

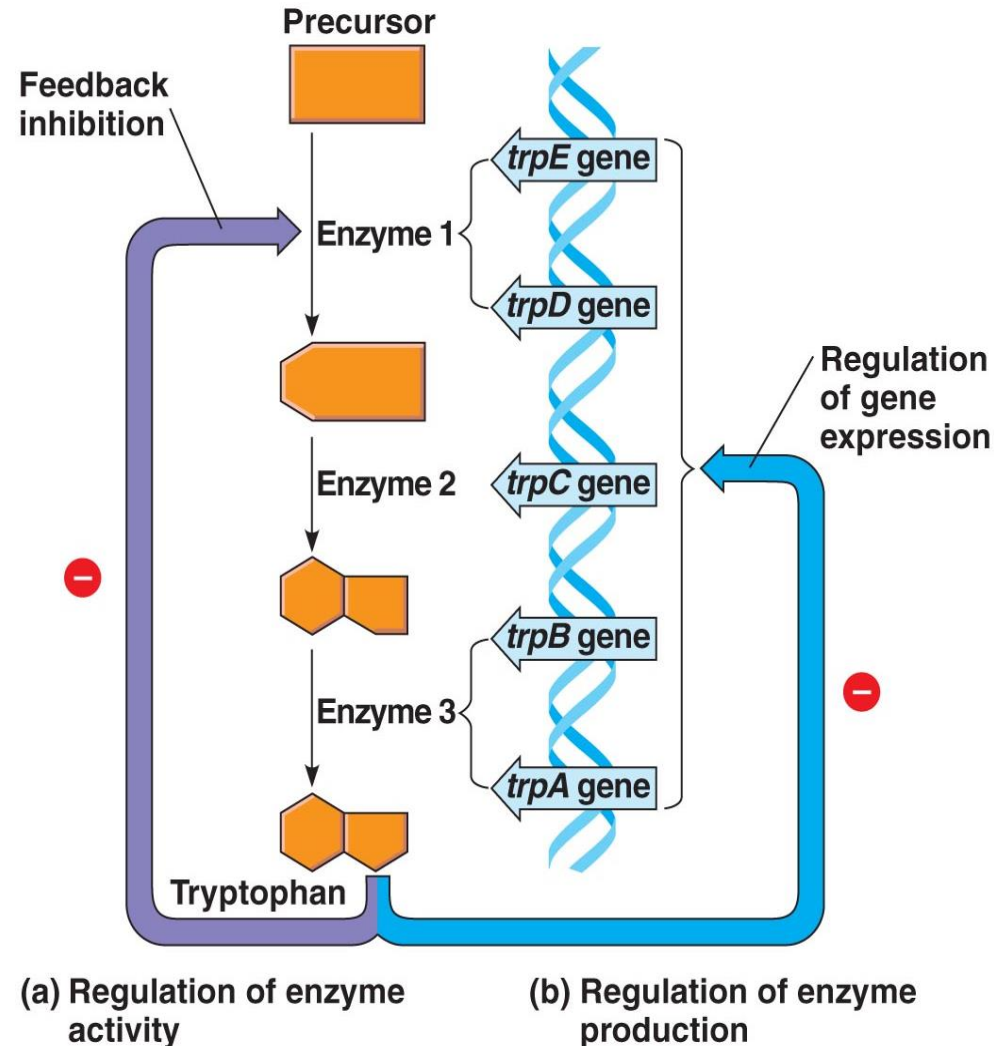
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Control of Prokaryotic Gene Expression

