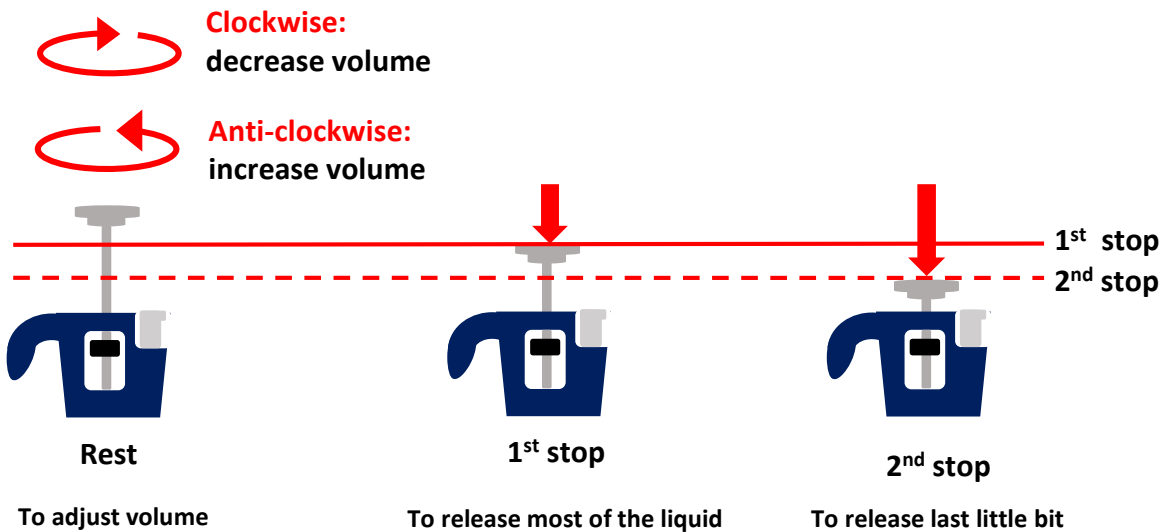
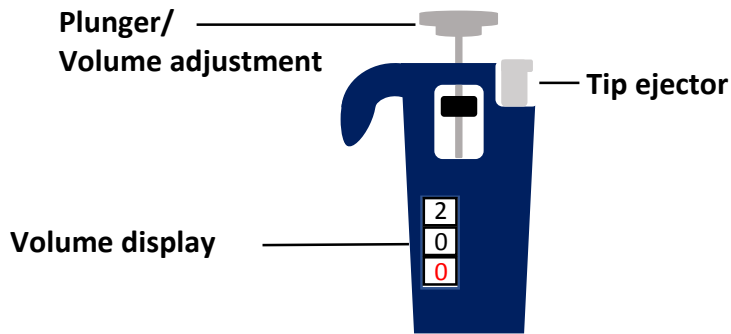


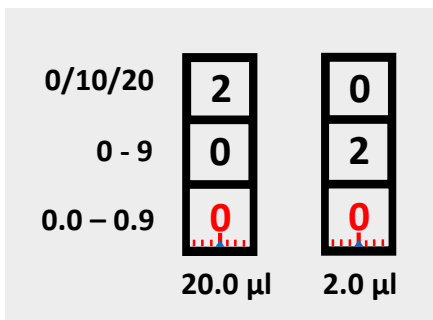
How to use a micropipette?



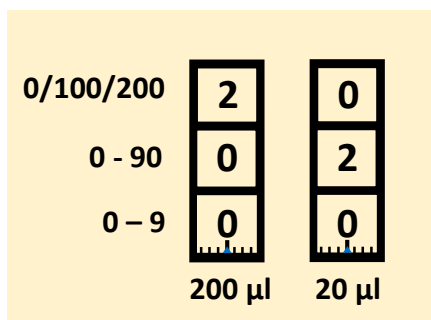
Do NOT over turn the plunger!

