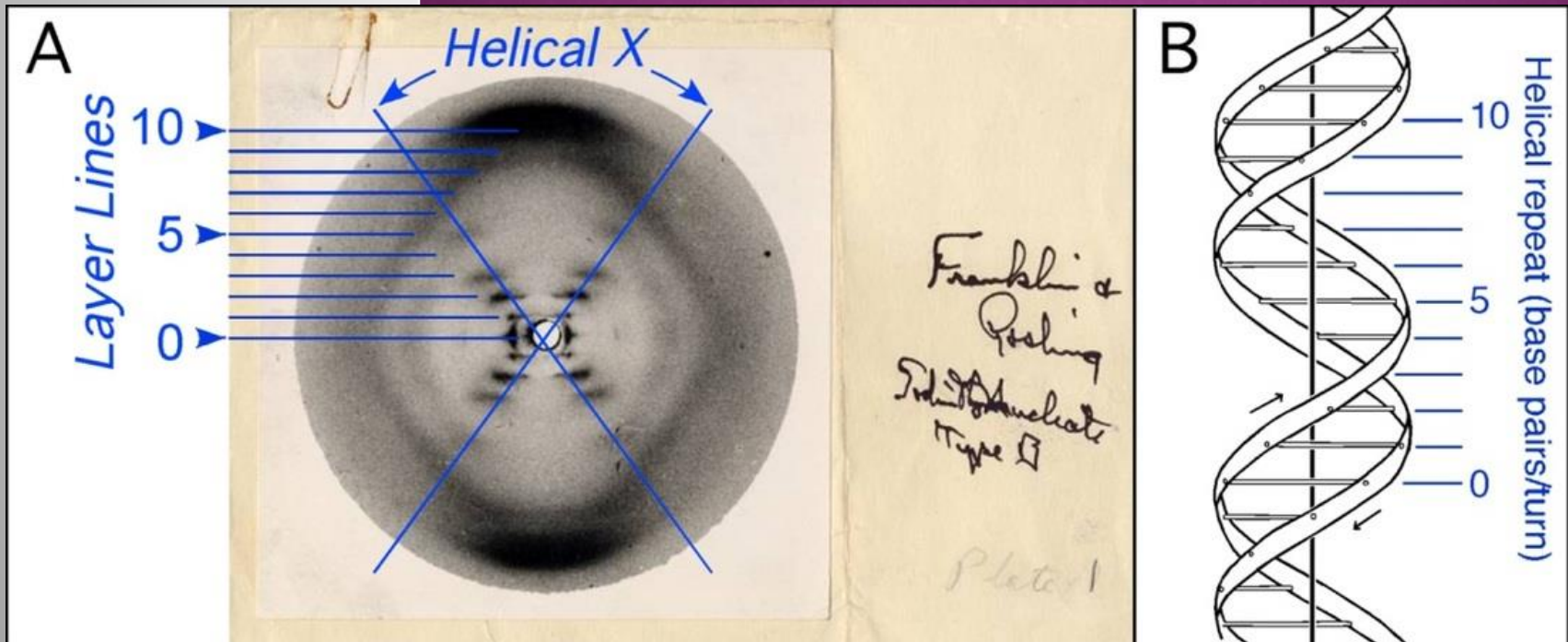
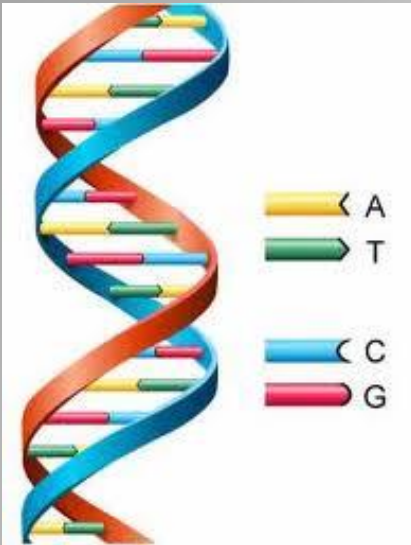