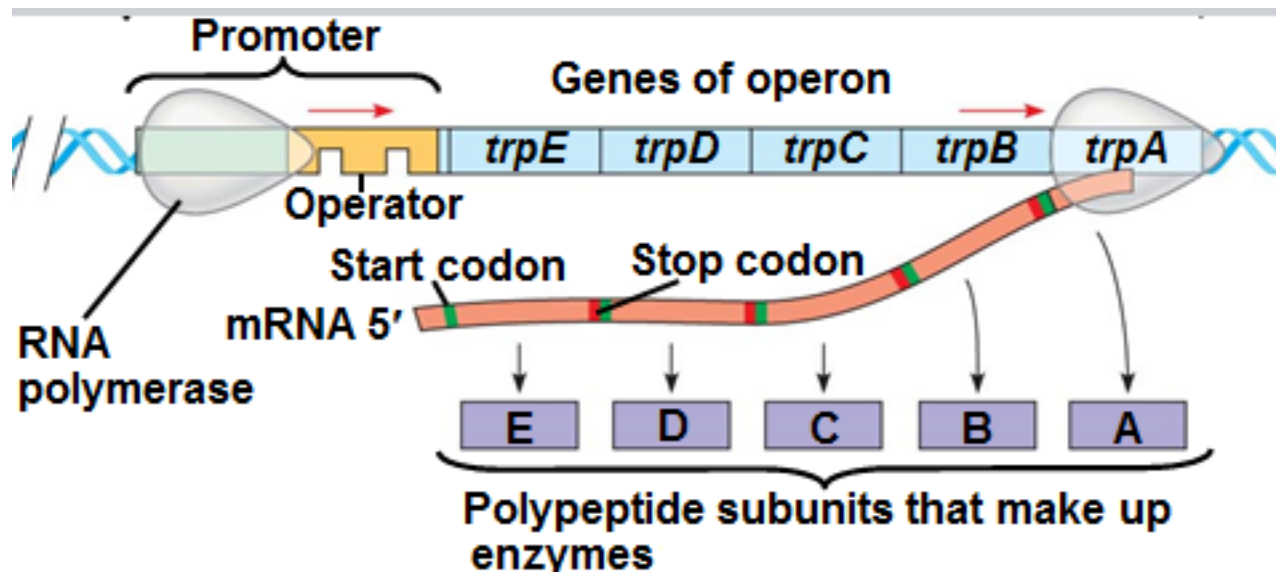
Presented by: Namrata A. Mohod

Regulating Biochemical Pathway for Tryptophan Synthesis.

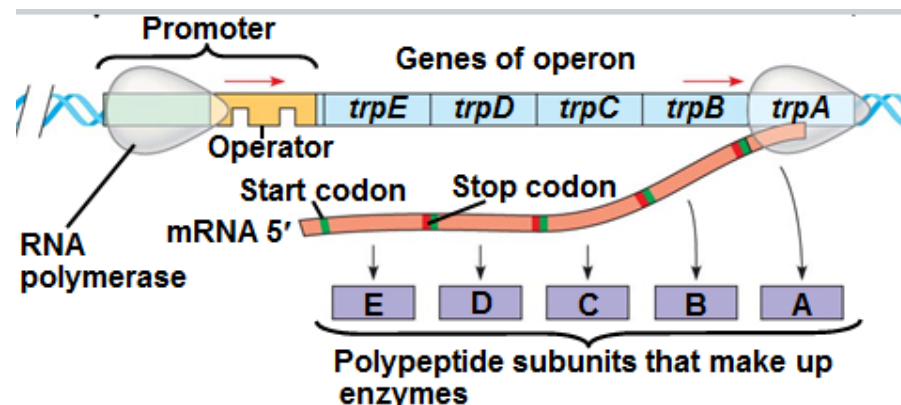
1. Produce something that will interfere with the function of the enzyme in the pathway.
2. Produce a gene regulator that can inhibit the transcription of one biochemical pathway enzymes.



1. Eukaryotic cells have many more genes (i.e. 23,000 in human cells) in their genomes than prokaryotic cells (i.e. average 3000).
2. Physically there are more obstacles to regulate eukaryotic genes because there is so much more DNA to manage. For example, eukaryotic chromatin is wrapped around histone proteins.
3. In addition there are other nonhistone proteins that are used in eukaryotic gene expression that are not used in prokaryotic gene expression.



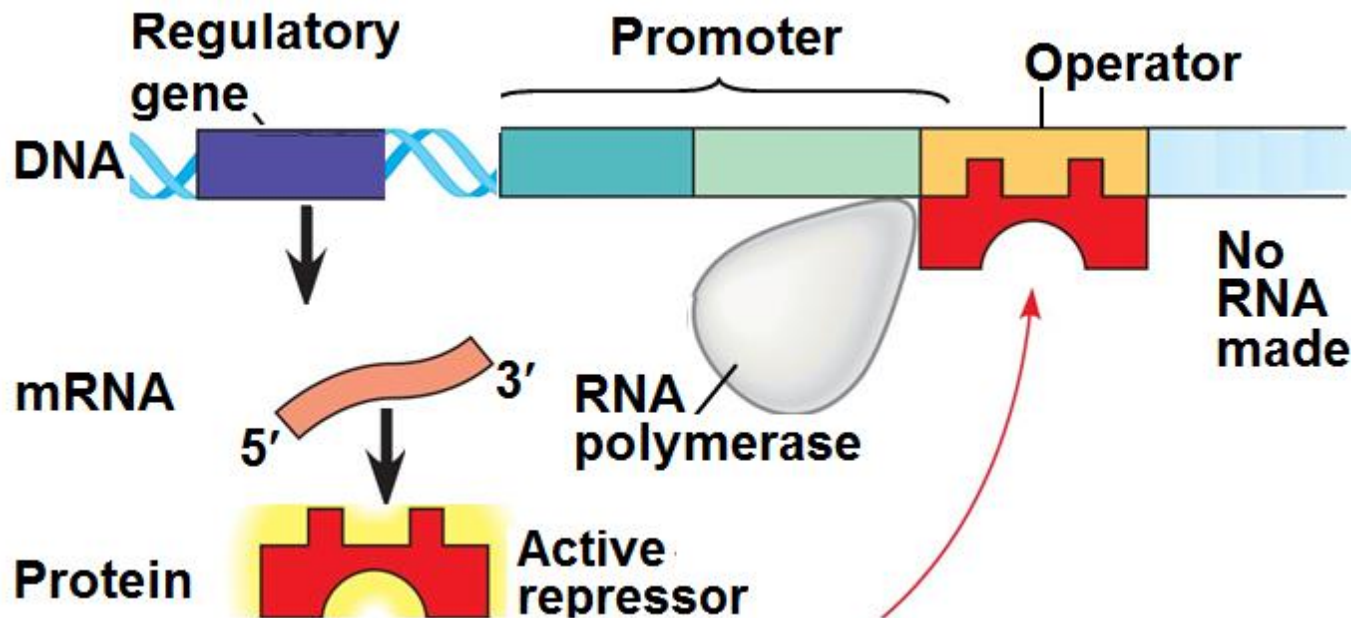
- Operon- A group of prokaryotic genes with a related function that are often grouped and transcribed together. In addition, the operon has only one promoter region for the entire operon.



