Prokaryotic gene regulation:

1. Operon: a series of linked genes under control of a single operator. Shows how bacteria turn on/off genes.
2. Promoter→ RNA Polymerase binds to the promoter in order to start the process of transcription.
3. Operator→ Repressor binds to the operator.
4. Regulatory gene→ Gene that codes for the repressor protein.
5. TRP Operon: makes tryptophan when tryptophan is low; negative feedback
6. Tryptophan: amino acid found in meat; corepressor
7. When tryptophan is present, it binds to the repressor protein and activates it. The repressor then binds to the operator and prevents the RNA polymerase from properly attaching therefore transcription does not occur.
8. Lac Operon: makes enzymes that break down lactose.
9. Lactose: broken down by the process of hydrolysis; which is the addition of water that breaks down the disaccharide.
10. Induction by depression: When lactose is present it binds to the repressor and inactivates it, the repressor can then no longer bind to the operator which allows the process to continue and the enzymes that break down lactose to be made.
11. When lactose is not present, the repressor freely binds to the operator and stops the process of transcription therefore not creating the enzymes that break down lactose.
12. Repressor: binds to the operator and puts a kink in the gene which prevents RNA polymerase binding
13. Glucose also activates the repressor. So if there is an abundance of glucose then the enzymes that break down lactose will not be made.

* Lacl→ repressor
* Laco→ promoter/operator: RNA polymerase binds for transcription of the operon.
* Lacβ→ β-galactosidase: codes for the protein that breaks lactose disaccharide into monosaccharide
* LacP→ permease: allows lactose to enter the cell

1. *I+* normal inducible repressor; represses by binding to the operator
2. non-functional repressor; cannot bind with operator

*ID* represses even when lactose is present; cannot bind with lactose but can bind with operator. It acts trans (diffusion) and is dominant over *I+.*

*O-*  Cannot bind repressor; acts cis and is recessive to *O+.*

1. Pribnow box: the middle of the promoter which is where the RNA polymerase binds.
2. Consensus sequence: that sequence that is composed of the most prevalent nucleotide of that position.
3. TATA Box: found in all of the bacterial promoters and about half of the eukaryotic promoters.
4. RNA has helicase
5. A-T pairs: have only 2 hydrogen bonds

C-G pairs: have 3 hydrogen bonds

1. The part that is melted first where the DNA lets in the RNA polymerase is A-T rich.

Multiple Choice Questions:

1. What part of the Operon does the RNA polymerase bind to in order to start the transcription of the operon?
2. Regulatory gene
3. LacP
4. Promoter
5. Operator
6. How does the presence of Tryptophan affect the enzyme production?
7. Tryptophan binds to the repressor and activates it which then stops enzyme production.
8. Tryptophan binds to the repressor and inactivates it which then allows for the production of enzymes.
9. The presence of tryptophan does not affect the enzyme production.
10. Tryptophan binds to RNA polymerase and stops the enzyme production.
11. In the case of the *I+* repressor, what does the + indicate?
12. + indicates dominance
13. + indicates that it is recessive
14. + indicates that it is non-functional
15. + indicates wild type
16. What does the Lac *I+* protein do to the gene to stop RNA polymerase from transcribing?
17. It separates the gene into two pieces which prevents RNA polymerase from transcribing.
18. It binds to the gene and creates a kink which prevents RNA polymerase from transcribing.
19. It breaks down the gene to prevent RNA polymerase from transcribing.
20. It creates a bunch of coils in the gene which prevents RNA polymerase from transcribing.
21. What is the difference between the A-T base pair and the G-C base pair that makes the A-T base pair easier to break?
22. A-T base pair has three covalent bonds
23. G-C base pair has two hydrogen bonds
24. A-T base pair has two hydrogen bonds
25. A-T pair has hydrogen bonds and G-C has covalent bonds

Essay:

1. What is the difference between the function of tryptophan in the TRP Operon and the function of lactose in the LAC Operon?
2. State what the lacl, lacO, lacβ, and lacP are and their functions. How do these work together in the function of the operon?