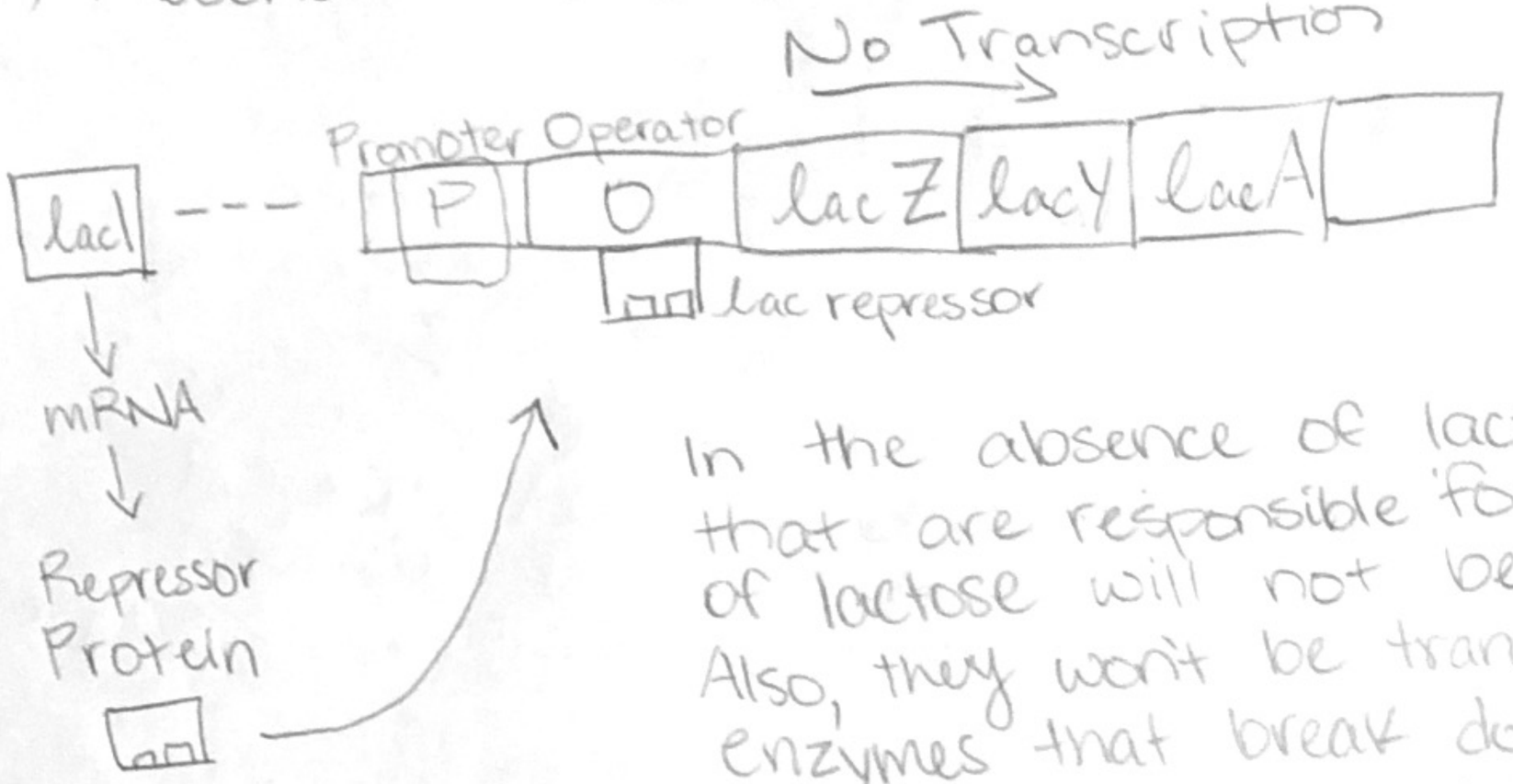
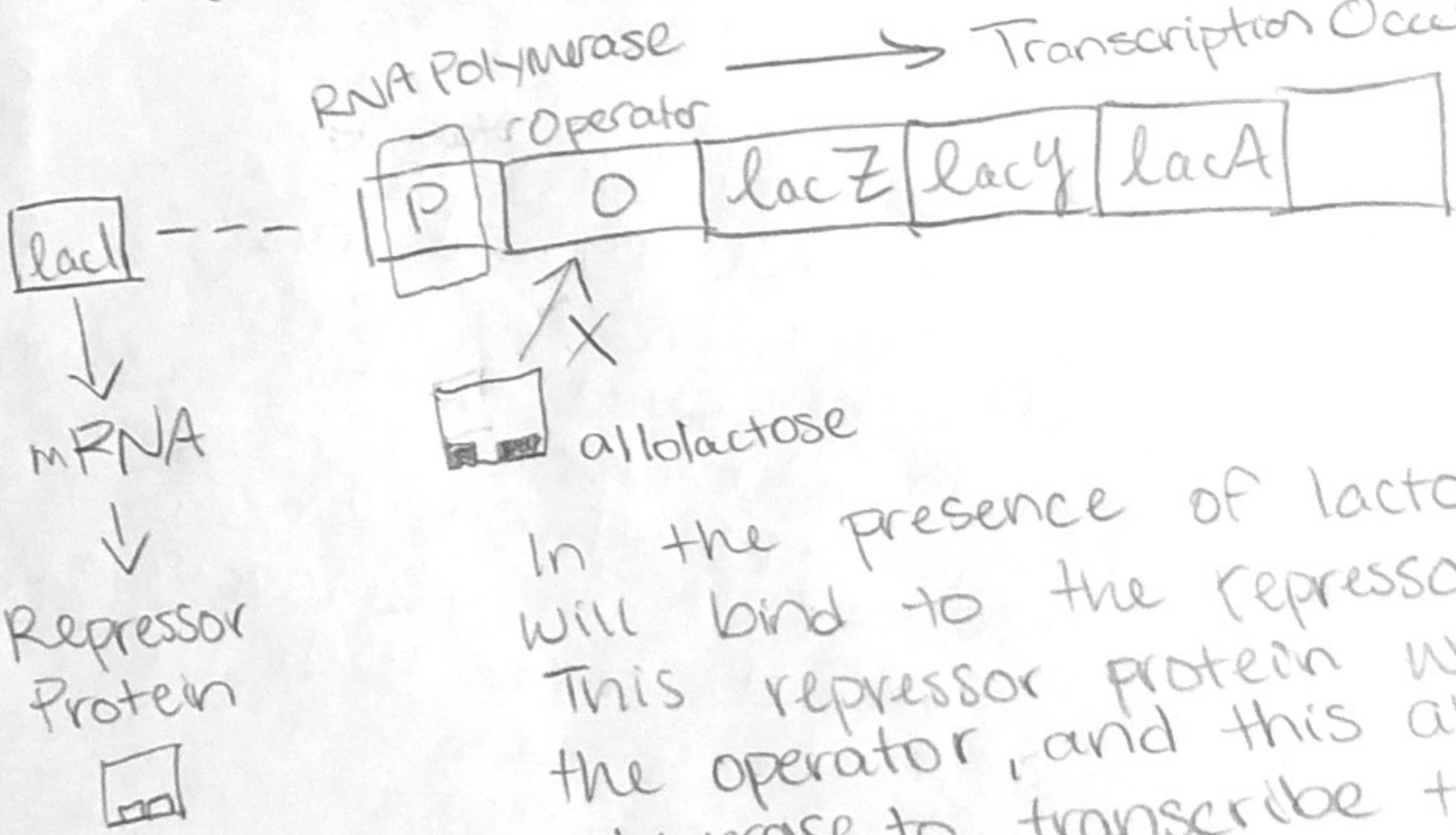
1.) Absence of Lactose



