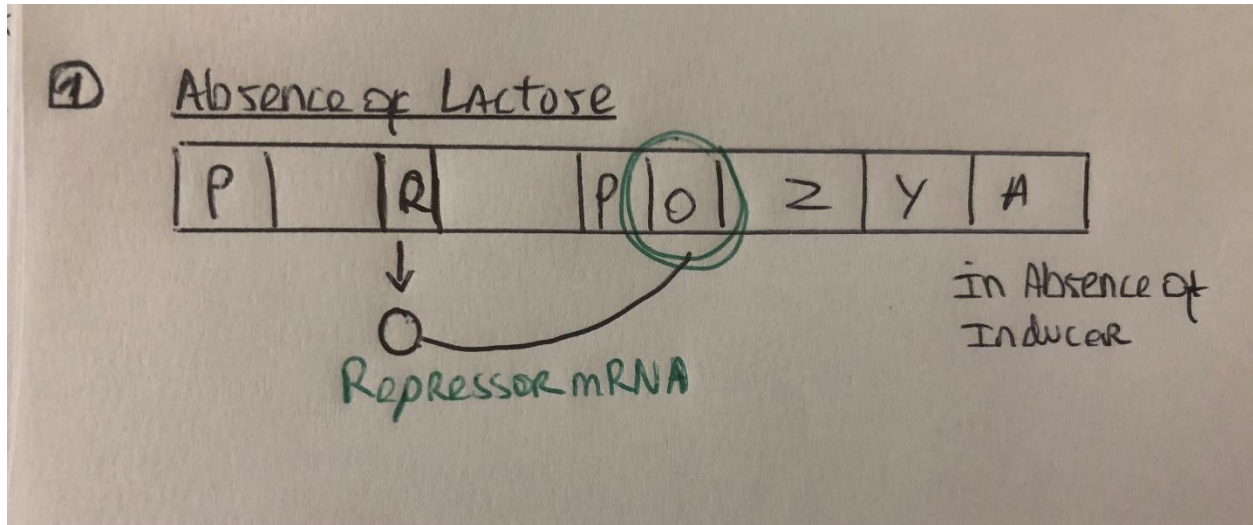


Lac Operon

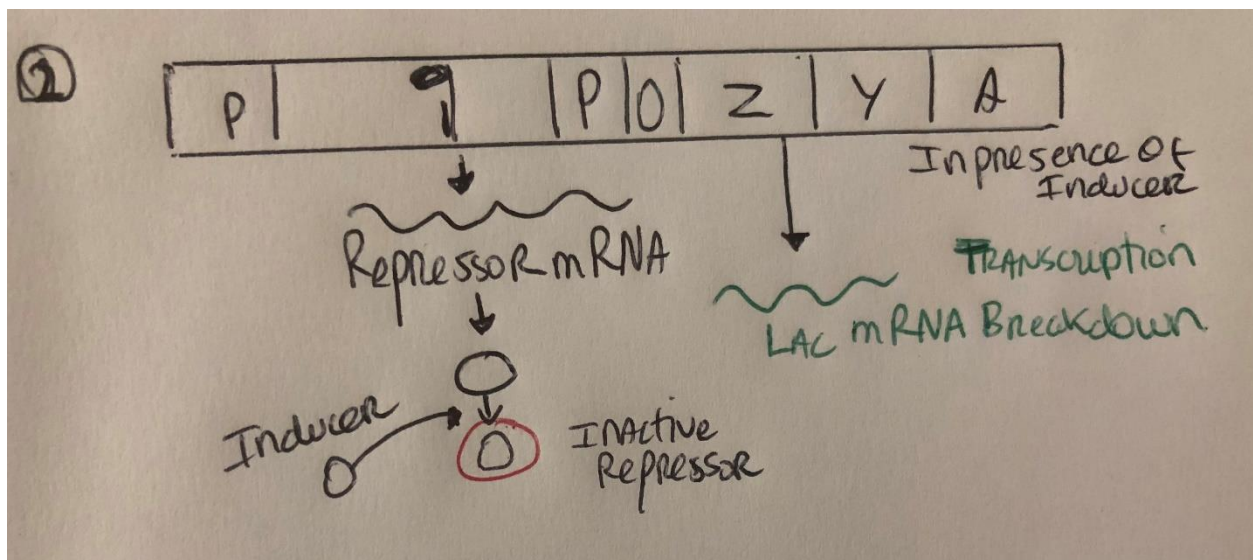
Draw and describe the regulation of the *Escherichia coli* lac operon in the following situations:

1. In the absence of lactose (disregard presence or absence of glucose).



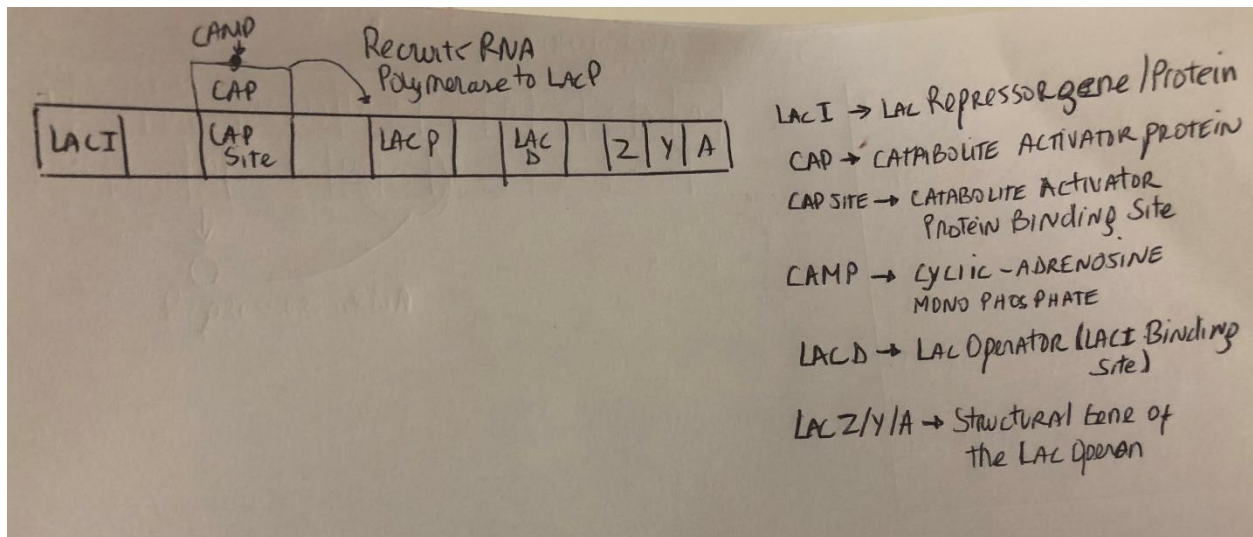
- Lactose is not the preferred carbohydrate source; lac operon is turned off. Negative regulation
- Repressor binds to the operator region (O) and prevents RNA polymerase from transcribing the operator.

2. In the presence of lactose (disregard presence or absence of glucose).



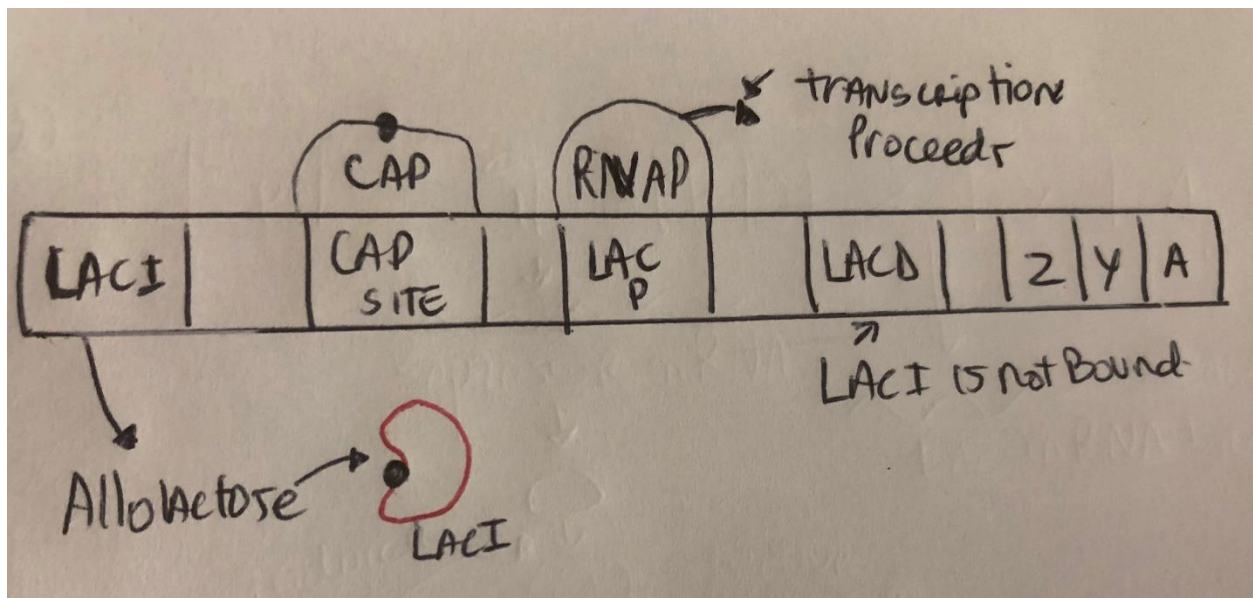
lac operon is turned on only when glucose is absent; positive regulation

3. In the absence of glucose (disregard the presence or absence of lactose).



- In the absence of glucose there is high cAMP. The binding of the CAP-cAMP complex to the promoter site is required for transcription of the lac operon
- The CAP protein (Catabolite Activator Protein) binds to the cAMP (cyclic-AMP), which is at high concentrations in the cell when Glucose is absent. This allows CAP to bind to the CAP binding site and recruit RNA polymerase to the Lac Promoter.

4. In the absence of glucose and the presence of lactose.



- In the absence of glucose and lactose, CAP binds to the CAP binding site and the repression of the Lac operon by LacI is relieved as the Lac Repressor molecule (LacI) is bound by Allolactose, a stereoisomer of Lactose.

- This binding prevents Lac Repressor from binding to the Lac Operator, allowing transcription of the lac operon to proceed.

This regulation of gene expression takes place during transcription, the synthesis of RNA from the DNA precursor.