

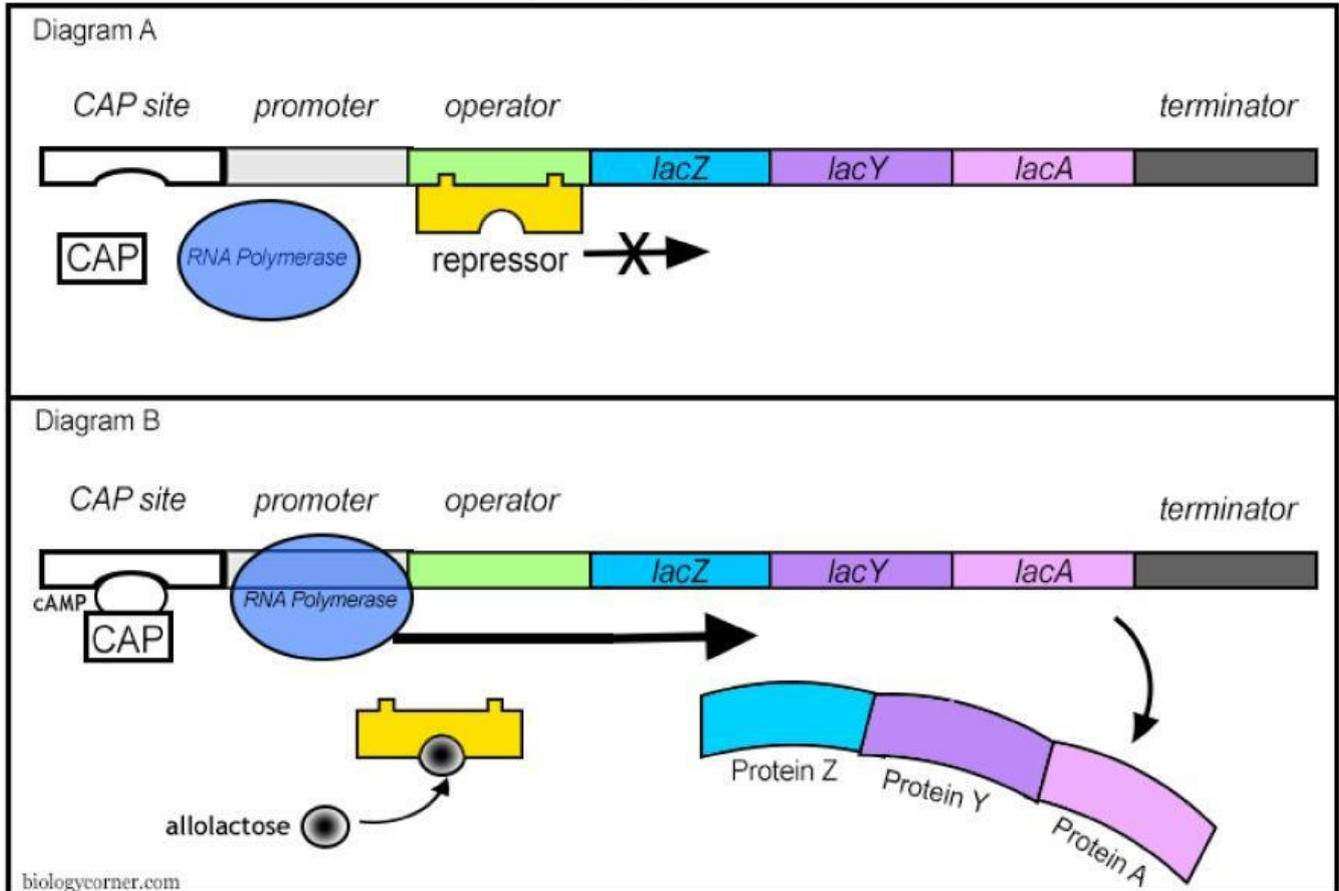
Gene Regulation in Prokaryotes - Trp and Lac-Operons

E. Coli bacteria consume sugars, mainly glucose to fuel their metabolic needs. When glucose is not present, they can consume lactose instead. Lactose is a sugar found in milk. It requires an enzyme, lactase, to break down. This enzyme is not needed under normal circumstances when glucose is present. Gene regulation refers to the ability of organisms to turn the production of proteins on and off as needed.



Two regulatory proteins are involved in this process. The first is the lac repressor, which acts as a lactose sensor. The second is a catabolite activator protein (CAP) which acts as a glucose sensor. This system is called an **inducible operon**.

