**Chapter 15 Active Reading Guide: Regulation of Gene Expression Mrs. Javon**

# Section 1

1. Why is it necessary for cells and organisms to regulate when genes will be expressed?

1. The basic mechanism for control of gene expression in prokaryotes at the transcription level is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, proposed by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. All genes are not “on” all the time. Using the metabolic needs of E. coli, explain why not.

1. Feedback inhibition is a recurring mechanism throughout biological systems. In the case of E. coli regulating tryptophan synthesis, is it positive or negative inhibition? Explain your choice.

1. What is a promoter?

1. What is the operator? What does it do?

1. List the three components of an operon, and explain the role of each one.

1. How does a repressor protein work?

1. What are regulatory genes?

1. Distinguish between inducible and repressible operons, and describe one example of each type.

1. Draw a sketch of the lac operon with the following terms: operon genes, operon, RNA polymerase, mRNA, repressor protein, operator, repressor, regulatory gene, inducer. Know the function of each structure.

1. Compare and contrast the lac operon and the trp operon.

1. What happens when a repressor is bound to the operator?

1. What is CAP? How does CAP work?

1. Explain why CAP binding and stimulation of gene expression is positive regulation.

# Section 2

1. Even though all cells of an organism have the same genes, there is differential gene expression. What does this mean?
2. Why is gene expression even more important in multicellular organisms than in unicellular ones?

1. What percentage of the genes of a typical human cell is expressed at any given time?

1. What is the common control point of gene expression for all organisms?

1. Gene expression can be regulated by modifications of the chromatin. Distinguish between heterochromatin and euchromatin as to their structure and activity.

1. What occurs in histone acetylation? How does it affect gene expression?

1. What is DNA methylation? What role may it play in gene expression?

1. The inactive mammalian X chromosome is heavily methylated. What is the result of this methylation?
2. Identical twins in England were raised in the same household, had the same profession and lived as adults in the same neighborhood, yet one developed an inherited form of cancer and one didn’t Explain how the study of epigenetic inheritance could explain this.

1. What is genomic imprinting, and how is it maintained? Give an example discussed earlier in human genetics.
2. What are transcription factors and what is their function in gene expression?

1. Explain how enhancers and activators interact with transcription factors to affect gene expression.

1. In prokaryotes, functionally related genes are usually clustered in a single operon. What has been found to be the case in eukaryotes?

1. How can alternative RNA splicing result in different proteins derived from the same initial RNA transcript?

1. Posttranscriptional control includes regulation of mRNA degradation. Explain how this affects translation.

# Section 3

1. It is now known that much of the RNA that is transcribed is not translated into protein. These RNAsare called noncoding RNAs. Read carefully to discern a crucial role played by these RNAs. What isthis role?

**Chapter 16.1**

1. What three processes lead to the transformation of a zygote into an organism?
2. Explain what happens in *cell differentiation* and *morphogenesis*.
3. What is meant by *determination*? Explain what this means within an embryonic cell.
4. What is controlled by *homeotic genes?*