① Set Volume

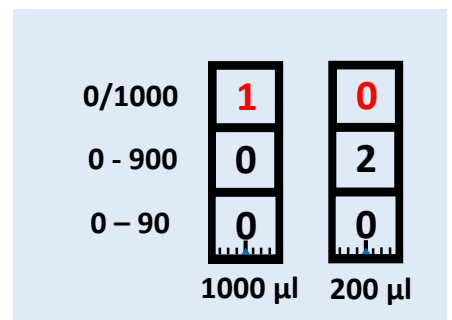
P 20 pipette = 2 – 20 μ l



P 200 pipette = 20 – 200 μ l



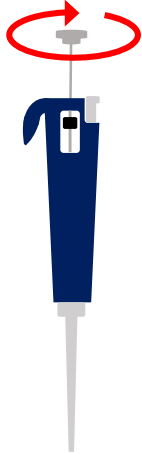
P 1000 pipette = 200 – 1000 μ l



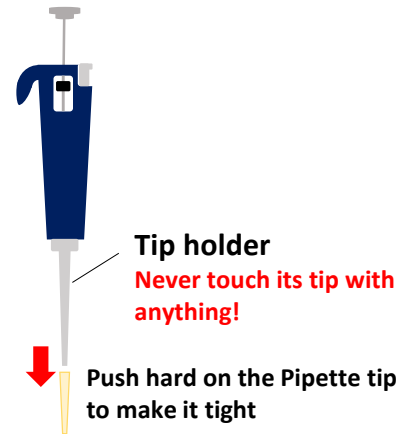
Never set volume above or below the limits!

