Bacterial Genetics

Pages 46-47; 210-218

1. Overview (pp 46 - 47)

    A. DNA

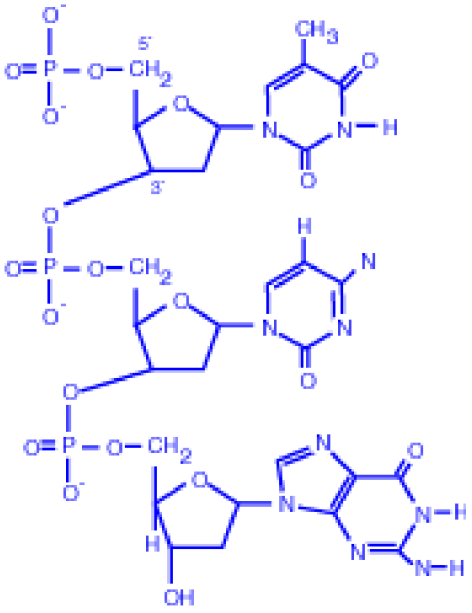
        i. Genome

        ii. Genes

            a. Genotype

            b. Phenotype

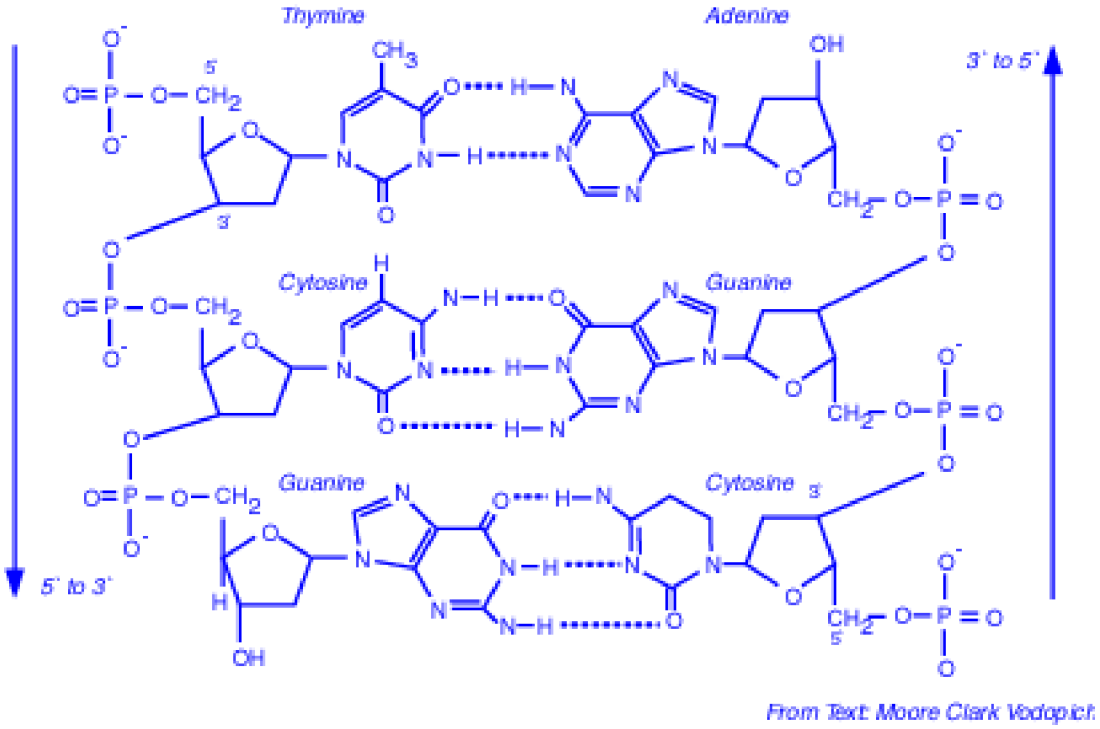
        iii. Construct



iii. Base Pairs

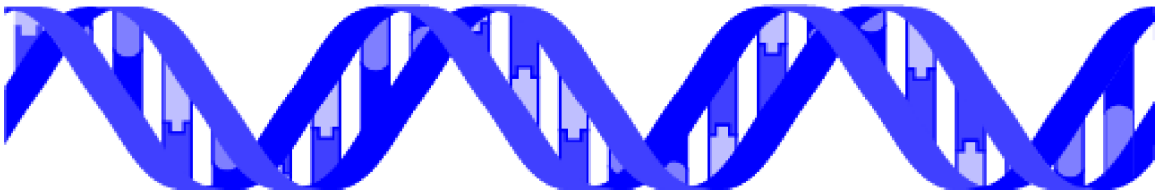
- Thymine – Adenine 
- Guanine – Cytosine 

