Lac Operon Assignment
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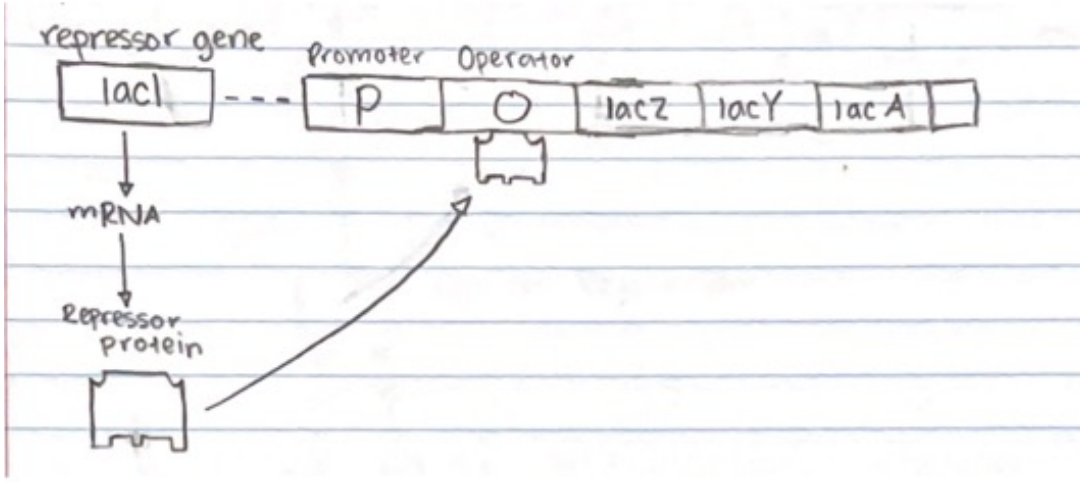
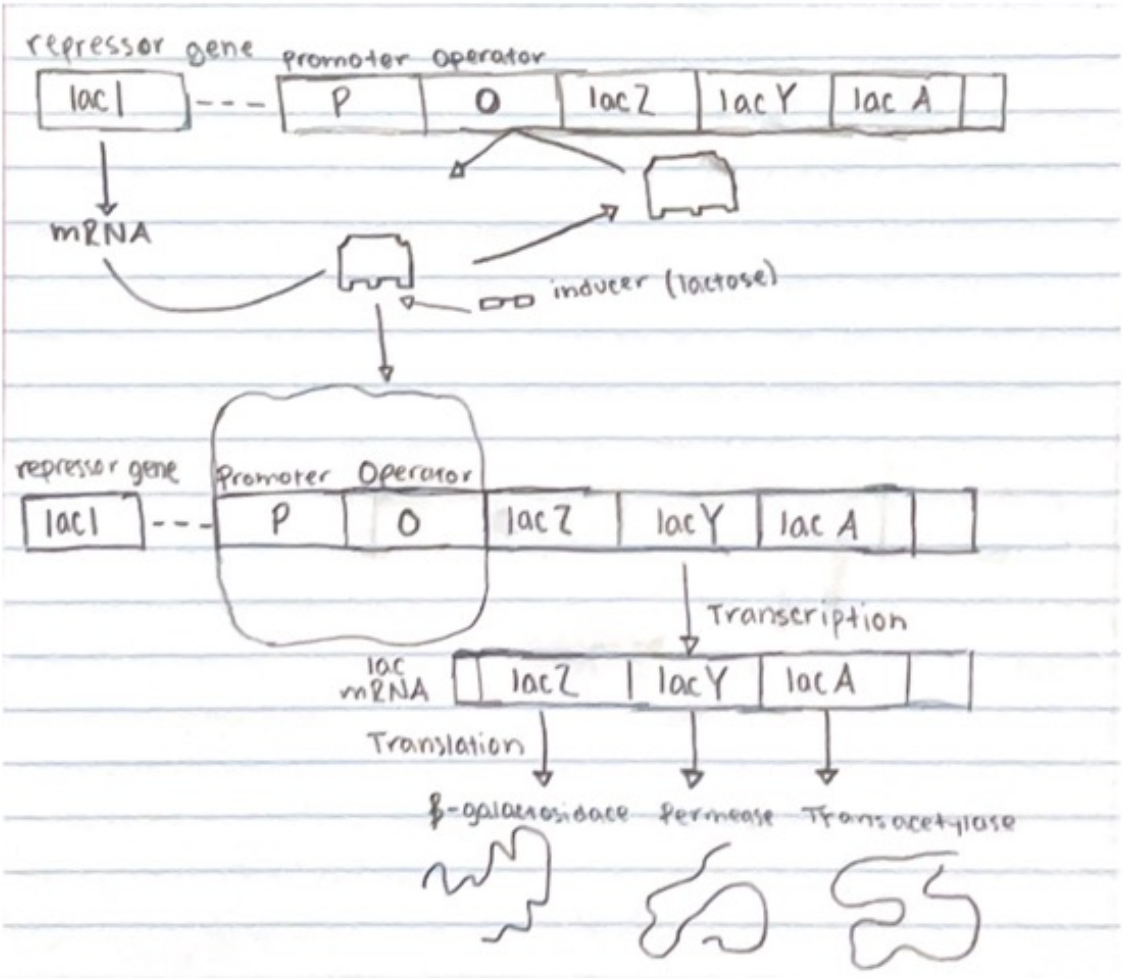
March 26, 2022

