Operon

Part 1

Molecular Biology

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MicroDome

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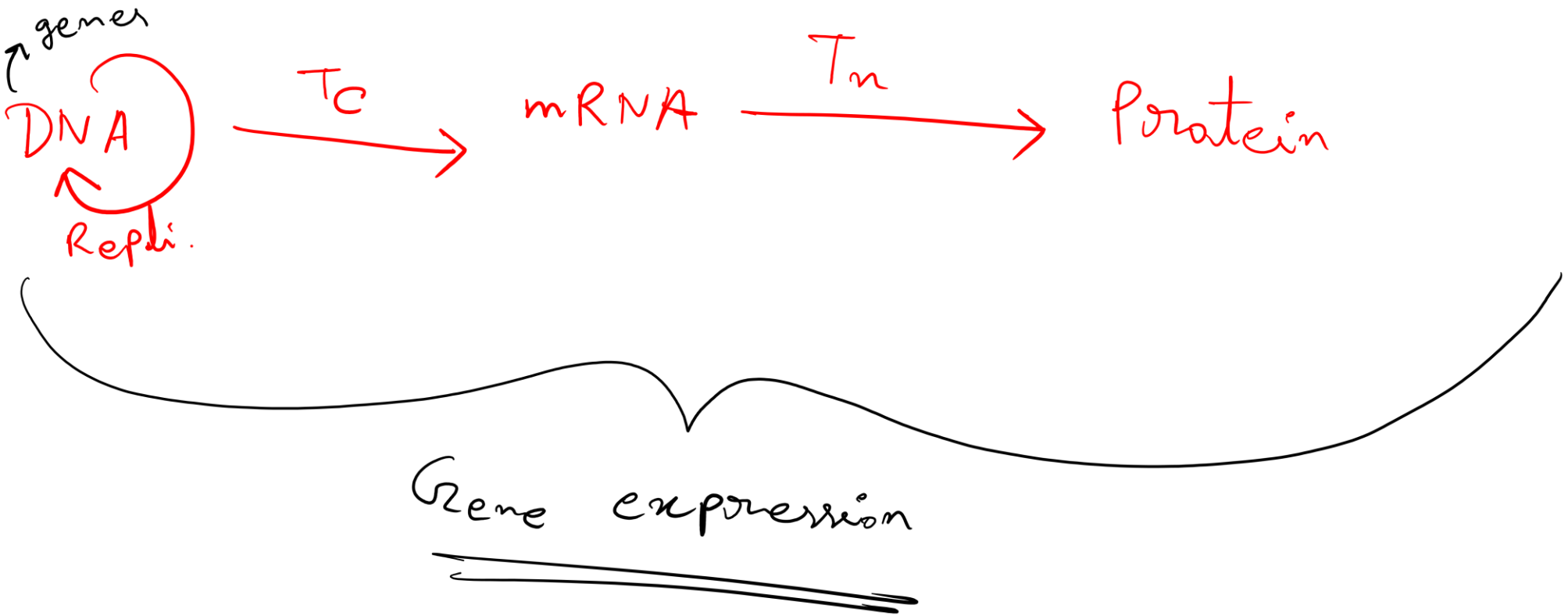
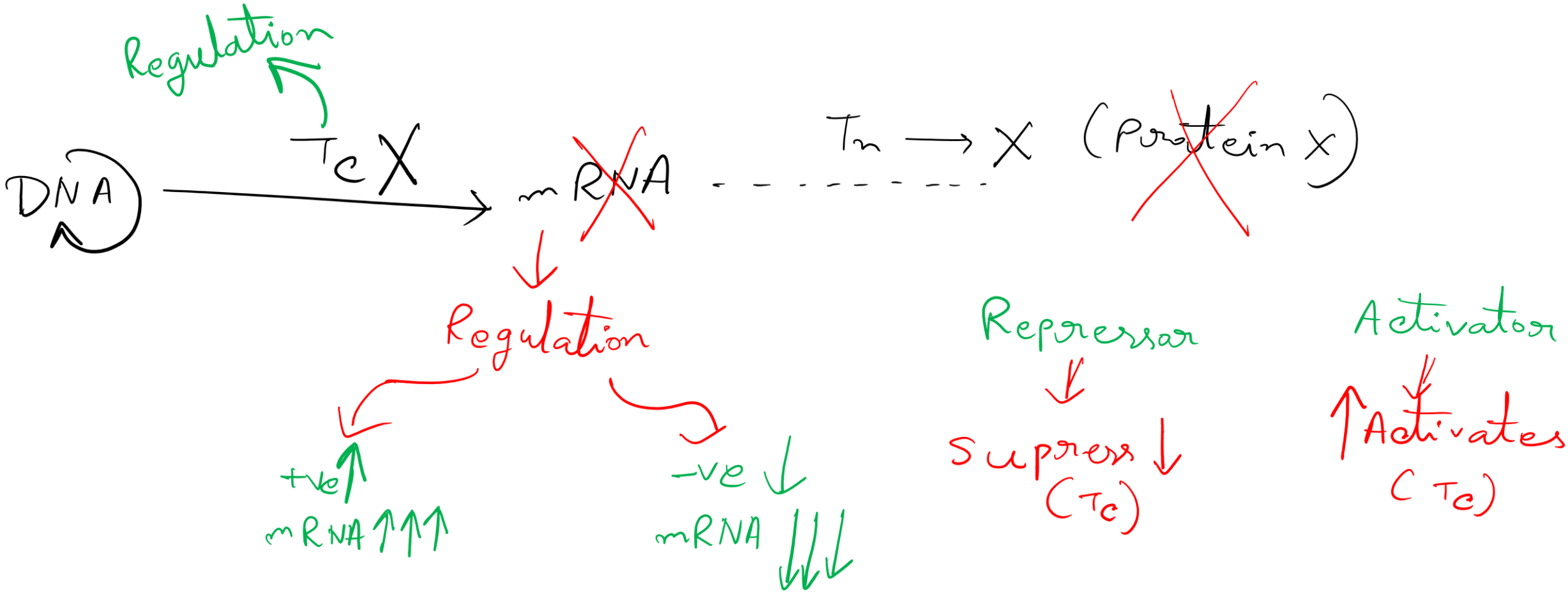
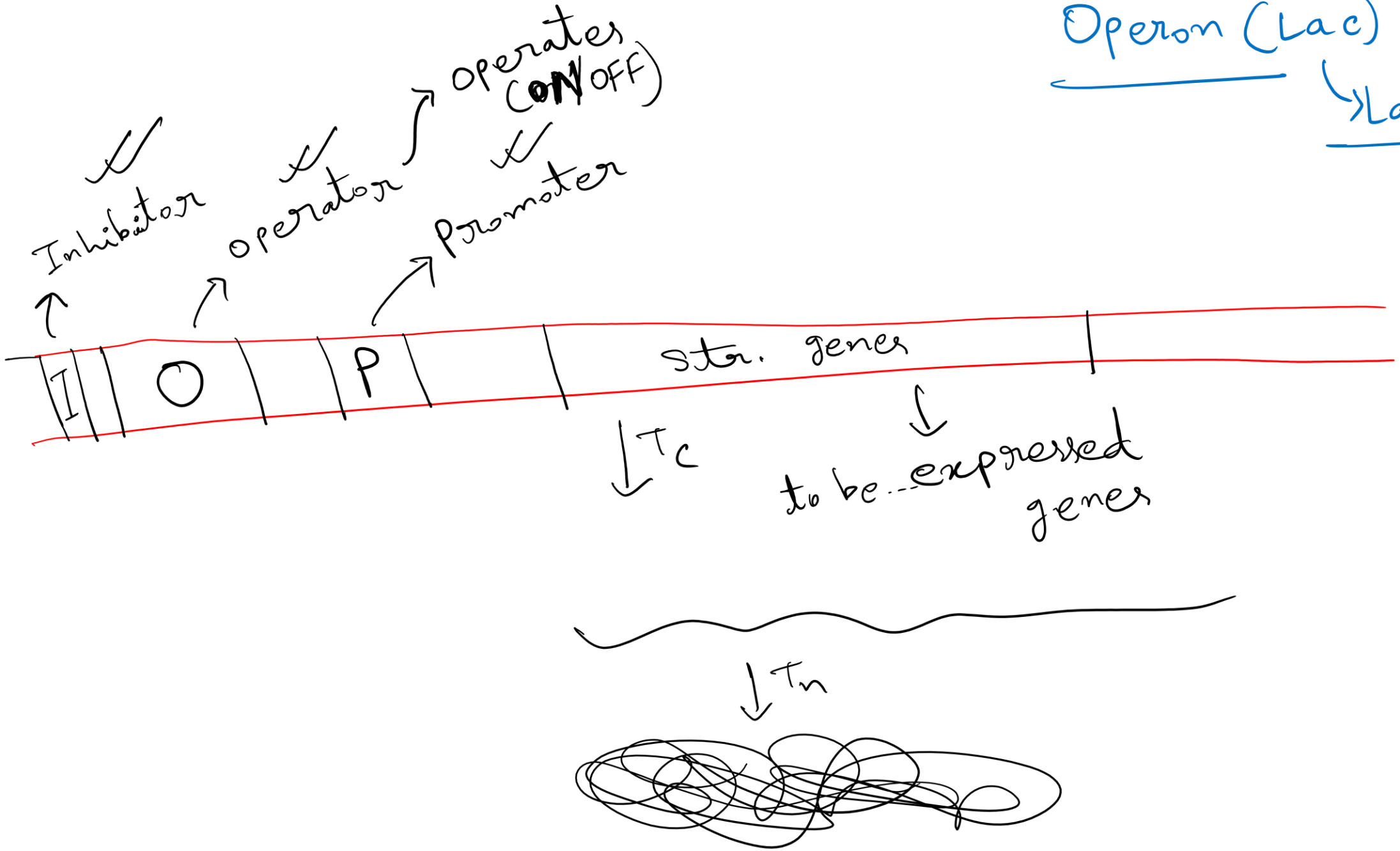
Operons → ?