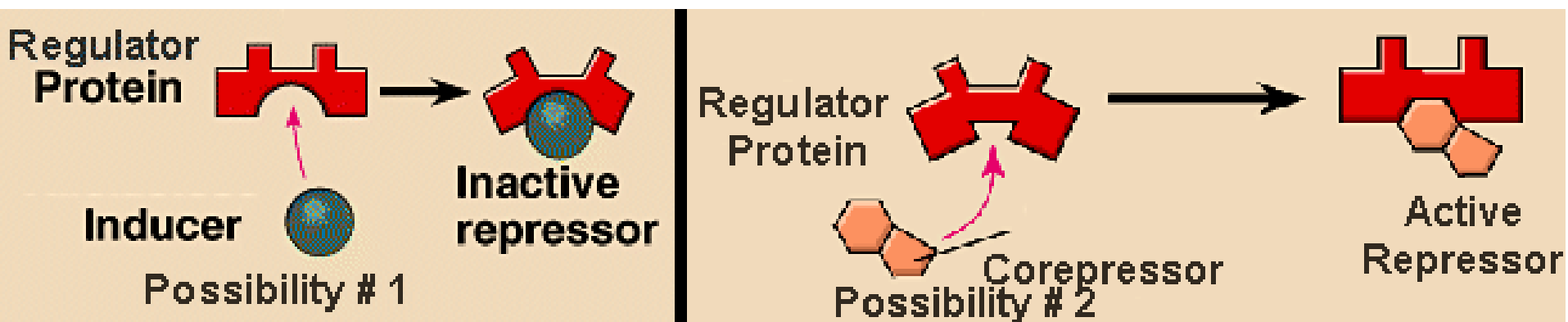
An operon is composed of the following:

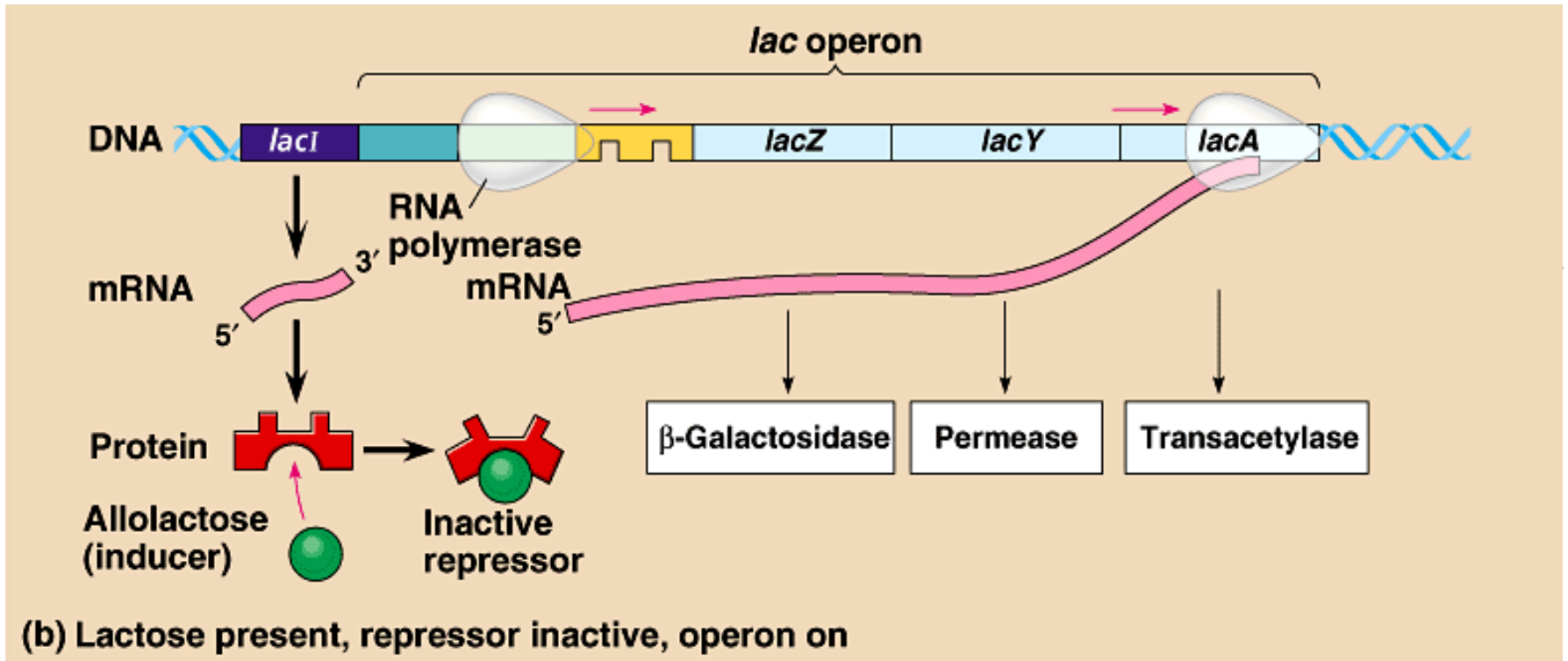
- Structural genes- genes that are related and used in a biochemical pathway.
- Promoter-The nucleotide sequence that can bind with RNA polymerase to start transcription. This sequence also contains the operator region.
- Operator-The nucleotide sequence that can bind with repressor protein to inhibit transcription.