Escherichia coli lac operon in the absence of lactose.



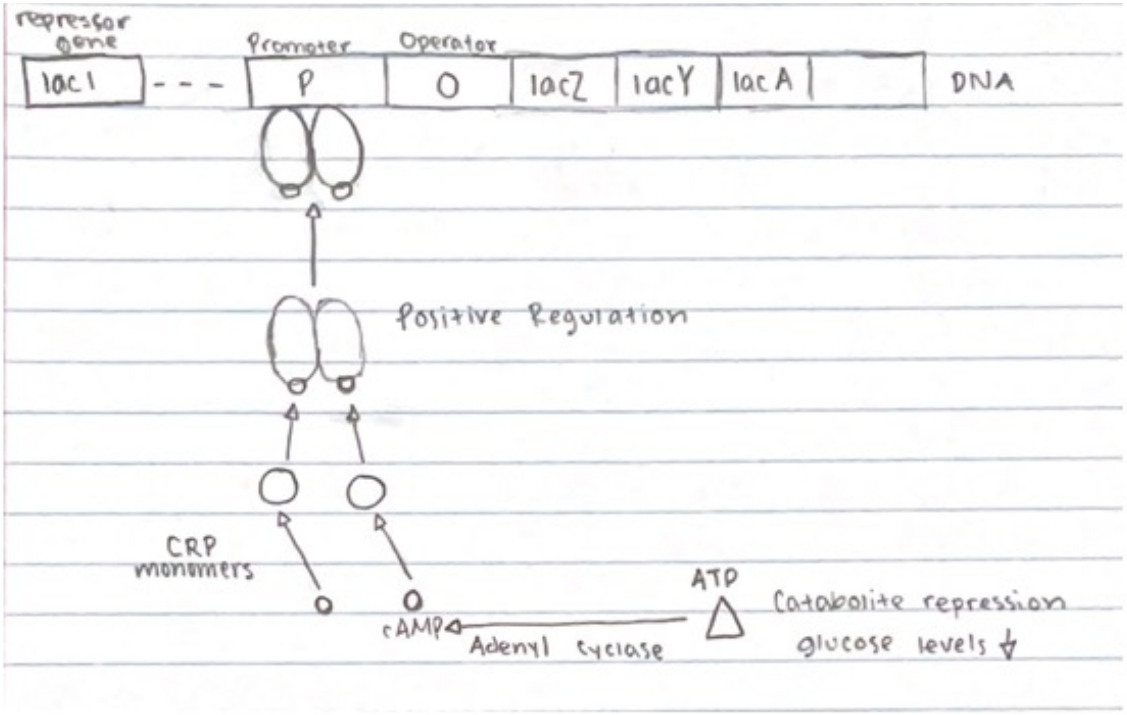
The repressor gene (lacI) creates the repressor protein that attaches to the operator of the E Coli. which stops the physical touch of the promoter and RNA polymerase with the structural genes (lacZ, lacY, and lacA), and subsequently stops the expression of the Z, Y, and A genes. When there is no lactose, which acts as the inducer, the repressor protein stays attached/bound to the operator, “switching off” the gene expression.

