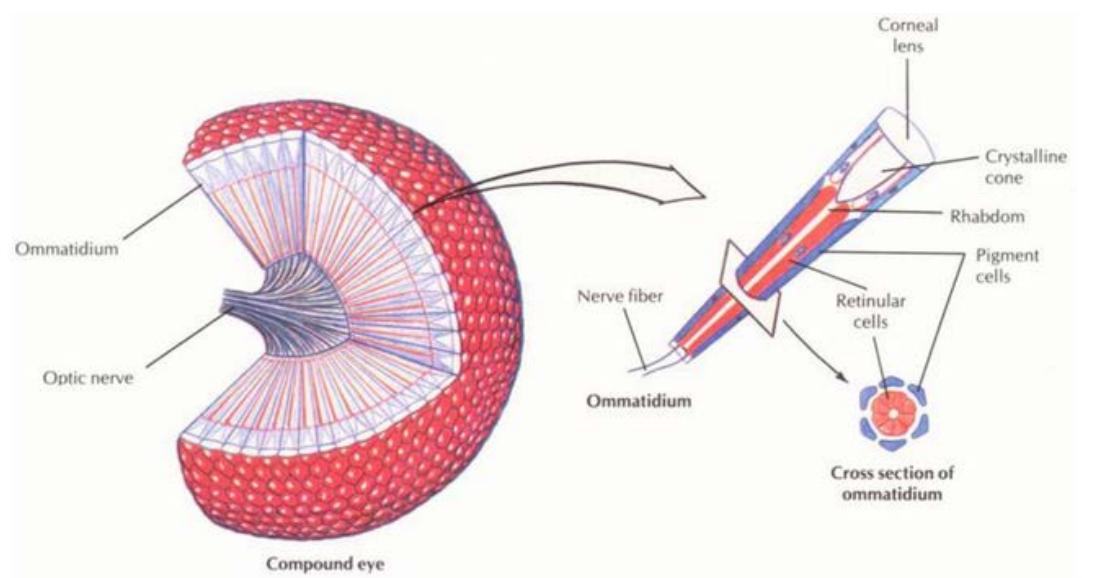
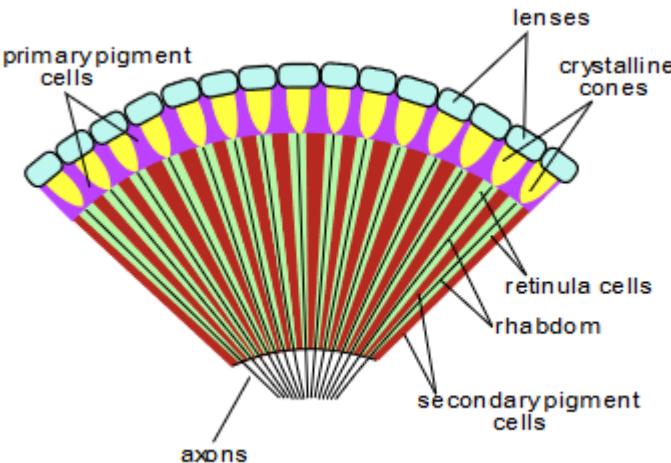
Floema: Sistema format per canals interns de què disposen les plantes
vasculars per a la conducció de la saba elaborada.
(bidireccional, gradient difusió)



DIMORFISME SEXUAL

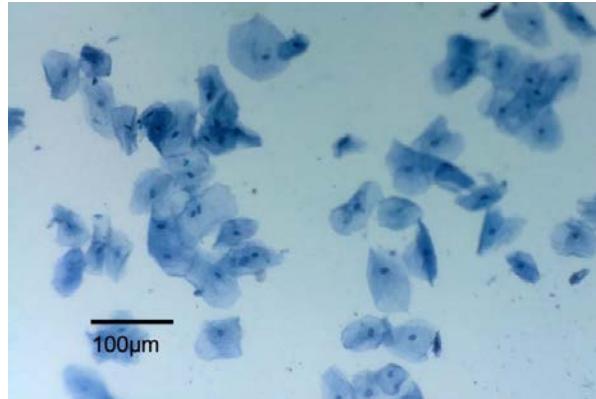


INSECTES



TINCIONS

CÈL·LULA ANIMAL: MEMBRANA MUCOSA

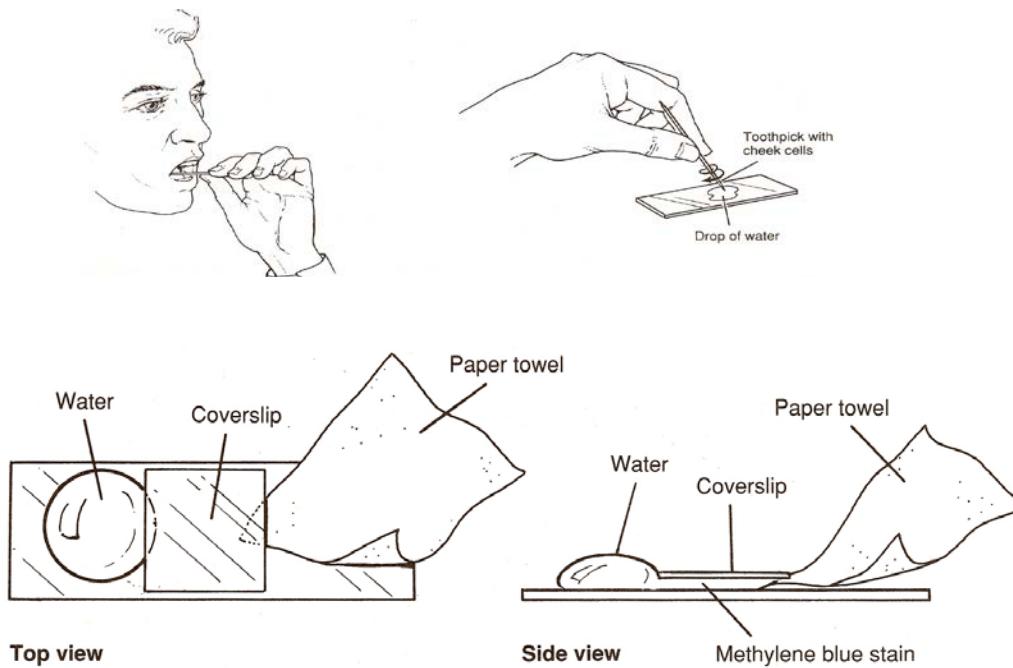


Materials

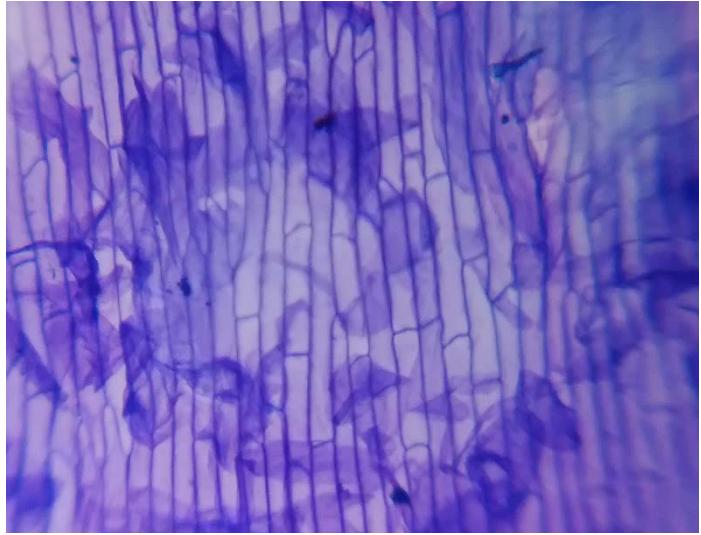
- Hisop cotó
- Blau de metilè

Protocol

- 1) Agafeu un hisop (bastonet) de cotó net i raspeu suavament l'interior de la boca.
- 2) Col·loqueu el bastó de cotó al centre del microscopi durant 2 o 3 segons.
- 3) Afegiu una gota de solució de blau de metilè i col·loqueu un full de tapa a la part superior.
- 4) Traieu l'excés de solució deixant que una tovallola de paper toqui un costat del tapa.
- 5) Col·loqueu la diapositiva al microscopi amb

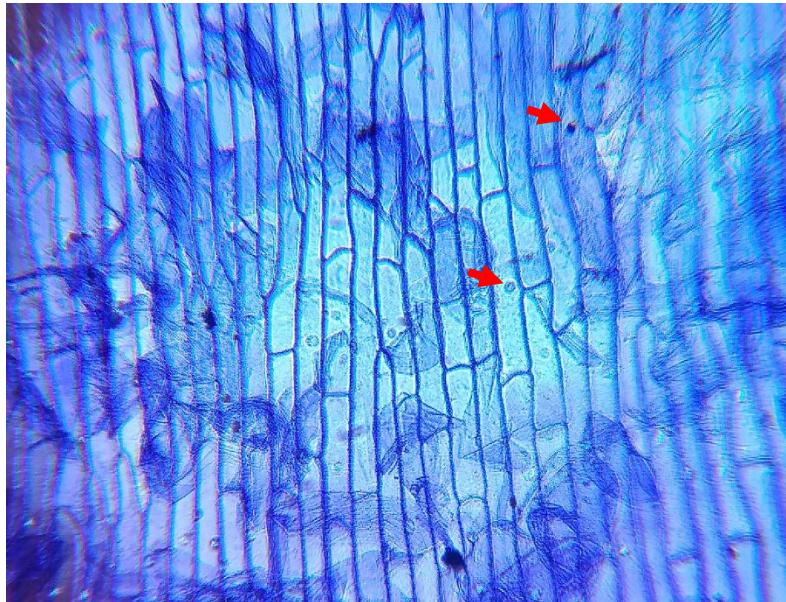


CÈL·LULA VEGETAL: EPIDERMIS VEGETAL



Materials

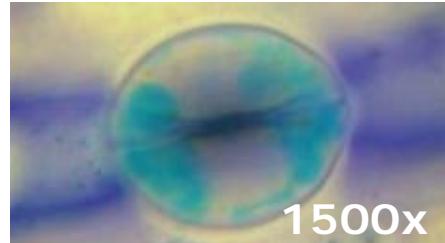
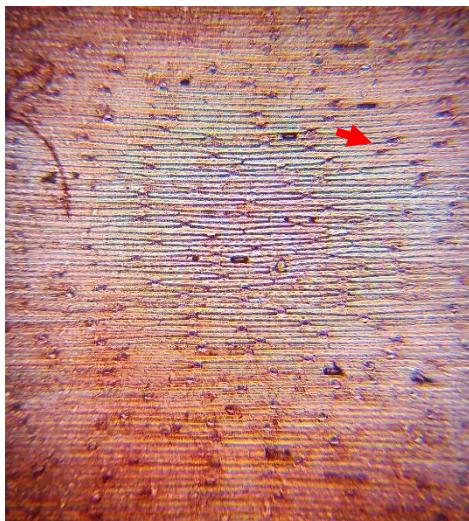
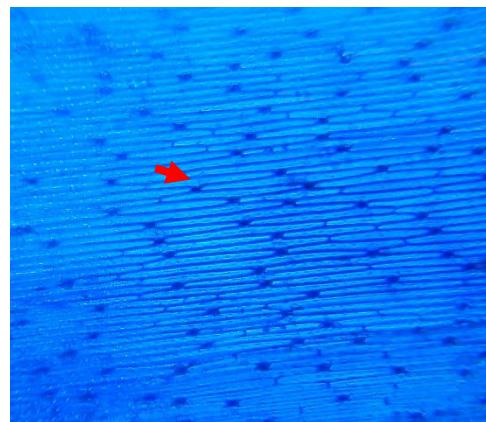
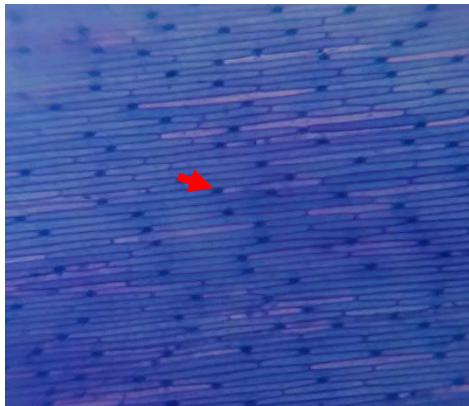
- Ceba
- Blau de metilè



Protocol

- 1) Tallar una ceba a quarts; en un de els quarts, separar les capes formen la ceba i, en la seva cara interna, separar l'epidermis (el teixit transparent que recobreix el full)
- 2) Col·locar l'epidermis sobre un portaobjectes, tenint cura de que el teixit quedi estirat.
- 3) Col·locar el portaobjectes sobre una placa Petri.
- 4) Amb el comptagotes afegir blau de metilè, fins a cobrir la preparació.
- 5) Incubar 5 mins a temperatura ambient
- 6) Rentrar la preparació amb aigua destil·lada fins que aquesta surti transparent.
- 7) Col·locar un cobreobjectes i assecar la preparació per sota amb paper de filtre

CÈL·LULA VEGETAL: ESTOMES



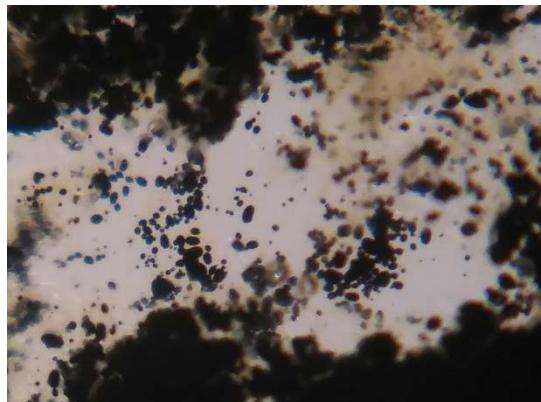
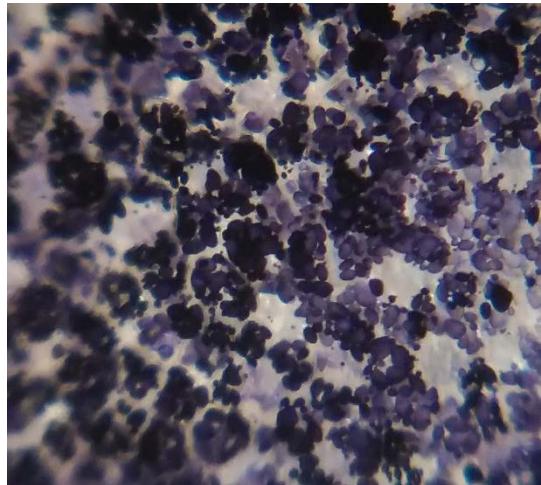
Materials

- Porro (puerro)
- Blau de metilè

Protocol

- 1) A la zona verda del porro, tallar una part petita (2x2cm) de la fulla i separar l'epidermis.
- 2) Col·locar l'epidermis en un portaobjectes, on prèviament hi ha 3 gotes d'aigua per tal de facilitar-ne la extensió.
- 3) Assecar l'aigua excedent amb paper de filtre i col·locar sobre la placa de Petri
- 4) Afegir blau de metilè i incubar durant 5 minuts a temperatura ambient. Vigilar que la mostra no s'assequi, afegint mes colorant si es necessari.
- 5) Amb un comptagotes, netejar l'excés de colorant.
- 6) Col·locar sobre la preparació un cobreobjectes evitant que es formin bombolles.
- 7) Visualitzar al microscopi

CÈL·LULA VEGETAL: AMILOPLASTS



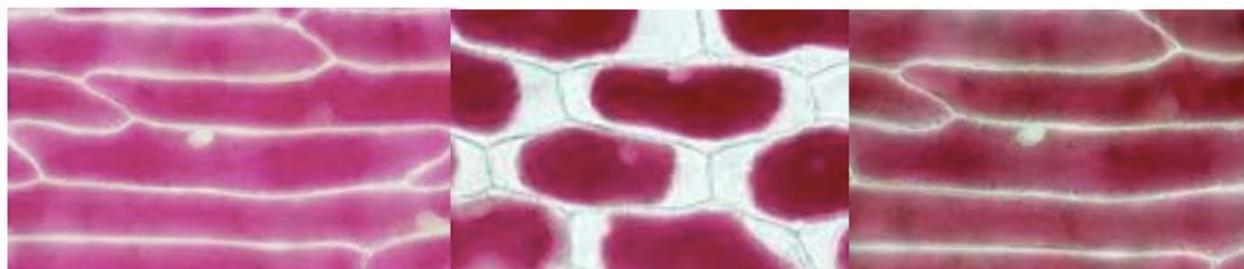
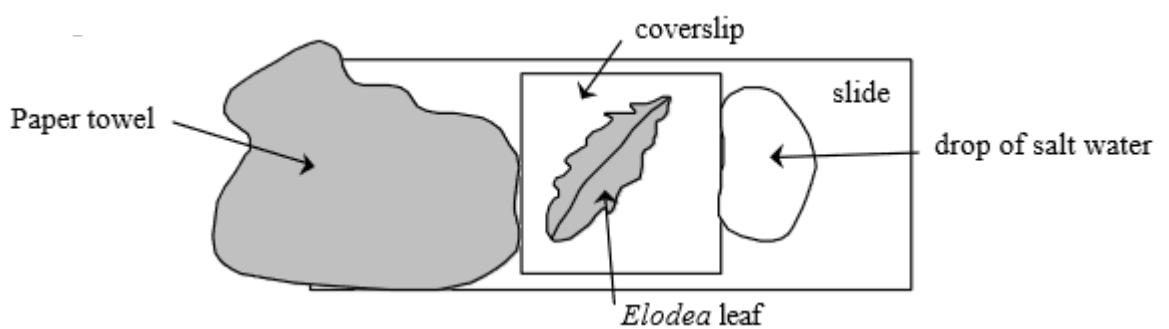
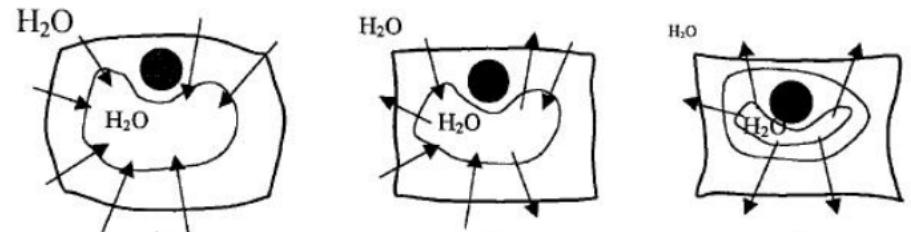
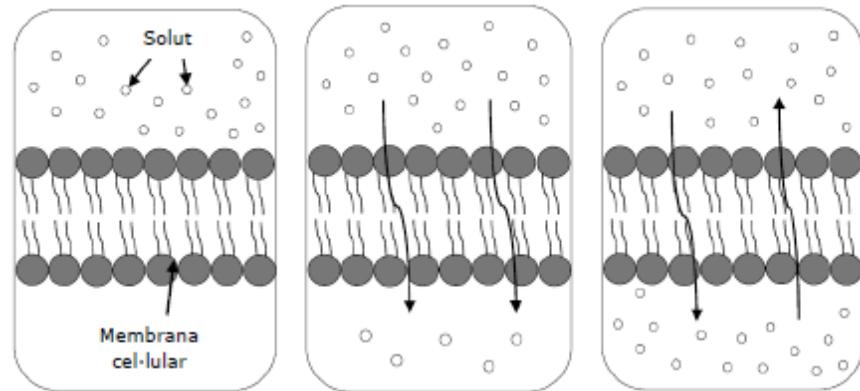
Materials

- Patata
- Iode/Lugol

Protocol

- 1) (A) Raspar una patata amb la punta del bisturí.
(B) Tallar un tros molt prim de patata
- 2) Amb cura, depositar el producte obtingut en un portaobjectes realitzant una extensió.
- 3) Fixar la mostra per assecat a temperatura ambient (3 min.)
- 4) Afegir una gota de lugol i incubar a temperatura ambient durant 3 minuts.
- 5) Rentar suavament amb aigua destil·lada.
- 6) Col·locar un cobreobjectes i comprimir suavament la preparació amb els dits.

OSMOSIS



Initial view of onion cells under the 40X

View of onion cells after 20% salt solution was added

View of onion cells after flushed with distilled (100%) water.