Regulation
Tc X
DNA
mRNA
Tn → X
(Protein X)
Regulation
+ve
mRNA ↑↑↑
-ve
mRNA
Repressor
Supress ↓
(Tc)
Activator
↑Activates
(Tc)

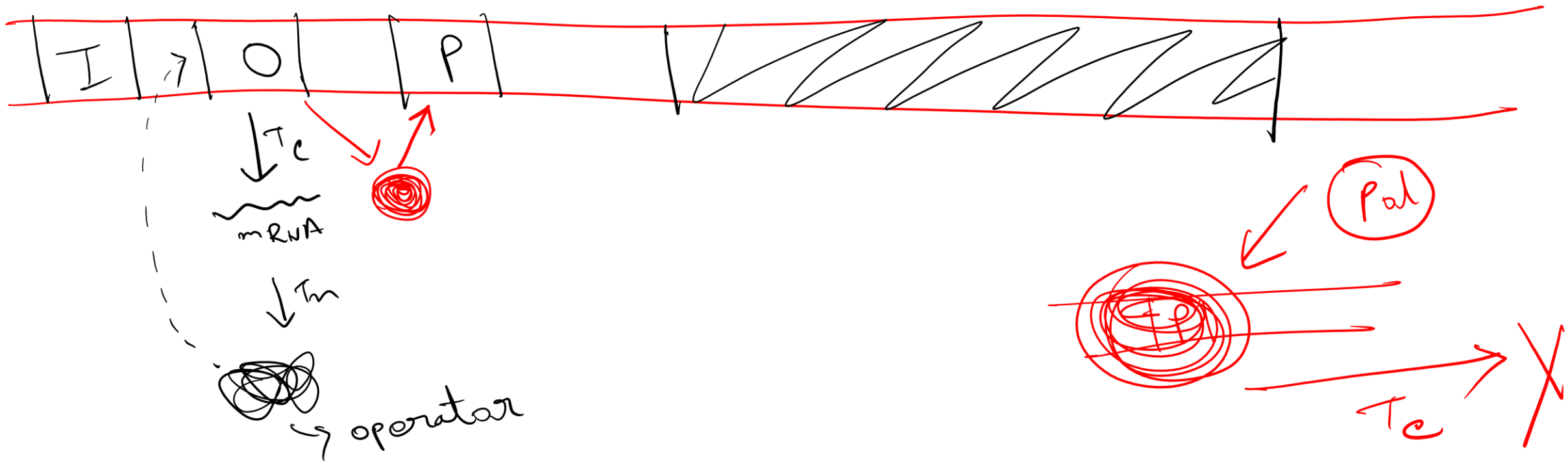
Operon (Lac)

↳ Lactase



If binds to 'P' → No. T_c (No pol. binds to 'P')
RNA

binds or not?



Gene (codon → 3 nt)

exp.

always ON

Housekeeping genes

ON/OFF regulate (Repressible Operon)

(P53)

↳ ON

function loss

cancer

Repressible Operon (R)