Escherichia coli lac operon in the presence of lactose



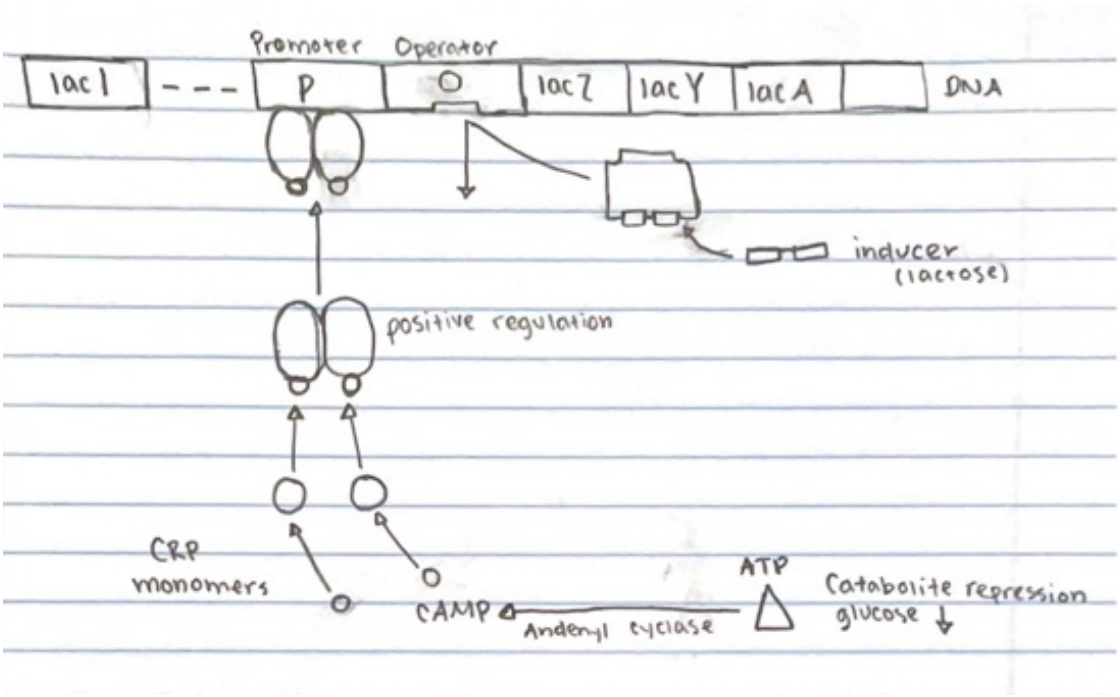
When lactose is present in the cell, it acts as an inducer and attaches/bounds to the repressor gene. When attached to the repressor protein, the repressor cannot bind to the operator, which allows the physical touch of the RNA polymerase and promoter and activates gene expression. The structural genes are then able to perform transcription and translation in gene expression.

Escherichia coli lac operon in the absence of glucose



The definition of catabolite repression is that glucose decreases the availability of adenyl cyclase which also causes the reduction of availability of cAMP binding to CRP. This means that when glucose levels are low or absent, the availabilities are higher for cAMP to bind to CRP. When cAMP bind to the CRP it creates the cAMP receptor protein. This attaches/binds to the promoter and promotes the expression of lac structural genes. This is known as positive regulation. The CRP attached to the promoter enhances the RNA polymerase enzyme's ability to initiate transcription through physical contact.

Escherichia coli lac operon in the absence of glucose AND the presence of lactose



When glucose levels are low or absent, adenyl cyclase increases availability, increasing the availability of cAMP binding to CRP. The CRP binds to the promoter which enhances the activity of the RNA polymerase through physical contact. Since there is also a presence of lactose, it acts as an inducer and attaches to the repressor protein. This removes the repressor protein from the operator, allowing the expression of the structural lac genes. In this case, the gene expression is "switched on" through the presence of lactose, and the ability to transcribe is enhanced through the absence of glucose.

This also occurs in the transcription process of gene expression. This is because the lactose "switch" cannot happen after gene expression has already begun. Also, gene expression is enhanced by the absence of glucose through the RNA polymerase's ability to transcribe with cAMP and CRP binding to the promoter.