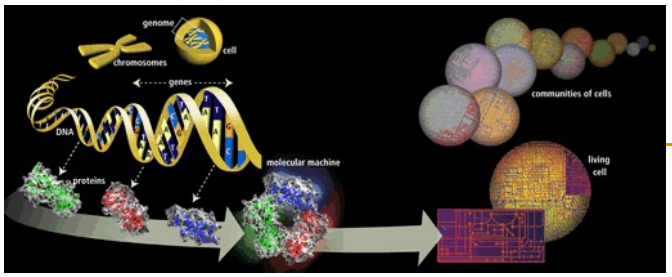
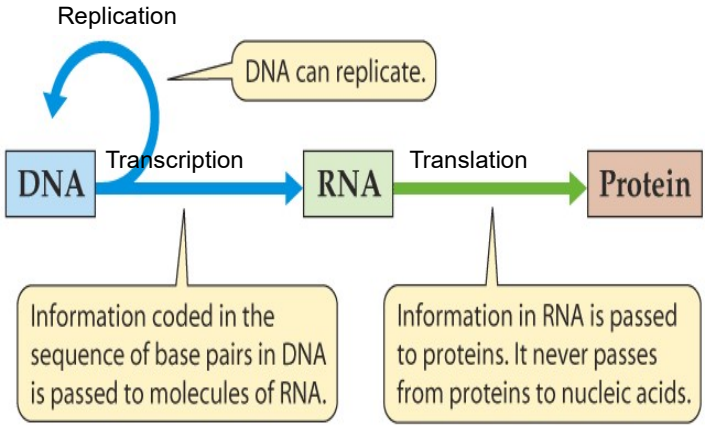
A Brief Introduction to DNA & RNA



DNA, RNA, and the Flow of Information



DNA Structure and Functions

DNA and RNA are polymers of nucleotides

- DNA is a nucleic acid, made of long chains of nucleotides

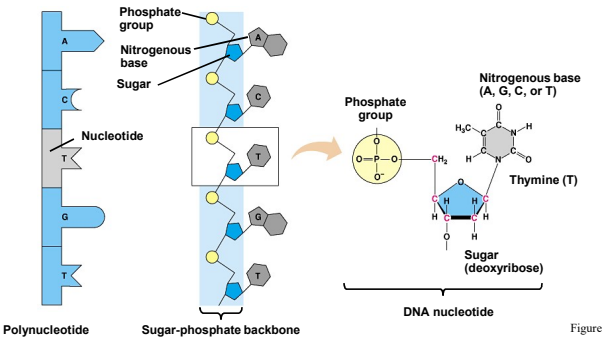


Figure 10.2A

- DNA has four kinds of bases, A, T, C, and G

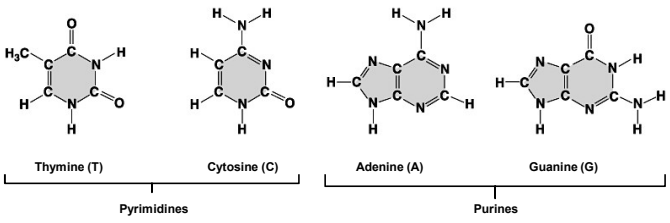
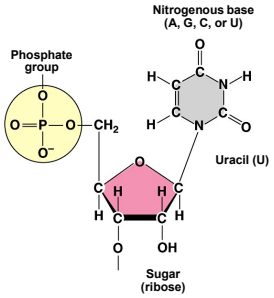


Figure 10.2B

- RNA is also a nucleic acid
  - different sugar
  - U instead of T
  - Single strand, usually



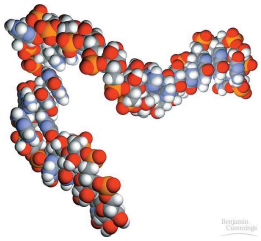


Figure 10.2C, D

DNA is a double-stranded helix

- James Watson and Francis Crick worked out the three-dimensional structure of DNA, based on work by Rosalind Franklin