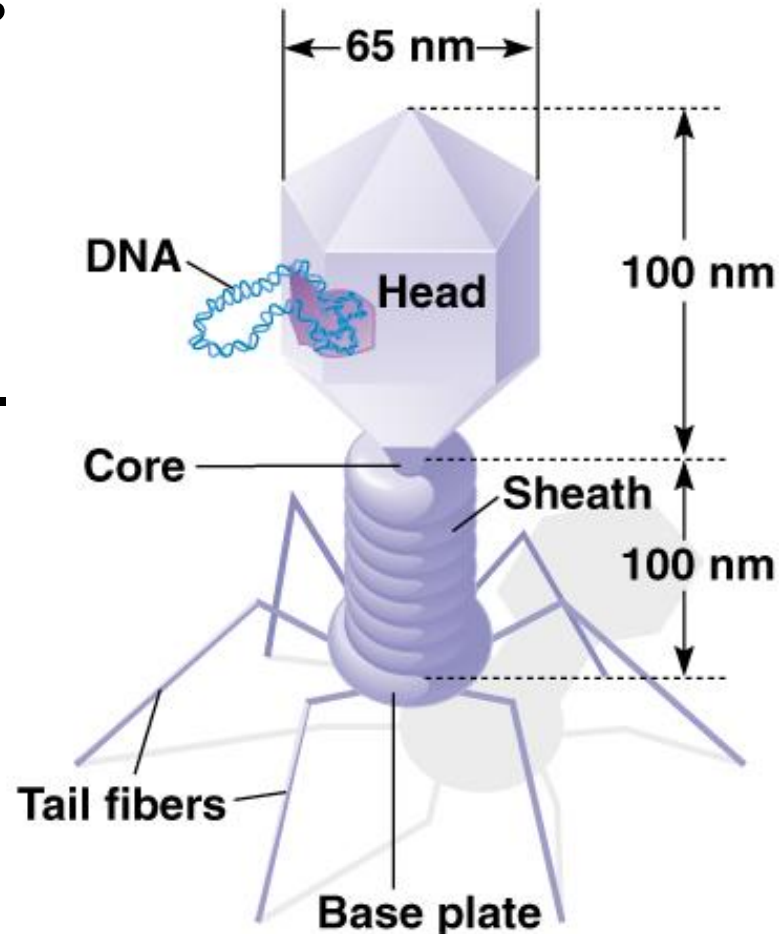
CHAPTER 12: DNA

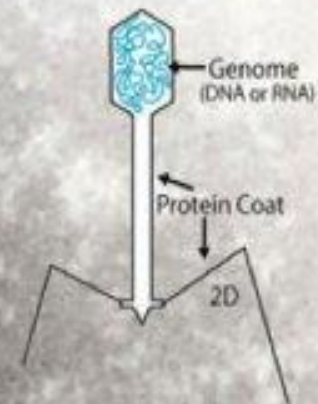
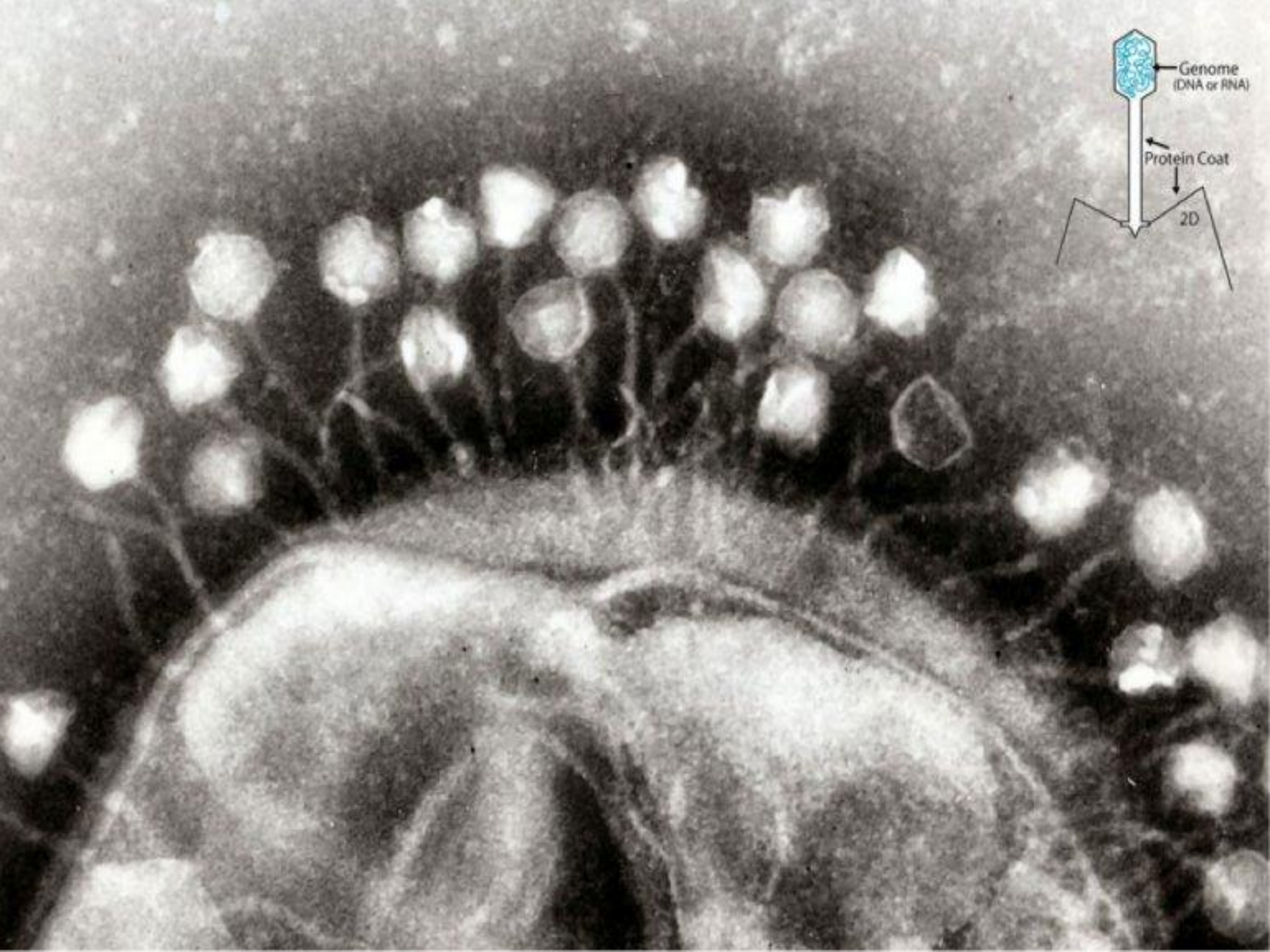


