

Biology 112 – 921 Study guide for Final exam

1. Transcription comparison:

What is different?	Eukaryotes	Bacteria
Site of transcription	Nucleus	Cytoplasm
How many RNA polymerase?	3	1
What is the promoter structure?	TATA box, 30 bp upstream	-35 box and -10 box
What are the proteins involved contacting the promoter?	Basal transcription factors	Sigma

2. Polymerase comparison:

	DNA polymerase	RNA polymerase
Are primers required?	yes	no
Type of nucleotide required	DNA nucleotides: ATCG	RNA nucleotides: AUCG
Direction of movement	Reads the template from 3' to 5'	Reads the template from 3' to 5'
Process starts at which end:	3'	3'

3. Compare these three gene expression systems.

	<i>lac</i> operon	<i>mal</i> operon
Regulates breaking down of:	It regulates the breaking down of lactose	It regulates the breaking down of maltose
What binds to the operator & when does this occur	The LacI repressor protein <u>binds to the operator</u> when lactose levels are low	The maltose bound MalT activator <u>binds to the operator</u> when maltose levels are high
High levels of what substance affects the operon how?	High levels of lactose induce the operon.	High levels of maltose induce the operon
Is this positive regulation or negative regulation? Why?	This is negative regulation because a repressor protein inhibit gene expression	This is positive regulation because an activator protein enhance/promote gene expression

4. Consider the *lac* operon.

What happens if lactose levels have been used up by the cell? Put the following list in order of when they occur (1-5).

5	RNA polymerase is blocked from transcribing the genes for the lactose metabolizing enzymes
4	When RNA polymerase tries to bind to the promoter, it cannot get past the LacI repressor protein
1	The enzymes B-galactosidase, permease, and transacetylase are not required by the cell due to low levels of lactose
2	Most of the LacI protein becomes free (un-bound from lactose) and therefore has a conformational change.
3	The un-bound-from-lactose LacI protein can now bind to the operator

5. Consider the *mal* operon. What happens if maltose levels are high? Put the following list in order of when they occur (1-4).

3	"Mal T plus maltose" – has a greater affinity for the operator
2	Maltose binding to MalT changes the shape of MalT
5	RNA polymerase binds more effectively to the malPQ promoter, leading to high levels of malPQ transcription.
1	Maltose is transported into the cell from the environment

6. Why is it valuable to cells to be able to regulate their gene expression?

Not all proteins are required at all times

Not all proteins are diminished quickly

Waste of the cell's resources if all genes were transcribed and translated at all times

By having some genes under regulation, the cell can manage its resources as needed