



# Genetic Material

## DNA Structure & Function

# DNA: Amazing Facts

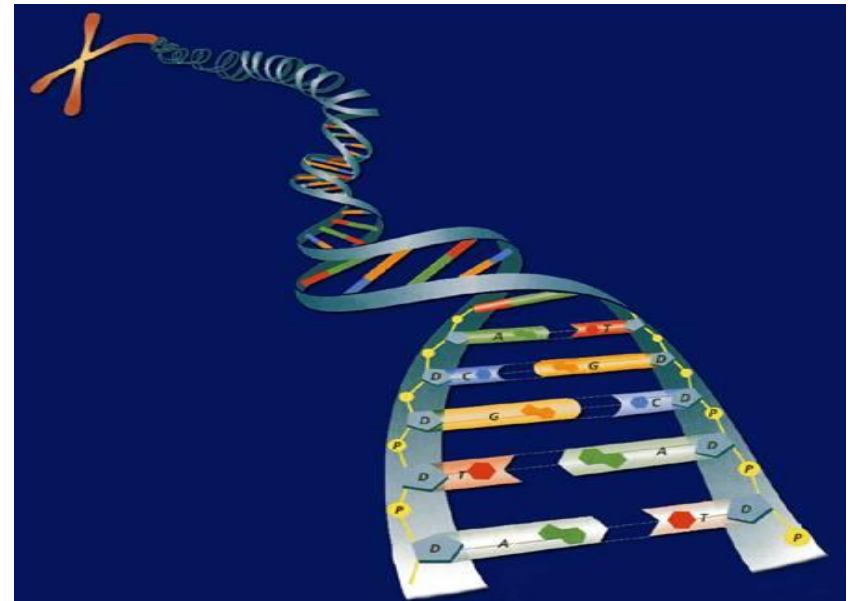
- DNA from a single human cell extends in a single thread for almost 2 metres long!!!
- It contains information equal to some 600,000 printed pages of 500 words each!!!  
*(a library of about 1,000 books)*



# General Purpose of DNA:

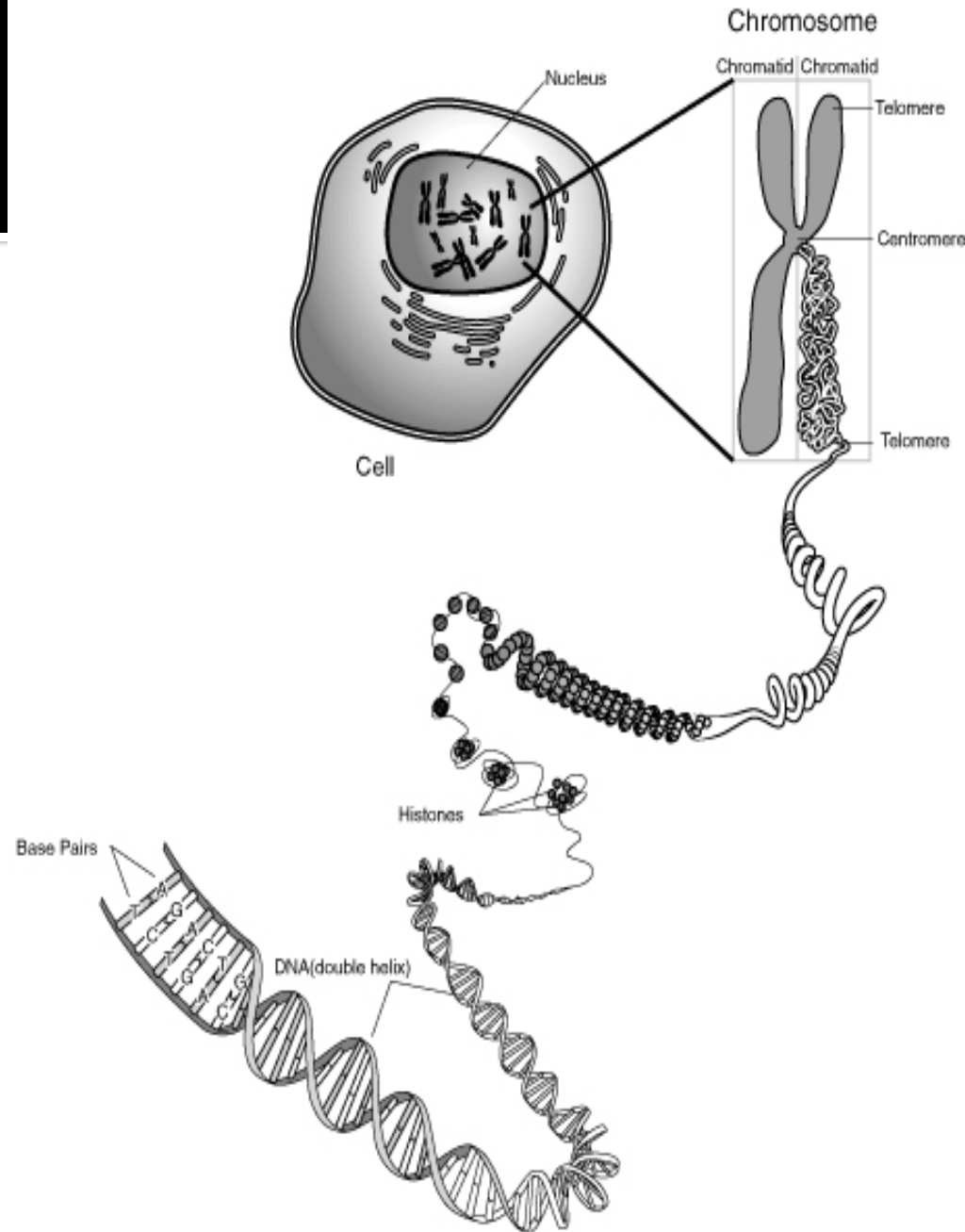
- Stores and transmits genetic information from parent to offspring
- DNA stands for

