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| **Following the Big Ideas** | |
| **Big Idea 1** | Random changes in the DNA can lead to phenotypic variation that can be acted upon by natural selection |
| **Big Idea 3** | Regulation of prokaryotic genes is often at the operon level, whole eukaryotes tine tune gene expression and modify gene products. |
| **Big Idea 4** | Regulation of gene activity involves intricate interactions with internal and external factors. |

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| **Essential Questions** |
| * How do changes in DNA lead to variation in phenotypes are the subject to natural selections? * How does the operon model explain how gene expression is regulated in prokaryotes? * How do regulatory genes, molecules, and transcription factors control gene expression in eukaryotes? * How can cells specialize when the contain the same set of genetic information? |

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| **Vocabulary** | |
| 1. Operon 2. Operator 3. Promoter 4. Repressor 5. Regulatory Genes 6. Heterochromatin 7. Euchromatin | 1. Histone acetylation 2. DNA methylation 3. Epigenetics 4. Enhancers 5. Activators 6. Transcription factors 7. Alternative splicing |

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| **Chapter Outline and Reading Guide** | |
| **Section 1**   1. All genes are not “on” all the time. Using the metabolic needs of E. coli, explain why not. 2. What are the two main ways of controlling metabolism in bacterial cells? 3. 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. 4. Distinguish between inducible and repressible operons, and describe one example of each type. 5. Explain why CAP binding and stimulation of gene expression is positive regulation. 6. Describe the relationship between glucose supply, cAMP, and CAP. 7. How can both repressible and inducible operons be negative regulators? | **Section 2**   1. Even though all cells of an organism have the same genes, there is differential gene expression. What does this mean? 2. What percentage of the genes of a typical human cell is expressed at any given time? 3. What is the common control point of gene expression for all organisms? 4. The inactive mammalian X chromosome is heavily methylated. What is the result of this methylation?   **Section 3**   1. It is now known that much of the RNA that is transcribed is not translated into protein. These RNAs are called noncoding RNAs. Read carefully to discern a crucial role played by these RNAs. What is this role? |

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| **After You Have Read…** |
| 1. Describe the structure of an operon and the role of each component. 2. Distinguish between a repressible and inducible operon 3. Distinguish between positive and negative control of gene expression 4. List the levels of control of gene expression in eukaryotes and describe the key components of each    1. Summarize how chromatin’s structure may be involved in regulating gene structure    2. Identify the mechanisms of transcriptional, post-transcriptional, and translational control |