MÒDUL 3

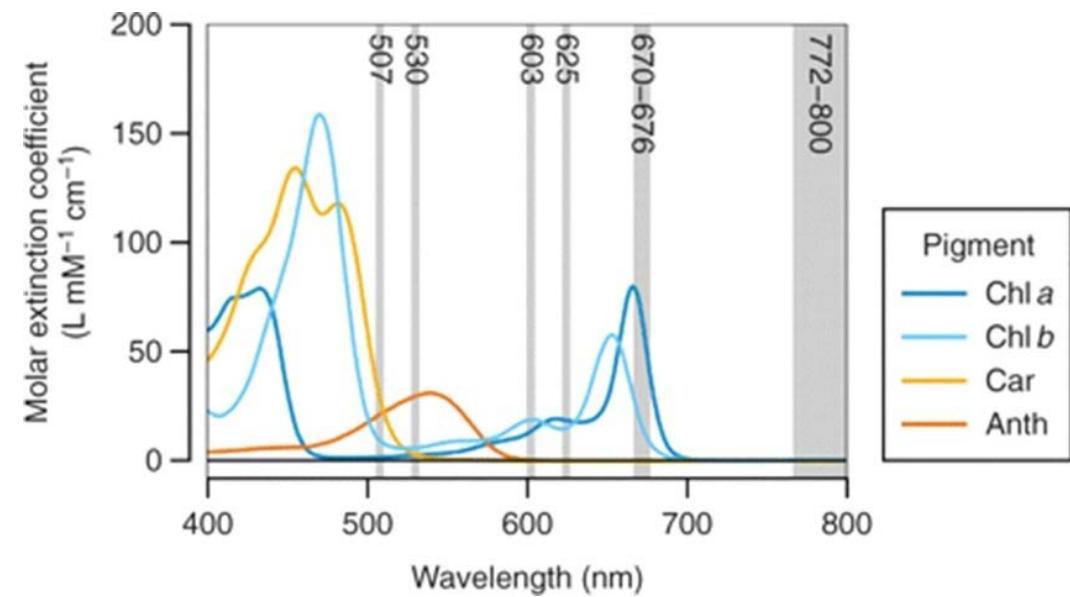
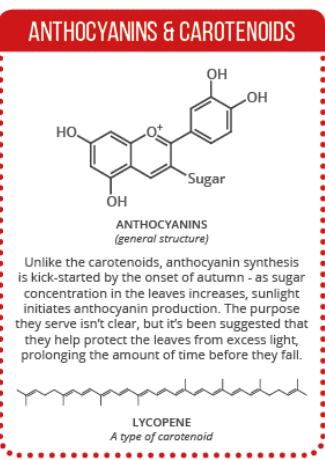
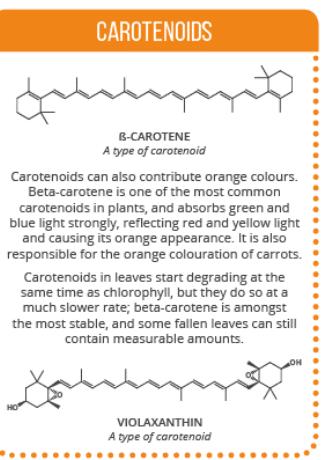
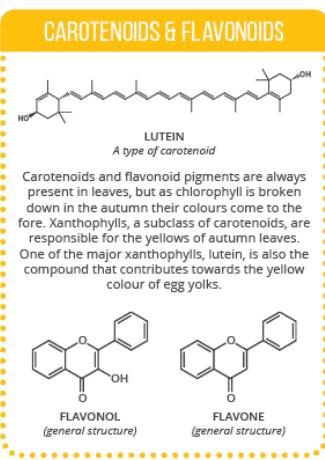
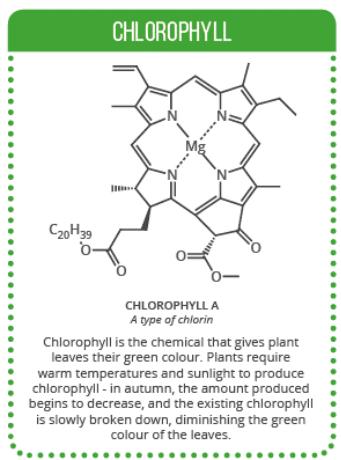
COLORIMETRIA

APOPTOSIS

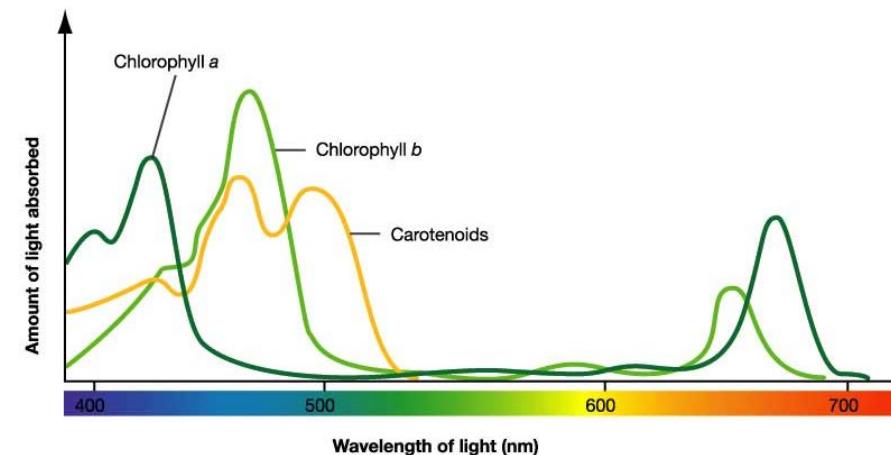
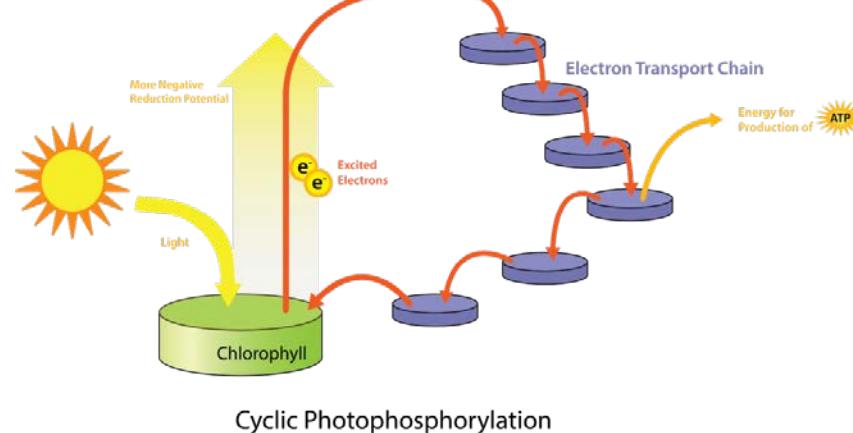
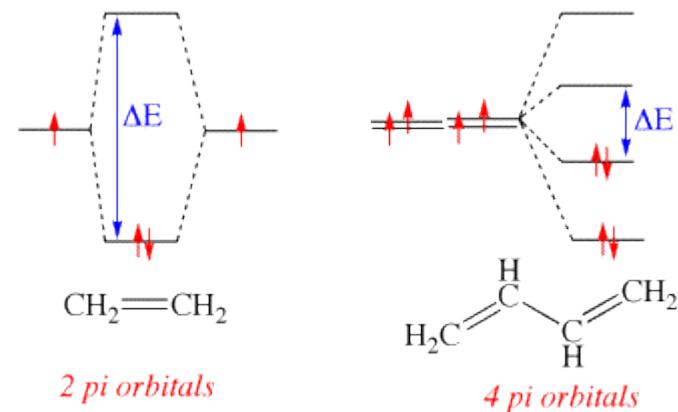
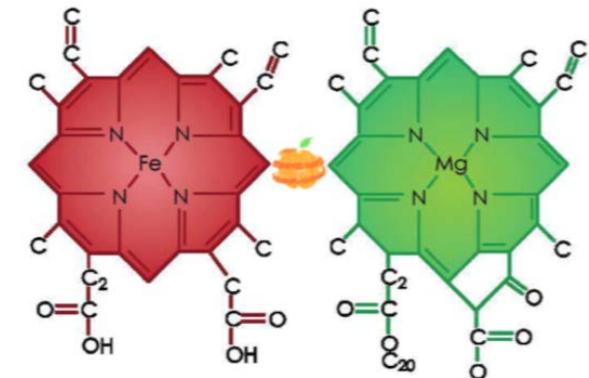
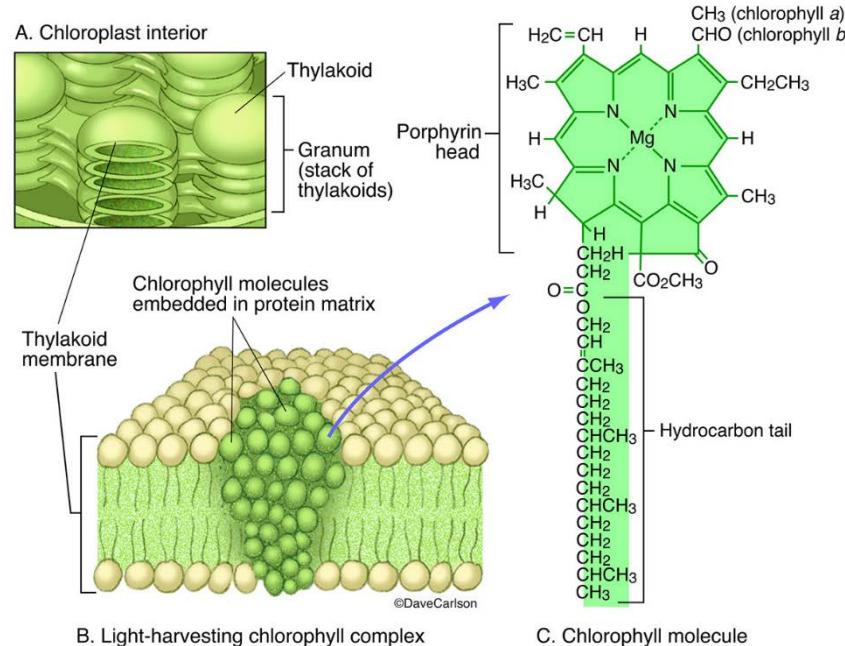
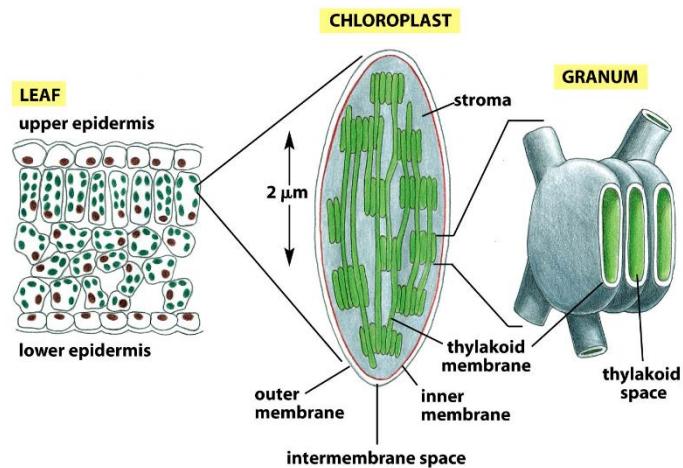


PIGMENTS

THE CHEMISTRY OF THE COLOURS OF AUTUMN LEAVES



CLOROFIL·LA



INDICADOR PH

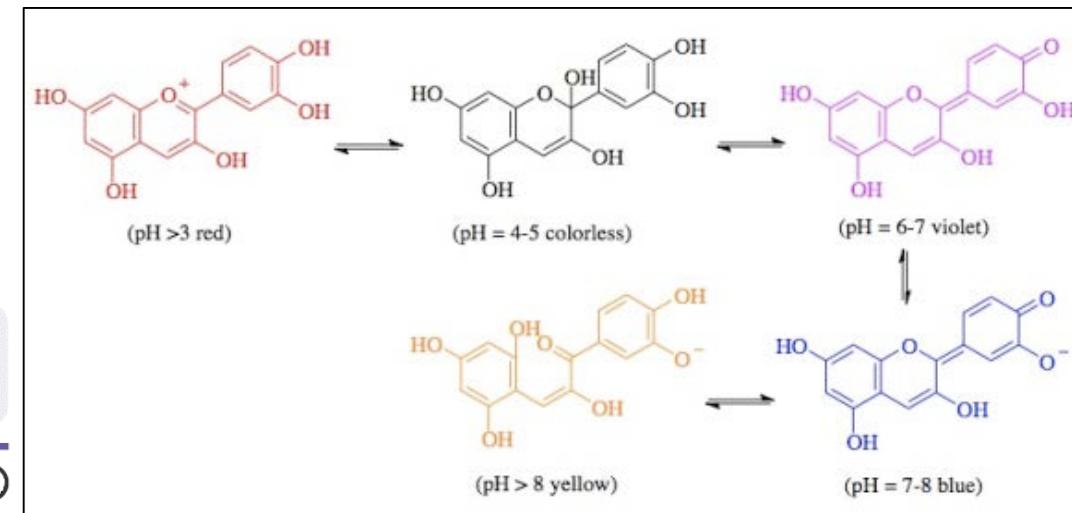
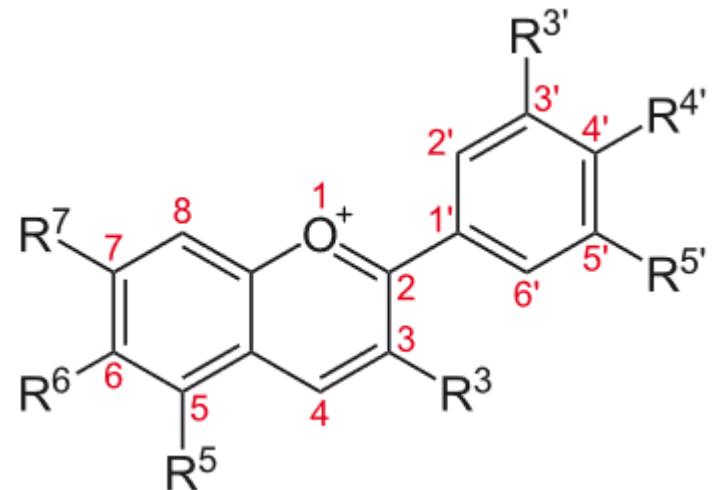
MAKING AN INDICATOR FROM RED CABBAGE

The compounds that give red cabbage its colour can be extracted and used as a pH indicator solution. Here we look at the method and the colours!

- MAKING THE INDICATOR**
- 1 ROUGHLY CHOP THE CABBAGE
- 2 BOIL FOR A FEW MINUTES
- 3 STRAIN AND LET COOL
- 4 USE AS AN INDICATOR!



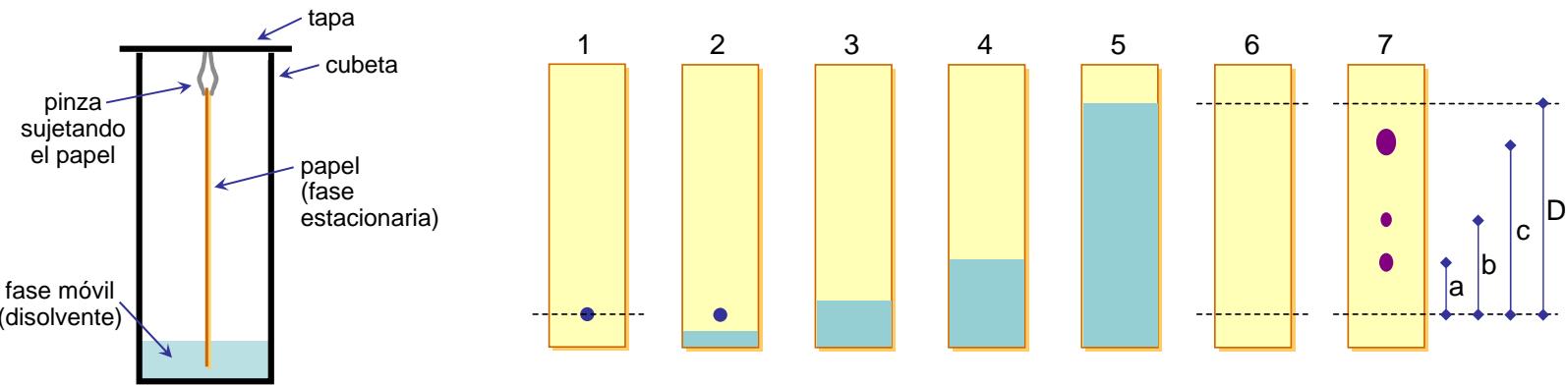
The red cabbage extract can be used to determine whether substances are acidic or alkaline. The structures of the anthocyanin pigments which give the red cabbage its colour are subtly changed at varying pH. These different structures give a range of colours.



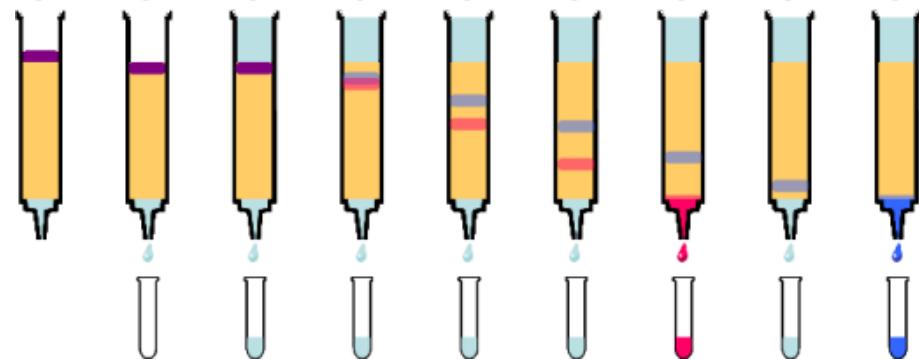
CROMATOGRAFIA

TIPUS

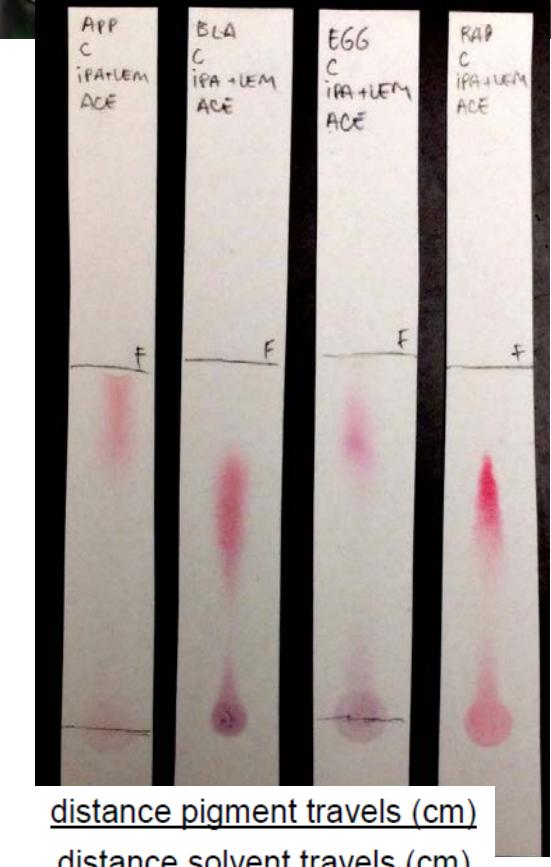
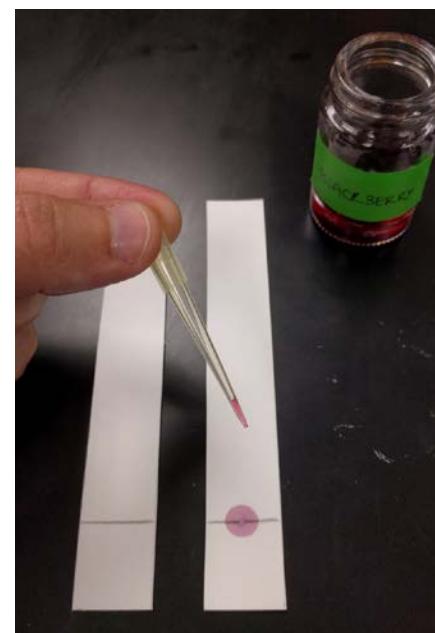
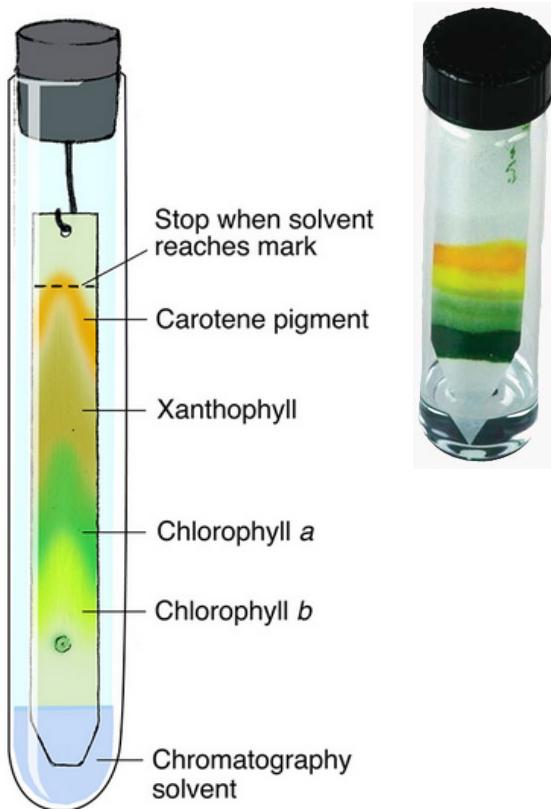
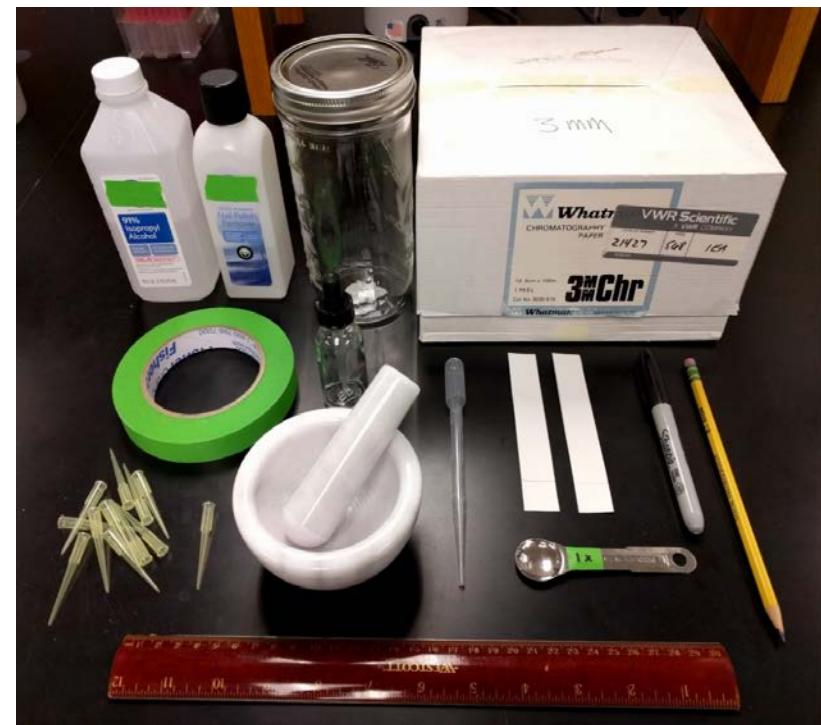
Plana