**DEOXYRIBONUCLEIC ACID**



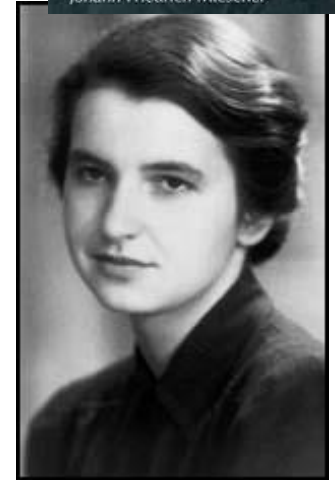
# DNA Packaging

- DNA exists in long fibres called **chromatin**
- DNA in chromatin is wrapped tightly around **histones**
- DNA & histone are further coiled tightly to form **nucleosomes**
- Nucleosomes are eventually wound together to form **chromosomes**



# History of DNA

- **Discovery of the DNA double helix**
  - Friedrich Miescher** – started investigating a compound he found in the nucleus of cells, called it “nuclein” **(1869)**
  - Rosalind Franklin** - X-ray photo of DNA. **(1952)**
  - Watson and Crick** - described the DNA molecule from Franklin’ s X-ray. **(1953)**

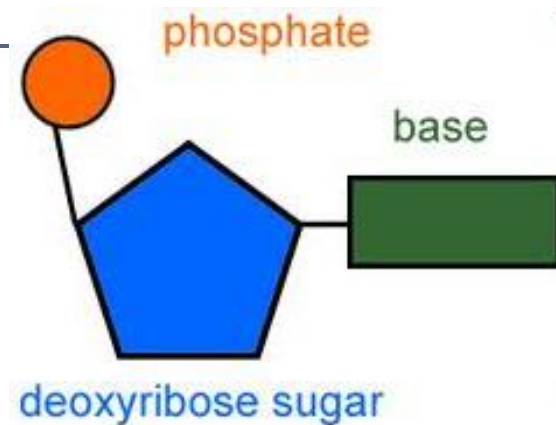


# Components of DNA

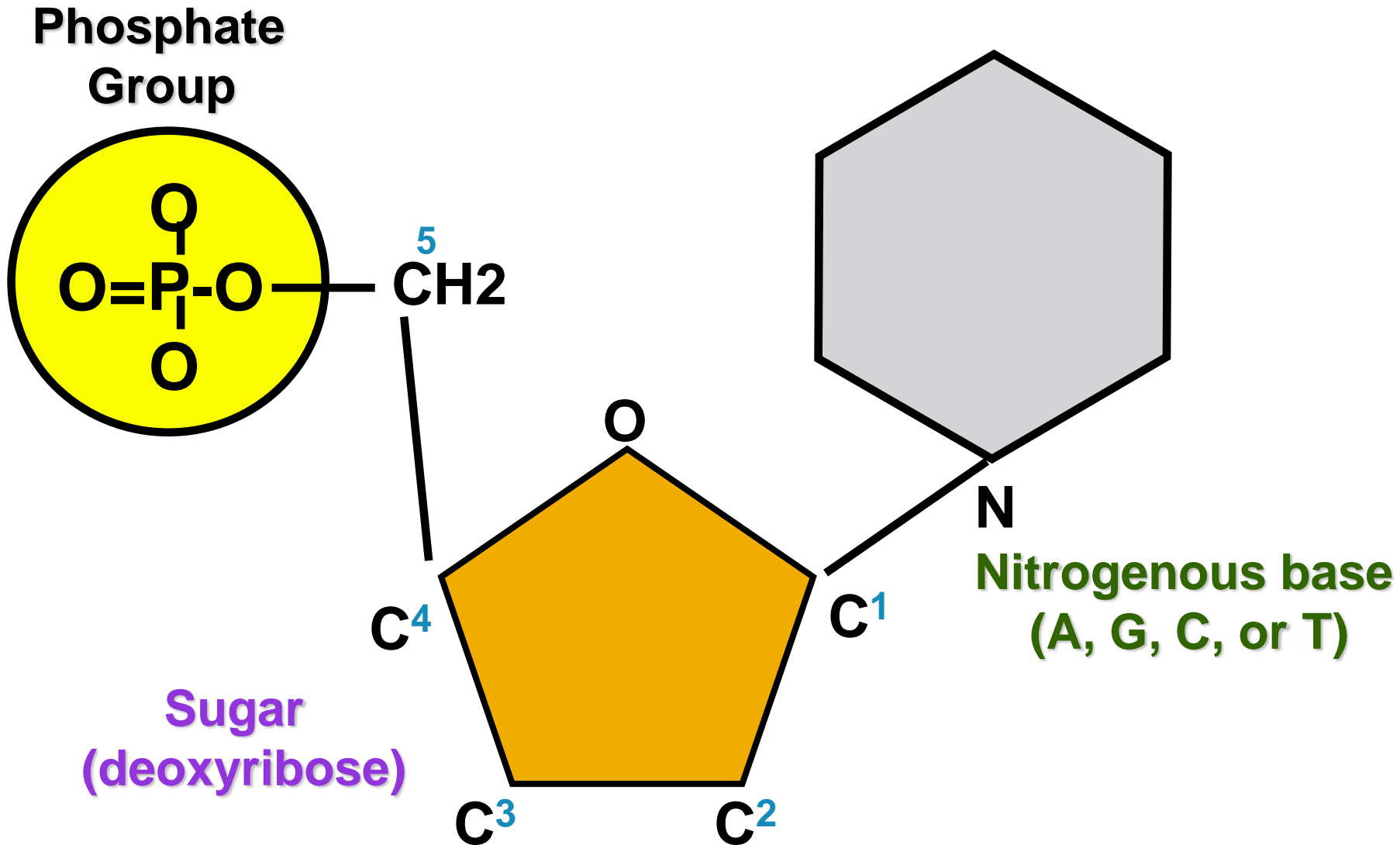
(1) a 5-carbon/pentose sugar called deoxyribose