Initial → ON

final → OFF

Activator

Initial → ON

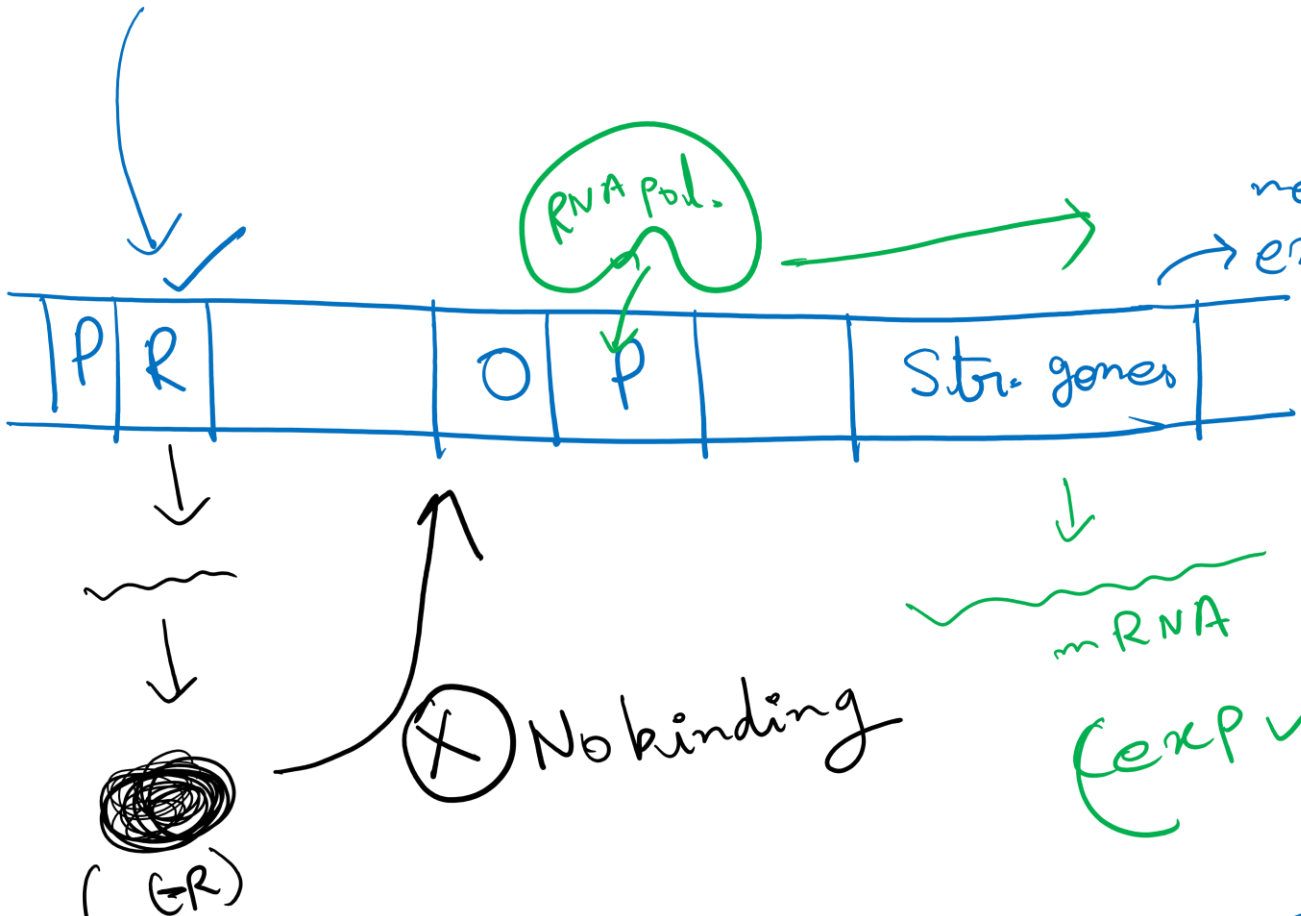
Final → OFF