Hershey-Chase Bacteriophage Experiment - 1953

Bacteriophage = Virus that attacks bacteria and replicates by invading a living cell and using the cell's molecular machinery.

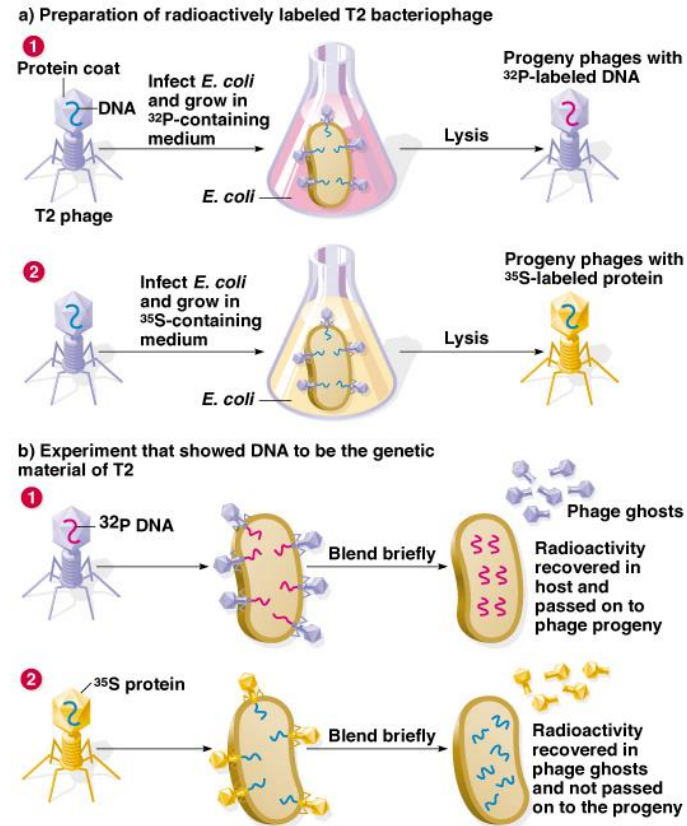
Bacteriophages are composed of DNA & protein





Hershey-Chase Bacteriophage Experiment - 1953

1. T2 bacteriophage is composed of DNA and proteins:
2. Set-up two replicates:
 - Label DNA with ^{32}P
 - Label Protein with ^{35}S
3. Infected *E. coli* bacteria with two types of labeled T2
4. ^{32}P is discovered within the bacteria and progeny phages, whereas ^{35}S is not found within the bacteria but released with phage ghosts.



Hershey and Chase Experiment

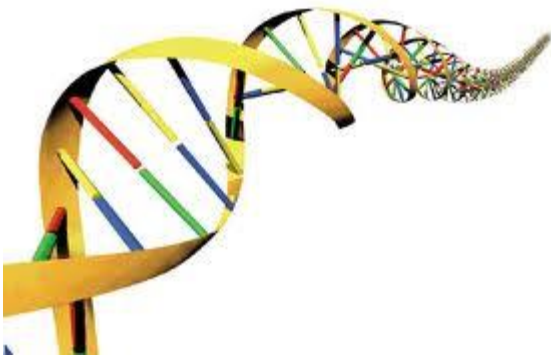
Read page 340-341 in textbook
Answer questions on page 181 of packet



Martha Chase & Alfred Hershey

12.1 THE ROLE OF DNA IN HEREDITY

- ◉ **Stores information** needed for traits and cell processes
- ◉ **Copying information** needed for new cells
- ◉ **Transferring information** from generation to generation