(2) a  $\text{PO}_4$  group or phosphate

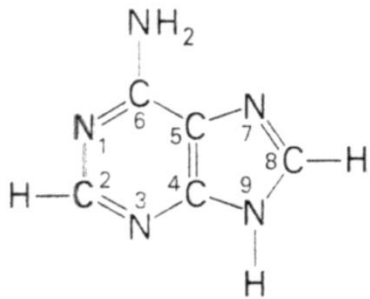
(3) a nitrogen containing base



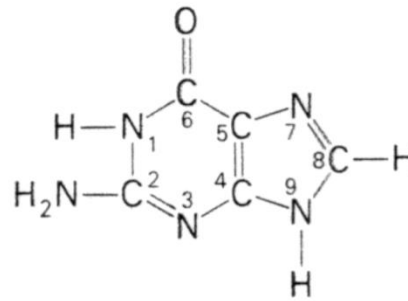
# Unit of DNA: The Nucleotide



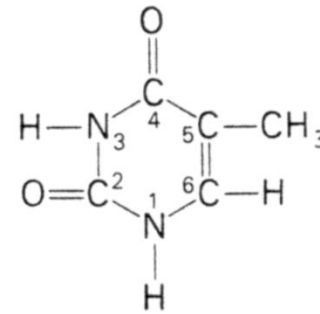
# 4 Nitrogenous Bases



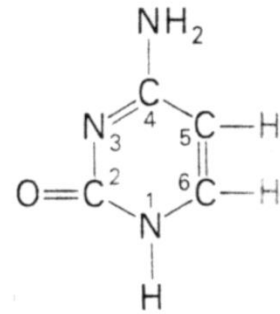
Adenine  
(A)



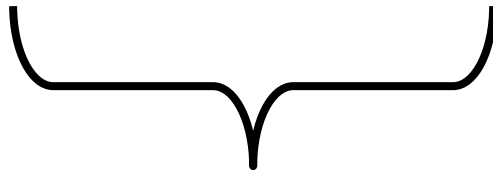
Guanine  
(G)



Thymine  
(T)



Cytosine  
(C)