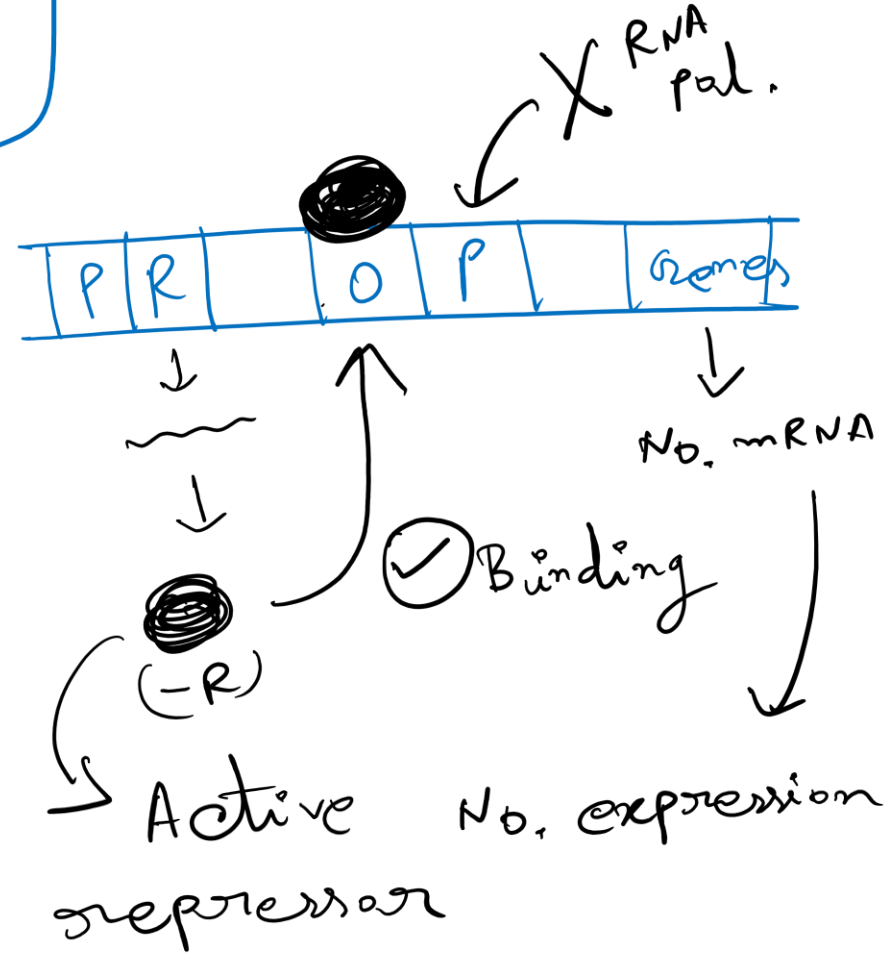
Repressor

I → OFF

F → ON

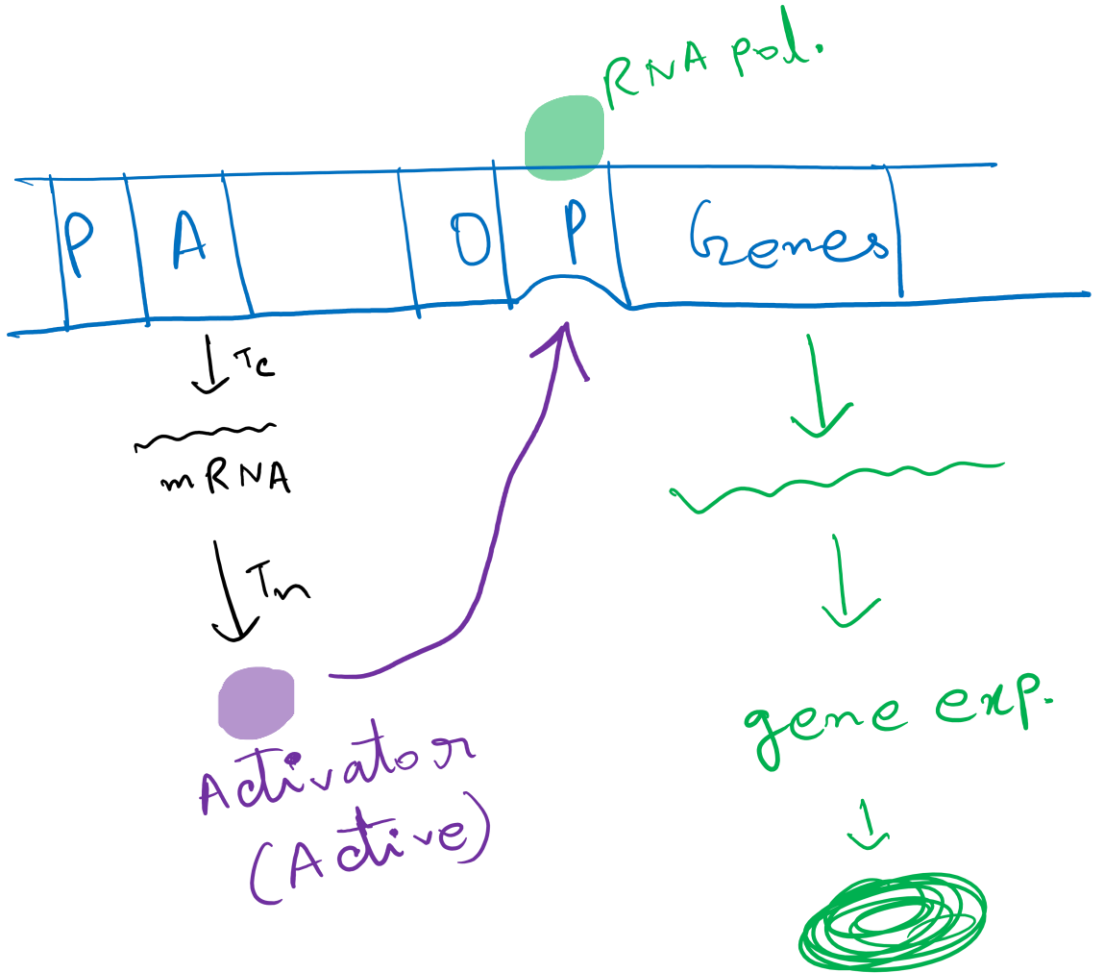
Repressor (-R)

