

Integrative Biology 102: Lecture Outline

DNA & Protein Synthesis

Lecture Objectives:

By the end of the lecture, you should be able to:

1. explain the role of DNA as genetic material.
2. list the functions of proteins in a cell.
3. explain the connection between DNA and proteins.
4. explain the universality of the genetic code and its significance.
5. label a diagram of a DNA molecule, name the units of which the DNA molecule is composed, and identify the three parts of each unit.
6. describe base pairing in DNA molecules. Given the base sequence of one strand of DNA, predict that of a complementary strand of DNA.
7. draw a diagram that illustrates the structure and duplication (replication) of a DNA molecule.
8. list the differences between the RNAs and DNA.
9. describe and diagram the process of transcription. Given the DNA base sequence for a gene, predict the mRNA base sequence made during transcription.
10. describe and diagram the process of translation in protein synthesis.
11. write a paragraph to explain the production of a protein molecule from the genetic code contained within a gene.
12. compare the structures of DNA and RNA molecules and identify the function of the three types of RNA: messenger RNA, transfer RNA, and ribosomal RNA.

Reading: Ch. 6.

Terms:

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|---------------|---------------------|---------------------------------|
| · chromosomes | · RNA: messenger, | · semi-conservative replication |
| · chromatin | transfer, ribosomal | · DNA polymerase |
| · histone | · ribose | · A, T, G, C, U |
| · ribosome | · base pairs | · nucleotides |
| · amino acids | · nucleic acid | · phosphate group |
| · deoxyribose | · codon | · genome |
| | · anticodon | |

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1. Breakthroughs in the coding of DNA molecules

2. Gene Expression (Making Proteins)

- functions
- role in cellular activity

3. DNA structure and organization

- Nitrogen bases:
 - Adenine(A)
 - Cytosine(C)
 - Guanine(G)
 - Thymine (T)
- Nucleotide structure

4. Semiconservative replication of DNA

- How are enzymes involved?

5. Protein synthesis

- How is RNA different from DNA?
- Kinds of RNA
- Production of proteins--(1. Transcription and 2. Translation)
- Transcription
 - Location
 - Role of proteins
 - Production of mRNA

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- Transcript mRNA

 - Production of a Polypeptide--Translation of mRNA
 - Location
 - Codons on mRNA

 - Anticodons and tRNA

 - Process

 - Polypeptide to protein

For the next lecture on *GM Crops: Applications & Concerns*, read [Leventin & McMahon Chapter 1, pgs. 12-17 and 7](#), and in Cunningham & Cunningham, pgs. 116-120. Be ready to answer this question:

- How do changes in DNA (*e.g.* mutations) bring about altered gene expression?