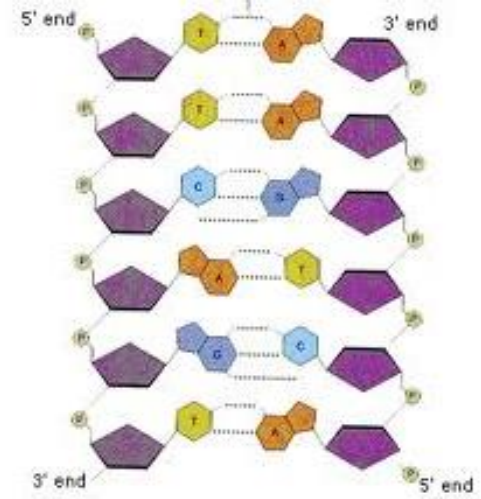
Purines



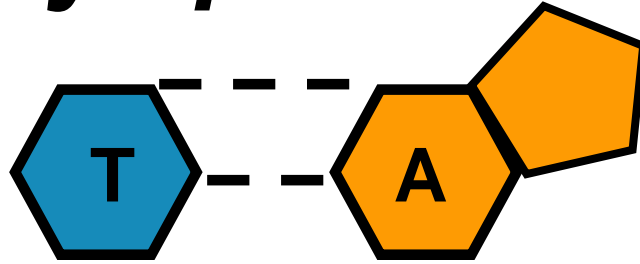
Pyrimidines



# Chargaff's Rule