iv. Complimentary Base Pairing in DNA



From Text: Moore Clark Vodopich

v. Double Helix



vi. Transcription and Translation

vii. Binary Fission

a. DNA ligase

2. Replication of DNA (pp 210 - 214)

A. DNA Helicase

B. DNA Polymerase

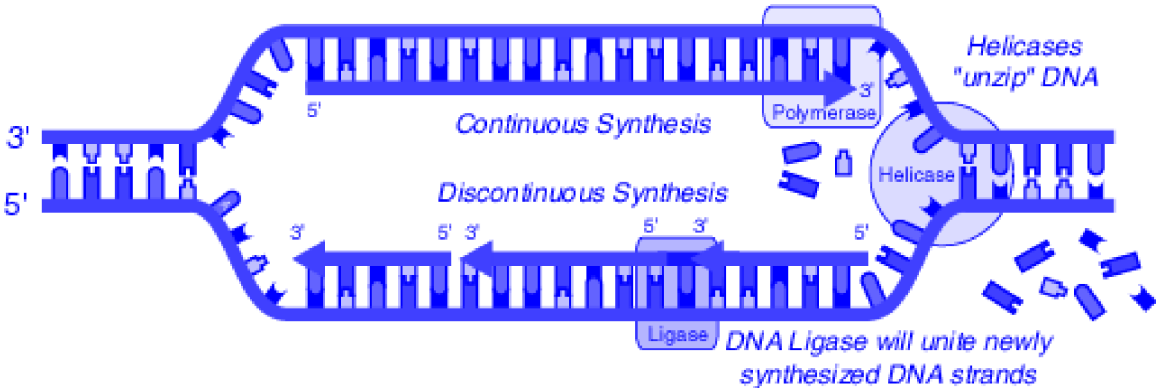
i. Continuous

a. 3’ to 5’

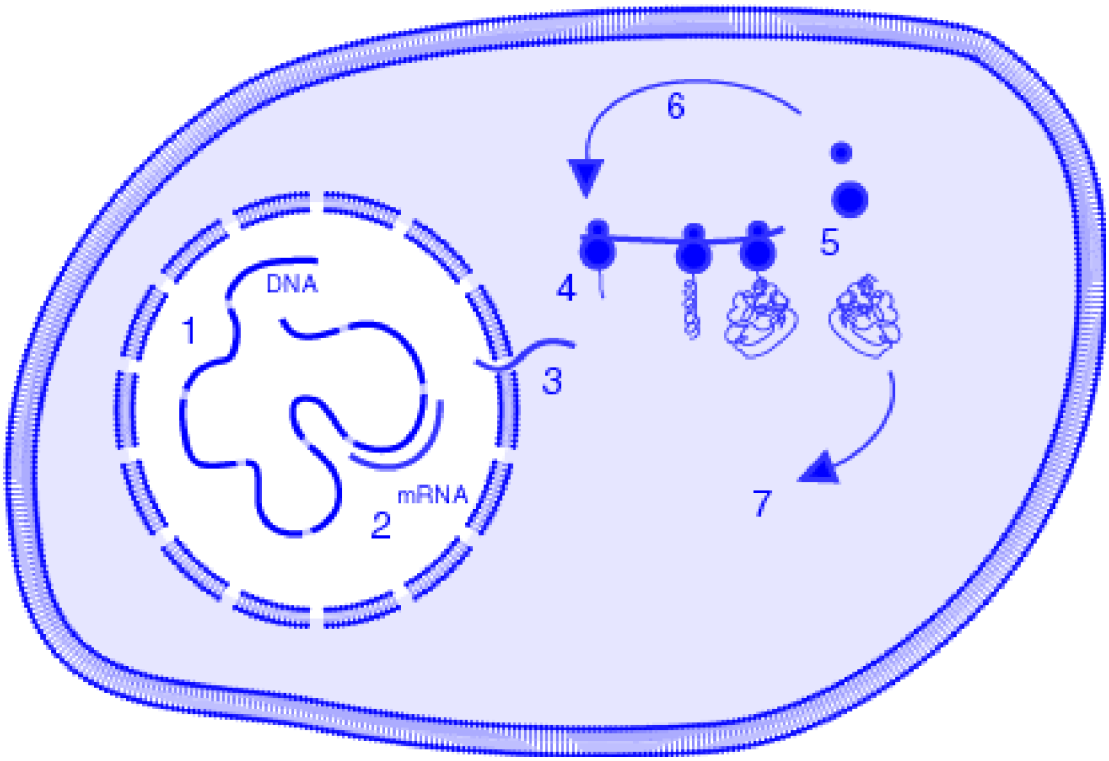
ii. Discontinuous

a. 5’ to 3’