Columna



PIGMENTS PLANES

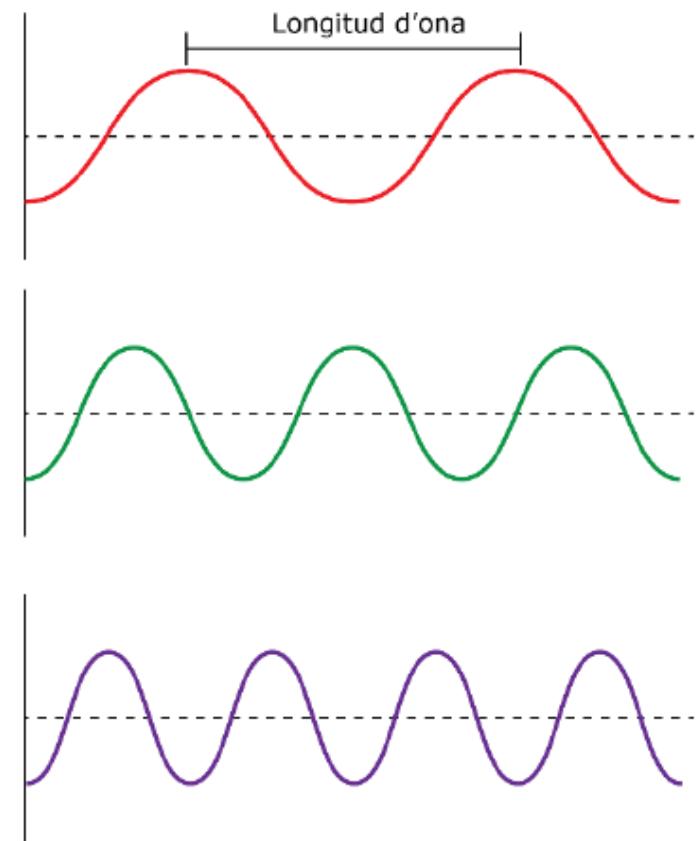
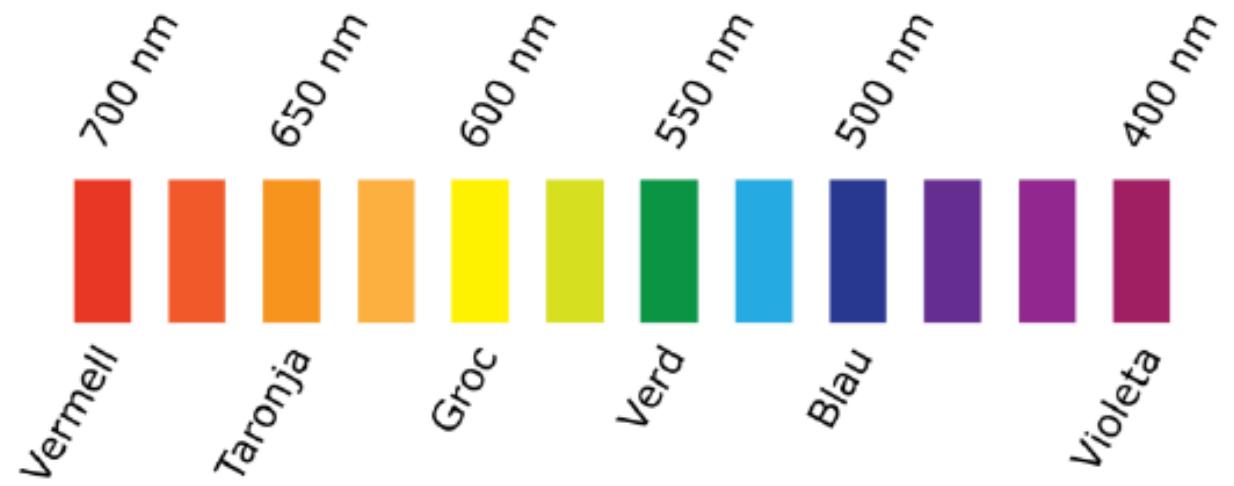
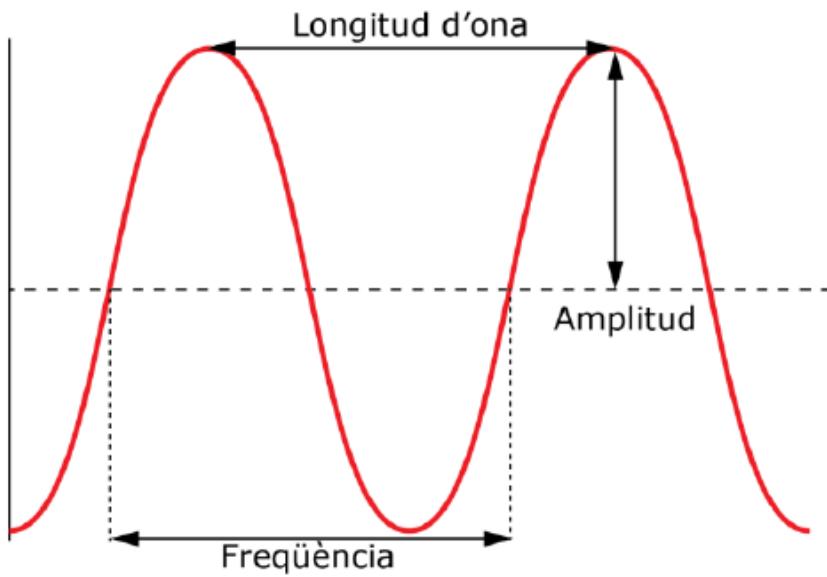


- Mostres (pell): Poma, albergínia, rave, mora, etc
- Fase mòbil: Acetona
- Fase estacionaria: Paper cromatografia
- Dissolvent mostra: 0,5ml isopropanol + 3 gotes suc llimona

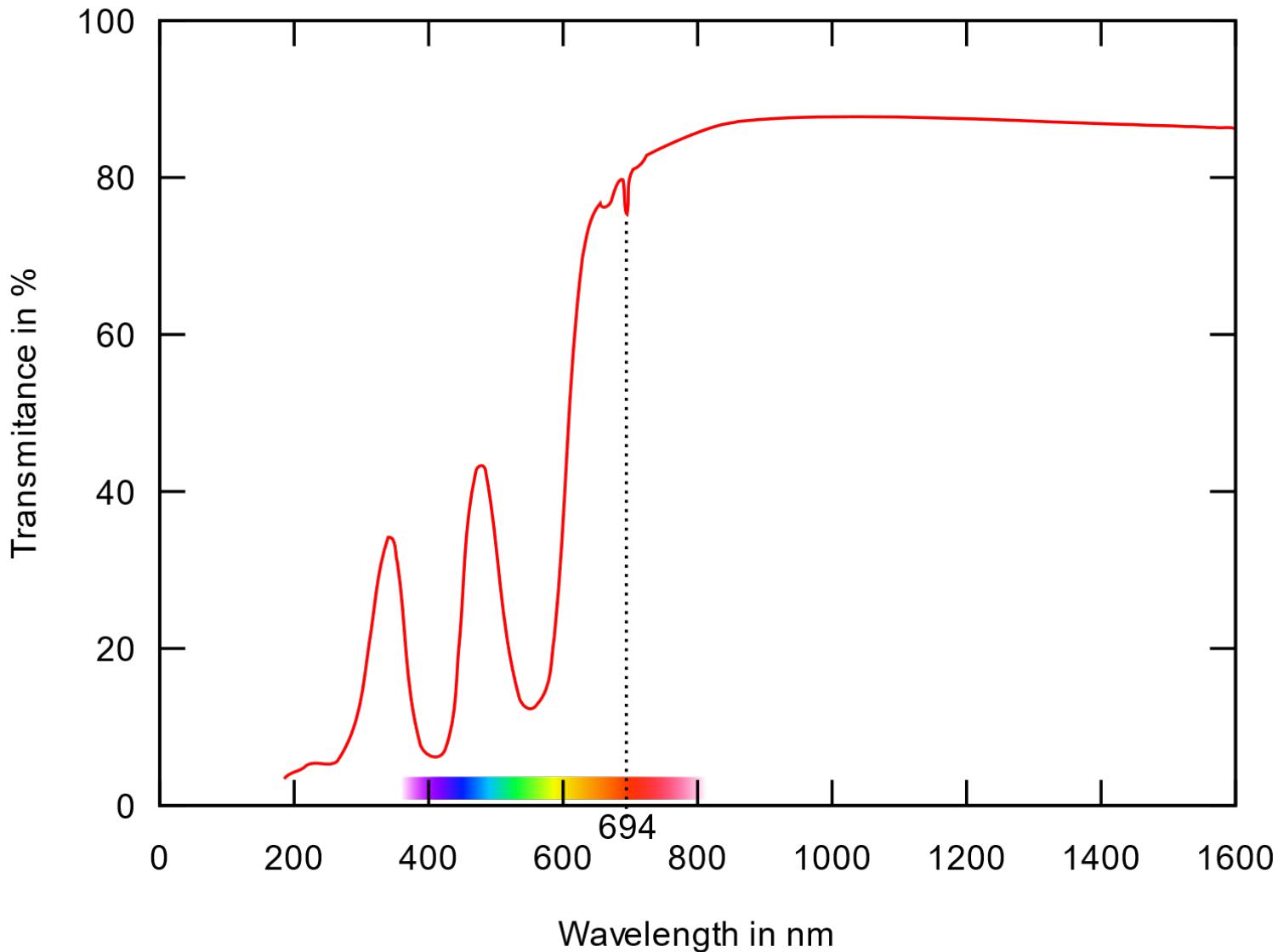
FACTOR DE RETENCIÓ $R_f =$

COLORIMETRIA

LLUM I COLOR

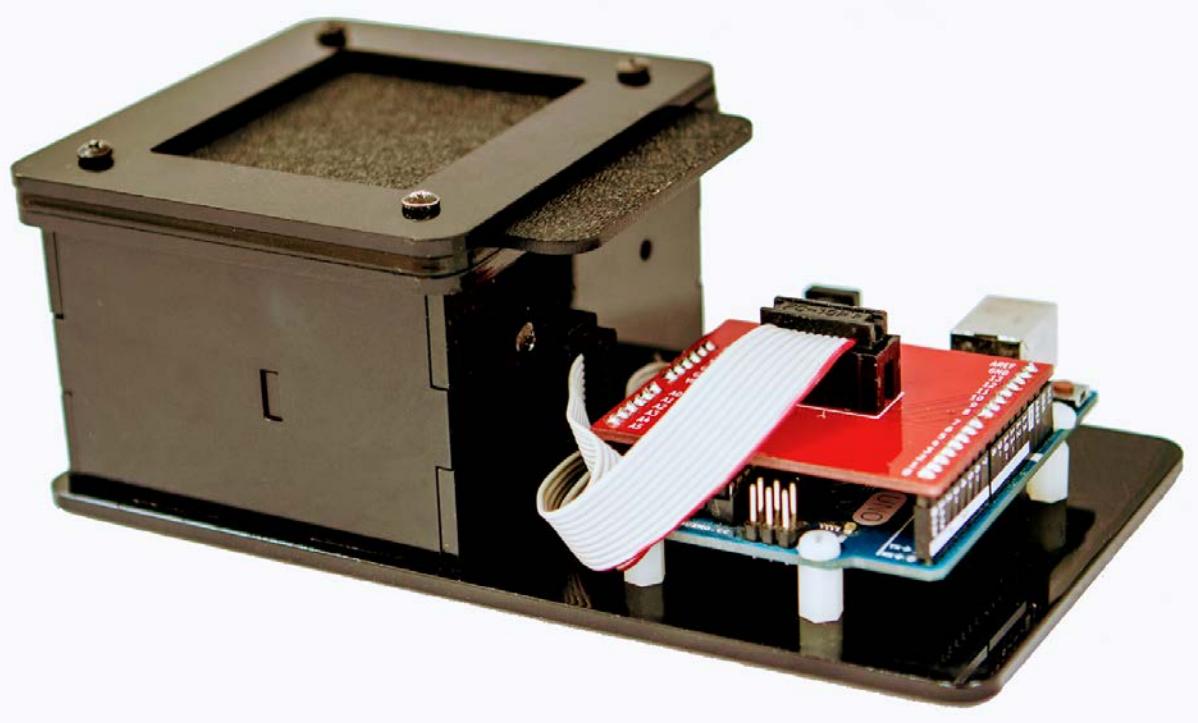


COLORIMETRIA VS. ESPECTROFOTOMETRIA

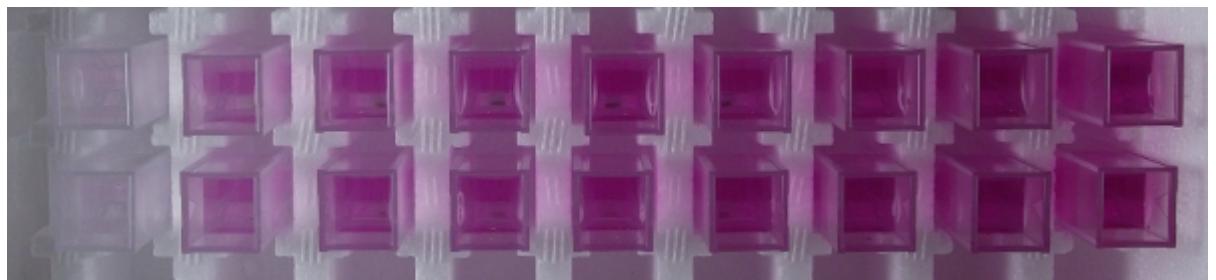
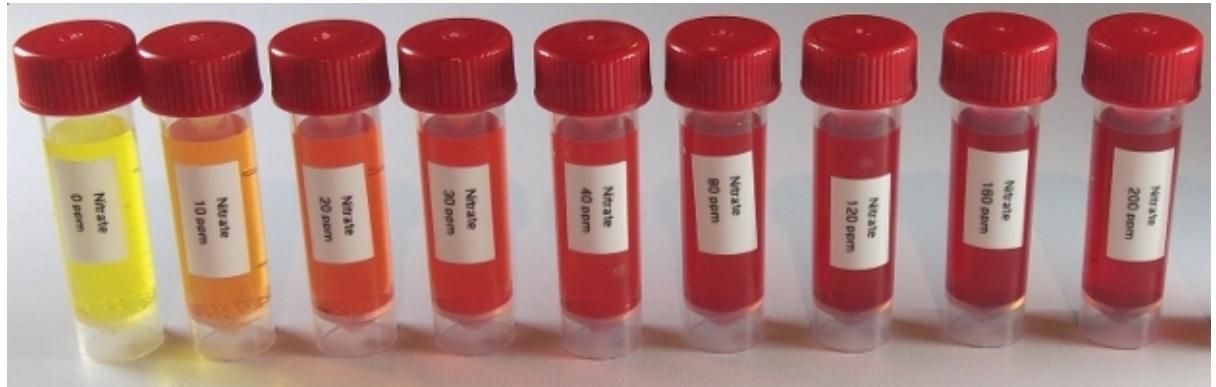


COLORÍMETRE

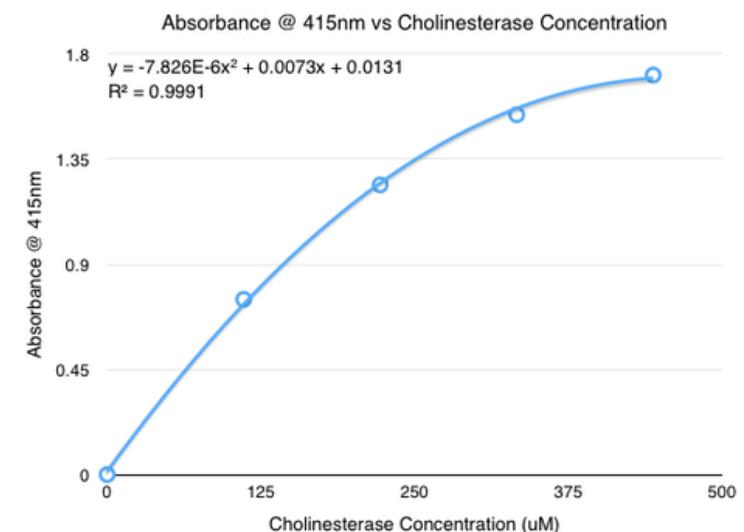
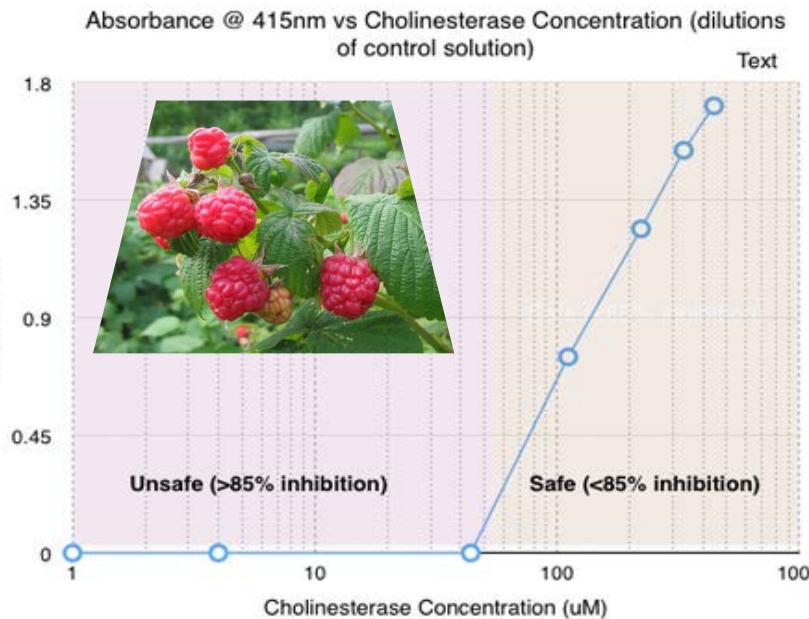
Open source
Basat en Arduino
Fàcil de modificar: LCD, WIFI



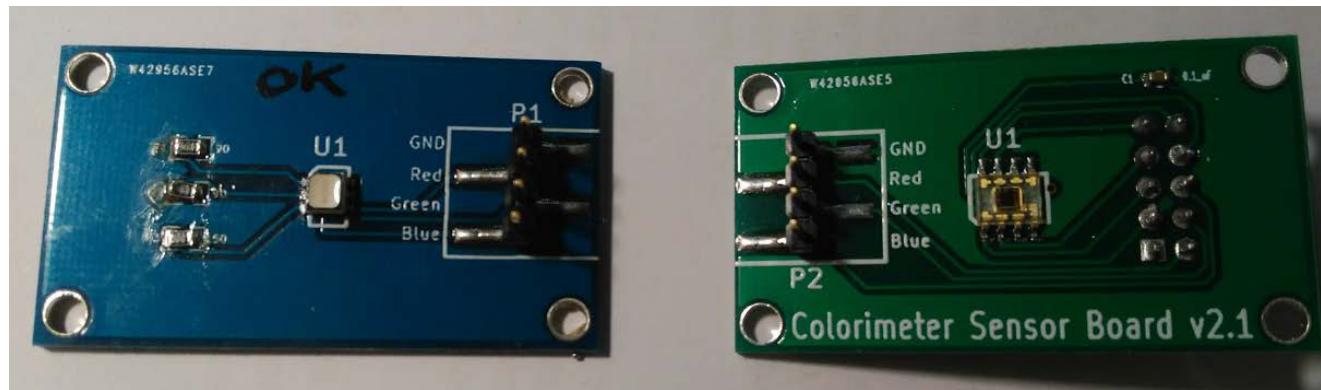
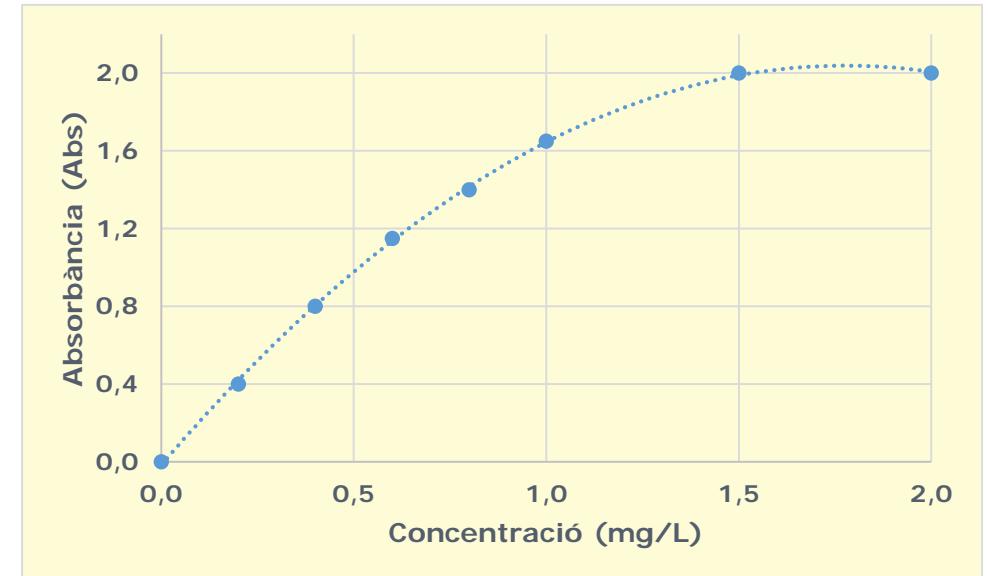
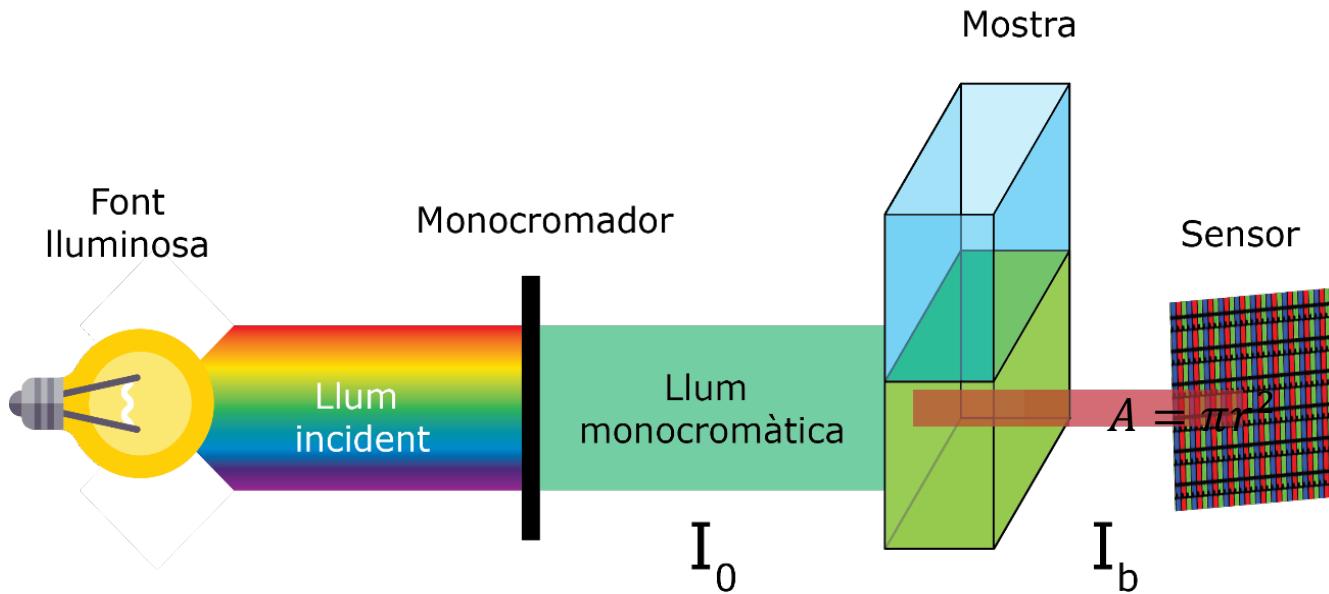
Amoniac	Nitrit	Nitrat
Ferro	Fosfat	Sulfat
pH	Potassi	



UTILITATS



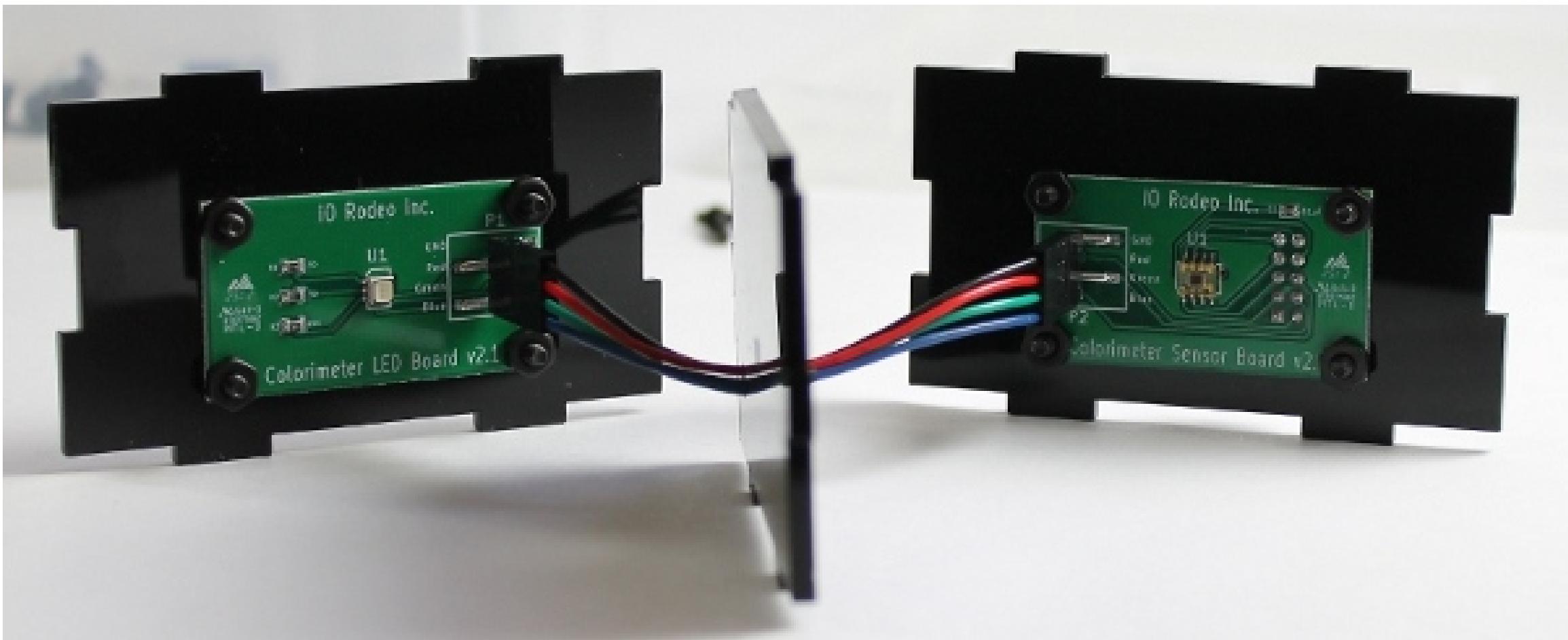
COM FUNCIONA?

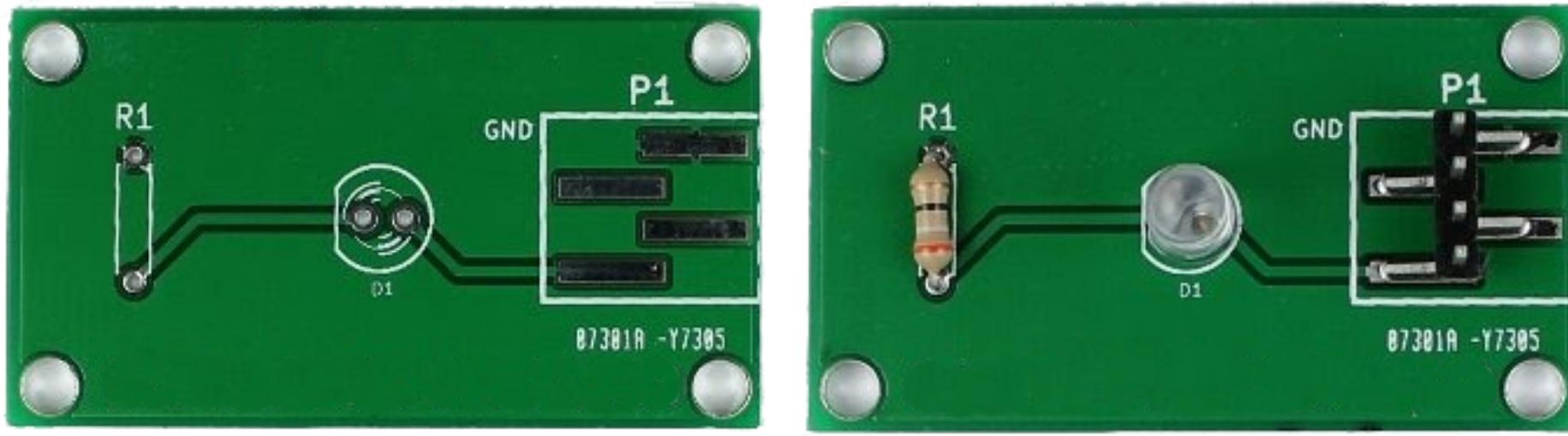
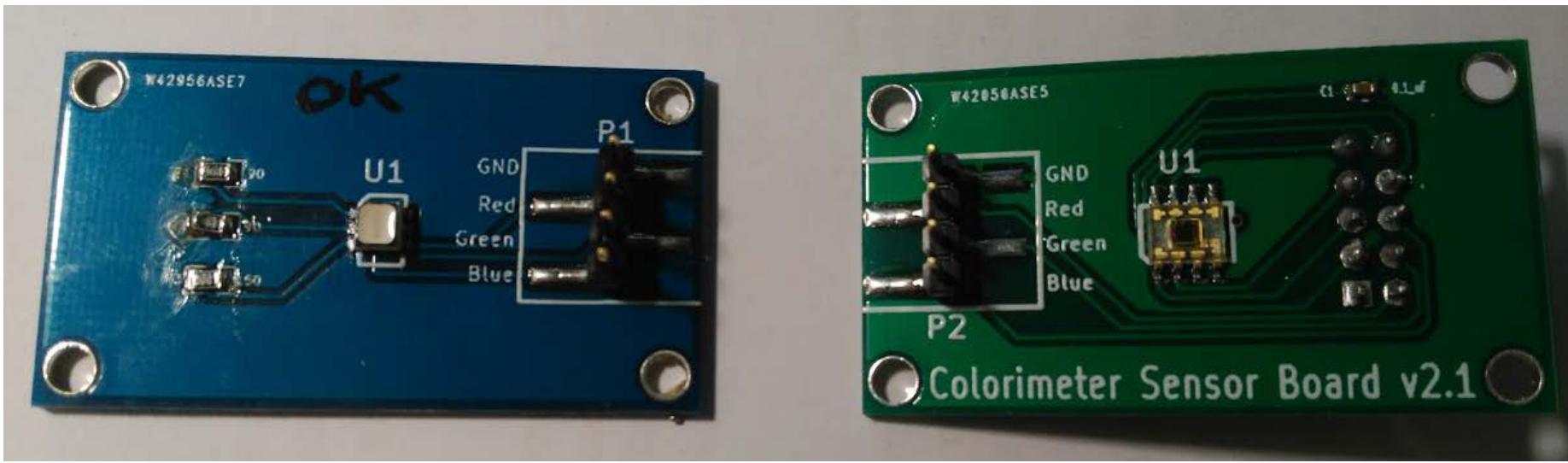


$$T = \frac{I}{I_0}$$

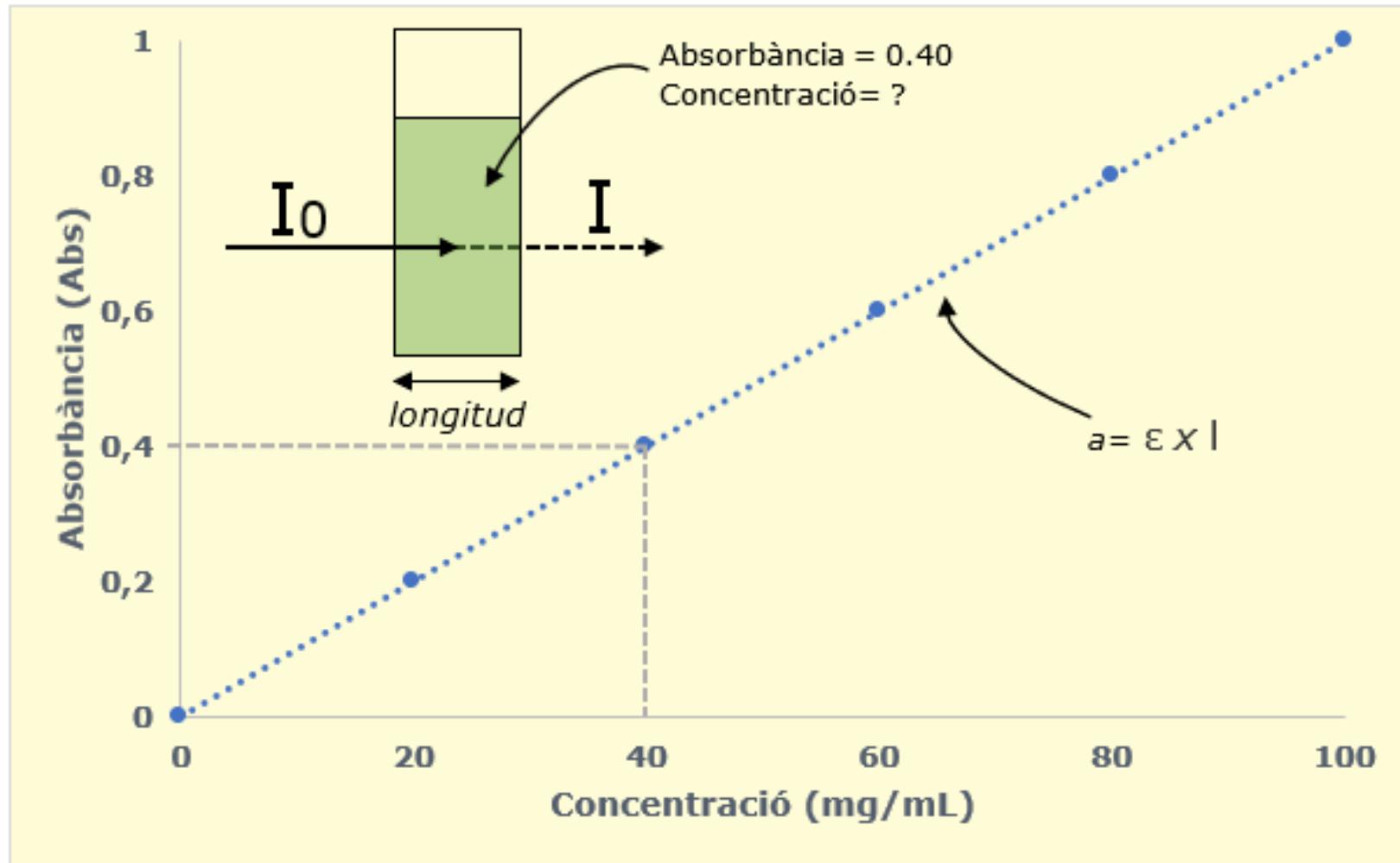
$$Abs = \log_{10} \left(\frac{1}{T} \right)$$

$Abs \leq 1.0 \rightarrow Error$



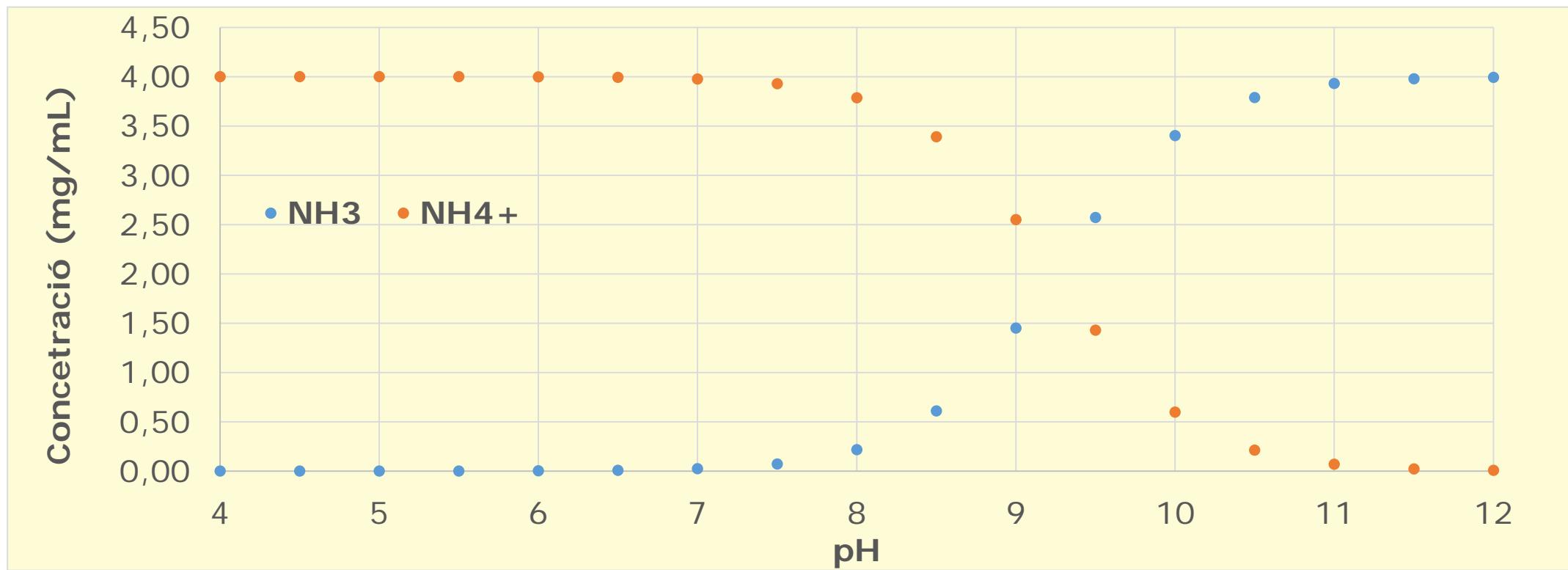


RECTA CAL·LIBRACIÓ

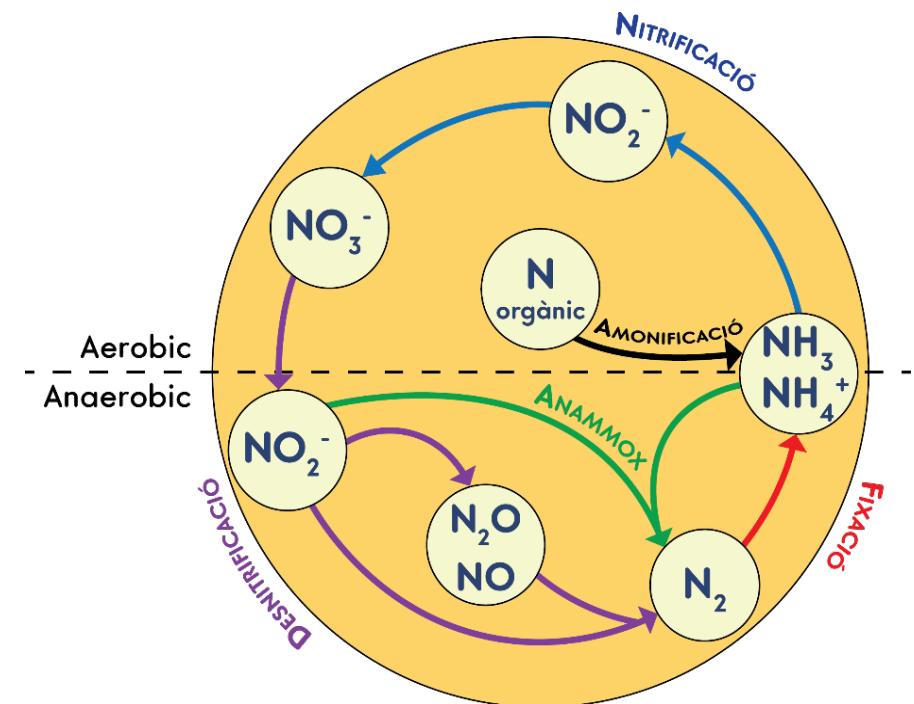
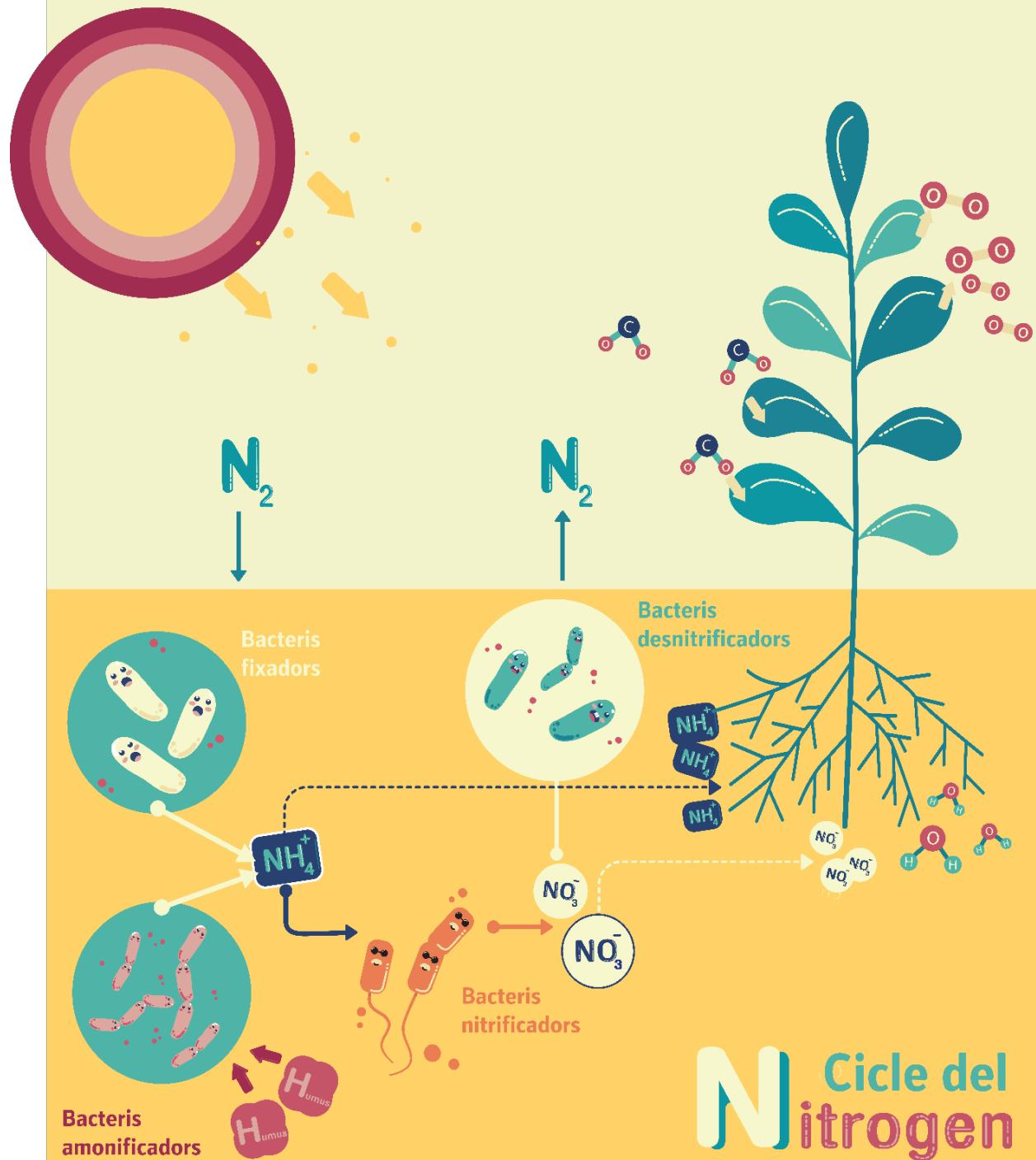


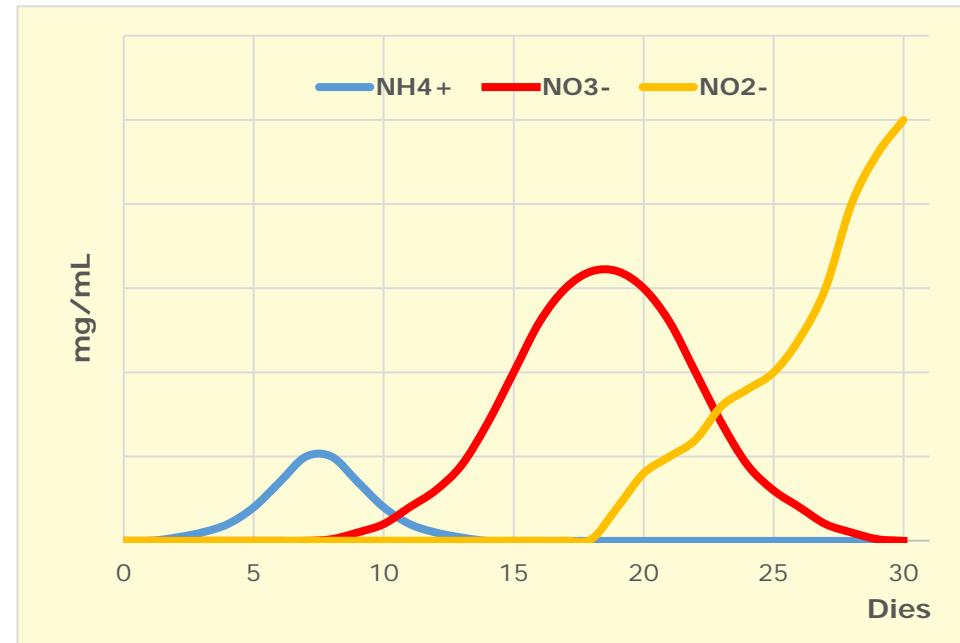
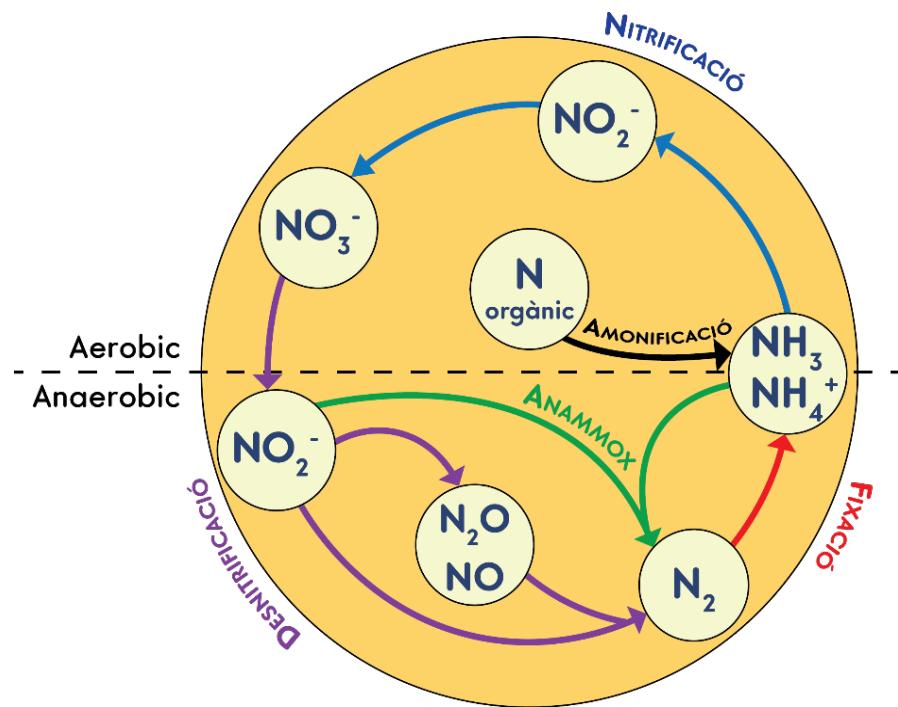
Equació HENDERSON-HASSELBALCH

$$[NH_3] = \frac{[NH_3 + NH_4^+]}{(1 + 10^{(pK_A - pH)})}$$



CICLE NITROGEN





Procés		Produeix						
		pH	O_2	NH_4^+	NO_2^-	NO_3^-	PO_4^{3-}	CO_2
Nitrificació	$\text{NH}_3/\text{NH}_4^+ \rightarrow \text{NO}_2^- \rightarrow \text{NO}_3^-$	▼	▼	▼	▲	▲	-	-
Assimilació	Captura de NH_4^+ y NO_3^- per plantes	▲	▲	▼	-	▼	▼	▼
Amonificació	Nitrogen orgànic convertit a $\text{NH}_3/\text{NH}_4^+$	▲	-	▲	-	▼	-	-
Desnitrificació	Reducció nitrats a $\text{N}_{2(g)}$	-	-	-	▼	▼	-	-
Eutrofització	Descomposició matèria orgànica	▼	▼	▲	-	-	▲	▲

RECTA PATRÓ

Red (632 nm)	Erioglaucina (628 nm)
Green (523 nm)	Eritrosina B (522 nm)
Blue (465 nm)	Sunset Yellow (482 nm)

	Peak wavelength	Bandwidth
Red	632 nm	18 nm
Green	523 nm	33 nm
Blue	465 nm	25 nm



	Eritrosina B	Erioglaucina	Sunset Yellow
Nom comercial	Acid Red #51	Blue #1	Food Yellow #3
Sigma Catàleg #	198269-25G	861146-25G	465224-25G
λ_{max} (nm)	522	628	482
Pes molecular (g/mol)	879.86	792.85	452.37
Coef. Extinció Molar (L/Mol*cm)	$\geq 82,500$ (524-528 nm)	$\geq 80,000$ (627-637 nm)	$\geq 20,000$ (479-485 nm)

Erioglaucina

H ₂ O (mL)	250.00
Massa (g)	0.198
Pes m (g/mol)	792.85
Concetració (μM)	1.0

Stock

Eritrosina B
Erioglaucina
Sunset Yellow

Stock A
(mL)

1

H₂O
(mL)

250

Stock B
(μM)

4

2,5

250

10

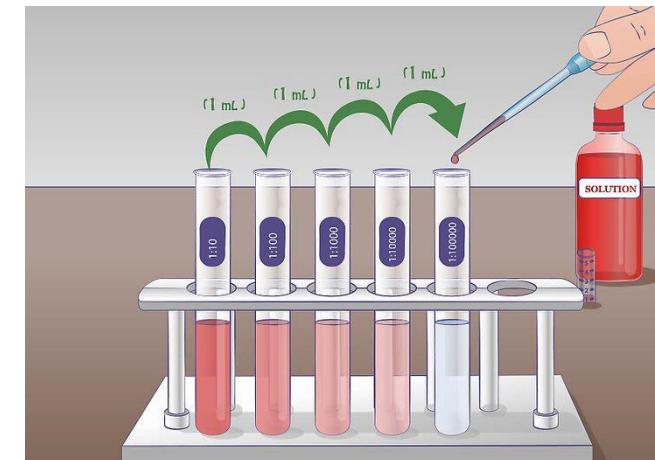
10

250

40

$$\text{Concetració}_{\text{Inicial}} \cdot \text{Volum}_{\text{Inicial}} = \text{Concetració}_{\text{Final}} \cdot \text{Volum}_{\text{Final}}$$

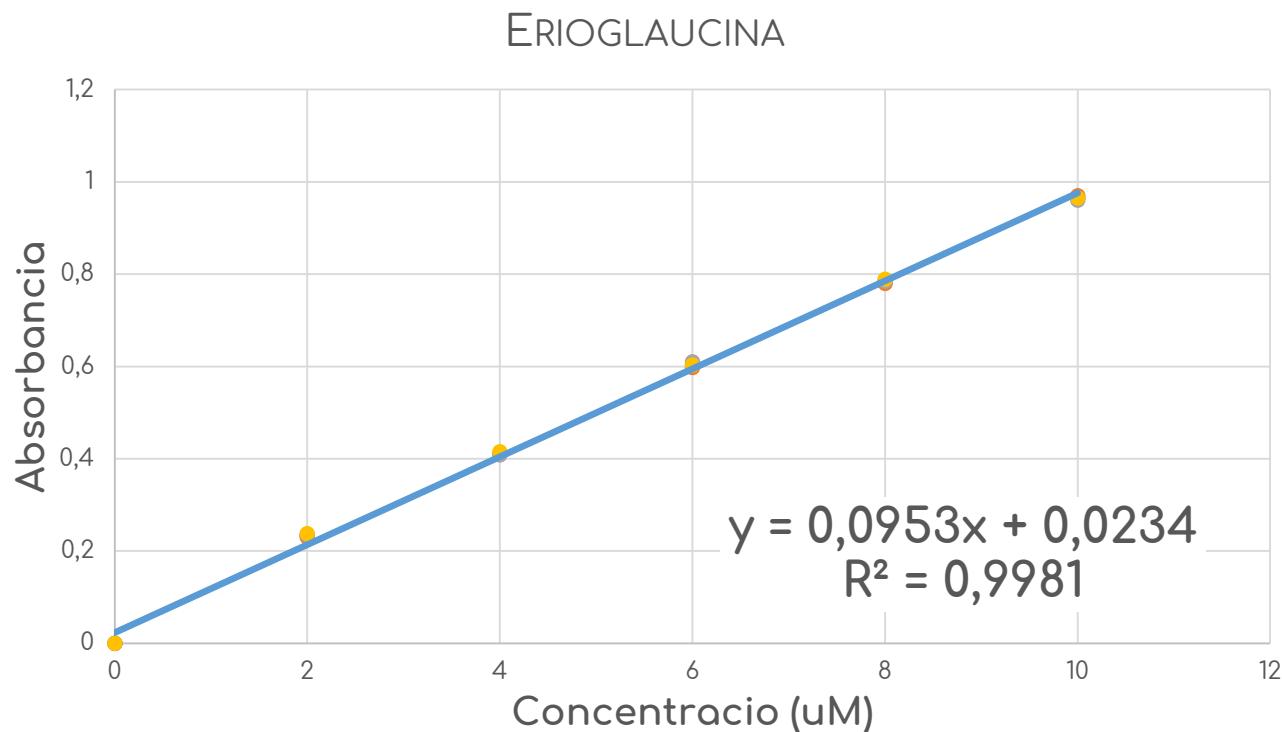
	Cf (μM)	Tub n-1 (ml)	Aigua (ml)
1	0	0	5
2	0,25	0,125	4,875
3	0,5	0,25	4,75
4	0,75	0,375	4,625
5	1	0,5	4,5
6	2	1	4
7	4	2	3
8	6	3	2
9	8	4	1
10	10	5	0



$$C_I \cdot V_I = C_F \cdot V_F$$

Ci	10 μM
Vi	5 ml
Vf	5 ml
Cf	???

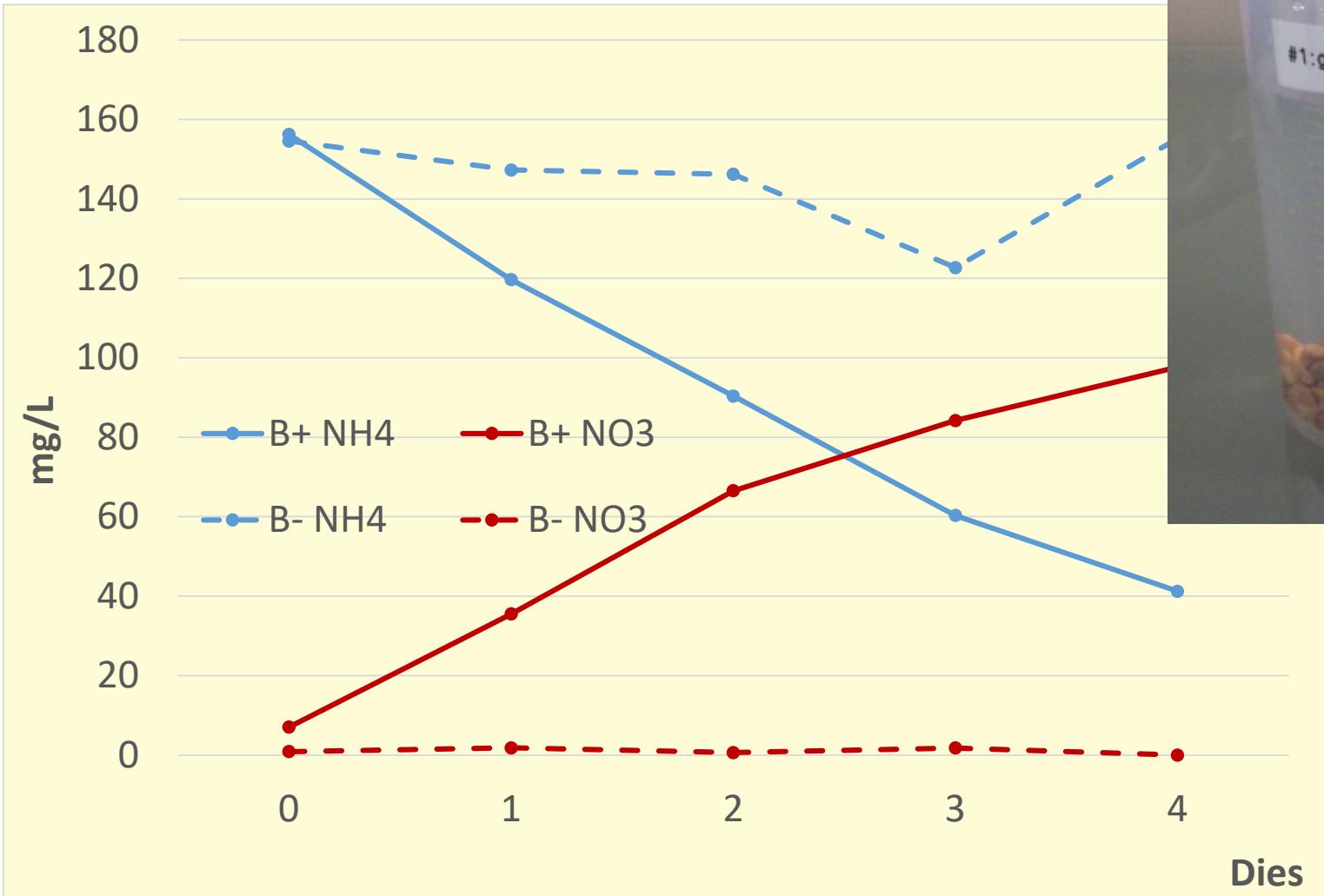
Conc (μ M)	X_1	X_2	X_3	X_m	Des Std
0	0	0	0	0	0
2	0,230	0,235	0,238	0,234	0,00404145
4	0,410	0,408	0,415	0,411	0,00360555
6	0,598	0,610	0,603	0,604	0,00602771
8	0,780	0,785	0,789	0,785	0,00450925
10	0,970	0,960	0,965	0,965	0,005



ANÀLISIS D'AIGÜES



Quantificació NH₄⁺ i NO₃⁻ en mostres d'aigua al llarg d'un breu període (4 dies) amb grava amb (B+) i sense (B-) bacteris nitrosomones.