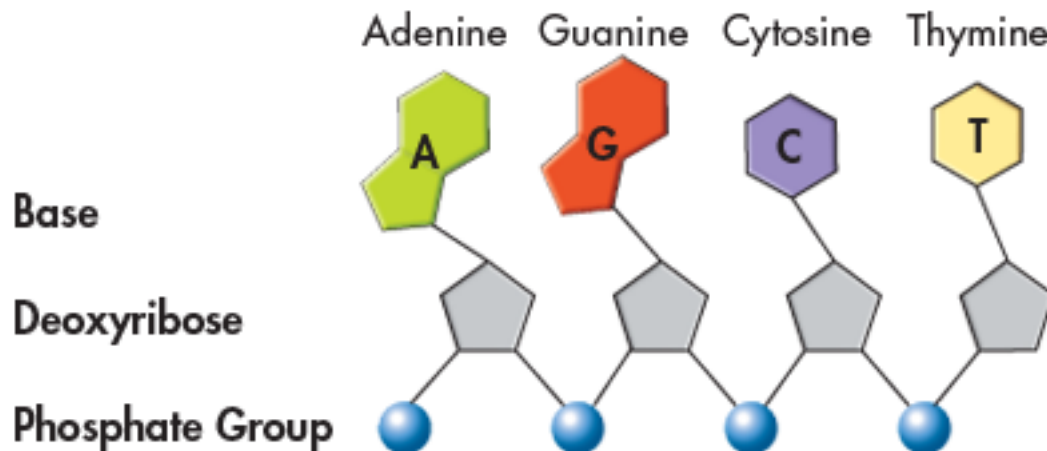
12.2 THE STRUCTURE OF DNA

- ◉ Why would it be important to understand the structure of DNA?
- ◉ The DNA molecule must give directions to make proteins which are needed to regulate the various functions of each cell
- ◉ Understanding the structure of DNA has been the key to understanding how genes work.

COMPONENTS OF DNA

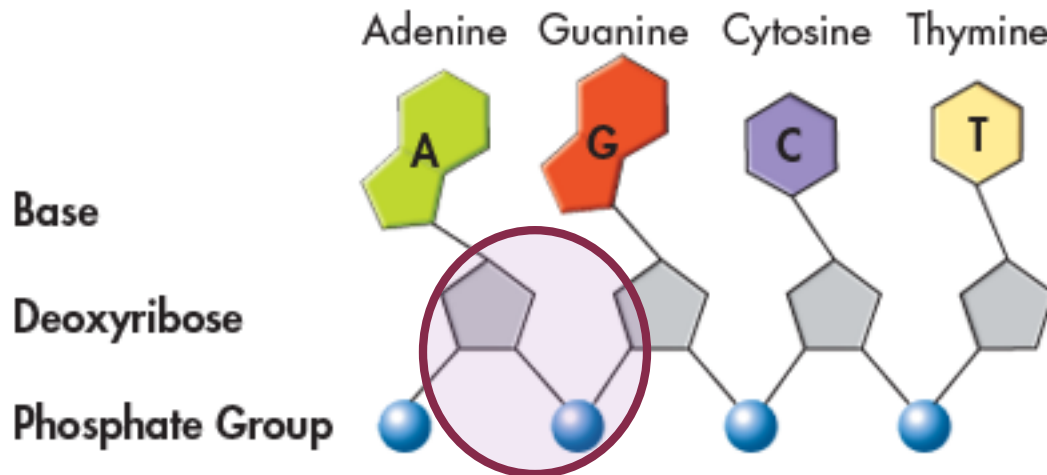
◉ Made of nucleotides (3 parts)

- Sugar (deoxyribose)
- Phosphate group
- Base (nitrogenous base)
 - A (adenine)
 - T (thymine)
 - C (cytosine)
 - G (guanine)



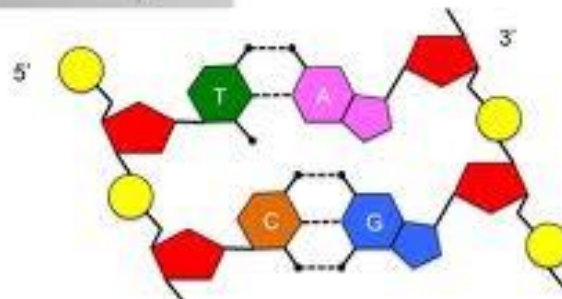
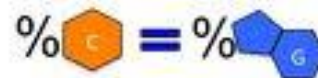
COMPONENTS OF DNA

- ◉ The nucleotides in a strand of DNA are joined by **covalent bonds** formed between the **sugar** and **phosphate** groups.
- ◉ The bases stick out **sideways** from the nucleotide chain.
- ◉ The nucleotides can be joined together **in any order**, any sequence of bases is possible



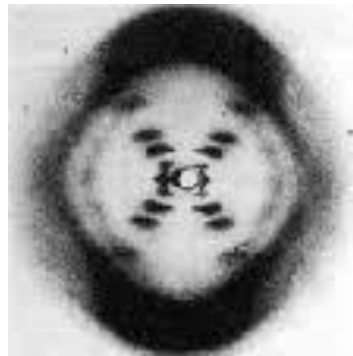
SOLVING THE STRUCTURE OF DNA

- Erwin Chargaff discovered that the percent of **adenine** and **thymine** in DNA were the same.
- The percent of guanine and cytosine are also equal.
- The observation that $[A] = [T]$ and $[G] = [C]$ became known as one of “**Chargaff's rules**.”



