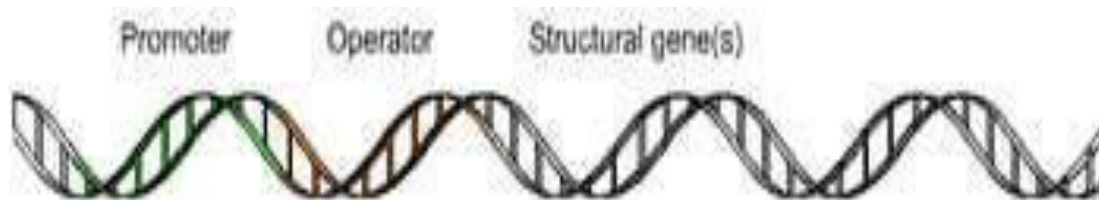




FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY

OPERON

- In genetics, an operon is a functioning unit of genomic DNA containing a cluster of genes under the control of a single promoter.
- Operons occur primarily in prokaryotes but also in some eukaryotes.
- Operons are related to regulons, stimulons and modulons.
- An operon is made up of several structural genes arranged under a common promoter and regulated by a common operator.
- It is defined as a set of adjacent structural genes, plus the adjacent regulatory signals that affect transcription of the structural genes.



General Structure of an Operon

An operon is made up of 4 basic DNA components:

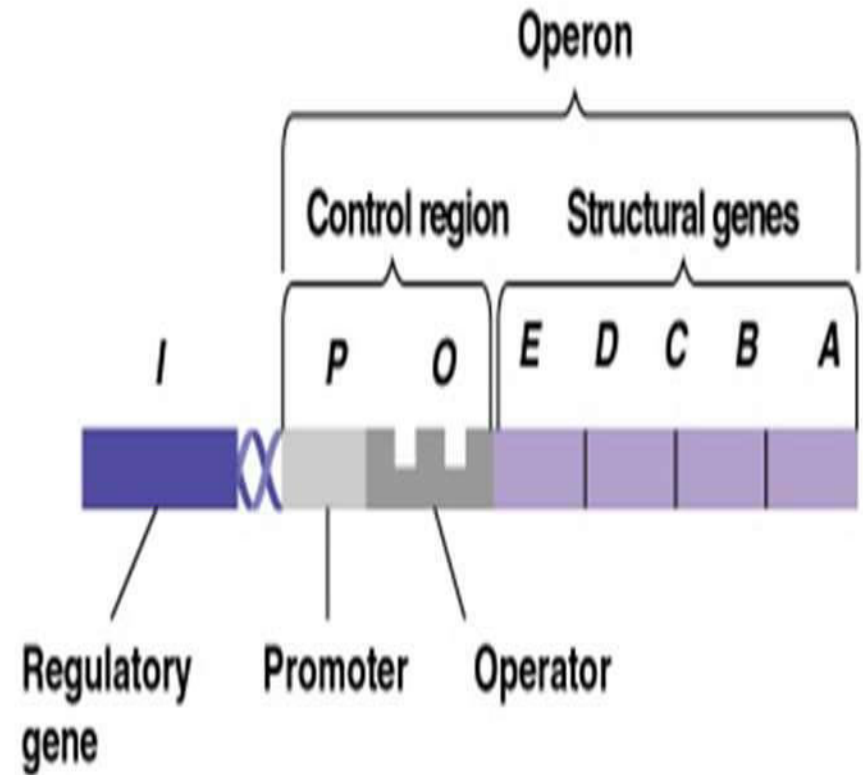
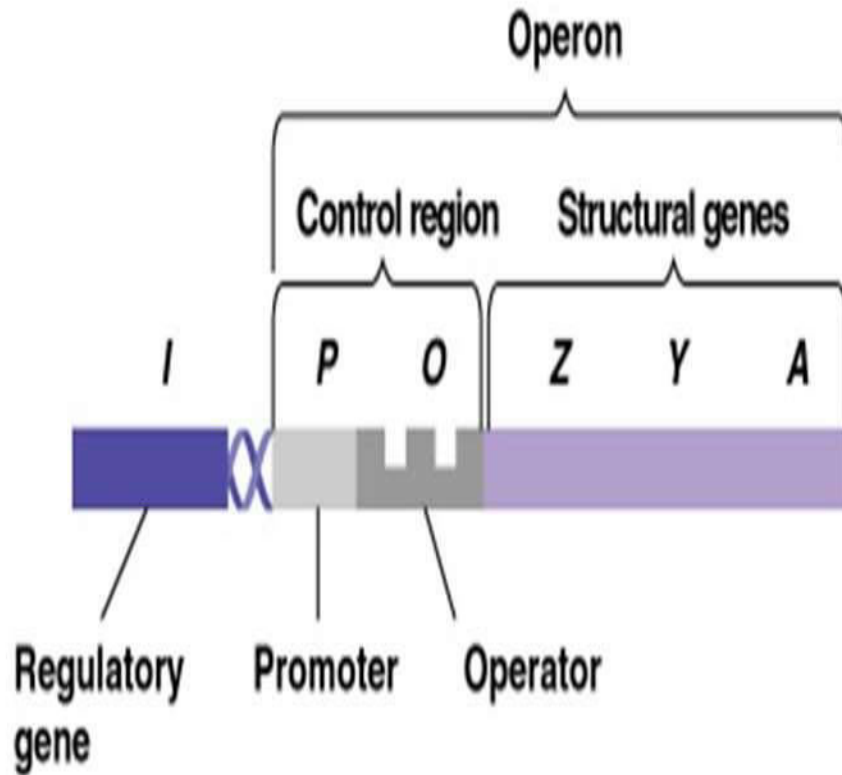
Promoter – a nucleotide sequence that enables a gene to be transcribed. The promoter is recognized by RNA polymerase, which then initiates transcription.