② Step of pipetting liquid

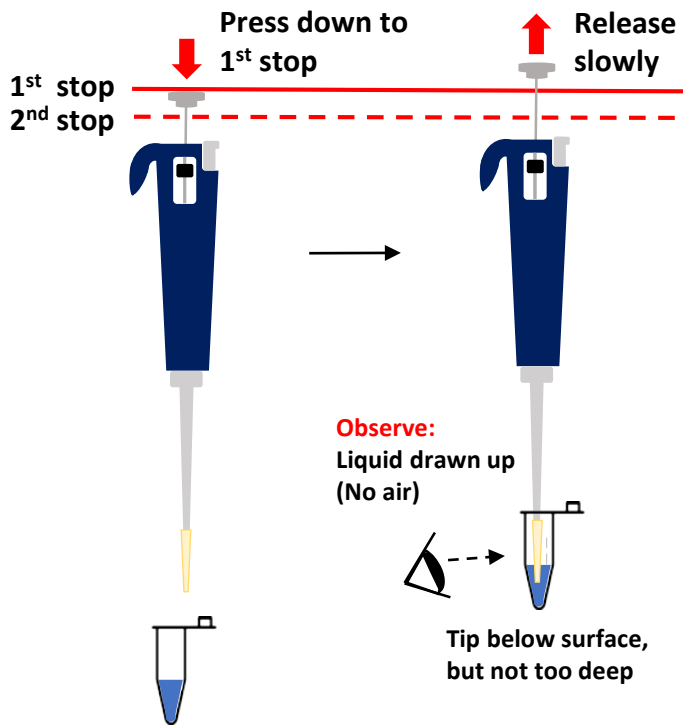
a. Set volume



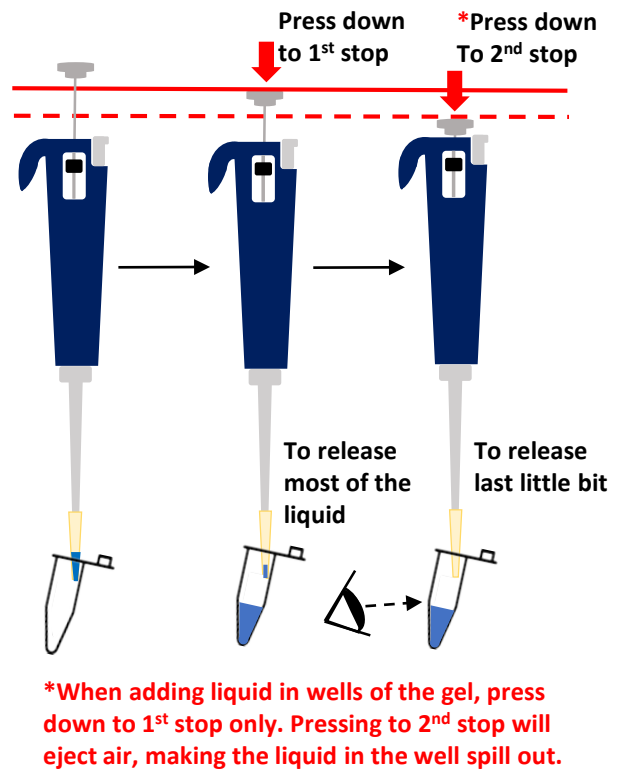
b. Insert pipette tip



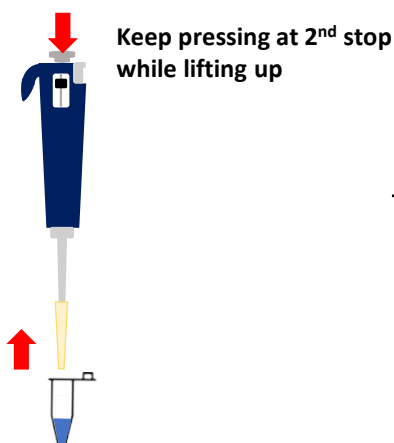
c. Suck up liquid



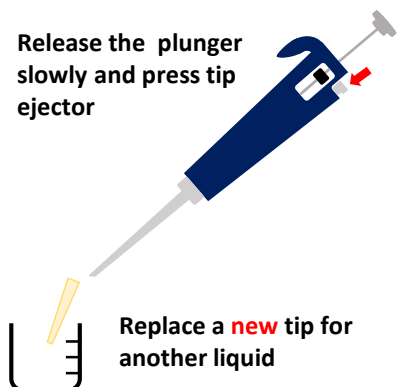
d. Release liquid



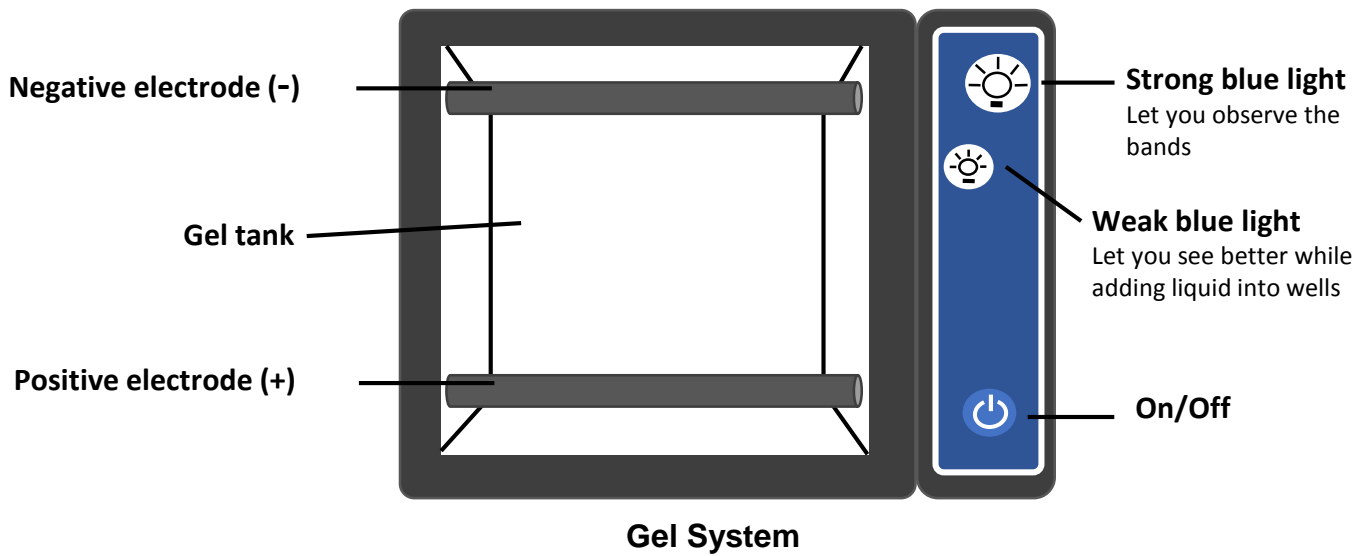
e. Lift up the tip



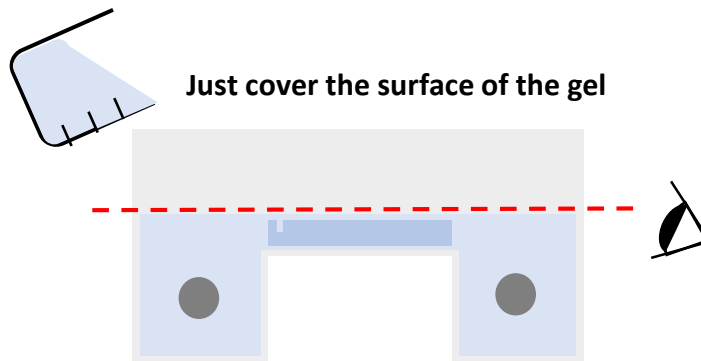
f. Eject the tip



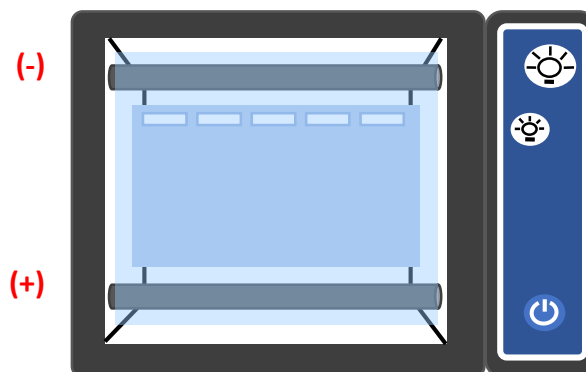