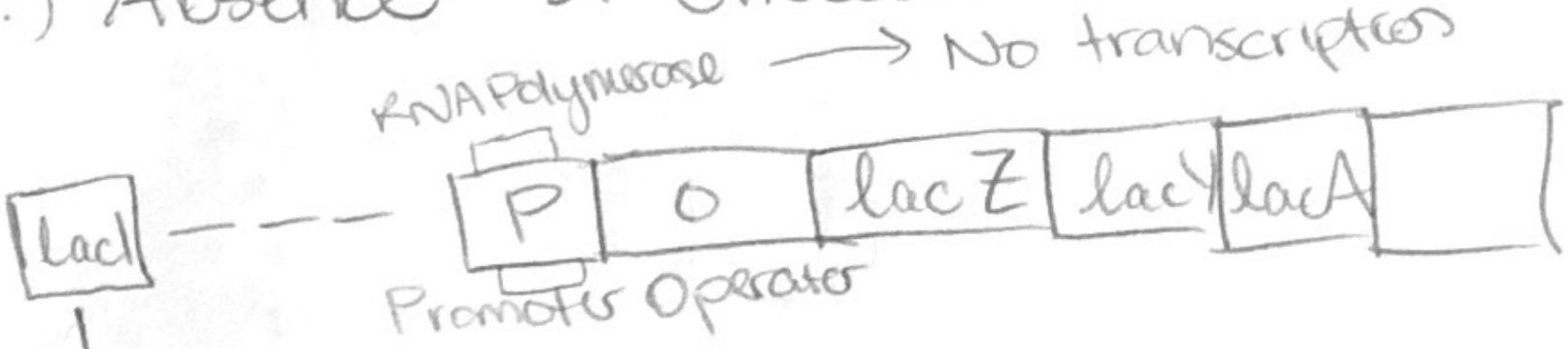
In the absence of lactose, the genes that are responsible for the metabolism of lactose will not be transcribed. Also, they won't be translated into the enzymes that break down lactose. The lac repressor Protein will bind to the operator and transcription will not happen. RNA polymerase is unable to transcribe.