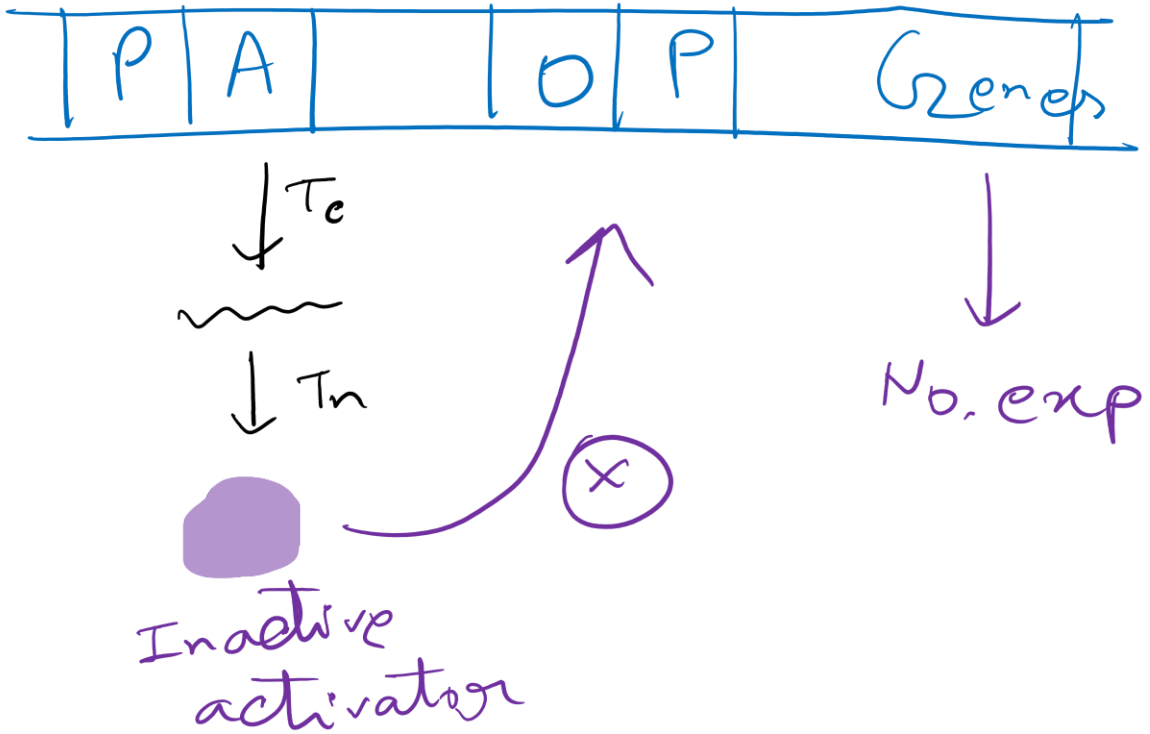

RNA Pol.
need to be exp.
P
R
O
P
Str. genes
mRNA
(exp ✓)
(-R)
✗ No binding
Inactive repressor


X RNA pol.
P
R
O
P
Genes
No. mRNA
(-R)
✓ Binding
Active repressor
No. expression


operator
Repulsion
RNA pol.
force
x
O
P

Activator (+R)


RNA pol.
P
A
O
P
Genes
Tc
mRNA
Tn
Activator
(Active)
gene exp.


