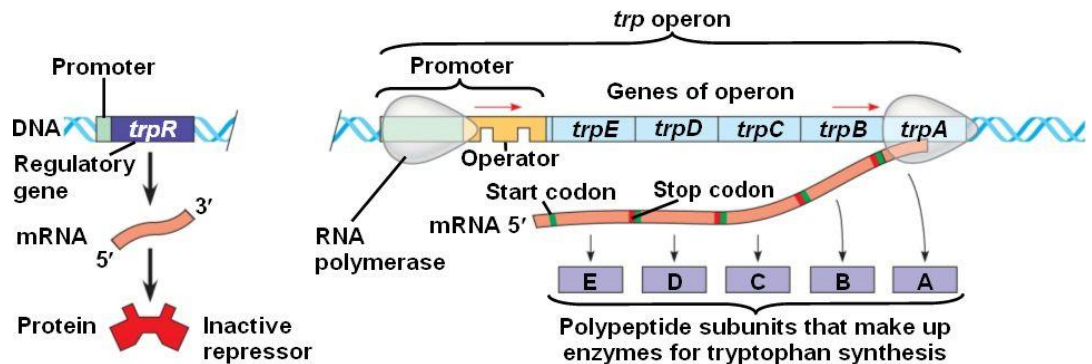
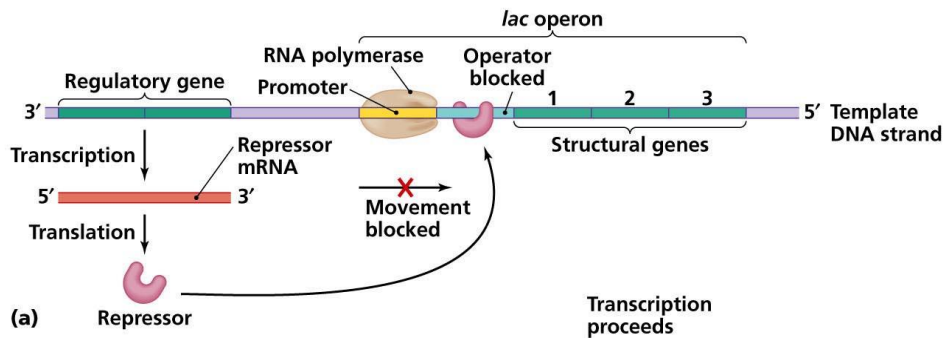


Control Mechanisms (lac & trp operons)



1. Complete the comparison of the *lac* Operon and the *trp* Operons as a means of gene regulation

	<i>lac</i> Operon	<i>trp</i> Operon
Regulates production of:	lactose breakdown	tryptophan
Number of genes and how they are controlled	3 - lactose is an inducer, it binds to repressor protein preventing its binding to operator & induces transcription of genes	5 - tryptophan is a corepressor, it binds to repressor protein activating it so it binds to operator, stopping transcription of genes
What binds to the operator & when does this occur	repressor protein - when little/no lactose is present	corepressor binds to operator when trp is present
High levels of what substance affects how this operon how?	lactose - turns operon ON	tryptophan - turns operon OFF

2. Why are genes under regulation?

To save energy, avoid over production of proteins, preserve cell/organism's resources

3. What is the function of the promoter?

binds RNA polymerase to begin transcription

4. What is the function of the operator?

bind repressor to turn OFF transcription

5. What happens if lactose levels are low? Put the following list in order (1-5)

5	RNA polymerase is blocked from transcribing the genes for the lactose metabolizing enzymes
4	When RNA polymerase binds to the promoter, it cannot get past the LacI repressor protein
1	The enzymes β -galactosidase, β -galactoside permease, and transacetylase are not required by the cell due to low levels of lactose
2	Lactose does not bind to the repressor protein, LacI
3	LacI, a repressor protein, is bound to the operator, which follows the promoter

6. What happens if tryptophan levels are high? Put the following list in order (1-4)

3	The trp repressor-tryptophan complex can now bind to the operator of the trp operon
1	Tryptophan does not need to be produced by the trp operon
2	Tryptophan will bind to the repressor protein, changing its conformation
4	RNA polymerase is blocked from transcribing the genes needed to synthesize tryptophan

7. The gene that regulates the production of the LacI protein is found further upstream of the *lac* operon. Explain the potential ramifications to the functioning of the *lac* operon and the production of its products under the following conditions:

- A mutation is found in the LacI gene **repressor protein not formed properly**
- A mutation is found in the second gene of the *lac* operon **enzymes needed to breakdown lactose not working properly**
- The RNA polymerase has difficulty binding to the promoter **limited / no transcription of genes**

8. A researcher was trying to determine whether two molecules (A and B) were corepressors or inducers in their respective operon systems. Data was collected regarding the levels of protein and the amount of gene transcription for the genes in their respective operons. The data is shown below.

	Level of protein	Transcription of gene 1	Transcription of gene 2
Molecule A	High	Low	Low
	Low	High	High
Molecule B	High	High	High
	low	low	Low

- B = inducer, when high levels there is high transcription** **A = corepressor, when high levels there is low transcription**
- Determine whether molecule A and molecule B are inducers or corepressors. Justify your answers.
 - Identify which system resembles the *lac* operon system and which resembles the *trp* operons system
B - lac operon, A - Trp operon
 - State a generality about operon systems involving an inducer and about operon systems involving a corepressor.
Inducers increase transcription
Corepressors decrease transcription