- Regulator gene- This gene produces a protein called a repressor that can inhibit the transcription of an operon by attaching to the operator.



- Repressors have allosteric properties. Modulators can bind to the repressor at an allosteric site changing the conformation of the repressor, thereby activating or deactivating the repressor. Usually the modulator is a product of the biochemical pathway.

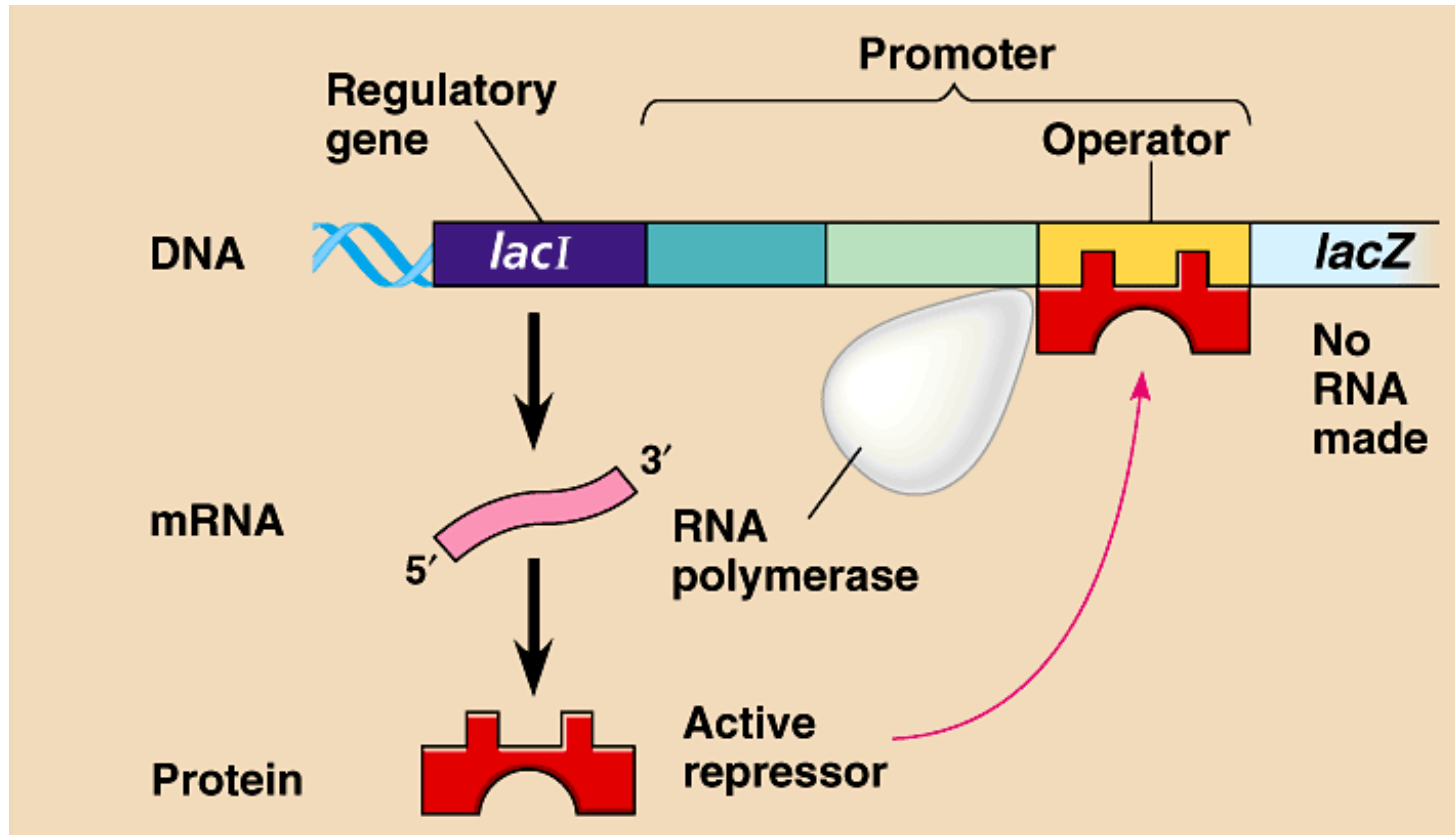




- The *lac* operon is an example of an inducible operon.

