

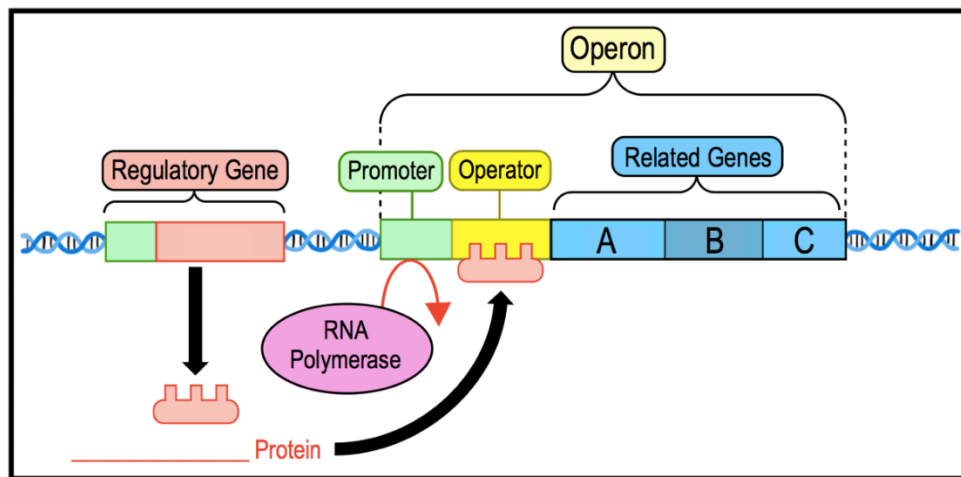
CONCEPT: PROKARYOTIC GENE REGULATION VIA OPERONS

- *Prokaryotes* must survive in environments that constantly _____ in the availability of nutrients.
 - Requires them to rapidly change their metabolic pathways by _____ expression of certain genes.
 - *Prokaryotes* commonly control expression of genes using _____.

Structure of an Operon

- _____: a set/group of prokaryotic genes of related function controlled by a single **promoter**.
- Transcription of the *operon* is regulated by the _____: region of DNA where **regulatory proteins** bind.
 - **Regulatory protein**: binds to the *operator* & _____ RNA polymerase binding to the promoter.
 - **Repressor**: regulatory protein that _____ RNA polymerase binding (*preventing* transcription).
 - **Activator**: regulatory protein that _____ RNA polymerase binding (*stimulating* transcription).

EXAMPLE: Structure of an Operon & Repressor Protein Binding.



PRACTICE: Altering patterns of gene expression in prokaryotes would likely increase a prokaryote's survival by _____.

- Organizing gene expression, so that genes are expressed in a given order.
- Allowing each gene to be expressed an equal number of times.
- Allowing a prokaryote to adjust to changes in environmental conditions.
- Allowing environmental changes to alter a prokaryote's genome.

PRACTICE: Which of the following is true about operons?

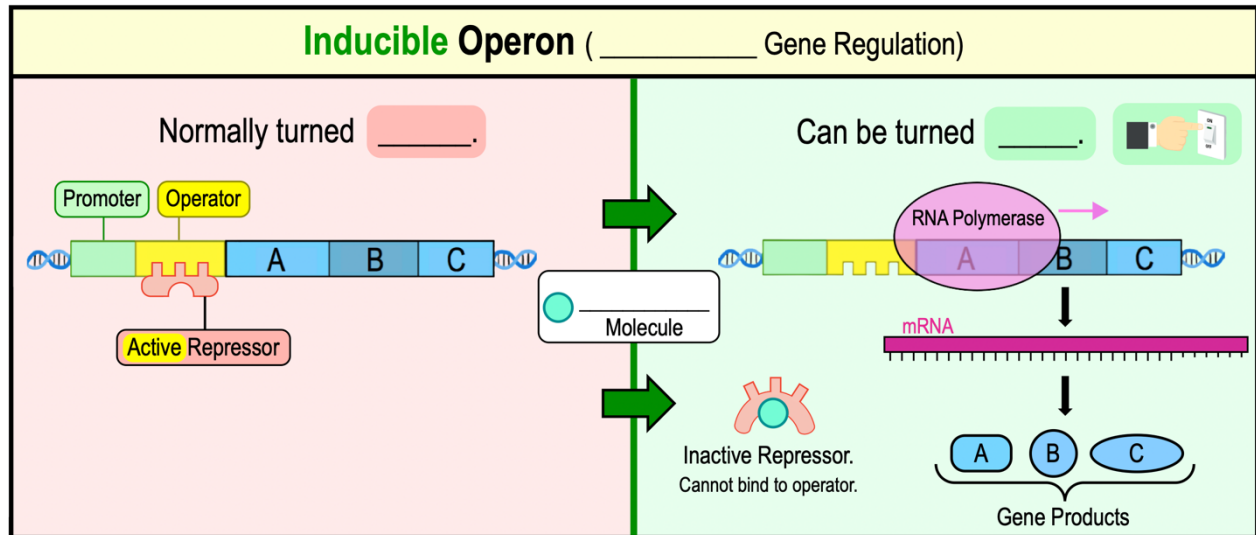
- They allow the organism the opportunity to simultaneously regulate transcription of multiple genes.
- They allow the organism the opportunity to regulate transcription of a single gene.
- They allow many genes to be expressed at the same time, even those unrelated in function.
- They significantly increase the rate of DNA replication, thereby make transcription more efficient.