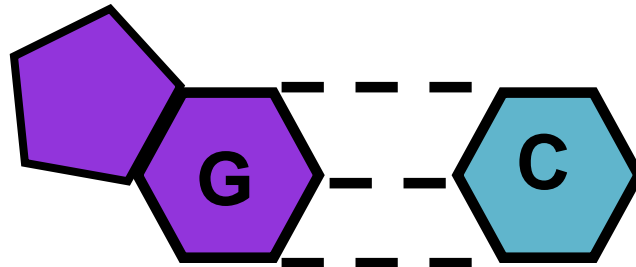


**“A” always pairs with**



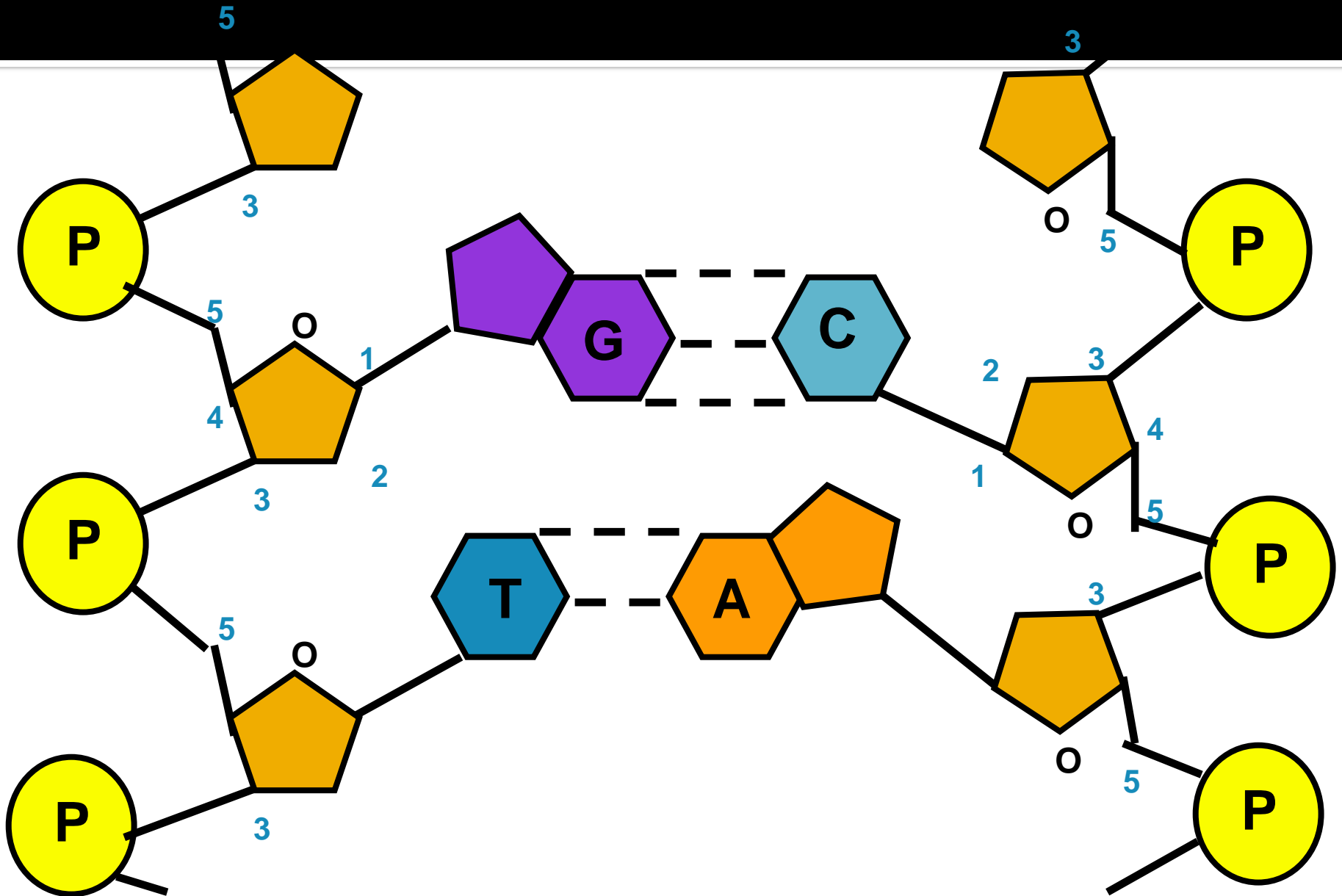
**“T”**

**“C” always pairs with**