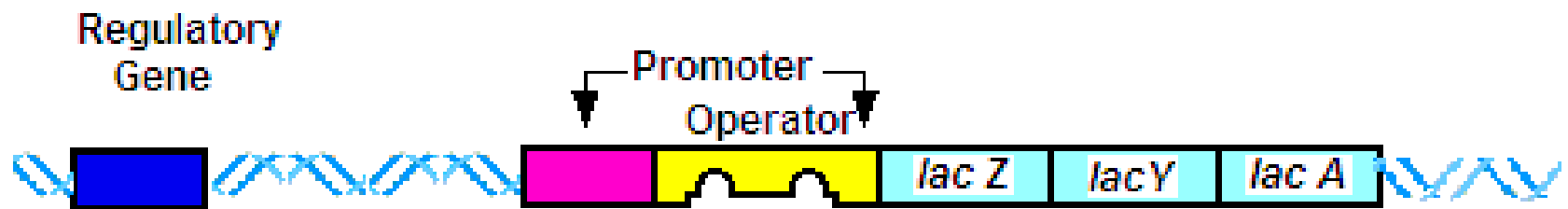
The *lac* operon with lactose present

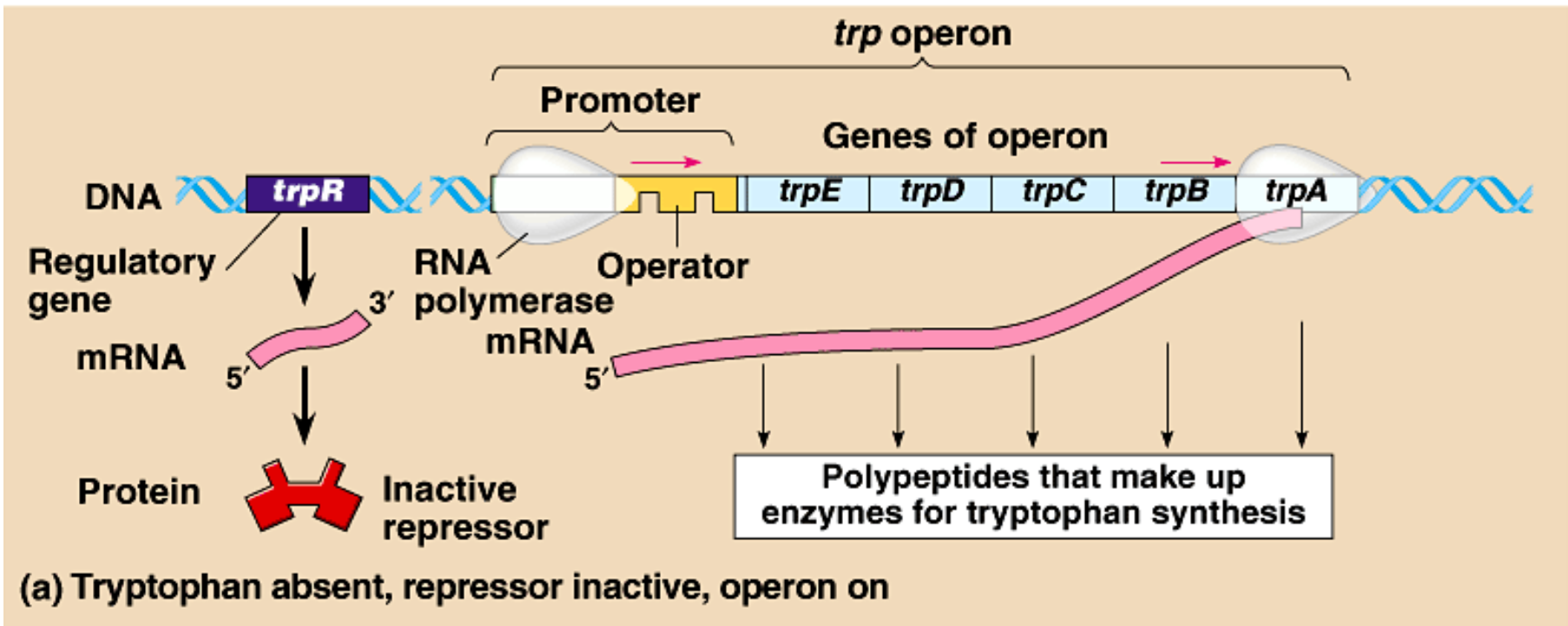




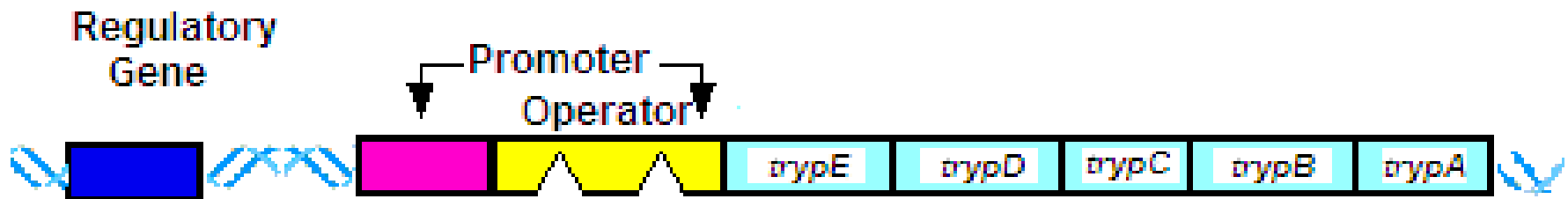
- If no lactose or allolactose is present, the