C. DNA Ligase



3. Transcription and Translation
   A. Overview of Processes



1. The genetic material for eukaryotic organisms (includes humans) is DNA. The information is divided up into functions segments called genes. Each gene will code for a particular structural or functional molecule necessary for cellular growth and maintenance. In this case we will assume that the gene codes for a particular enzymatic protein.
2. Transcription of the information from DNA into RNA (called mRNA or messenger RNA). This transcription process is necessary as ribosomes can only work with RNA.
3. The messenger RNA leaves the nucleoplasm via a nuclear pore and enters the cytoplasm.
4. First the small and then the large ribosomal subunits attach the to the mRNA in order to translate the genetic material into a protein. As they translate the mRNA they add the appropriate amino acids, according to instruction, to a growing polypeptide chain. Note that multiple ribosomes can do the translation process simultaneously (called a polysome).

5. After a ribosome has finished translating the mRNA, the two ribosomal subunits and the newly formed protein disengage the mRNA.
6. The ribosomes can then repeat the process and translate the mRNA once again.
7. The newly formed protein enters the cytoplasm to do it's particular cellular function.

B. Ribosomes (rRNA) (see p. 94)

i. Structure (30s & 50s ribosomal subunits)

ii. Function

C. Transcription (pp 214 - 218)

i. RNA Polymerase

ii. Nucleotides

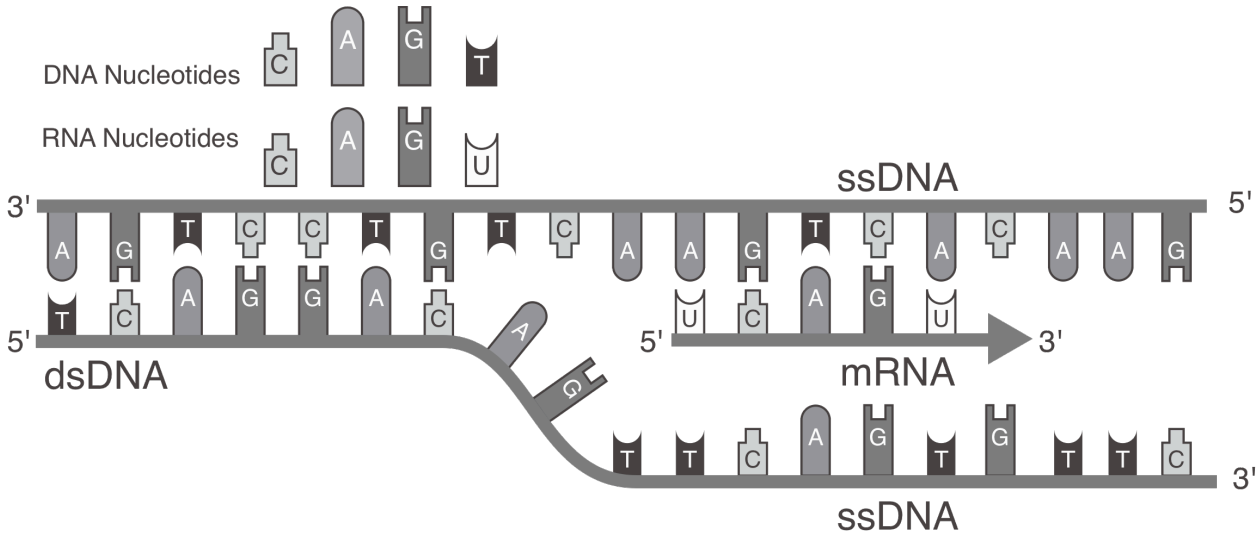
a. DNA Nucleotides

- Thymine – Adenine 
- Guanine – Cytosine 

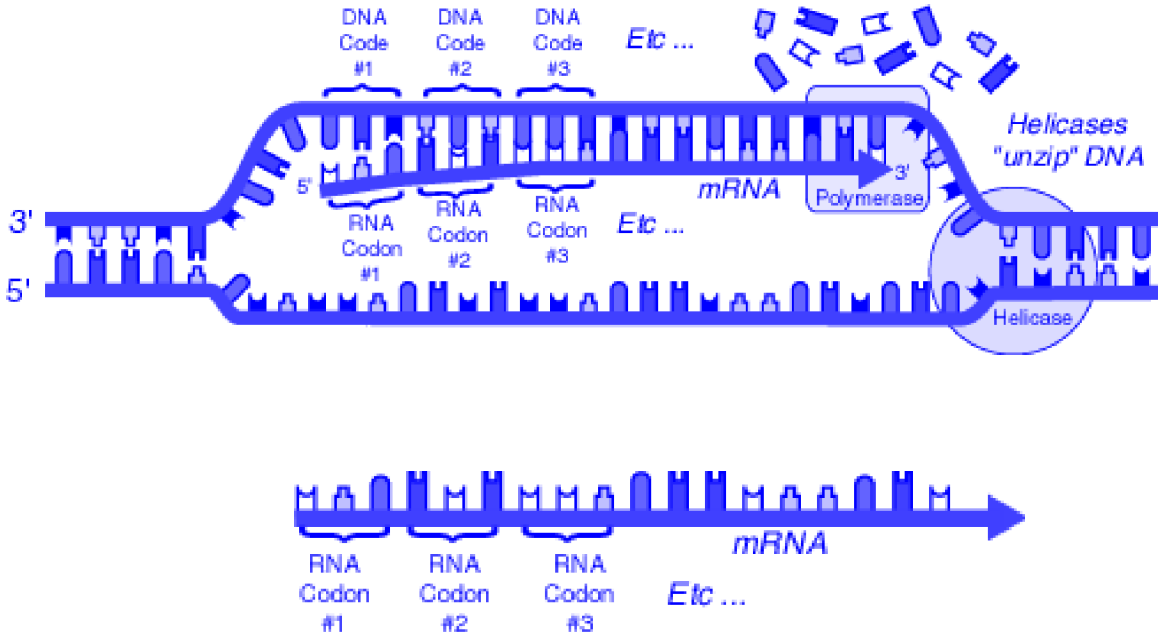
b. RNA Nucleotides

- Uracil – Adenine 
- Guanine – Cytosine 

iii. Process of Transcription



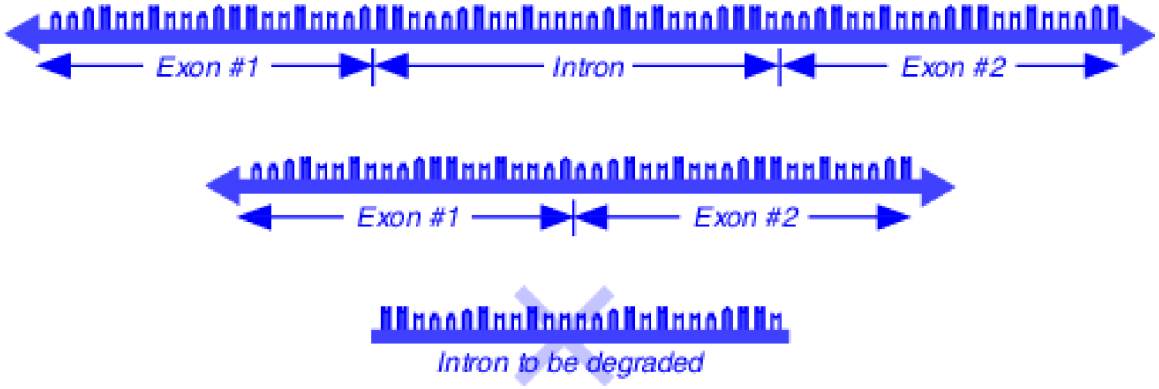
iv. Codes and Codons



v. mRNA Processing

a. Exons

b. Introns

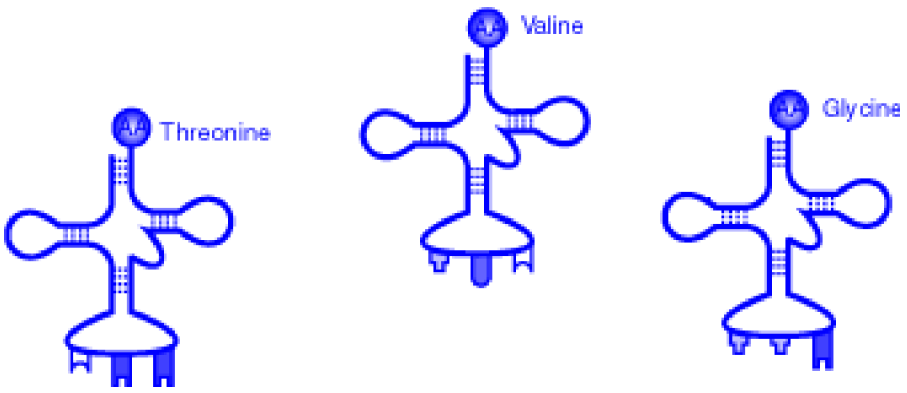


D. Translation (pp 215 - 218)

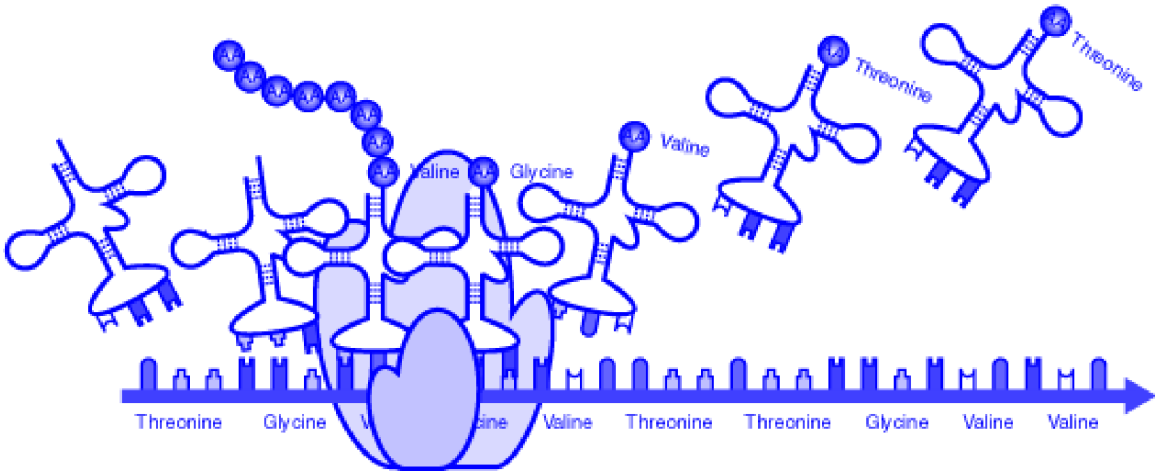
i. Transfer RNA (tRNA)

a. Anticodon

b. Amino Acid Binding Site



DNA Code	mRNA Codon	tRNA Anticodon	Amino Acid
TTT	AAA	UUU	Lysine
TGG	ACC	UGG	Threonine
CCG	GGC	CCG	Glycine
CAT	GUA	CAU	Valine
CTC	GAG	CUC	Glutamate
GAG	CUC	GAG	Leucine
AGA	UCU	AGA	Serine
ACT	UGA	ACU	"Stop"



ii. Steps of Translation

a. Initiation

b. Elongation

c. Termination

4. Regulation of Gene expression