2) Presence of Lactose



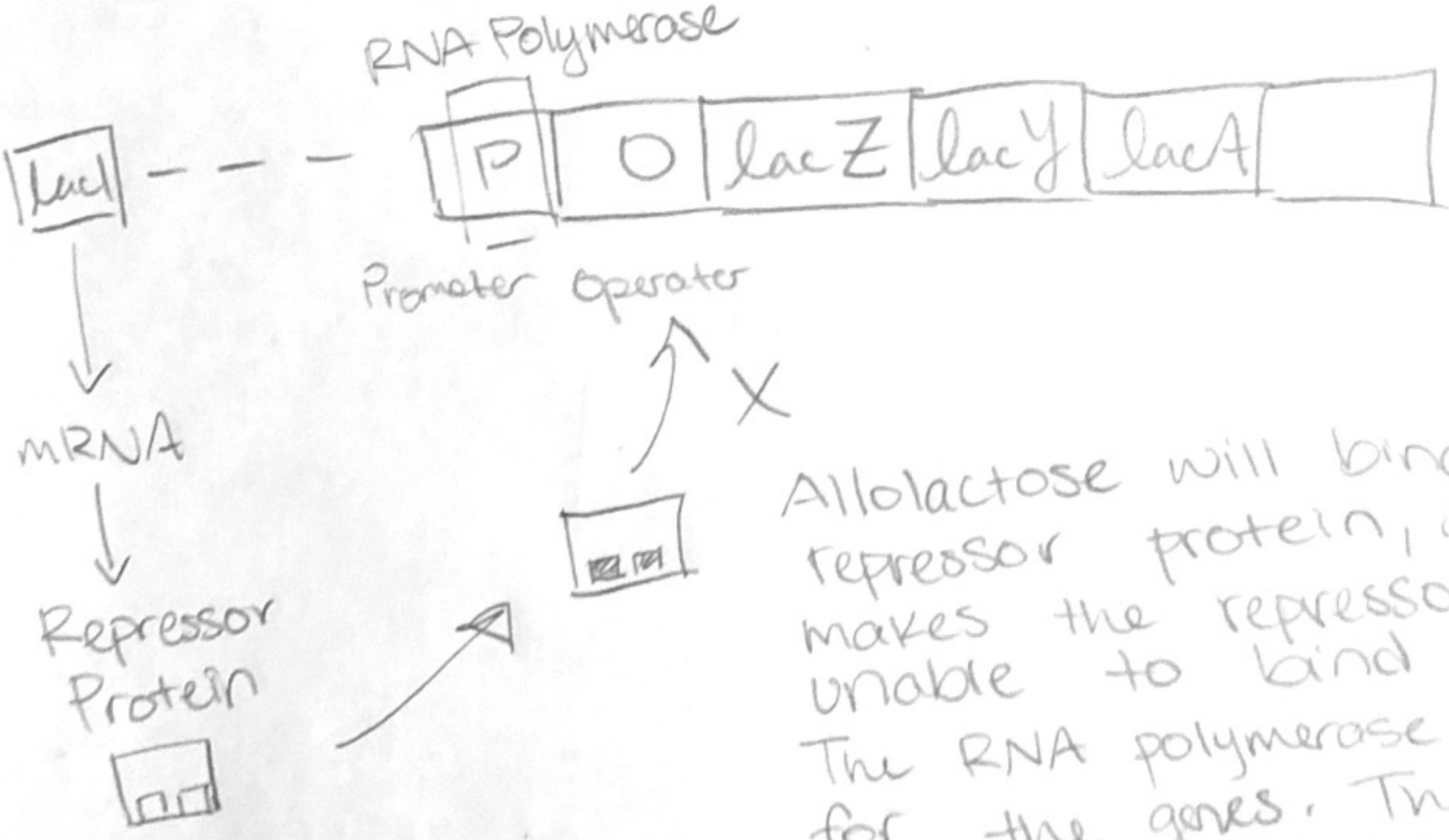
In the presence of lactose, allolactose will bind to the repressor protein. This repressor protein will not bind to the operator, and this allows for RNA polymerase to transcribe the genes for breaking down lactose.

3.) Absence of Glucose



cAMP levels will be high because glucose is absent, and the CAP is active and bound to DNA. The CAP allows for the RNA polymerase to bind to the promoter. This may allow transcription.

4) Presence of Glucose And Presence of Lactose



Allolactose will bind to the repressor protein, and this makes the repressor protein unable to bind to the operator. The RNA polymerase can transcribe for the genes. The presence of glucose results in low cyclic AMP. As a result, there will be less transcription.

This process of gene regulation takes place during transcription. When certain molecules are present this regulates the processes for certain genes to be transcribed. If lactose is present, this allows for the genes that metabolize lactose to be transcribed. If some molecules were not there transcription cannot occur and this is regulated.