CONCEPT: PROKARYOTIC GENE REGULATION VIA OPERONS

Inducible Operons

- _____ **Operon**: normally turned "_____" but can be turned "_____" (*induced*) in presence of **inducer**.
 - **Active repressor protein** represses transcription but can be inactivated by the _____ molecule.
 - In other words: the inducer inactivates the repressor protein, so transcription is turned _____.

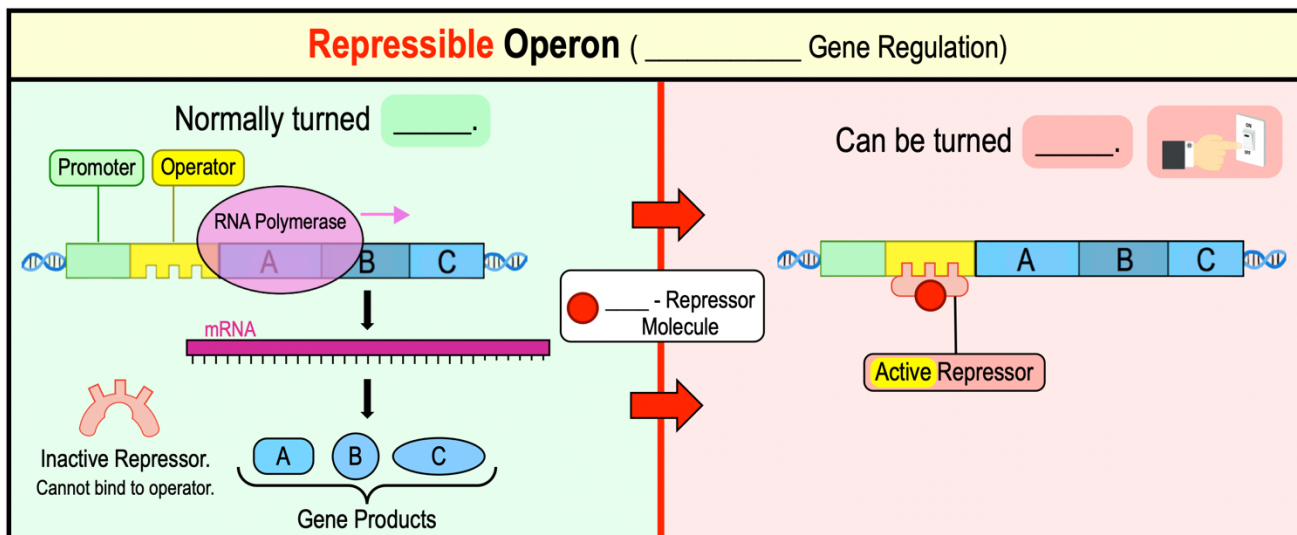
EXAMPLE: An inducible operon is turned on in the presence of an inducer molecule.



Repressible Operons

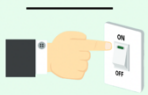
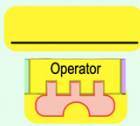
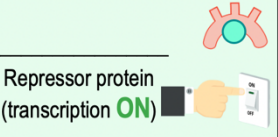
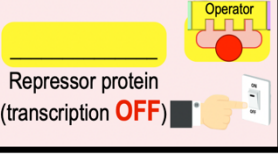
- _____ **Operon**: normally turned "_____" but can be turned "_____" (*repressed*) by **active repressor protein**.
 - **Inactive Repressor protein** can _____ repress transcription without a **co-repressor**.
 - _____-**repressor**: small molecule that binds to the repressor forming an **active repressor protein**.
 - In other words, the **co-repressor** activates the **repressor protein**, so transcription is turned _____.

EXAMPLE: A repressible operon is turned off in the presence of a co-repressor molecule.



CONCEPT: PROKARYOTIC GENE REGULATION VIA OPERONS

Review of Inducible vs. Repressible Operons

Type:	Normally turned:	Can be turned:	Repressor protein normally:	Regulatory molecule:	Effect of regulatory molecule:	Example:
Inducible Operon					 Repressor protein (transcription ON)	<i>lac</i> operon
Repressible Operon					 Repressor protein (transcription OFF)	<i>trp</i> operon

PRACTICE: Which of the following molecules is a protein that stops the transcription of a gene?

- a) Operon.
- b) Inducer.
- c) Promoter.
- d) Repressor.

PRACTICE: When this is present in the cell, it binds to the repressor and the repressor can no longer bind to the operator:

- a) Operon.
- b) Inducer.
- c) Promoter.
- d) Repressor.
- e) Corepressor.

PRACTICE: Which of the following statements is FALSE?

- a) An inducible operon is turned on by the presence of an inducer molecule.
- b) An inactive repressor protein requires binding of a corepressor molecule to become active.
- c) A repressible operon is turned on when the repressor protein is not bound to the corepressor molecule.
- d) An active repressor protein is inactivated by the binding of an activator molecule.