MÒDUL 4

GENÈTICA

HISTORIA

Miescher
(1870, DE)

Aïllament
DNA

Watson & Crick
(1953, UK)

Estructura
DNA

Mullis
(1984, USA)

PCR

Varios
(2000, USA)

Biologia Sintètica

Illumina
(2003, USA)

Maquines
seqüenciació
automàtiques 2.0

Nanopore
(2015, UK)

Maquines
seqüenciació
automàtiques 3.0

DNA = material
genètic

Avery
(1940, USA)

Seqüenciació

Sanger
(1977, USA)

Maquines
seqüenciació
automàtiques

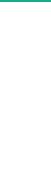
Applied
(1987, USA)

NIH
(2001, USA)

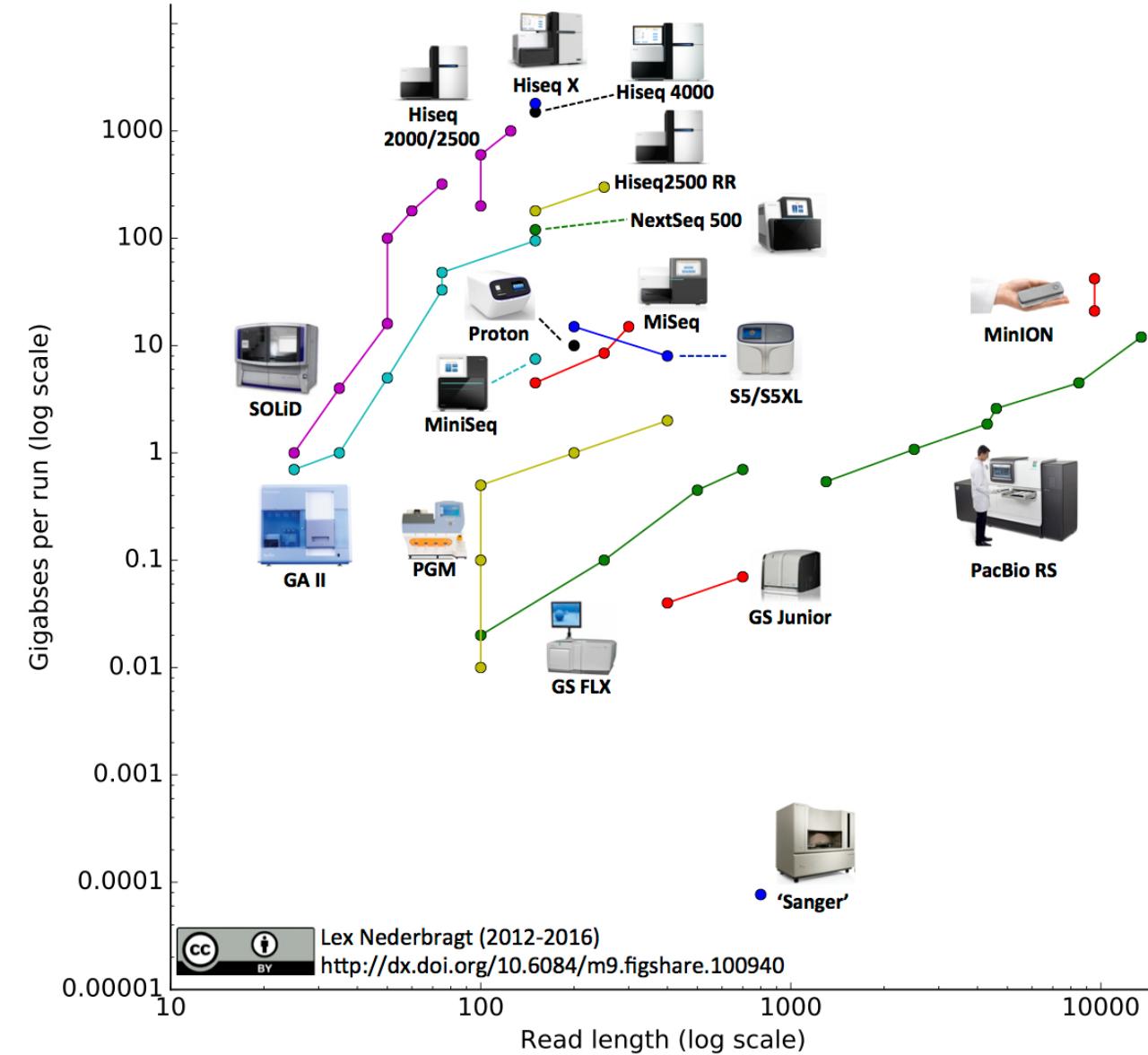
Projecte
Genoma Humà

Venter
(2014, USA)

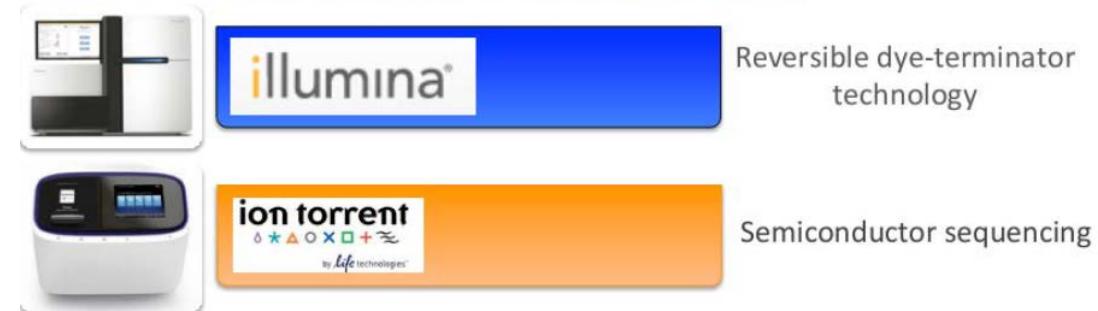
Cromosoma
Artificial



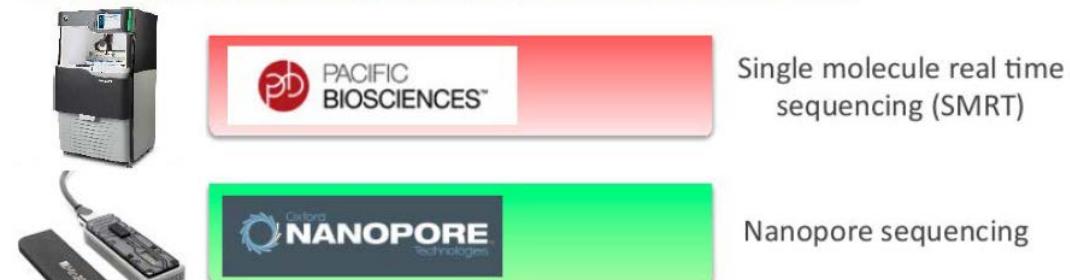
NGS EVOLUCIÓ



2nd Generation Sequencing : Sequencing By Synthesis (SBS)



3rd Generation Sequencing : Single Molecule Sequencing (SMS)

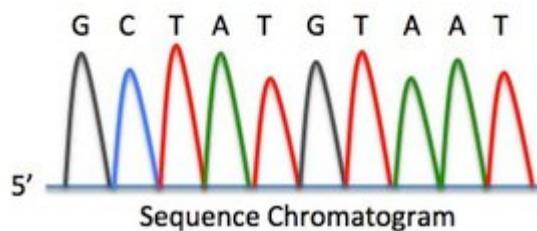
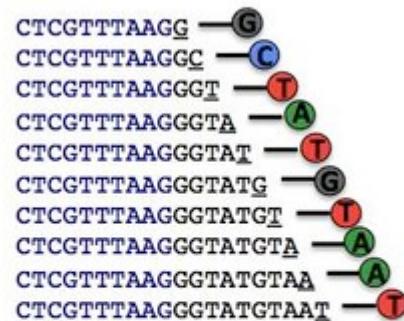


NGS TECHNOLOGIES

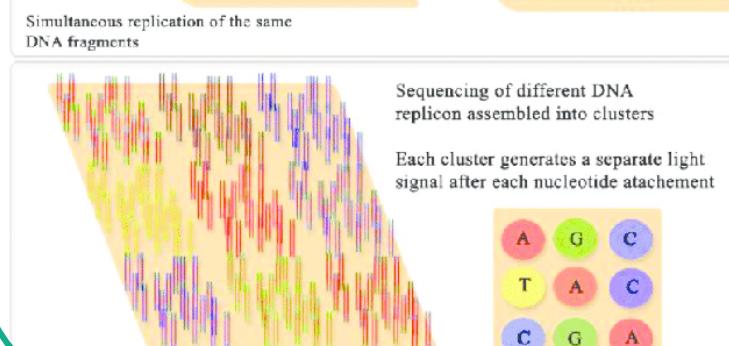
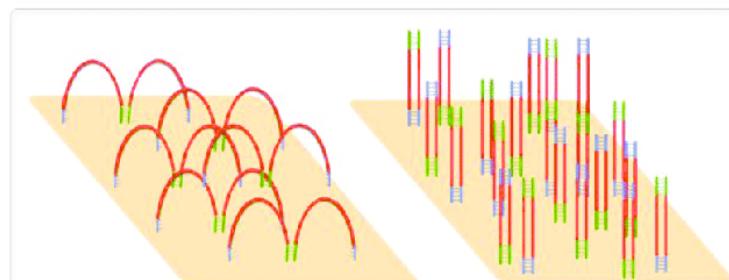
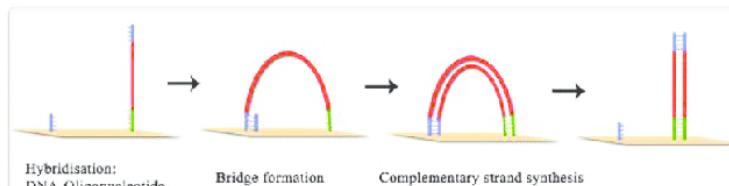
Sanger

Template Sequence
3' GAGCAAATTCCGATACATTATTGT... 5'

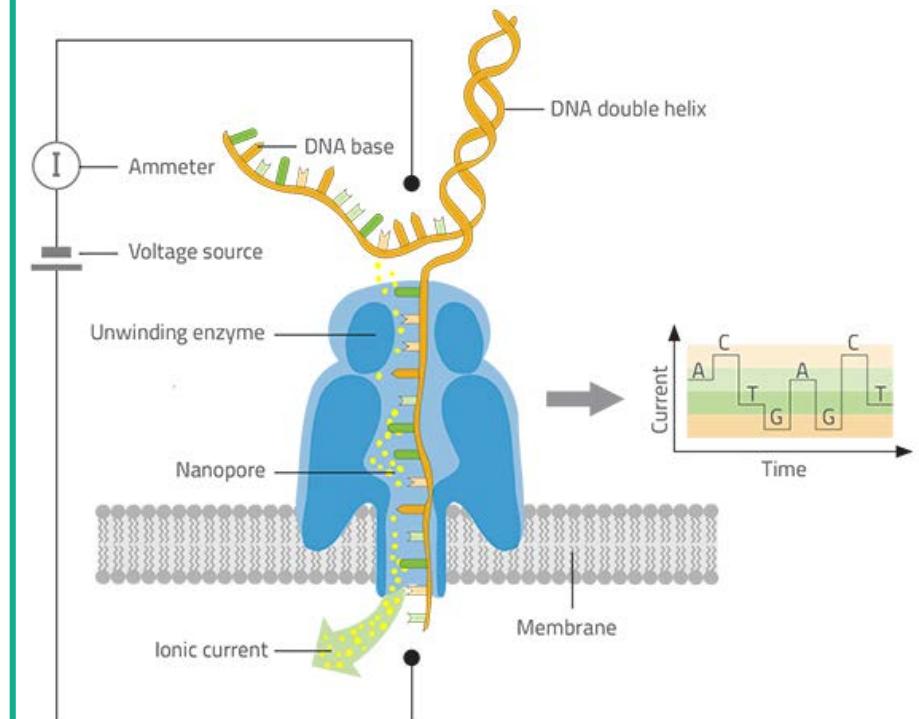
Primer
5' CTCGTTAAG... 3'



Illumina



Nanopore



Summer 2018 MinION specs :

512 nanopores per flowcell (~900 euros + 190 wash kit)
>8 Gbase per run (48h movie ~ 10-20Gb)

1D² Sequencing Kit (R9.5 SQK-LSK308) = 450 bases per second (~600 euros)
Read length ~ Fragment length
MinKNOW software 2.0

COST REAL PROJECTE SEQÜENCIACIÓ (2018)

Table 1 Overall cost per patient (in Euro) of the NGS applications for targeted genes panel in seven somatic genetics laboratories

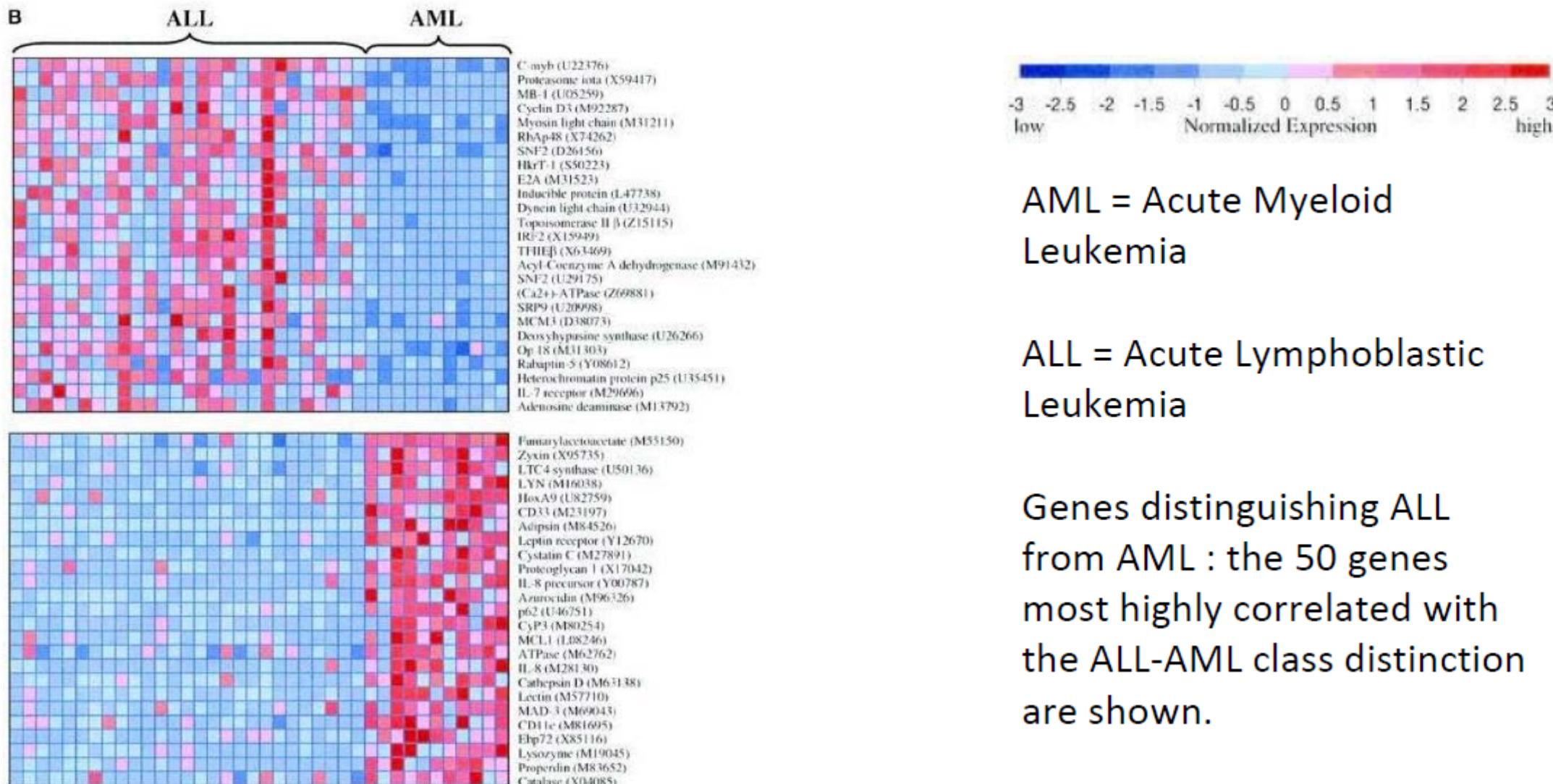
**Bioinformatician
salary and disk
storage (not
taken into
account in this
paper)**

Cost per process step (in €)	Mean
0. DNA extraction	
1. Enrichment /Library preparation	174€ (29%)
Part of consumables* (%)	
Part of equipment (%)	
Part of labor (%)	
2. Sequencing	120€ (20%)
Part of consumables* (%)	
Part of equipment (%)	
Part of labor (%)	
3. Bioinformatics analysis	44€ (7%)
Part of equipment & software (%)	
Part of labor (%)	
4. Technical validation	34€ (6%)
Part of consumables (%)	
Part of equipment (%)	
Part of labor (%)	
5. Biological validation	30€ (5%)
NGS production cost (0+1+2 +3+4+5)	
6. Cost of time not directly linked to NGS activity	23€ (4%)
7. Overhead cost	121€ (20%)
8. Other additional cost**	40€ (7%)
Total cost per patient (0+1+2 +3+4+5+6+7+8)	607€

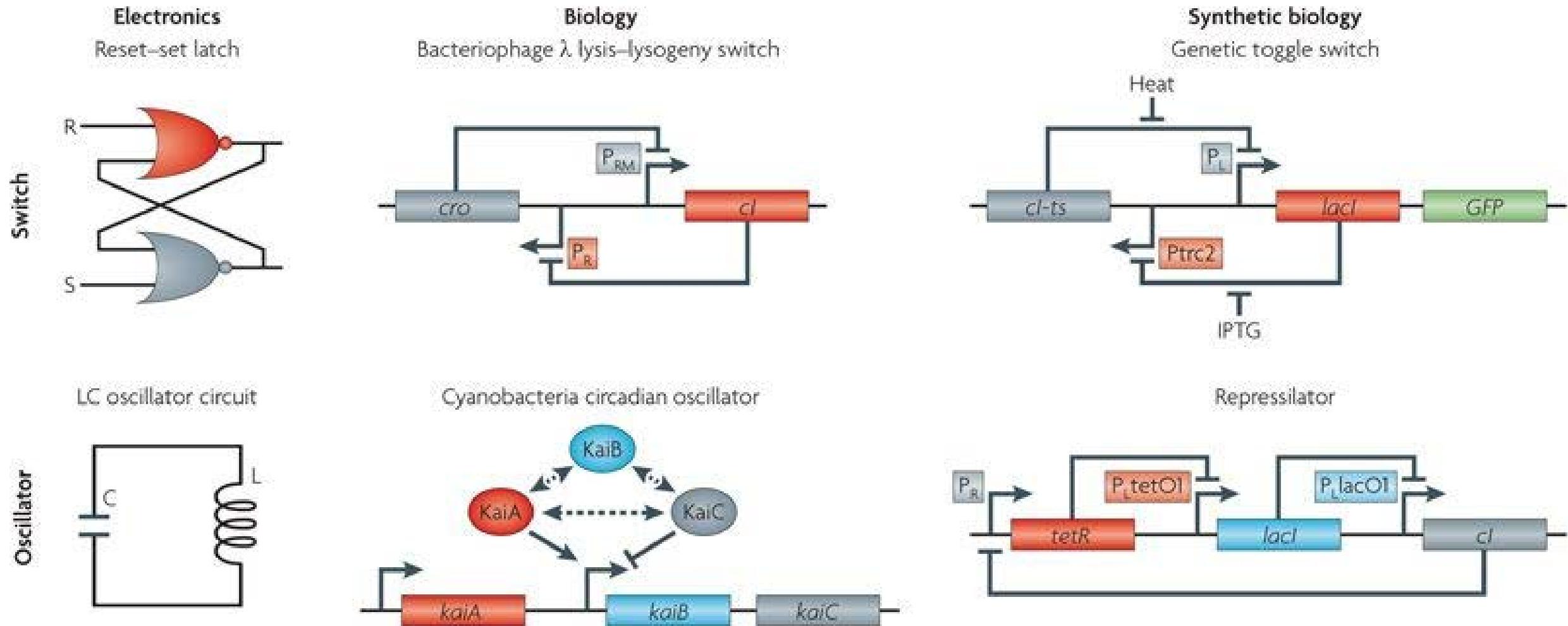
49%

22%

NGS MEDICINA



BIOLOGIA SINTÈTICA



REGISTRY STANDARD BIOLOGICAL PARTS



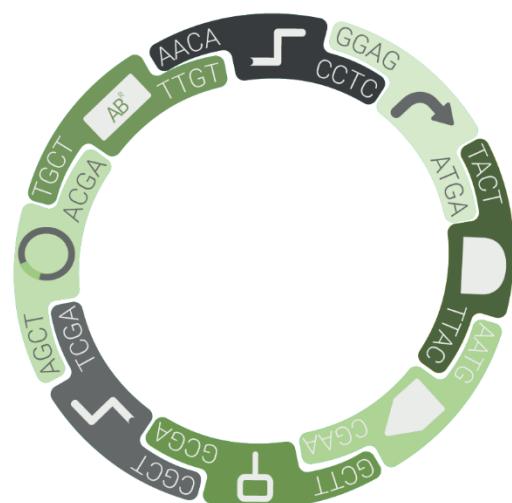
	Connector
	Promoter
	RBS
	CDS
	Terminator
	Connector
	ORI
	Antibiotic Resistance

Level 0

Single genetic part.