P
A
O
P
Genes
Tc
Tn
No. exp
Inactive
activator

Inducible Operon

Activator

Intial → OFF

Final → ON

Repressor

I → ON

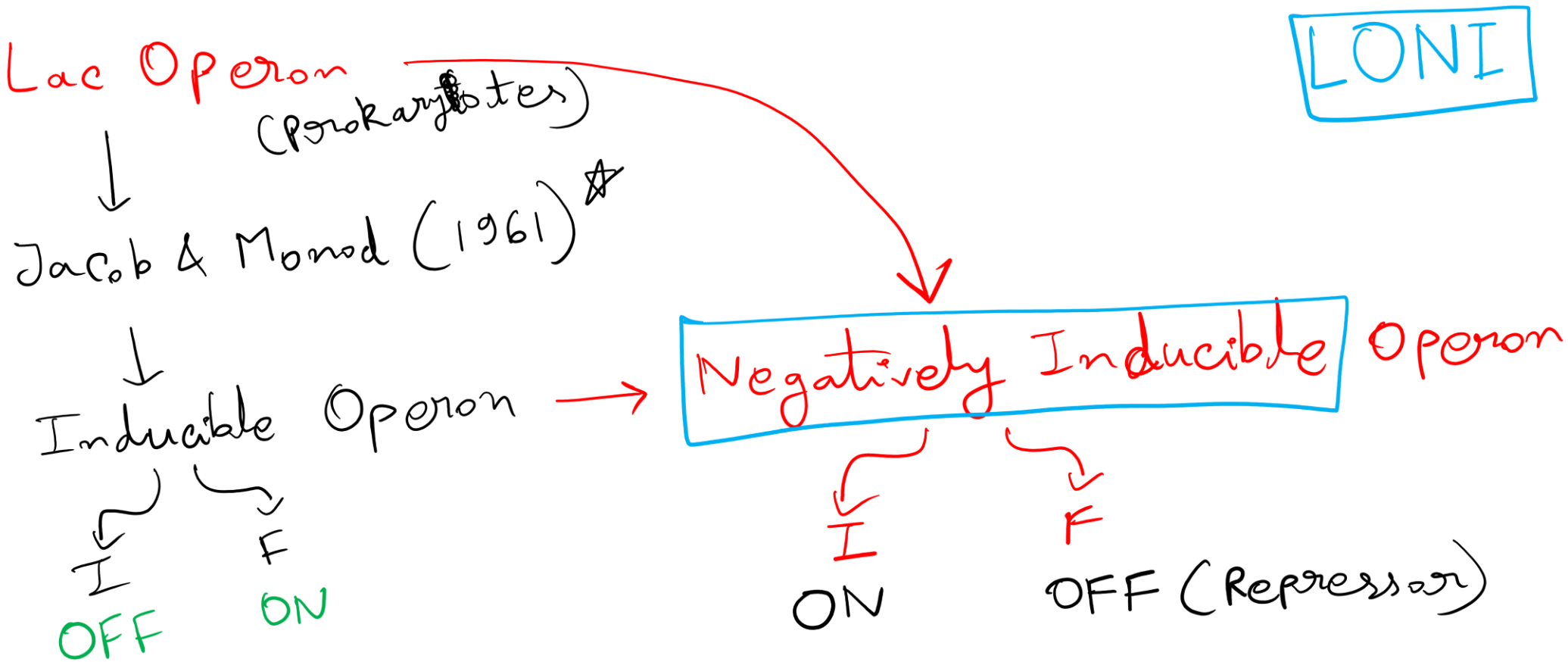
F → OFF

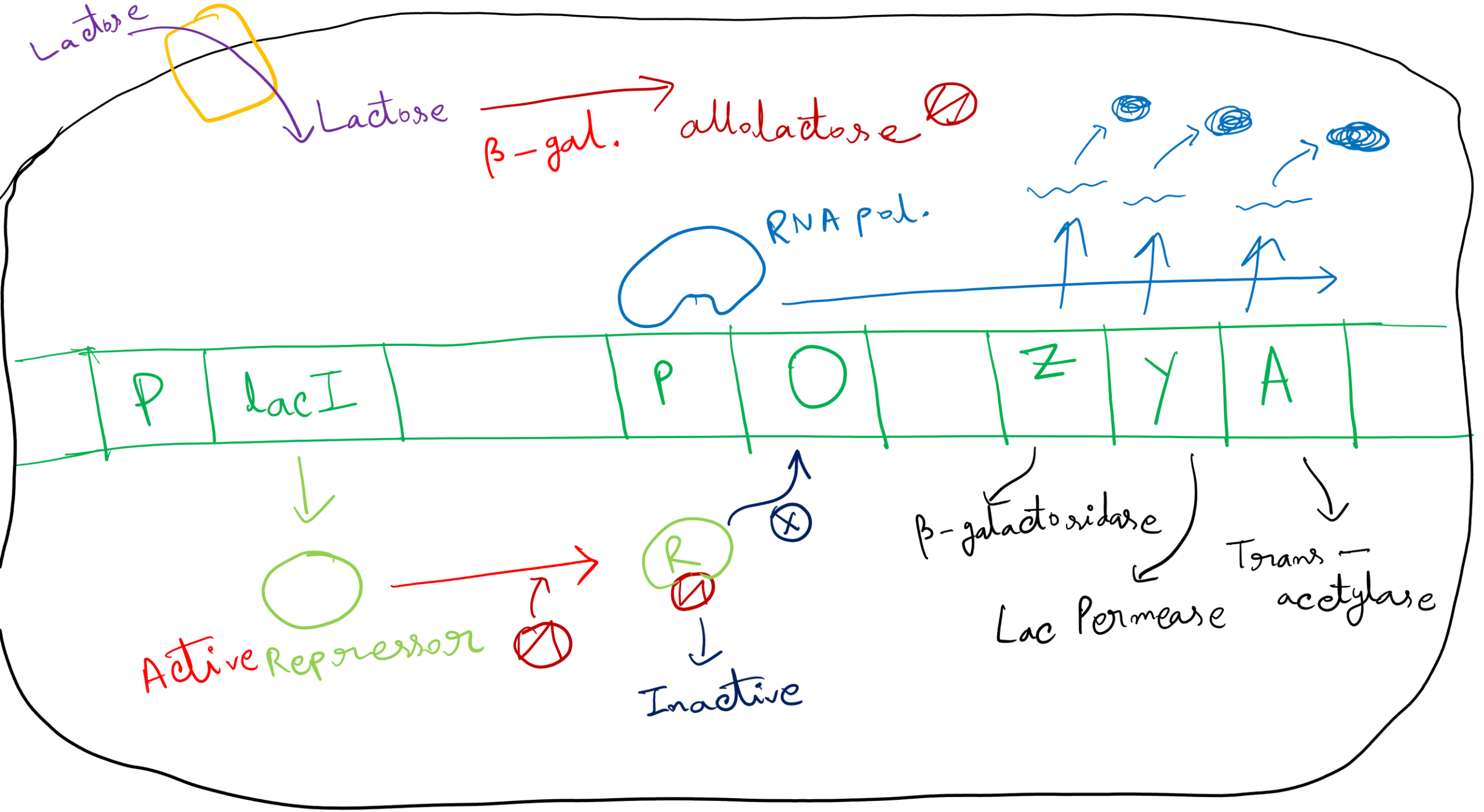
I → OFF

F → ON

Inducible Operon —ON→ mRNA ↑

Repressible n —OFF→ mRNA ↓


Lac Operon
(Prokaryotes)
Jacob & Monod (1961)
Inducible Operon
I
F
OFF
ON
LONI
Negatively Inducible Operon
I
F
ON
OFF (Repressor)

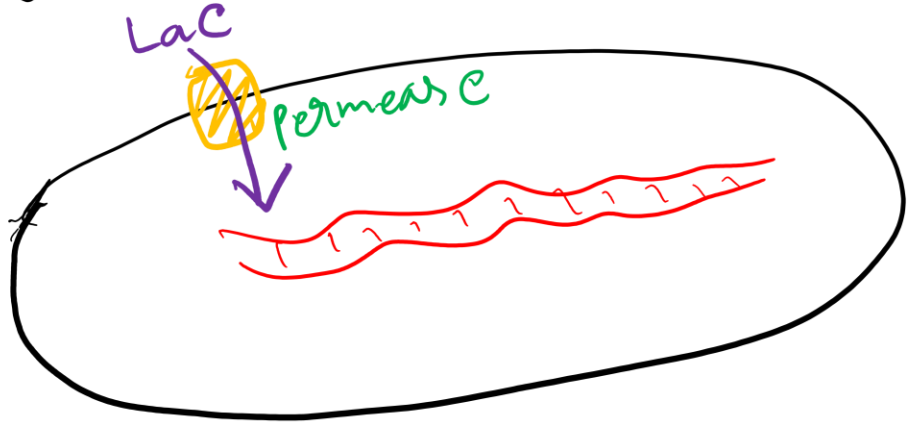

Lactose
Lactose
β-gal.
allolactose
RNA pol.
P
lacI
P
O
Z
Y
A
β-galactosidase
Lac Permease
Trans-
acetylase
Active Repressor
R
Inactive

Z —Tc→ mRNA —Tn→ β-gal. → convert lactose into allolactose

β-gal. → break lactose into gal & glu

lactose → galactose + glucose

Y —Tc→ mRNA —Tn→ Permease



A —Tc→ mRNA —Tn→ Trans-Acetylase → Transfer of acetyl groups