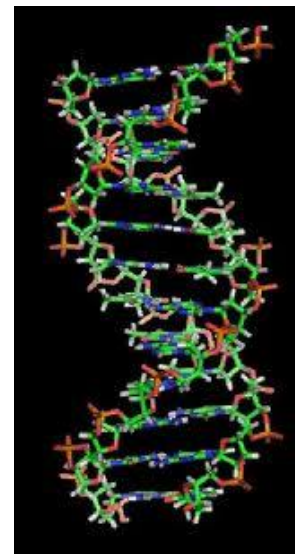
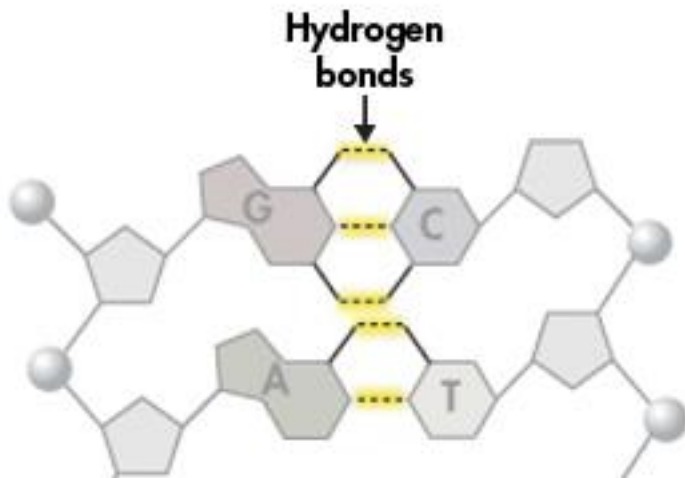
SOLVING THE STRUCTURE OF DNA

- Rosalind Franklin (1950) - used **X-ray diffraction** (aimed X-rays at DNA and looked at the scatter pattern) to find clues about the structure
 - Showed DNA has 2 strands
 - The DNA strands are twisted around each other like a spring (helix shaped)
 - The bases are in the center



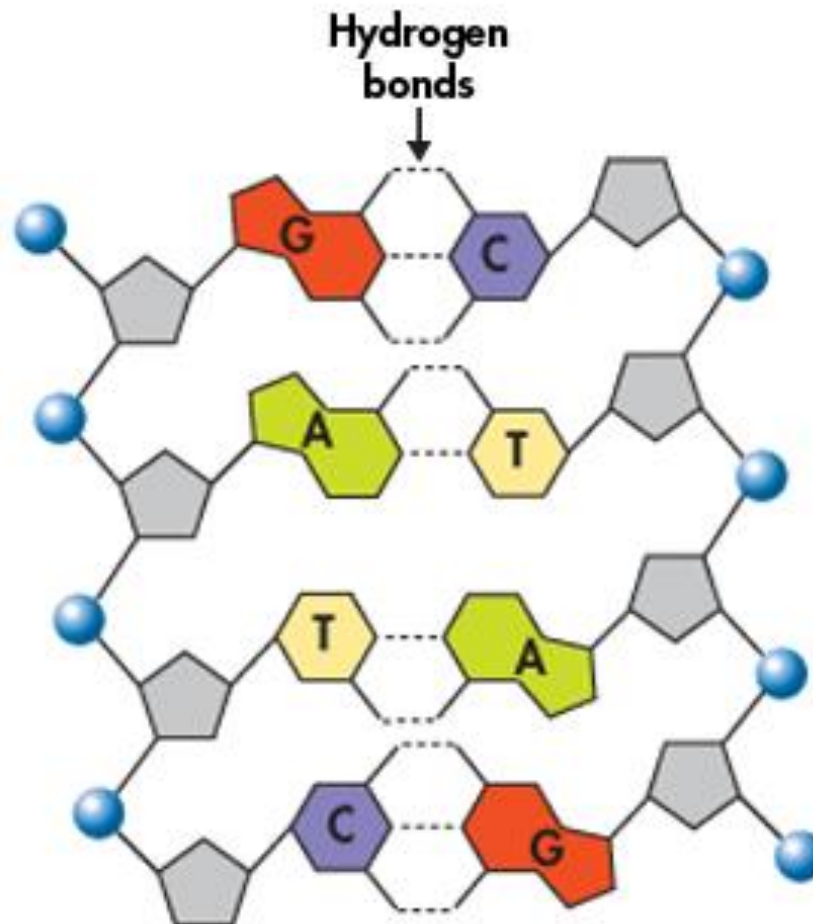
SOLVING THE STRUCTURE OF DNA

- ◉ **Watson and Crick** - built models of DNA
 - Discovered the **double helix** structure (2 strands twist around each other like staircases)
 - Explained Franklin's and Chargaff's earlier discoveries
 - Discovered that **hydrogen bonds** hold the DNA strands together
 - Weak forces that enable the DNA to **come apart**



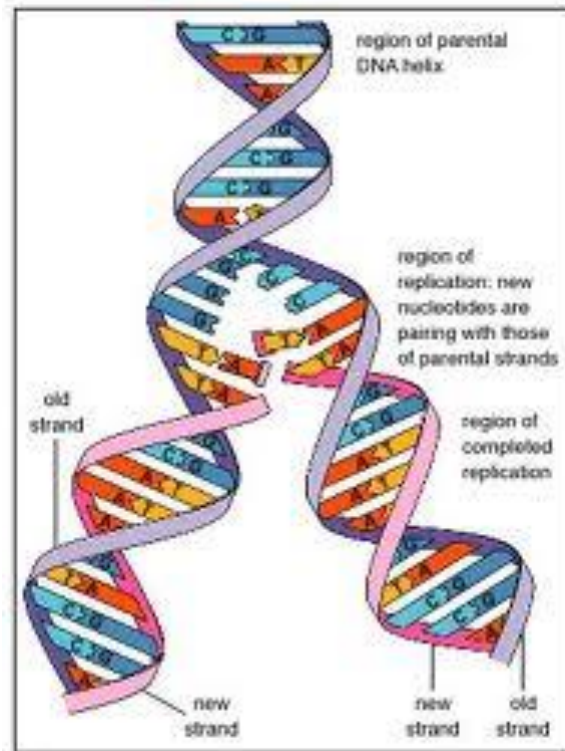
BASE PAIRING

- ◉ **Adenine** pairs with **Thymine**
- ◉ **Guanine** pairs with **Cytosine**



12.3 DNA REPLICATION

- ◉ Before a cell divides, it duplicates its DNA in a copying process called **replication**
- This process ensures that each resulting cell has the same complete set of DNA molecules



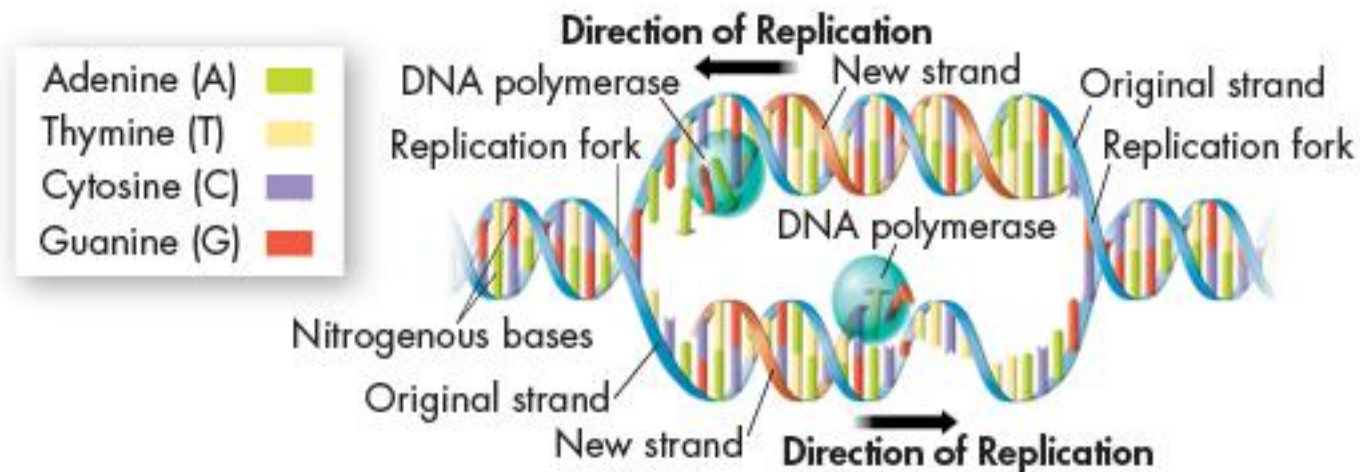
DNA replication 3 min.

DNA REPLICATION

- How does the double helix structure of DNA make replication (copying) possible?????
- Each strand of the double helix has all the information needed to reconstruct the other half by the mechanism of base pairing.
- Because each strand can be used to make the other strand, the strands are said to be **complementary**

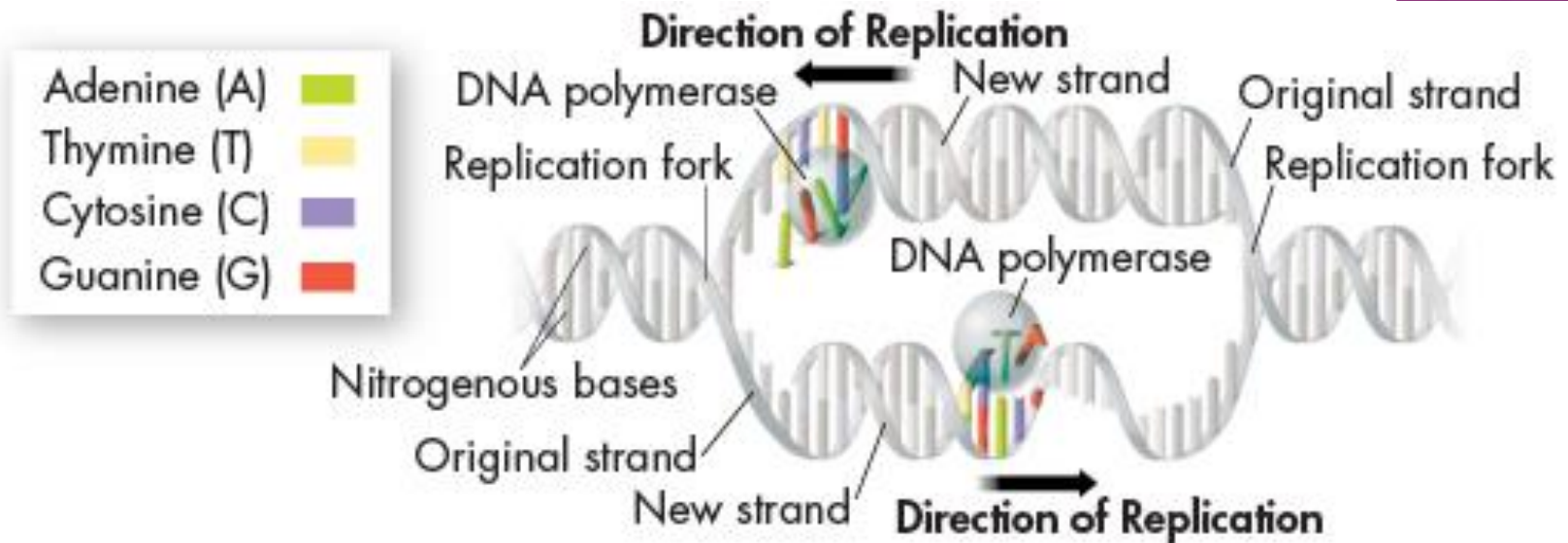
DNA REPLICATION

- The DNA molecule **separates** into two strands and then produces two new **complementary** strands following the rules of **base pairing**.
- Each strand of the double helix of DNA serves as a **template**, or model, for the new strand.