A. Transcription Control

i. Chromatin Activation

ii. Transcription Factors

B. Posttranscriptional Control

C. Translational Control

D. Posttranslational Control

5. Gene Regulation (pp 218 - 221) (see handout on *BACTERIAL GENETICS*)

A. Inducible Expression of a Gene - (*Lactose Operon*)

i. Operon

B. Repression of a Gene

6. Transformation (pp 232 - 234) (see handout on *BACTERIAL GENETICS*)

- Competent

A. Gram Positive Bacteria

- *Streptococcus pneumoniae*

B. Gram Negative Bacteria

- *Haemophilus sp*.
- *Neisseria sp*.

7. Conjugation (pp 234, 236) (see handout on *BACTERIAL GENETICS*)

   A. Plasmids (p. 235)

      i. Sex Pilus

      ii. Plasmid

      iii. Tra Genes

      iv. Sex Pilus

      v. F^+ and F^-

      vi. Hfr

8. Transduction (pp 234 - 235)

   - Bacteriophage (Phage)

   A. Induce Lytic Cycle

   B. Become Temperate Phage

      i. Generalized Transduction (See also page 389, figure 13.12)

      ii. Restricted (Specialized) Transduction (See also page 390, figure 13.13)

9. Mutations (pp 226 - 228)

   A. Spontaneous Mutations

   B. Induced Mutations

      i. Mutagens

         a. Ultraviolet Light