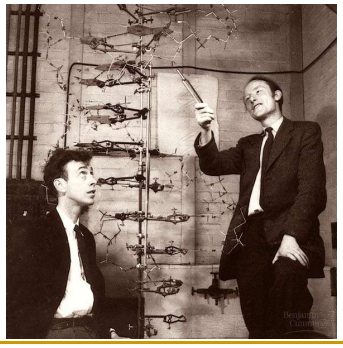


Figure 10.3A, B

- Hydrogen bonds between bases hold the strands together: A and T, C and G

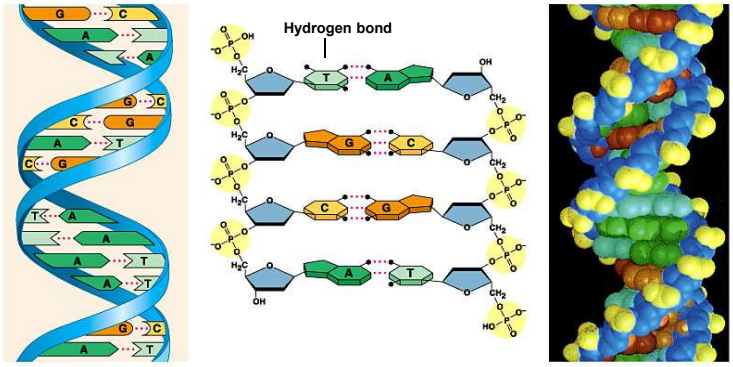


Figure 10.3D

Untwisting and replication of DNA

- each strand is a template for a new strand

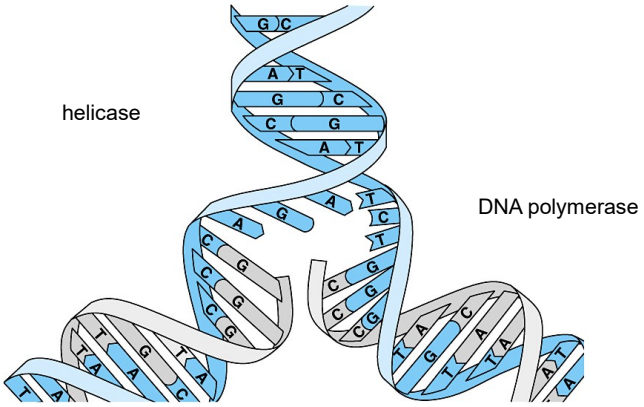
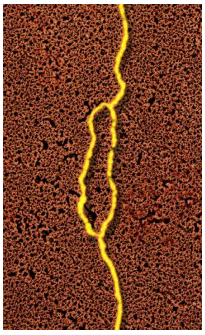
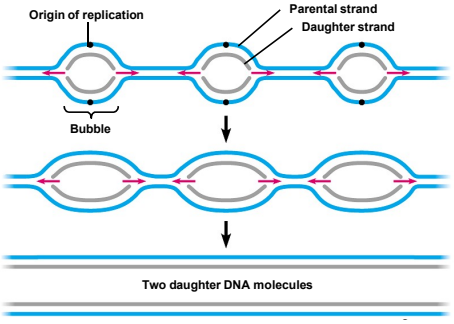


Figure 10.4B

How can entire chromosomes be replicated during S phase?

- DNA replication begins at many specific sites





- Each strand of the double helix is oriented in the opposite direction

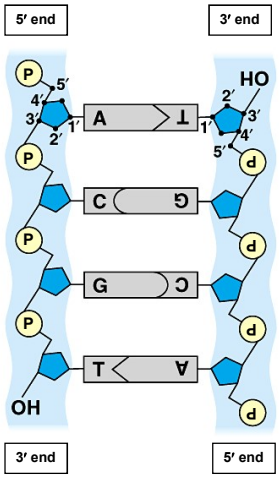


Figure 10.5B

Table 14.3
Sizes of Different Genomes

Different genetic sets. The genome sizes of a virus and six organisms, measured in number of base pairs.

Virus/Organism	Genome Size in Base Pairs
T2 virus	200,000
E. coli bacterium	4.6 million
Yeast	12 million
Fruit fly	180 million
Chicken	1.2 billion
Human	3 billion
Pea	5 billion

Virtually all organisms share the same genetic code "unity of life"

Second Base

First Base	U	C	A	G	Third Base
U	UUU phe UUC UUA leu UUG	UCU UCC UCA UCG ser	UAU tyr UAC UAA stop UAG stop	UGU cys UGC UGA stop UGG trp	U C A G
C	CUU CUC CUA leu CUG	CCU CCC CCA CCG pro	CAU his CAC CAA gln CAG	CGU CGC CGA CGG arg	U C A G
A	AUU AUC AUA ile AUG met (start)	ACU ACC ACA ACG thr	AAU asn AAC AAA lys AAG	AGU ser AGC AGA arg AGG	U C A G
G	GUU GUC GUA val GUG	GCU GCC GCA GCG ala	GAU asp GAC GAA glu GAG	GGU GGC GGA GGG gly	U C A G

Review: The flow of genetic information in the cell is DNA→RNA→protein

- The sequence of codons in DNA spells out the primary structure of a polypeptide
  - ✓ Polypeptides form proteins that cells and organisms use

Gene, DNA and Chromosomes