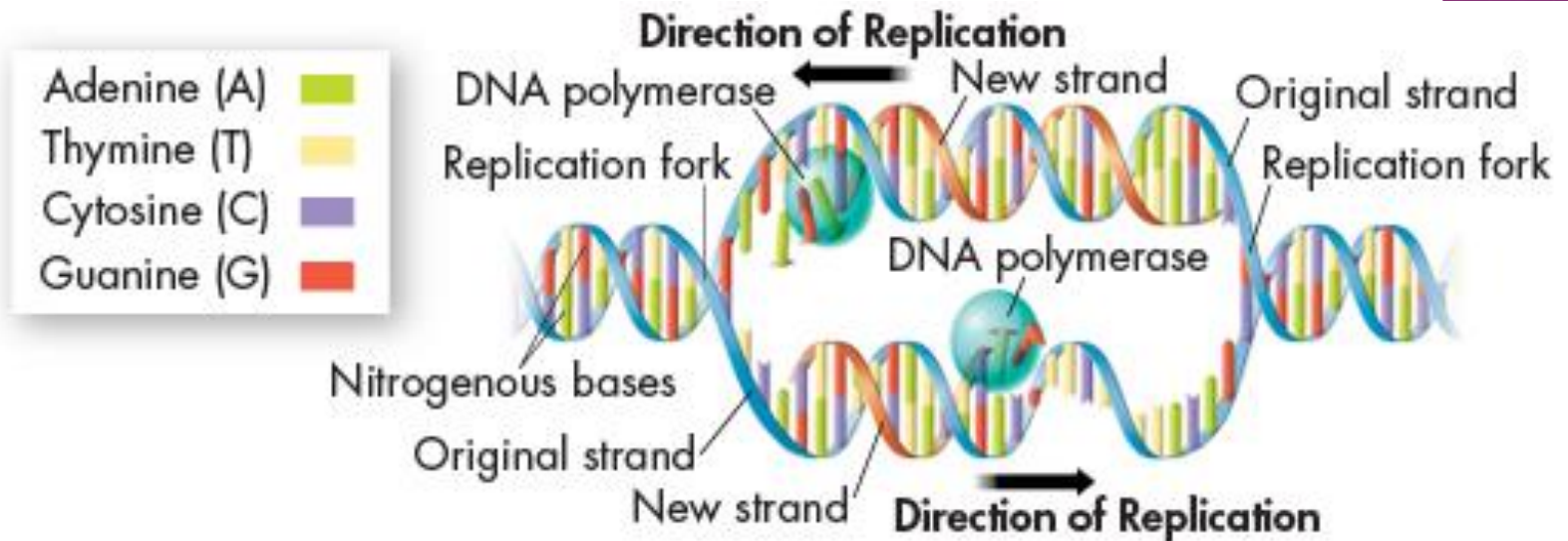
DNA REPLICATION

- The two strands of the double helix **separate**, or “unzip,” allowing two replication forks to form.
- New **bases** are **added** following the rules of base pairing (A-T and C-G) to the newly forming strand.



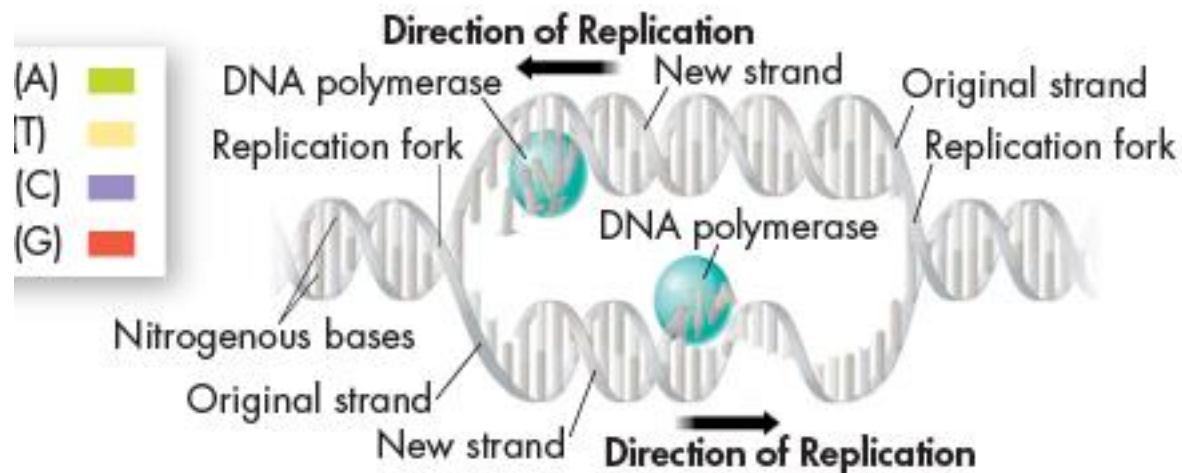
RESULTS OF DNA REPLICATION

- Each DNA molecule has **one original** strand and **one new strand** (semi-conservative).
- The result of replication is two DNA molecules **identical** to each other and to the **original** molecule.



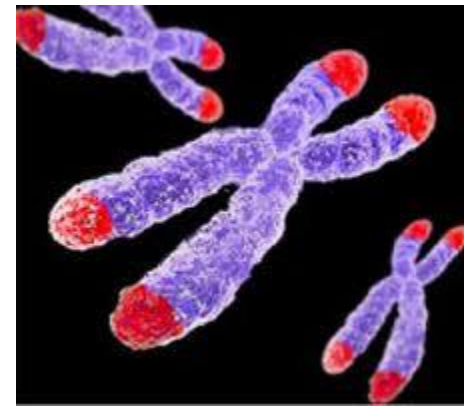
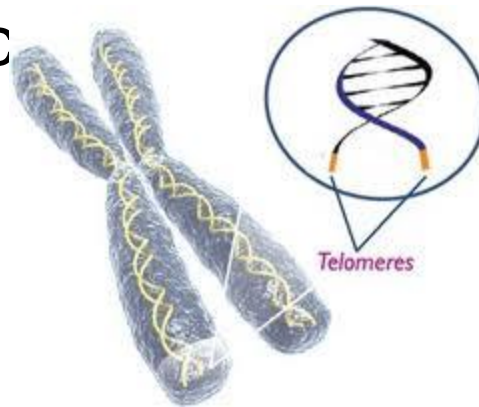
DNA REPLICATION AND ENZYMES

- ◉ DNA replication is carried out by enzymes. They first “unzip” a molecule of DNA by breaking the hydrogen bonds between base pairs and unwinding the two strands of the molecule
- ◉ **DNA polymerase** is an enzyme that **joins** individual **nucleotides** to produce a new strand of DNA and **proofreads** the new strand



TELOMERES

- ◉ The tips of chromosomes are known as **telomeres**
- ◉ Telomeres **are hard to copy**. DNA may be **lost** from telomeres each time a chromosome is replicated.
- ◉ An enzyme (**telomerase**) adds short, repeated DNA sequences to telomeres, lengthening the chromosomes and making it less likely important gene sequences will be lost during replic



DNA replication 3 min.