How to do a gel electrophoresis?



a. Add buffer to the gel tank



b. Put the gel tank into the gel system

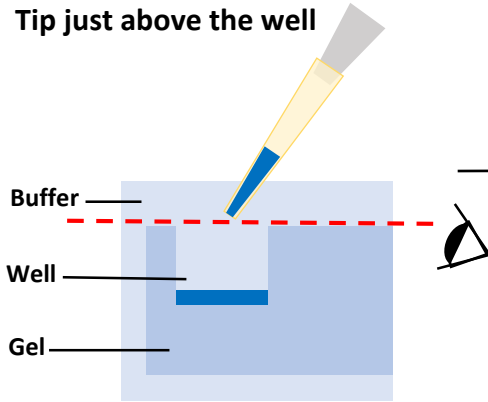


Make sure the wells are on the **negative (-)** side

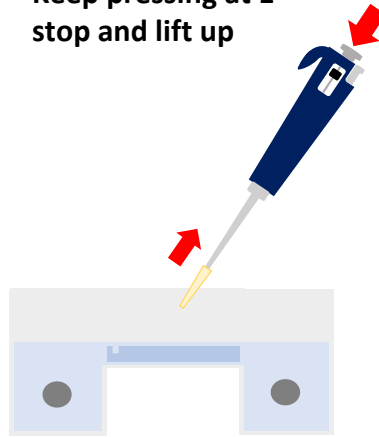
How to do a gel electrophoresis?

c. Add solution into the wells

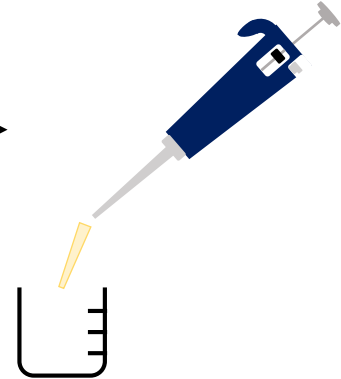
Press to 1st Stop **only**
Tip just above the well