repressor protein is active, binding to the operator site. This prohibits the RNA polymerase from transcribing the operon.

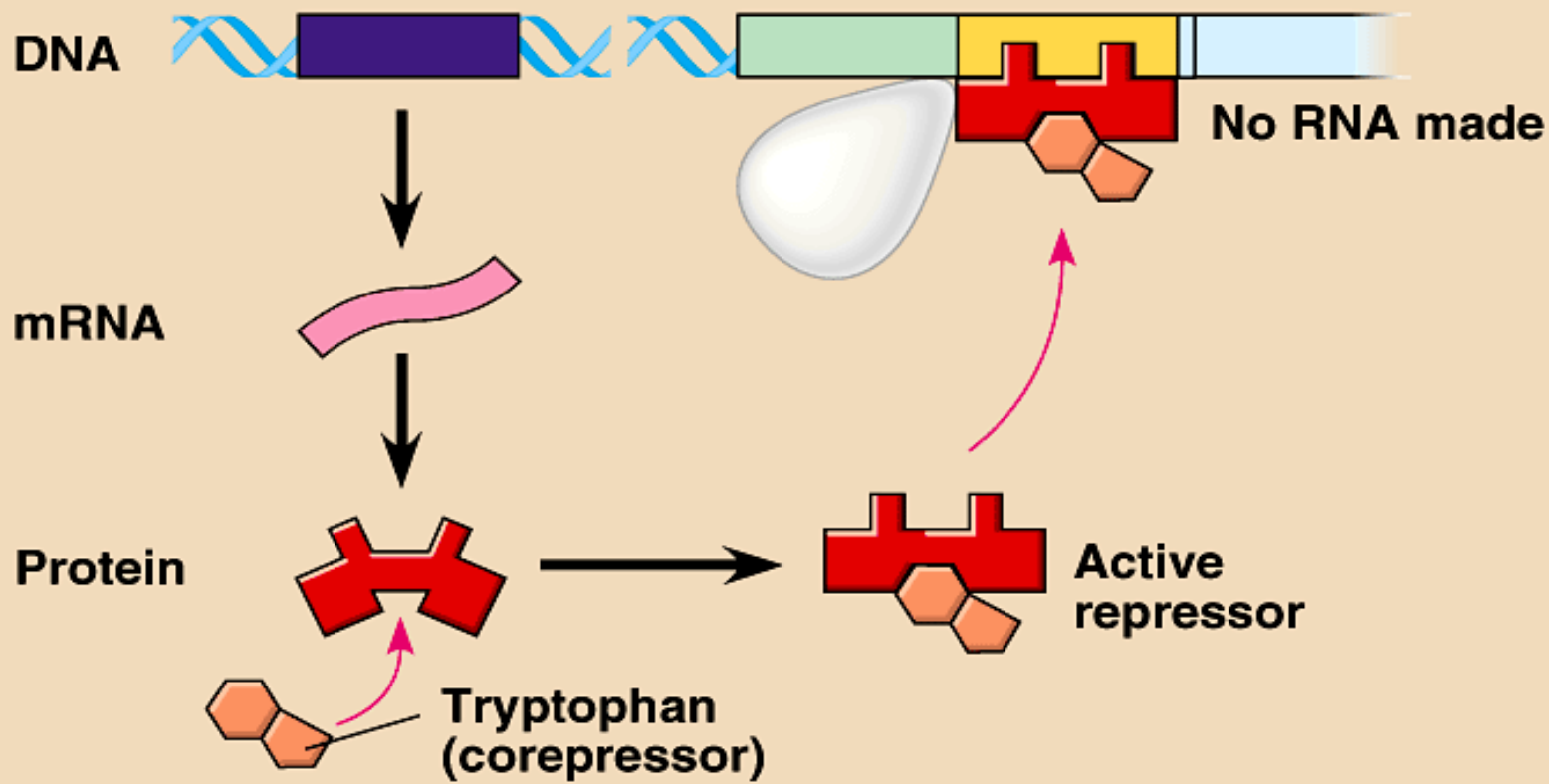
The *lac* operon with no lactose present