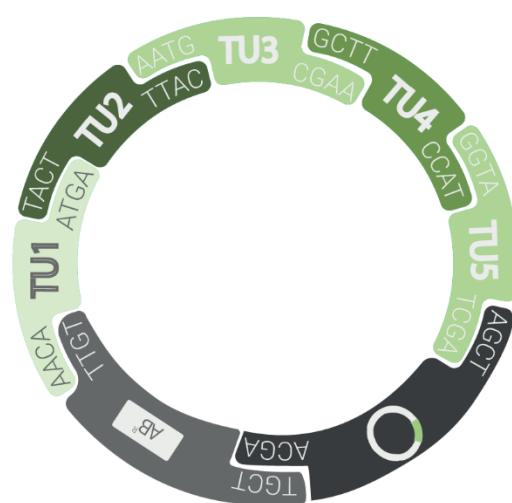
Level 1

Transcriptional unit (TU)
built out of level 0 parts.



BsaI

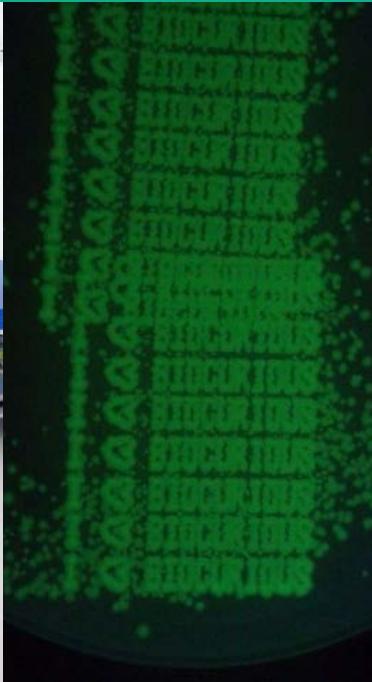
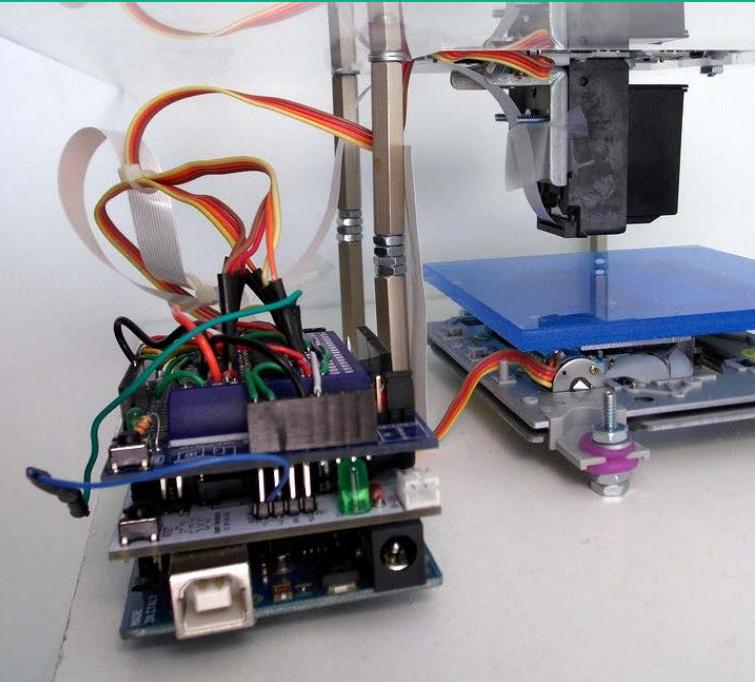
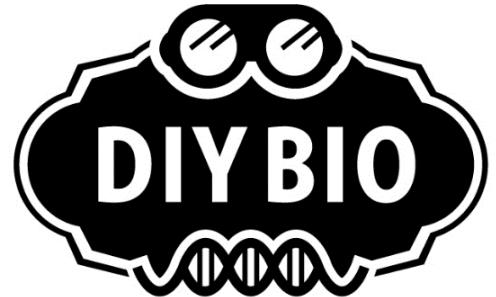
BsmBI



Level 2

Multigene cassette
built out of level 1 plasmids.

DIYBIO



PCR

PROTOCOL

Experimental Period 1 (~45 min)

Preparation: Dispense reagents and prepare equipment

- 20 min

- A DNA extraction**
 - 15 min
- B PCR set up**
 - 10 min
- C PCR programming & monitoring**
 - 5 min PCR programming
 - 15 min PCR monitoring, discussion



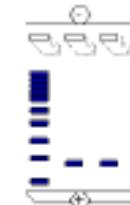
*Stopping point. miniPCR will run for approximately 1.5h
Once PCR is completed, you can store PCR product
in fridge (up to 1 week) or freezer (longer term)*

Experimental Period 2 (~45 min)

Preparation: Pour agarose gels

- 20 min

- D Restriction digest, PTC Taste test**
 - 15 min
- E Gel electrophoresis**
 - 25 min
- F Size determination & interpretation**
 - 5 min



EXTRACCIÓ ADN

MATERIAL

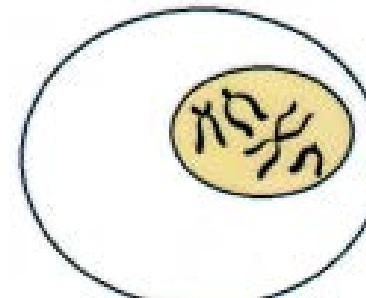
- 5g NaCl
- 80ml EtOH
- 80ml H₂O
- 14ml Detergent
- Filtre
- 3 Maduixes
- Bossa zip
- Escuradents



Salt prevents the DNA from sticking to all the protein in the mashed up strawberry

BUFFER

- 14g NaCl
- 80ml H₂O cup of water
- 15ml Detergent



Physical disruption and detergent break open cell membrane and nucleus



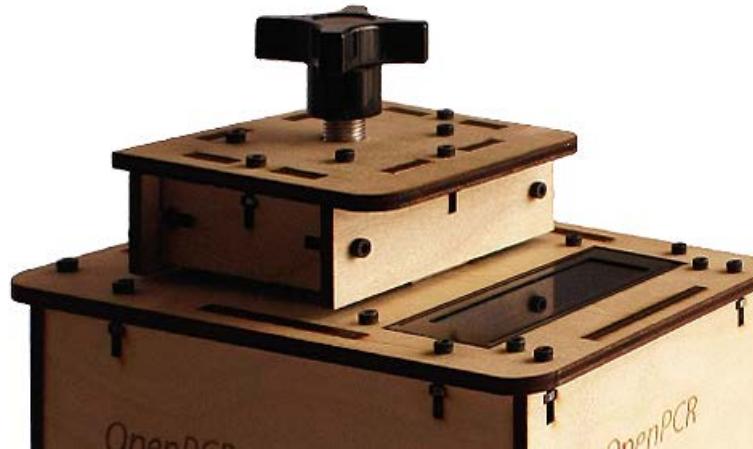
DNA in strawberry solution is precipitated with alcohol



TERMOCICLADORS



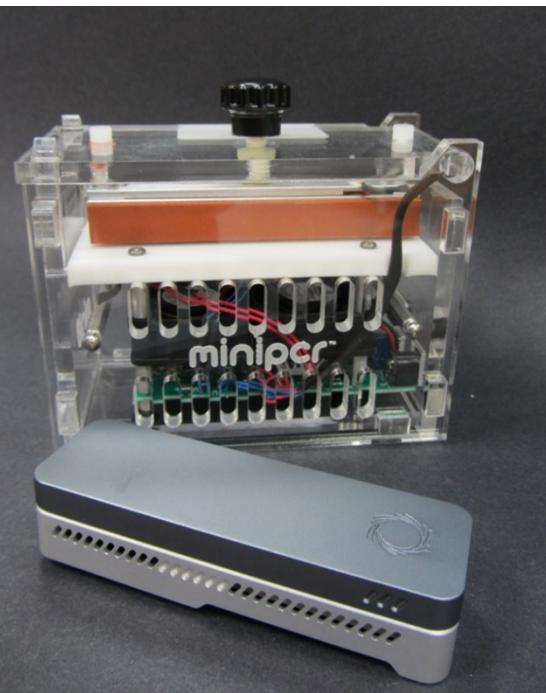
OpenPCR



YOUR OPEN-SOURCE
PCR THERMOCYCLER

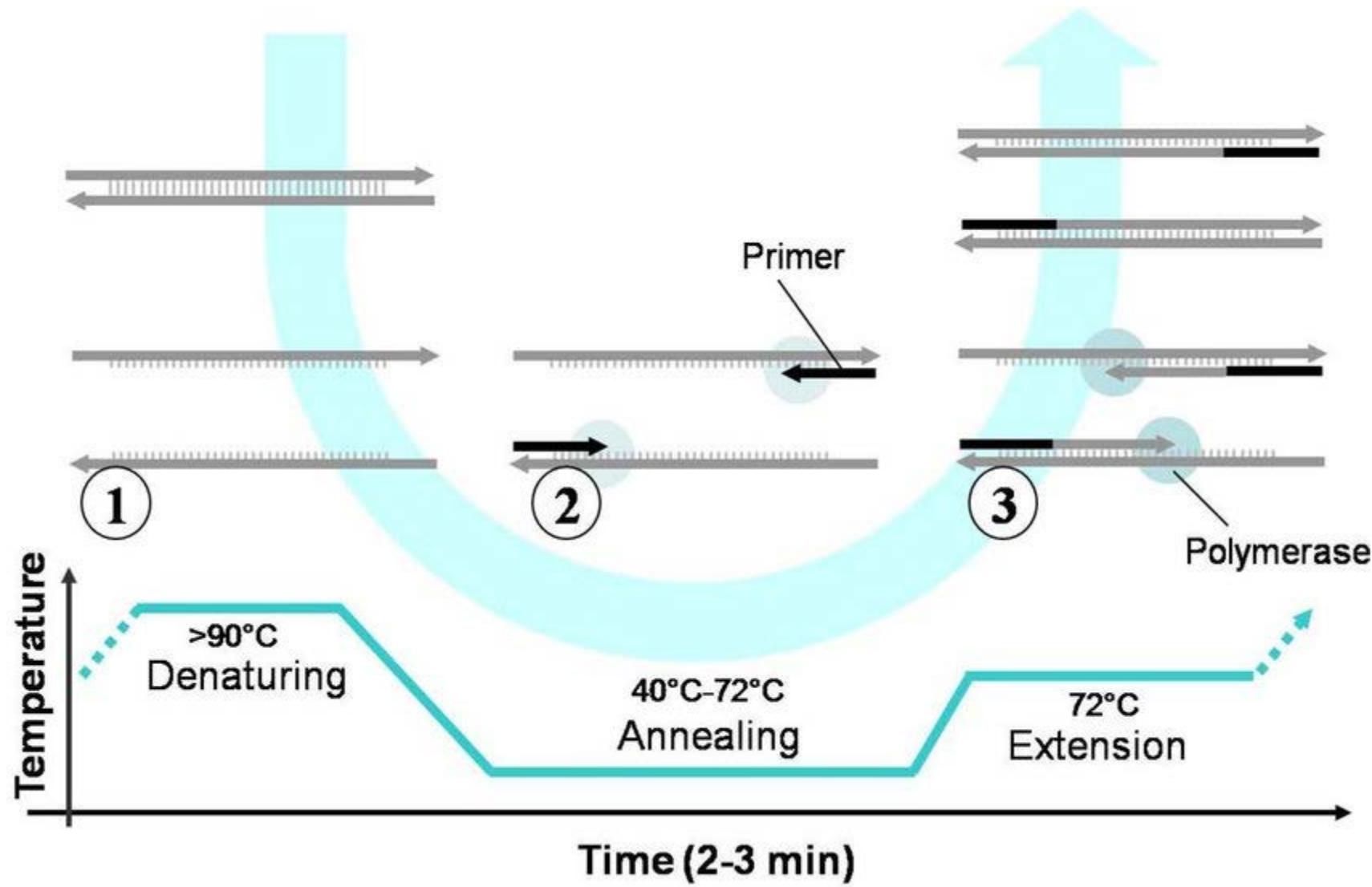
OpenPCR is a low-cost yet accurate thermocycler you build yourself, capable of controlling PCR reactions for DNA detection, [beer spoilage](#), and other applications.

[LEARN MORE](#)



NinjaPCR

PCR



minipcr Library: Set by Model used ▾

Library Crime Lab 30cyc

Now running HB37

Devices GMO

PARE final 25 cycles (Running..)

New PCR protocol X

PTC Taster Lab TAS2R38

Heated lid

Initial denaturation	Denaturation	Annealing	Extension	Final extension
94 °C	94 °C	60 °C	72 °C	72 °C
120 s	30 s	30 s	30 s	60 s

Number of cycles

Save Save and run

Plant Pcr 35

PARE PCR Testing

D1580

PCR Test 2 (2)

Hb 72 lid off (2)

Heat block 10 95

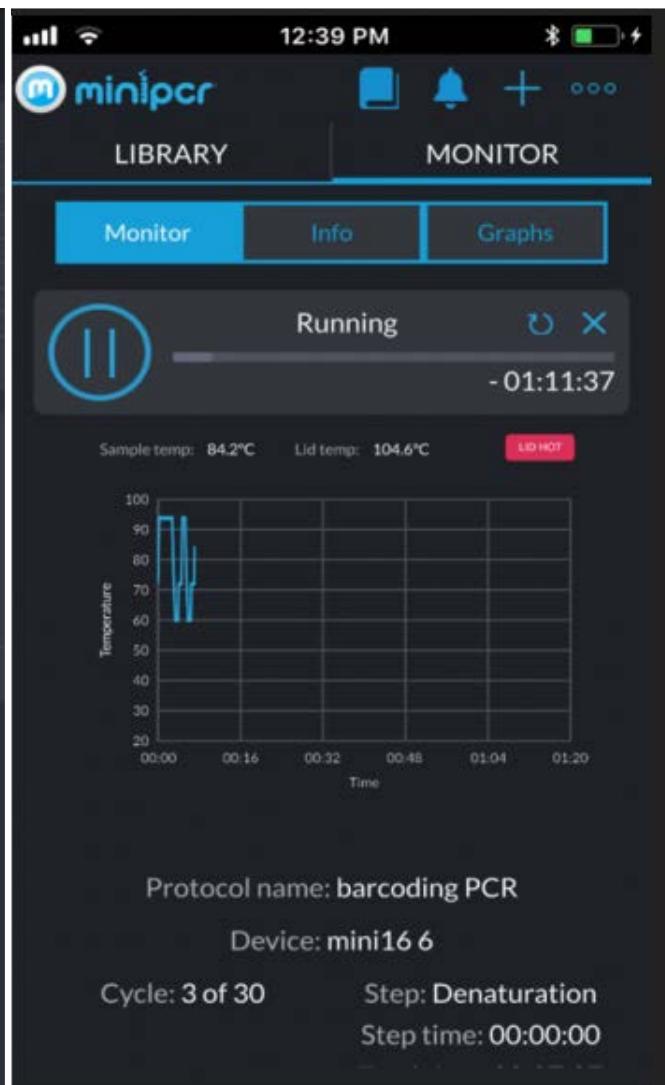
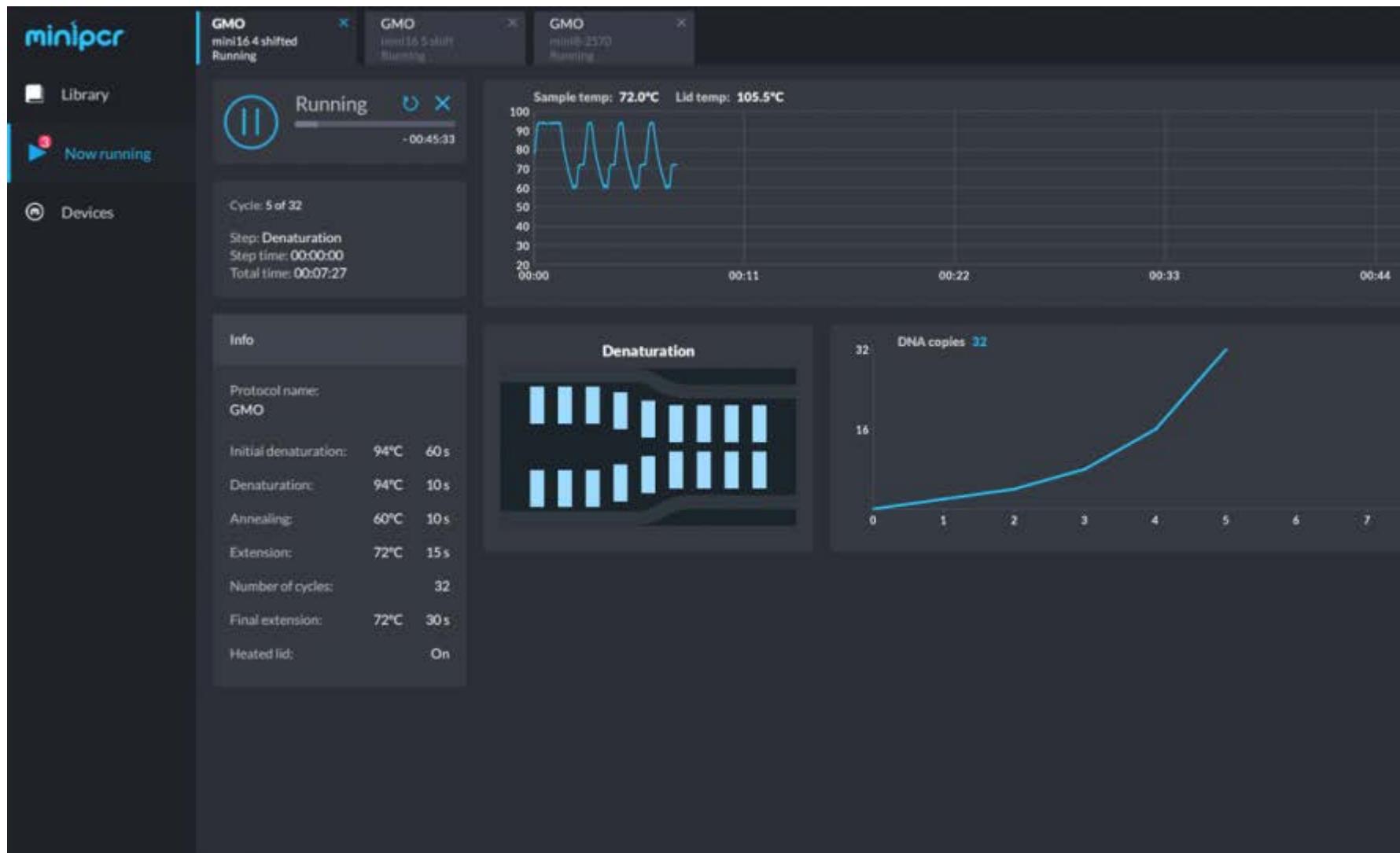
HB99

PCR Test 2

PARE PCR Testing (2)

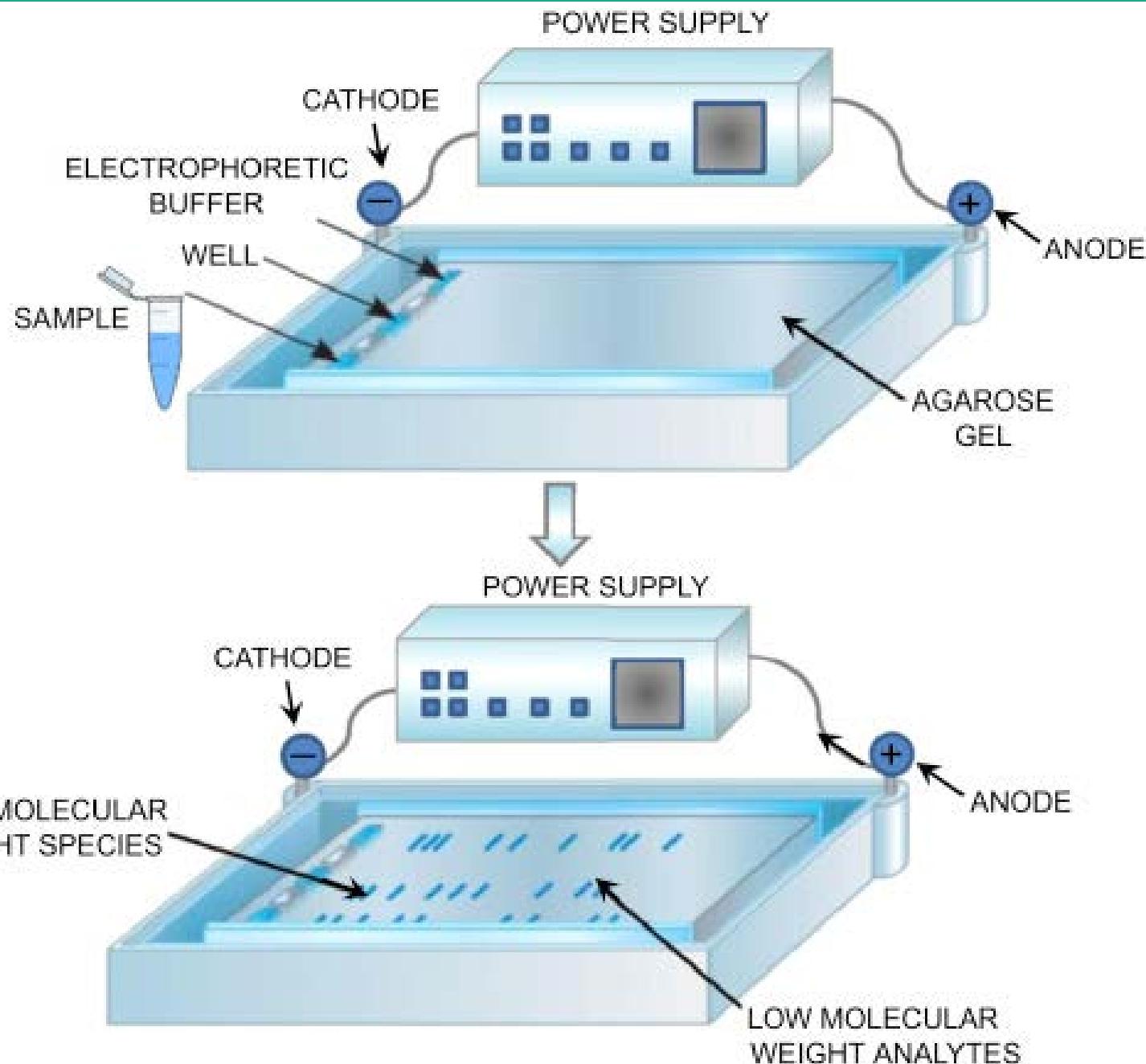
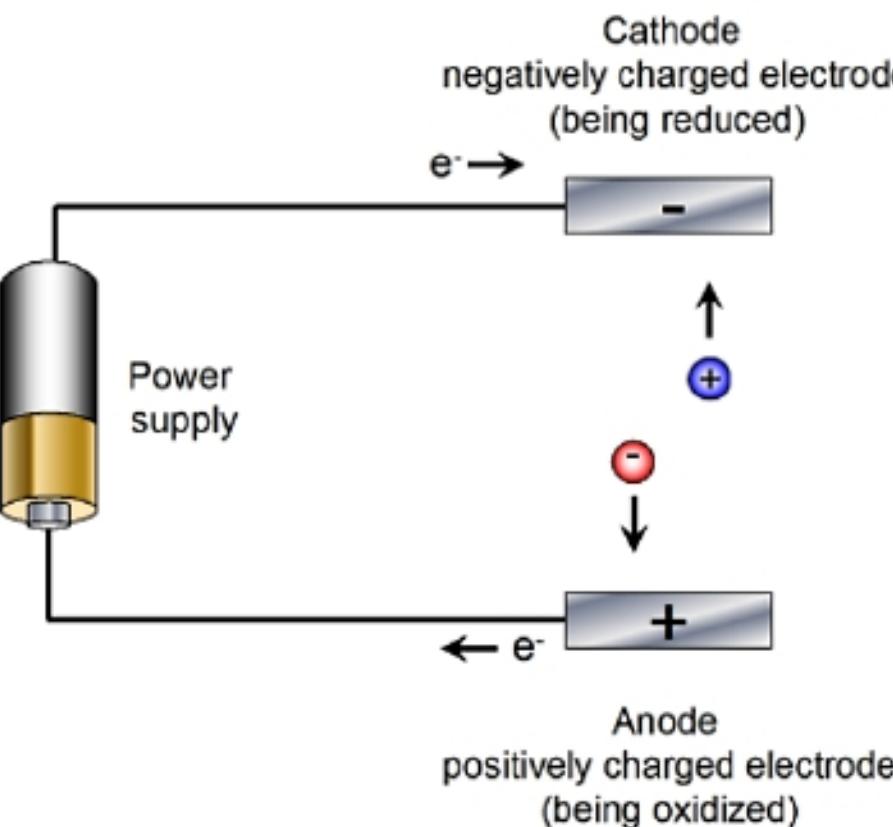
PARE PCR Testing (3)

MINIPCR



ELECTROFORESIS

ELECTROFORESIS TEORIA



ELECTROFORESIS COLORANTS

MATERIAL

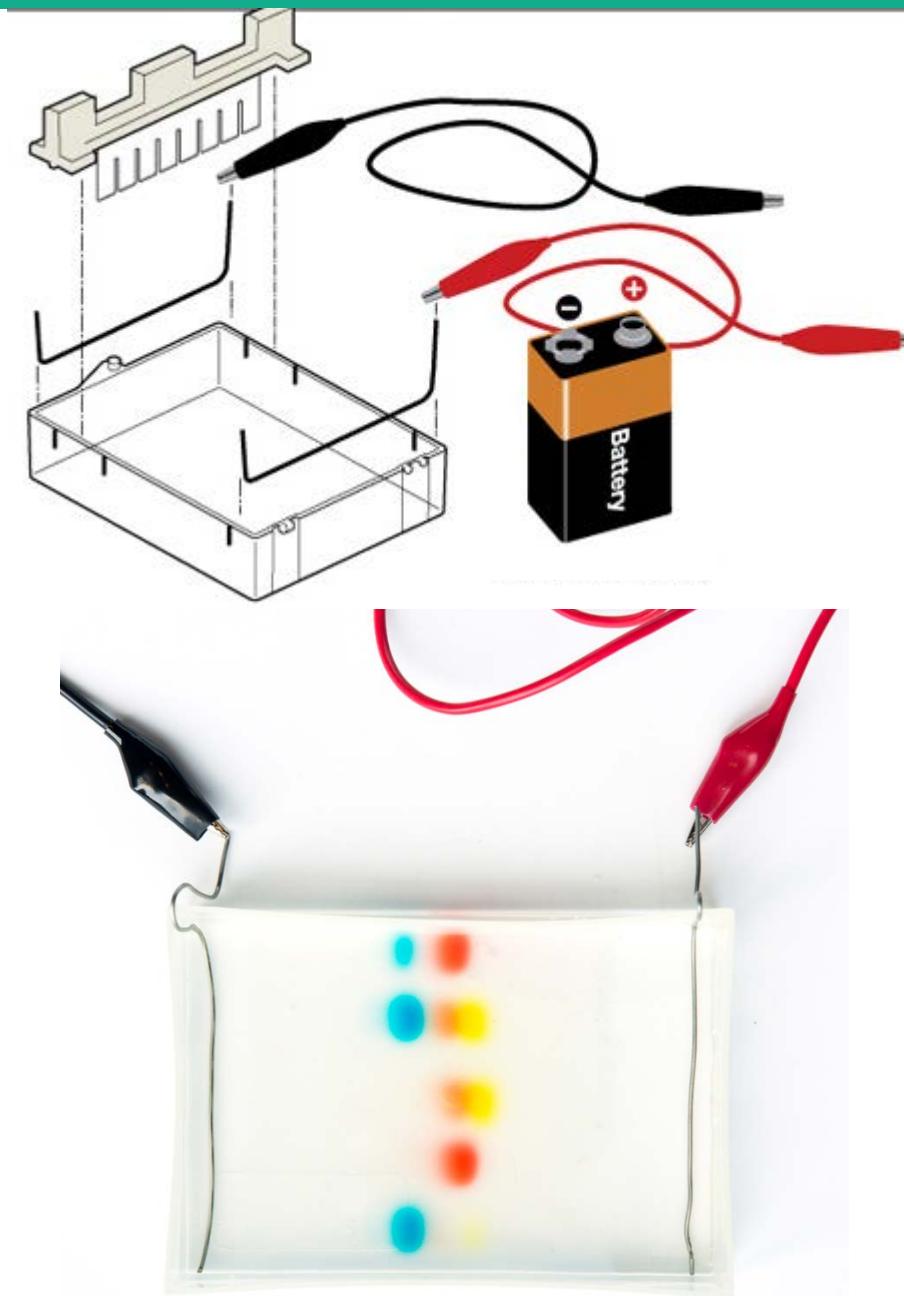
- Cubeta electroforesis
- Erlenmeyer
- Bateria , 1v/cm (5u x 9v)
- Electrodes
- Cables
- Pinta

BUFFER BAKING POWDER (0,2%)

- 2 g/L Baking Powder
- 0,05 g/L NaCl
- 1000ml H₂O

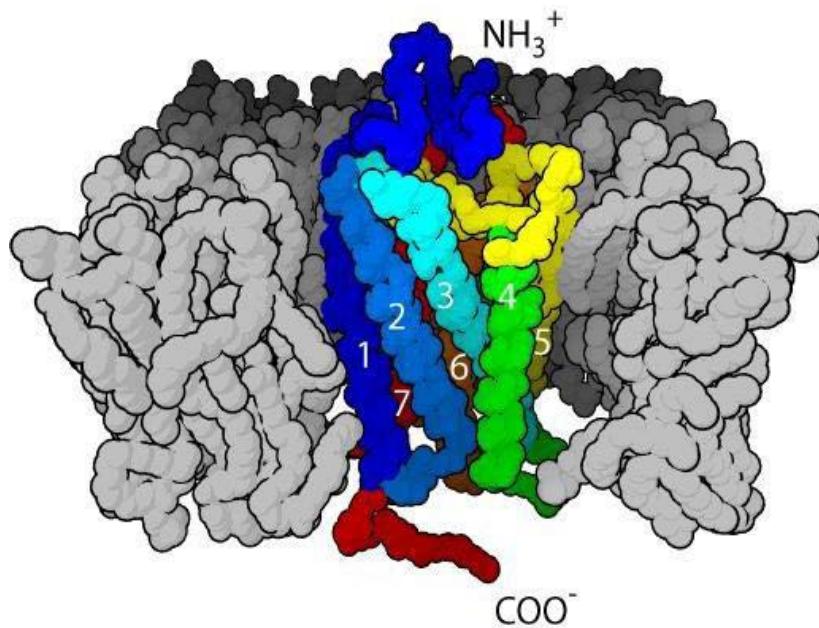
GEL AGAROSA (1%)

- 0,5g Agar
- 50ml Buffer Baking Powder

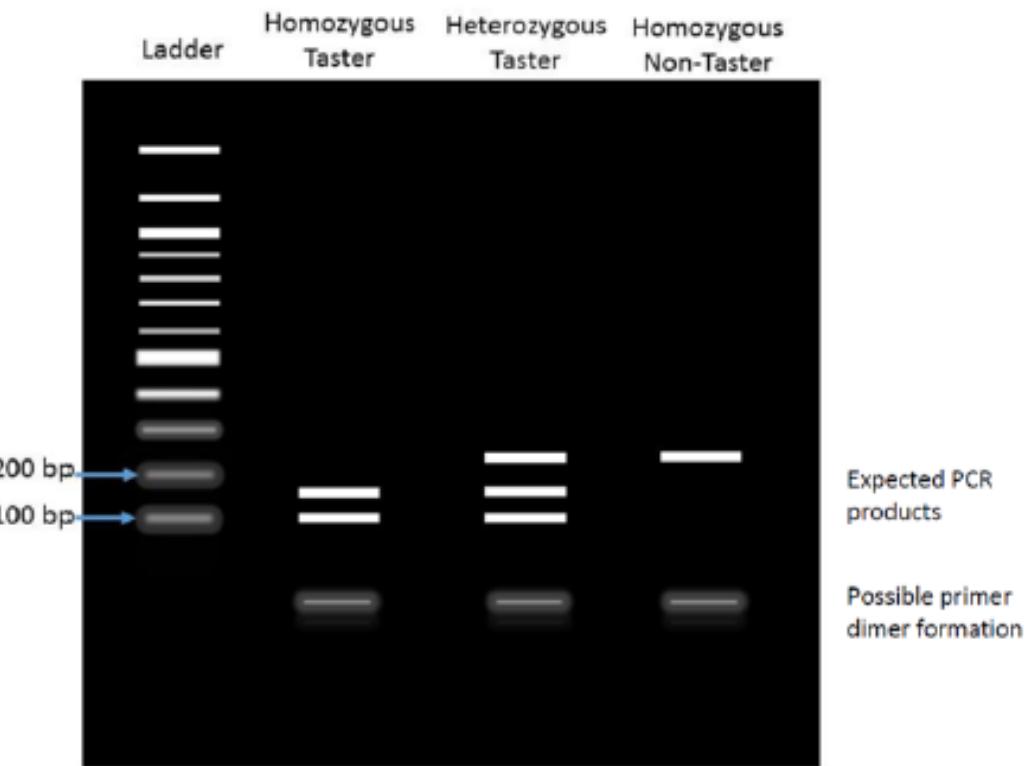


ACTIVITATS

GENT PTC



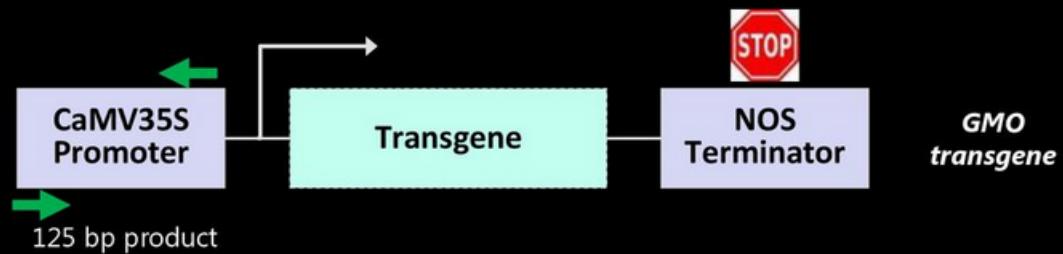
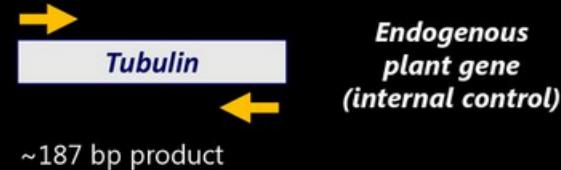
SNP	Position		Taster (PAV)		Non-Taster (AVI)	
	dNTP	AA	dNTP	AA	dNTP	AA
rs714598	145	49	C	Pro	G	Ala
rs1726866	785	262	C	Ala	T	Val
rs10246939	886	296	G	Val	A	Ile



ALIMENTS OMG

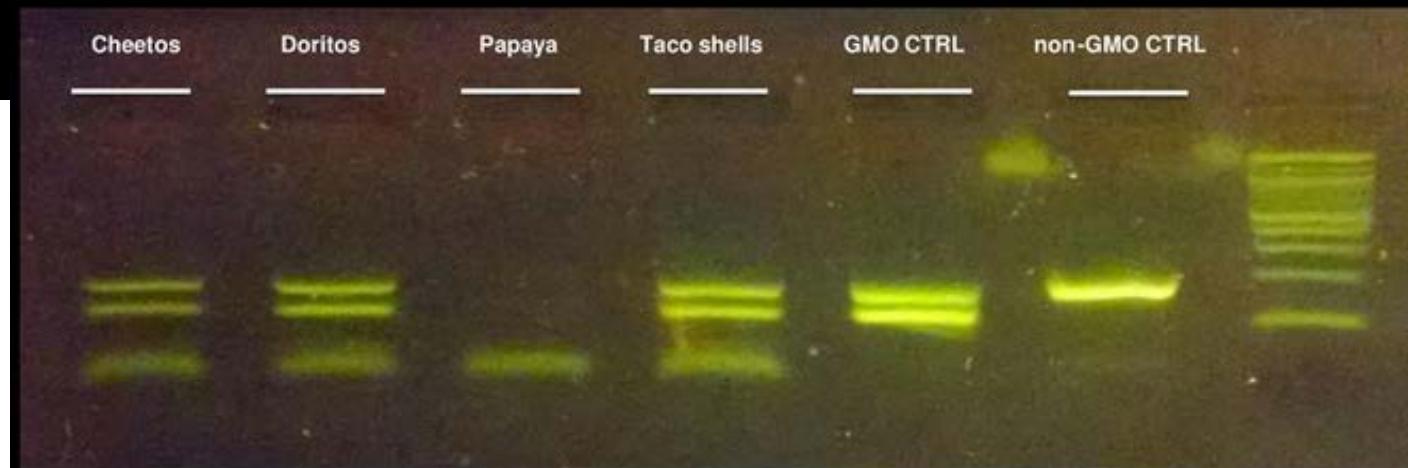
Detecting plant transgenes by PCR

Duplex PCR: internal control and transgene



miniPCR GMO Lab

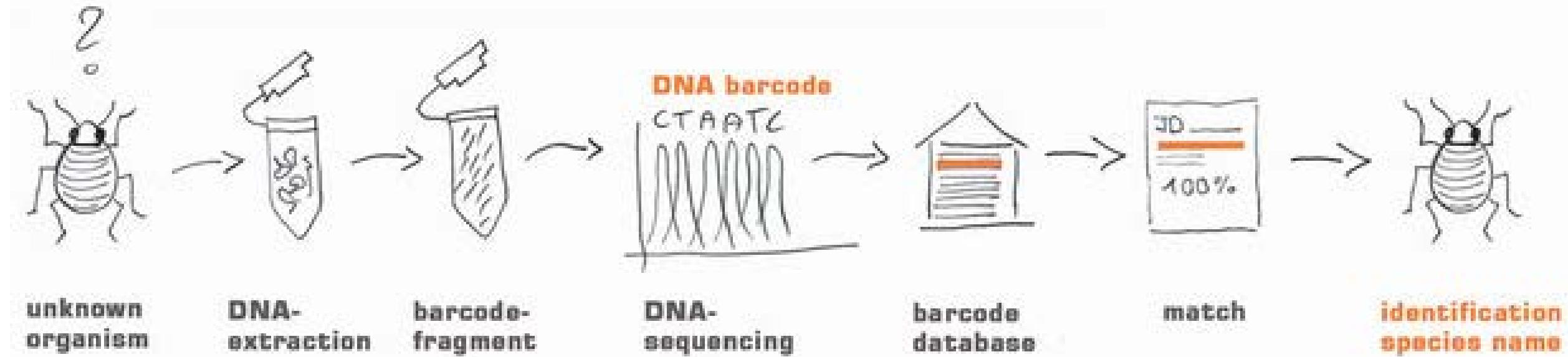
Detecting GMO sequences in foodstuffs



Tubulin: ~187 bp product

CaMV promoter: 125 bp product

DNA BARCODING





info@cured.bio

<https://github.com/curedbio>