Keep pressing at 1st stop and lift up

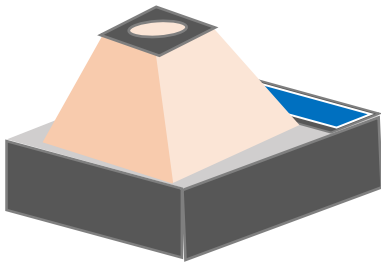


Add another solution with a **new tip**



 Press weak blue light to make the wells easier to see

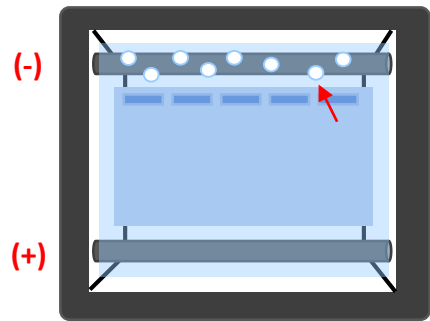
d. Turn on power



Place the photo hood on the gel system

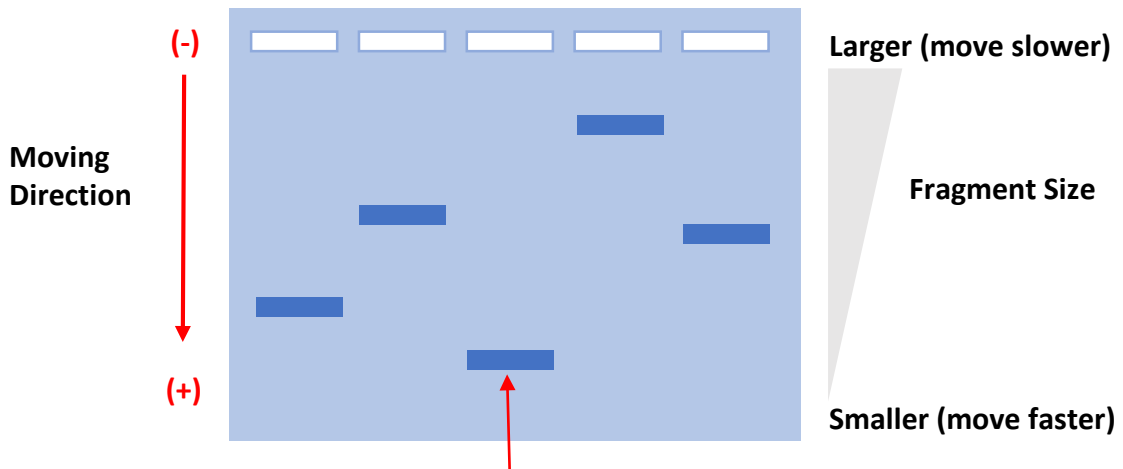
 Press strong blue light to observe the bands

e. Start running the gel



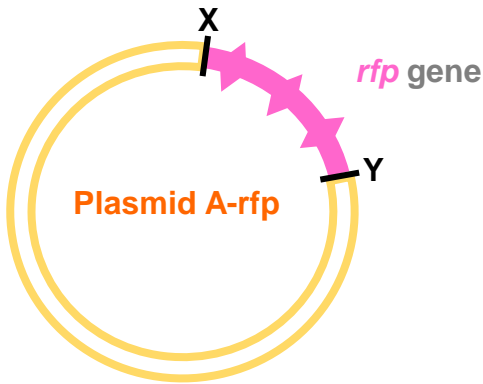
Bubbles come out at **negative (-)** electrode

f. Observe bands appearing from (-) to (+) electrode

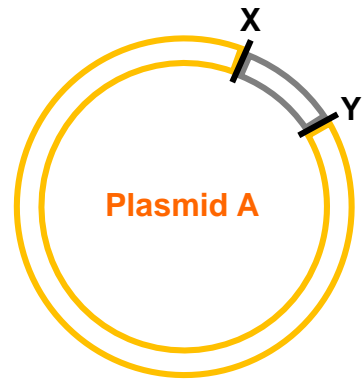


Bands show different sizes of DNA fragments

How to check if a plasmid has the *rfp* gene?