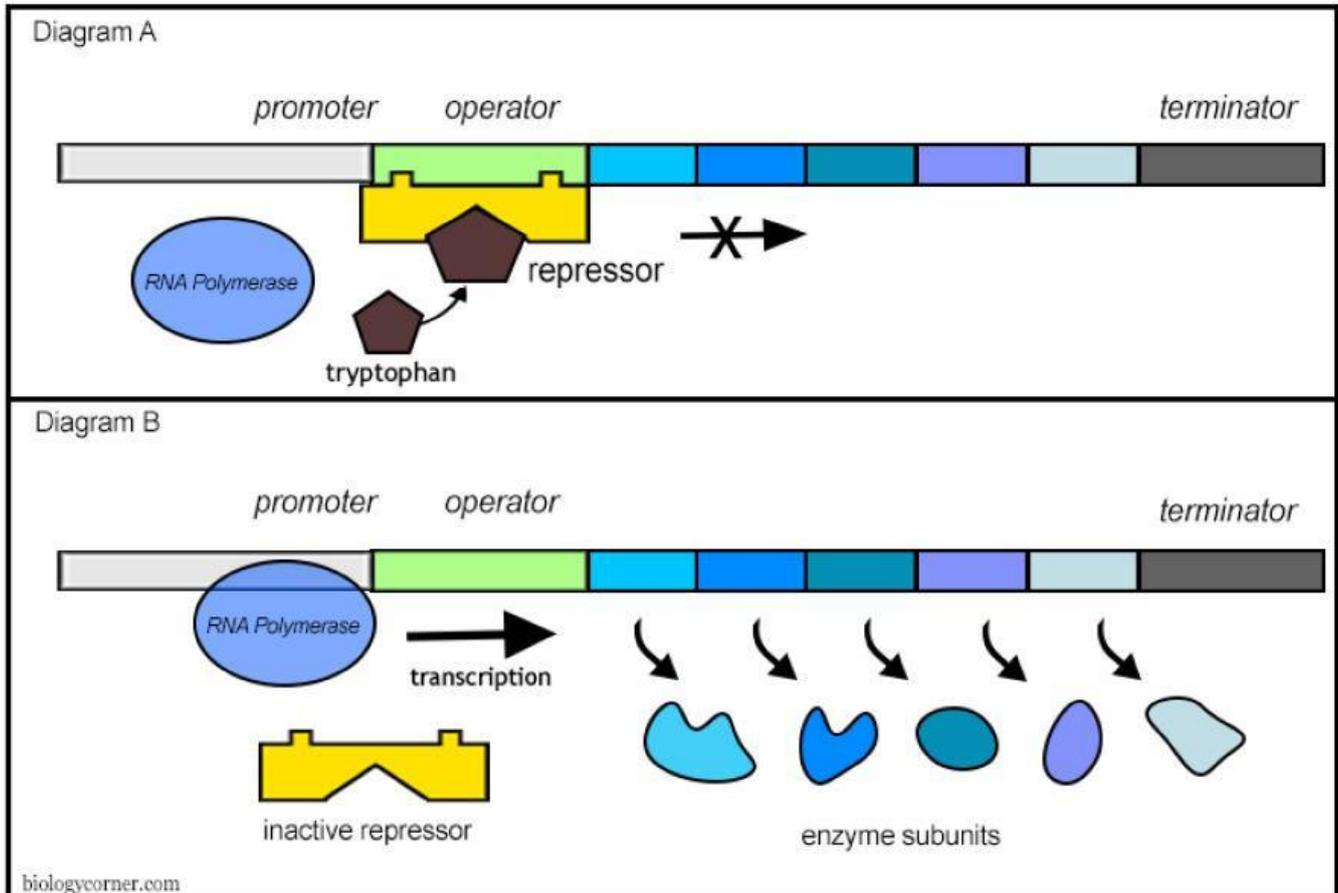
Examine the graphic which illustrates how gene regulation occurs in prokaryotes in the **Lac-Operon**.



1. What type of operon is illustrated in this model? _____
2. How many genes are contained within the operon? _____ How many proteins are made? _____
3. What are the two regulatory proteins in the operon? _____
4. Where does RNA polymerase bind to start transcription? _____
5. Where does the repressor bind? _____
6. When allolactose attaches to the repressor, what happens? _____
7. What is needed to turn transcription ON? _____
8. How is transcription turned OFF? _____

Repressible Operons

E. coli needs the amino acid tryptophan to survive. The bacteria can make its own tryptophan if it is not present in their diet. If tryptophan is present, the bacteria does not need to synthesize it, so the *trp* operon is turned off. Examine the image below showing the *Trp*-Operon



9. What serves as the repressor in the *trp*-operon? _____
10. What happens when tryptophan is NOT present in the environment? _____
11. What is the role of RNA polymerase in the system? _____
12. How many genes are involved in the *trp*-operon? _____ how many proteins are made? _____
13. What would happen if the operator region of the operon had a mutation that prevented the attachment of the repressor? _____
14. What would happen if a mutation occurred in one of the *trp* operon genes?

15. Compare an inducible operon to a repressible operon.