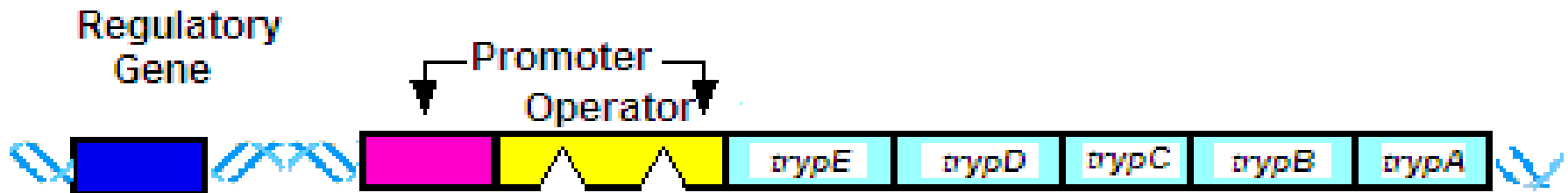
The *trp* operon with no tryptophan present



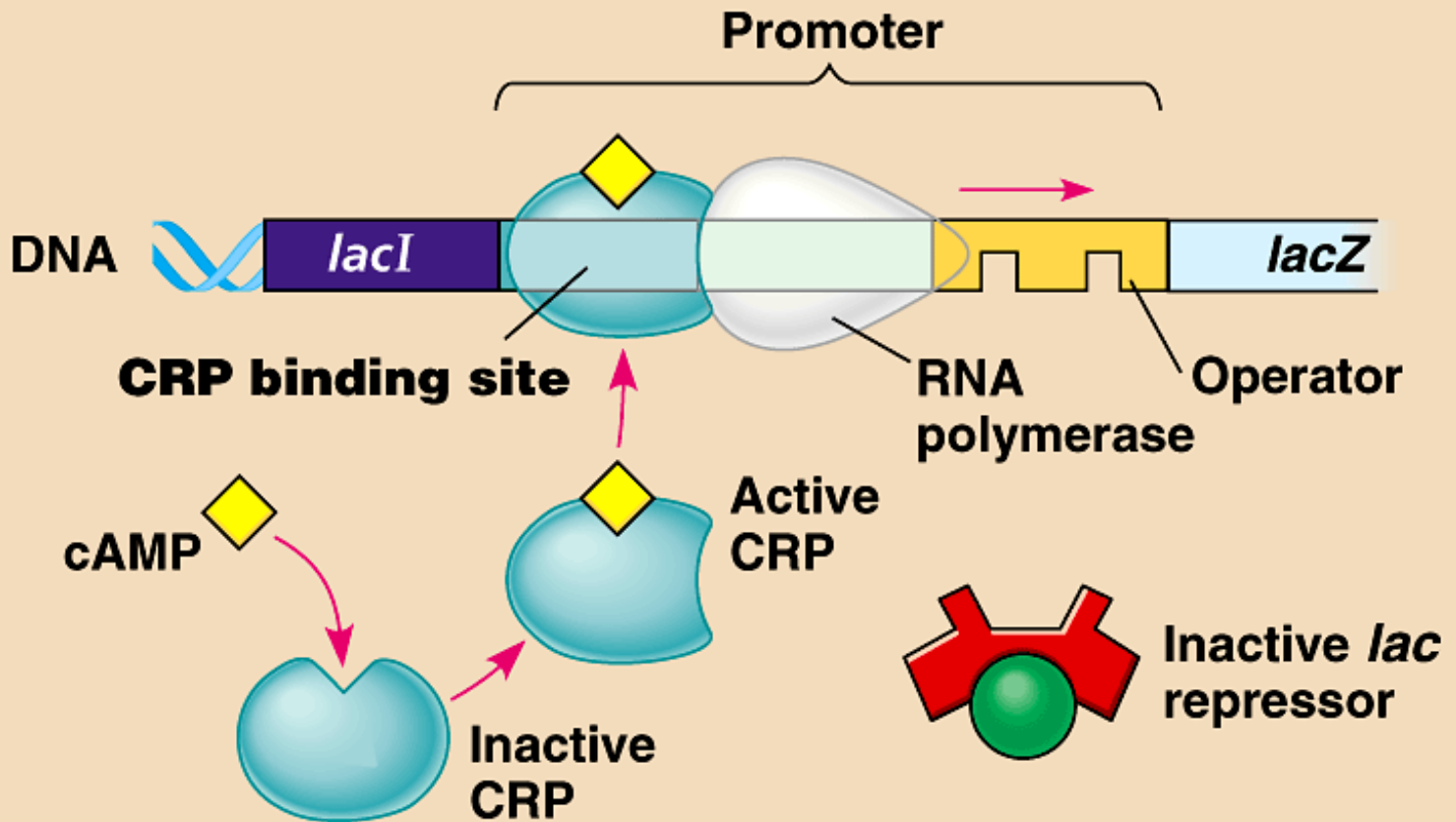


(b) Tryptophan present, repressor active, operon off

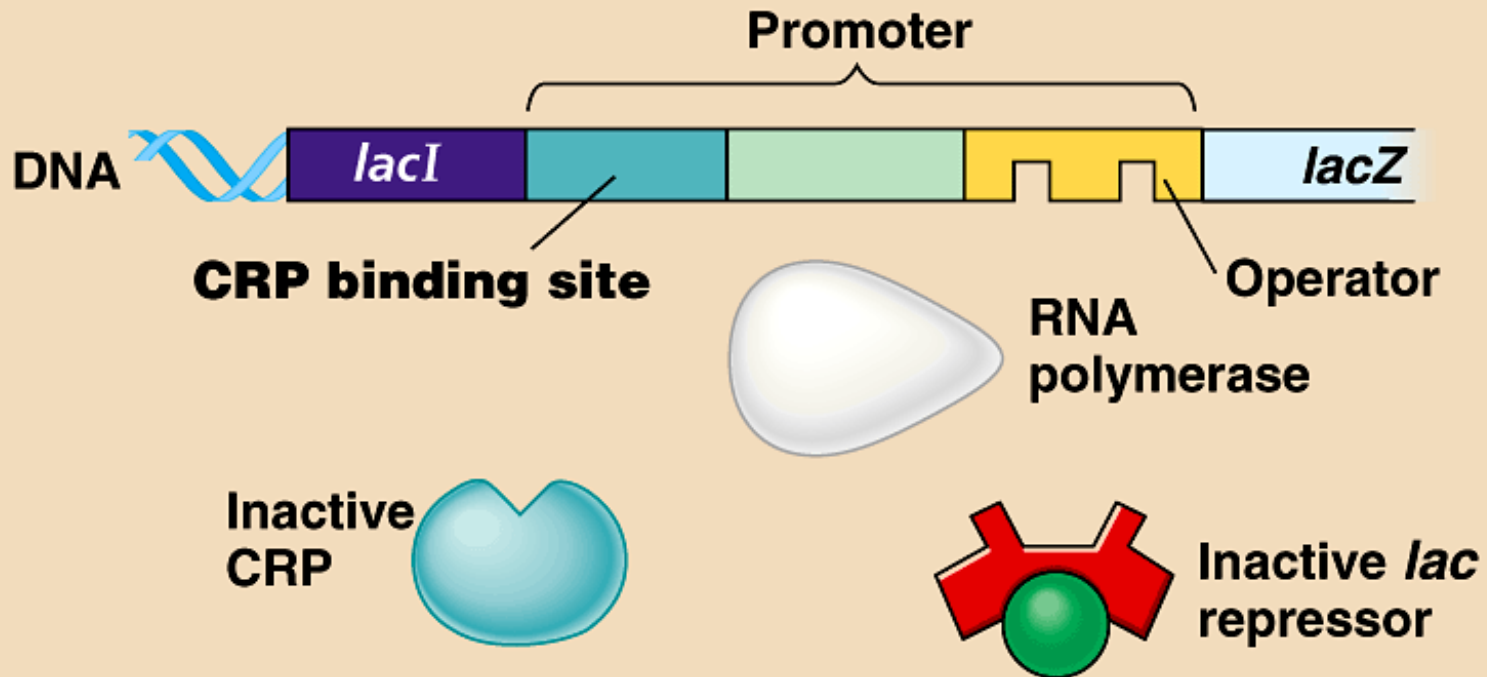
The *trp* operon with tryptophan present



- The *lac* and *trp* operons are example of negative gene regulation as the repressor protein inhibits transcription of the operons.



(a) Lactose present, glucose scarce (cAMP level high): abundant *lac* mRNA synthesized



(b) Lactose present, glucose present (cAMP level low): little *lac* mRNA synthesized

- Lactose present, glucose present (cAMP level low), little *lac* mRNA synthesized

THANK YOU