Part I – Control of Gene Expression in Prokaryotes

Learning Goal: Understand how gene expression can be turned on and off in prokaryotes

After the pre-class assignments you should be able to:

• Define and relate the terms operon, polycistronic mRNA, and structural gene
• Label a diagram of the lac operon and state the function of each component
• Identify proteins and small molecules that regulate expression of the lac operon
• Describe how the lac repressor and CRP regulate expression of the lac operon

By the time you take the final exam you should also be able to:

• Identify the differences between positive and negative forms of regulation
• Interpret data as it relates to the lac operon and other similar methods of regulation
• Predict whether gene expression of an operon will occur given specific environmental conditions
• Identify changes in gene expression based on the haplotypes found in the cell (i.e. using partial diploids)

Part II – Control of Gene Expression in Eukaryotes

Learning Goal: Understand mechanisms that help control gene expression in eukaryotes

After the pre-class assignments you should be able to:

• Describe the role of histone proteins in DNA packaging, nucleosome formation, and chromatin structure
• Discuss how histones are chemically modified to increase or decrease the expression of a gene
• Describe how DNA methylation affects gene expression in eukaryotes
• Discuss the role of Xist in regulating gene expression at the chromosome level and why this is important for regulating gene dosage
• Describe how alternative splicing allows for multiple gene products to be produced from the same gene
• Describe the role of posttranslational protein modifications in the control of gene expression

By the time you take the final exam you should also be able to:

• Explain how chromatin packaging affects gene expression in eukaryotes
• Predict the effect of mutations in gene regulatory elements on gene expression
• Predict how DNA methylation patterns and histone acetylation will affect gene expression
• Evaluate the effect of different chromatin modifying enzymes on gene expression