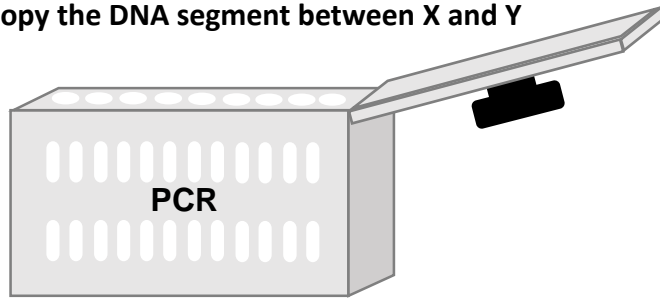
Plasmid with *rfp* gene



Plasmid without *rfp* gene

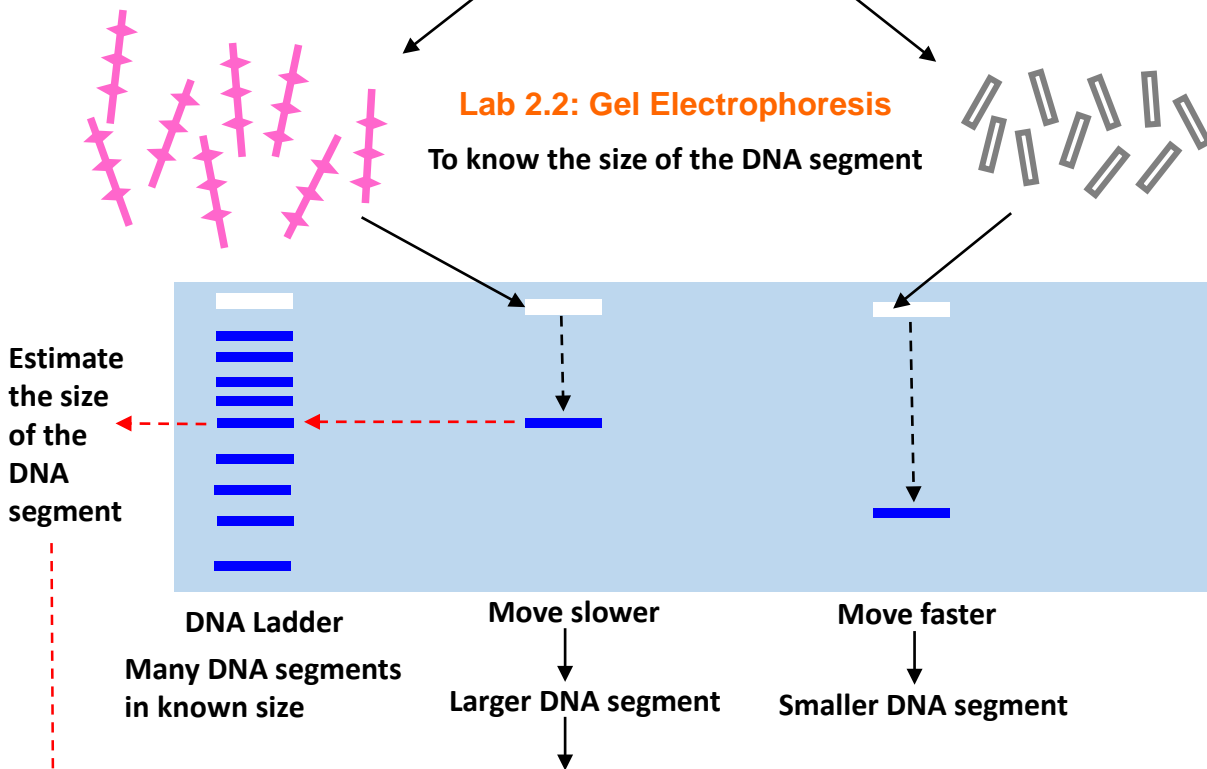
Lab 2.1: Polymerase Chain Reaction (PCR)

To copy the DNA segment between X and Y



Lab 2.2: Gel Electrophoresis

To know the size of the DNA segment



If the size is similar to the *rfp* gene,
it is concluded that the *rfp* gene is in plasmid A

How to make a plasmid with the *rfp* gene?



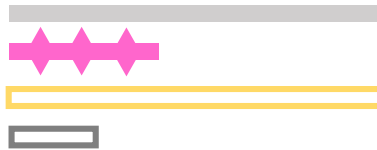
Source of *rfp* gene

Plasmid with DNA to express *rfp* gene and make bacteria resistant to **ampicillin**. So we know which bacteria have got the plasmid.

Lab 3.1: Restriction Digestion

To cut the plasmid at site X and Y

+ Restriction Enzymes 



Lab 3.2: Ligation

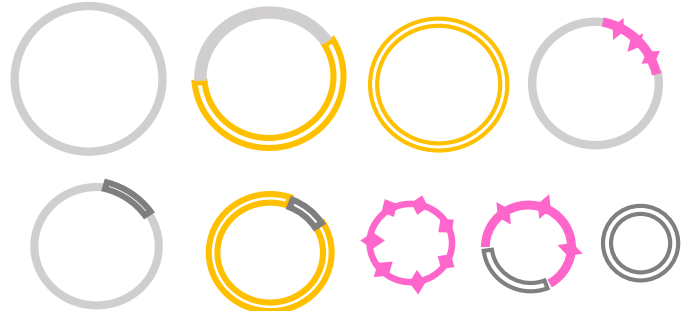
To stick the *rfp* gene to plasmid A between site X and Y