Regulator – These genes control the operator gene in cooperation with certain compounds called inducers and corepressors present in the cytoplasm.

Operator – a segment of DNA that a repressor binds to. It is classically defined in the lac operon as a segment between the promoter and the genes of the operon.

Structural genes – the genes that are co-regulated by the operon.





1 Structure of the operon. The operon consists of the promoter (*P*), and operator (*O*) sites, and structural genes which code for the protein. The operon is regulated by the product of the regulatory gene (*I*).

Operator to prevent transcription

- In negative inducible operons, a regulatory repressor protein is normally bound to the operator, which prevents the transcription of the genes on the operon .
- If an inducer molecule is present, it binds to the repressor and changes its conformation so that it is unable to bind to the operator. This allows for expression of the operon.
- The lac operon is a negatively controlled inducible operon, where the inducer molecule is allolactose.
- In negative repressible operons, transcription of the operon normally takes place.
- The trp operon, involved in the synthesis of tryptophan (which itself acts as the corepressor), is a negatively controlled repressible operon.

■ **With positive control, an activator protein stimulates transcription by binding to DNA.**

In positive inducible operons, activator proteins are normally unable to bind to the pertinent DNA.

■ **When an inducer is bound by the activator protein, it undergoes a change in conformation so that it can bind to the DNA and activate transcription.**

In positive repressible operons, the activator proteins are normally bound to the pertinent DNA segment.

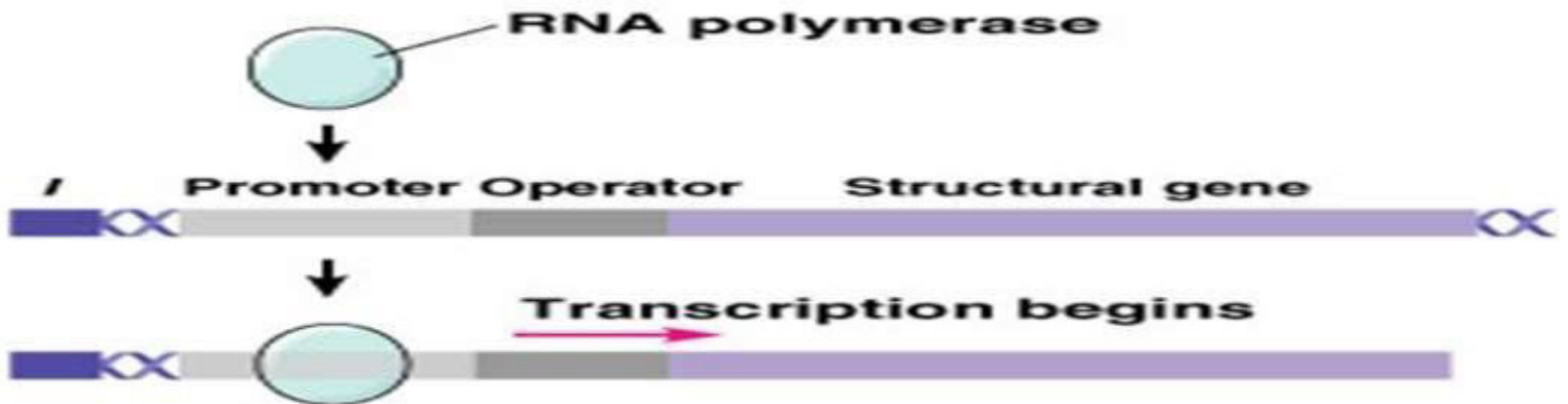
However, when an inhibitor is bound by the activator, it is prevented from binding the DNA.

This stops activation and transcription of the system.

Classification:

- 1- Catabolic (inducible) such as Lac OPERON**
- 2- Anabolic (repressible) such as ara OPERON**
- 3- Other types**

Without repressor:



With repressor:

