RAVEN CHAPTER 16 GUIDED NOTES: CONTROL OF GENE EXPRESSION

Raven 9th edition

1. What is meant by the phrase “control of gene expression”?

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2. What is the value of controlling gene expression for a prokaryote (a single-celled organism)?

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3. What is the value of controlling gene expression for a multi-celled eukaryote?

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4. Explain the different evolutionary forces that have caused the development of distinctly different systems of regulation for the control of gene expression in prokaryotes and in eukaryotes.

a. prokaryotes

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b. eukaryotes

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5. What is a gene’s promoter? What role does it serve in regulating transcription?

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Control of Transcription in Prokaryotes

6. Prokaryotes use a regulatory system called an operon. Explain what an operon is, label the following diagram, and identify the function of the following components: promoter, operator, repressor.

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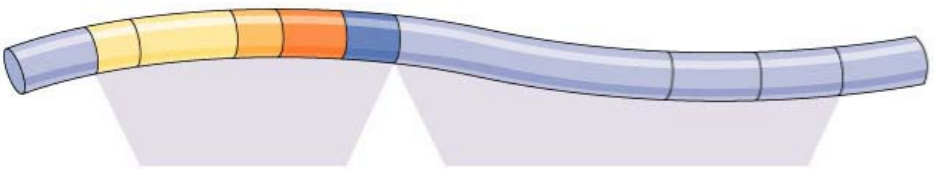
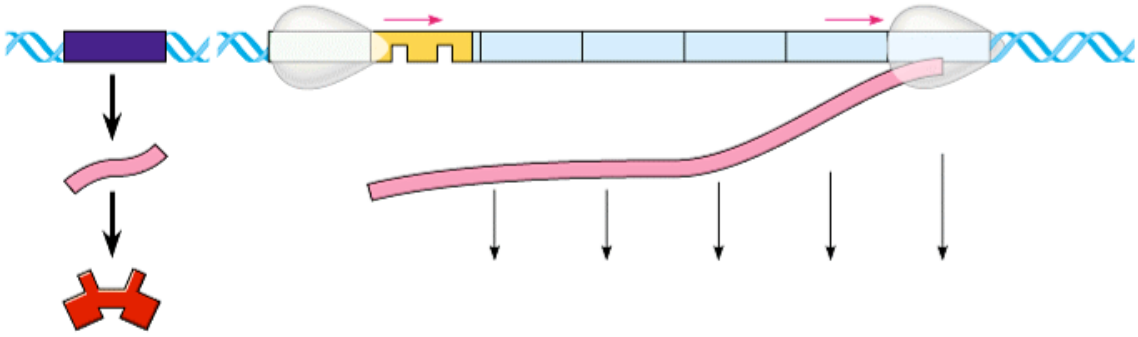
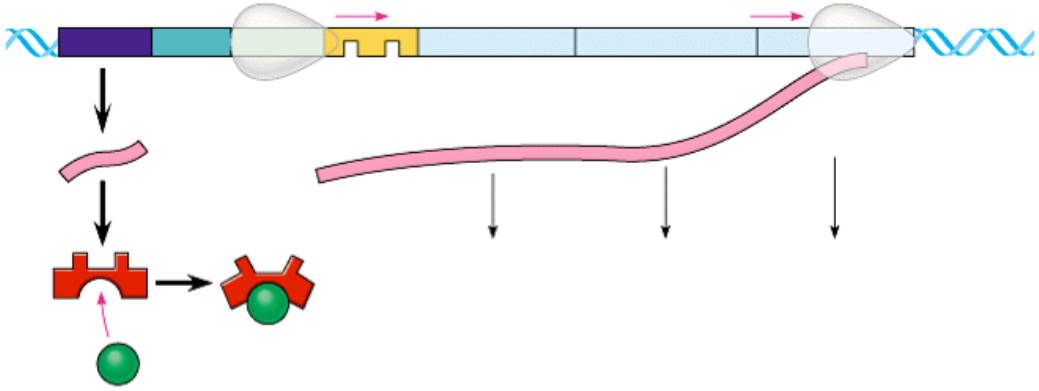


7. Although the following diagram is not from your text, but it is included here because it is a more straightforward representation of the tryptophan (trp) operon system. Label the diagram and use it to explain how this system regulates the synthesis of tryptophan in a bacterium.



8. Describe how the trp operon is an example of a repressible operon.

9. Although the following diagram is not from your text, but it is included here because it is a more straightforward representation of the lacose (lac) operon system. Label the diagram and use it to explain how this system regulates the digestion of lactose in a bacterium.



10. Does the diagram above represent the condition for the absence or presence of lactose?

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11. Describe what happens when lactose is absent.

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12. Describe how the lac operon is an example of an inducible operon.

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13. Summarize how the presence and absence of glucose influences the lac operon.

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Control of Transcription in Eukaryotes

14.Briefly outline why control of transcription is more complex in eukaryotes than in prokaryotes.

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15. Explain the general function of transcription factors. Briefly distinguish between the functions of basal transcription factors and specific transcription factors (activators).

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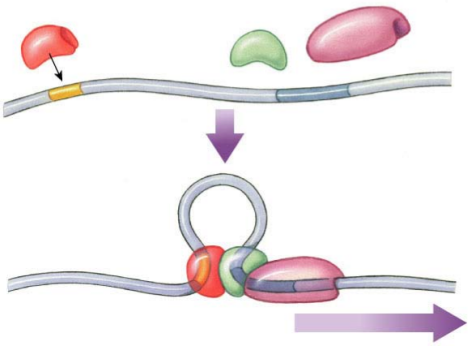
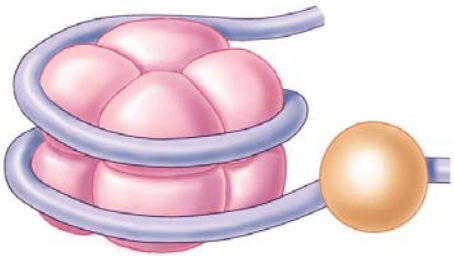
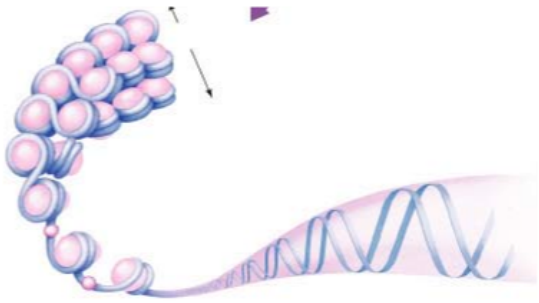
16. Use the following diagram to explain the coordinated functions of the enhancer and the promoter regions of the DNA.



18. Briefly describe the organization of DNA in the eukaryotic nucleus.





from Ch. 11

18.Transcription can also be regulated by chemically modifying chromosomes. Briefly described the effect on transcription of DNA methylation and histone acteylation._____

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Posttranscriptional Control

19. RNA interference is an exciting new area of research in molecular biology. Make some brief notes about the roles of small RNA molecules (siRNAs and miRNAs) in gene control

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20. How does alternative RNA splicing affect gene expression?

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21. Make notes on these additional methods of post-transcriptional control mechanisms.

a. Transport of mRNA out of nucleus

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b. Initiation of translation

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c. Stability of mRNA transcripts

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