Mix the DNA fragments

+ DNA Ligase



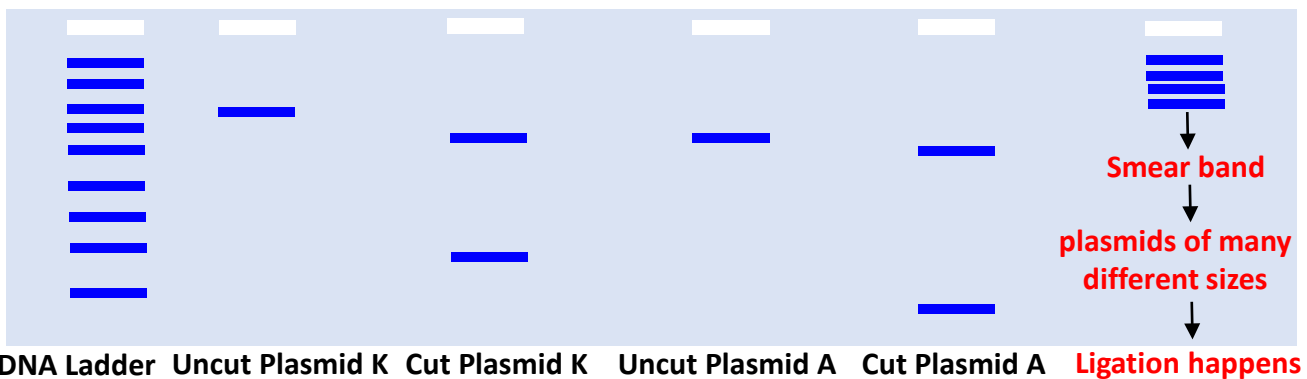
Target: Plasmid A with *rfp* gene



Other useless ligated plasmids

Lab 3.3: Gel Electrophoresis

To check if ligation occurs



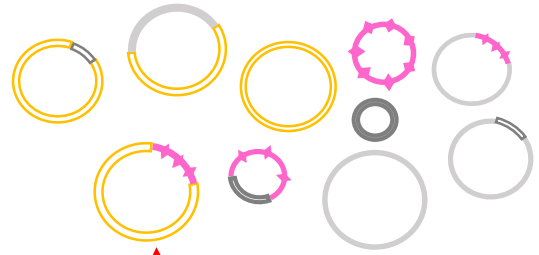
Chapter 4 Creating Genetic Modified Bacteria

How to put the plasmid with *rfp* gene into a bacteria?



Plasmid A with *rfp* gene

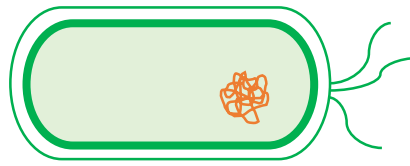
OR



Ligated plasmids
(include plasmid A with *rfp* gene)

Lab 4: Transformation

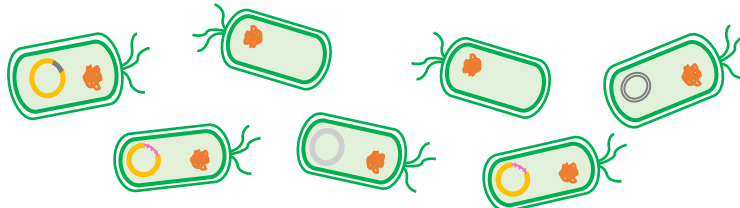
To put the plasmid A with *rfp* gene into bacteria



E. coli bacteria

Heat Shock

To open pores on the cell membrane so that plasmids can be taken into the bacteria.



E. coli bacteria
(some take in plasmids, some do not)



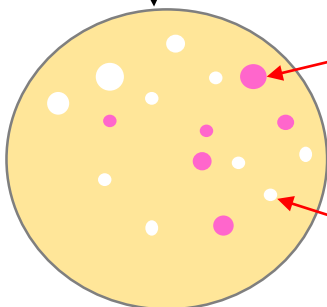
Bacterial culture
grow individual bacteria into colonies

Ampicillin

kill any bacteria without plasmid A that gives the bacteria resistance to ampicillin

Arabinose

Express the *rfp* gene and produce red fluorescent protein



Red bacterial colony –

bacteria that have taken in plasmid A with *rfp* gene

White bacterial colony –

bacteria that have taken in plasmids with ampicillin resistance but no *rfp* gene