I. Definitions
A. DNA (deoxyribonucleic acid)
B. RNA (ribonucleic acid)
C. Transcription
D. Translation

II. The Discovery of DNA as the Genetic Material

III. DNA Structure
A. Nucleotides - (A) adenine, (T) thymine, (G) guanine, (C) cytosine
   Three parts:
   “deoxyribose”
   Sugar
   A, T, G, C
   Nitrogen Base
B. The Double Helix
C. Replication

IV. Protein Synthesis
A. RNA (the bridge between DNA and protein synthesis)
   1. RNA Nucleotide
   2. DNA vs RNA

<table>
<thead>
<tr>
<th></th>
<th>DNA</th>
<th>RNA</th>
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</thead>
<tbody>
<tr>
<td>Function</td>
<td>master instructions</td>
<td>working copy</td>
</tr>
<tr>
<td>size:</td>
<td>very large</td>
<td>smaller</td>
</tr>
<tr>
<td># strands:</td>
<td>double stranded</td>
<td>single stranded</td>
</tr>
<tr>
<td>sugar:</td>
<td>deoxyribose</td>
<td>ribose</td>
</tr>
</tbody>
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3. Three Types of RNA
   a. messenger RNA (mRNA)
   b. transfer NA (tRNA)
   c. ribosomal RNA (rRNA)
B. Transcription - the DNA base sequence is "transcribed" into an mRNA base sequence

DNA template: A T A C G G G C A T A T C G
mRNA strand: __ __ __ __ __ __ __ __ __ __ __ __

C. Translation - the mRNA base sequence is "translated" into an amino acid sequence

1. The Code
DNA - instructions are written in the sequence of nucleotides (bases = alphabet)
RNA - sequences of three nucleotides form "codons" - words of the RNA language – each specifies a specific amino acid (the building blocks of a protein)

DNA template: A T A C G G G C A T A T C G
mRNA strand: __ __ __ __ __ __ __ __ __ __ __ __
amino acids: _______ _______ _______ _______

2. Reading the Code - Protein Synthesis

a. The Roll of tRNA and Ribosomes

D. Protein Synthesis - An Overview

DNA ----transcription-----\> mRNA ----translation-----\> amino acid sequence (=protein)

V. Additional Selected Key Terms (FYI)
anti-codon  codon  DNA  DNA replication  nitrogen base  nucleotide
RNA transcription  translation
Study Questions – DNA: Structure and Function

1. What is the relationship between DNA, chromosomes and chromatin?
2. In general, what is the overall function of DNA?
3. In general, what is the overall function of RNA?
4. What is transcription?
5. What is translation?
6. Describe the structure of DNA. What is DNA made of? What are the parts of DNA made of? How are these parts held together?
7. When does DNA replicate?
8. Why does DNA replicate?
9. Describe the process of DNA replication (note: you do not need to know the names of the different enzymes).
10. Compare and contrast DNA and RNA?
11. Name and describe the different types of RNA. What do each of these different types of RNA do?
12. Describe the process of transcription (note: you do not need to know the names of the different enzymes).
13. What is produced by transcription?
14. How is information carried by DNA, RNA?
15. Describe the genetic code. What are the “letters” and “words” of the genetic code?
16. What is a triplet? What is a codon? What is an anticodon?
17. Describe the process of translation?
18. What is the difference between the “template strand” and the “nonsense strand” on DNA?
19. What role do each of the following play in translation:
   a. mRNA
   b. tRNA
   c. Ribosome
20. What is the relationship between triplets, codons and amino acids?
21. Proportionally, how many nucleotides are required on the DNA molecule to code for a protein?
22. Summarize the relationship between DNA and protein.

“DNA is an abbreviation for deoxyribonucleicantidisestablishmentarianism, a complex string of syllables.”
  — Dave Barry

"The capacity to blunder slightly is the real marvel of DNA. Without this special attribute, we would still be anaerobic bacteria and there would be no music."
  — Lewis Thomas