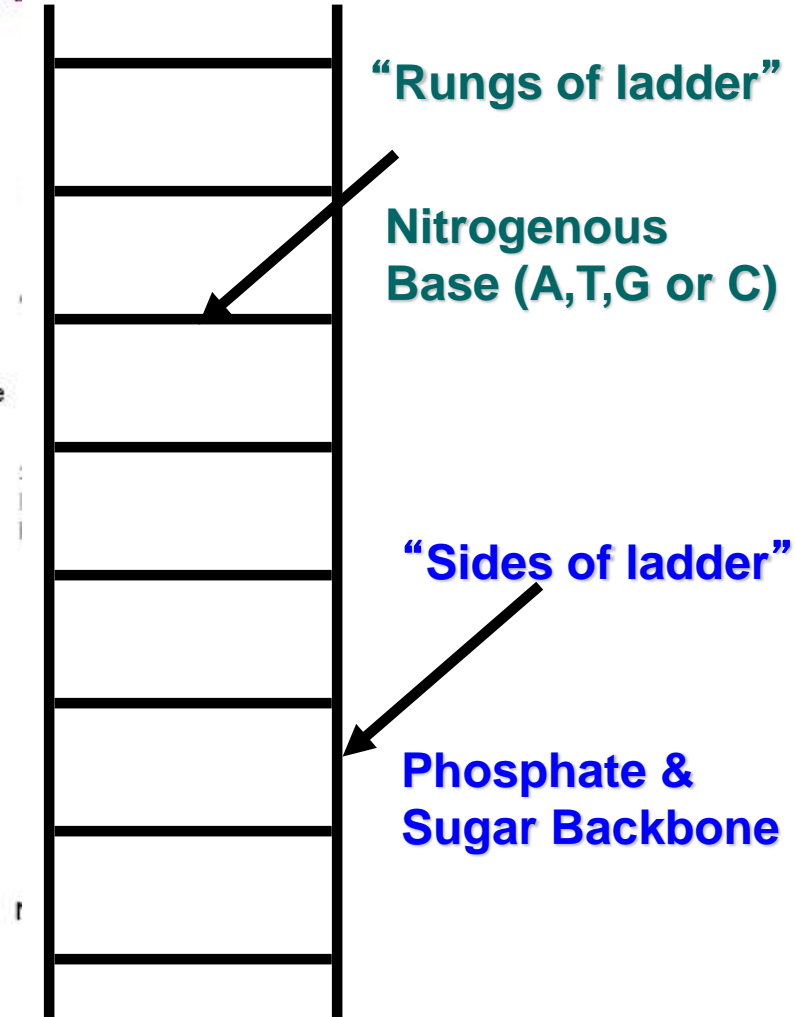
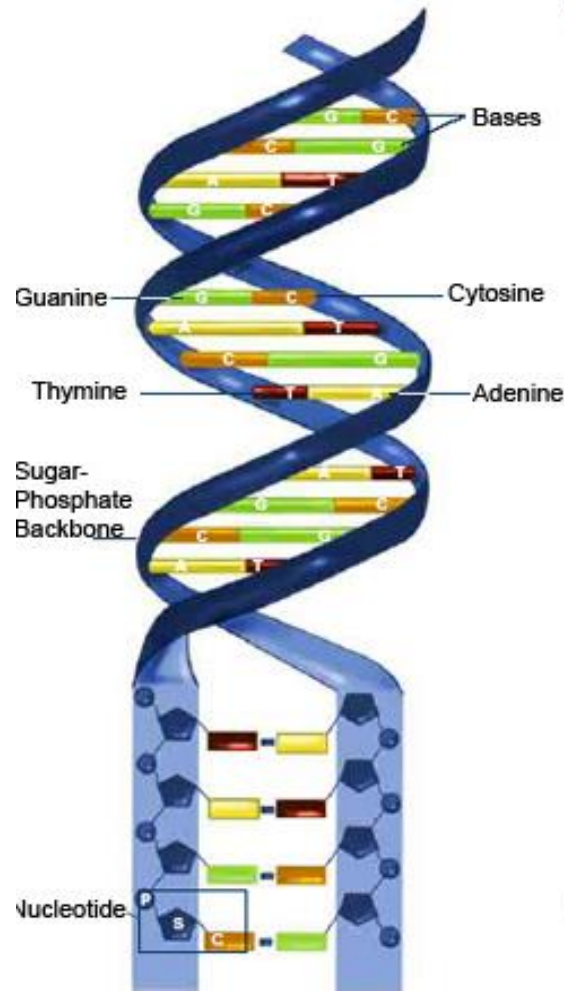
**“G”**

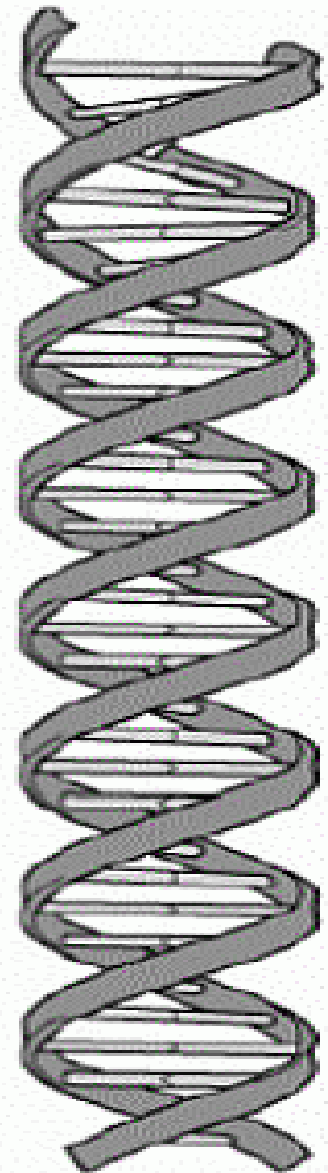
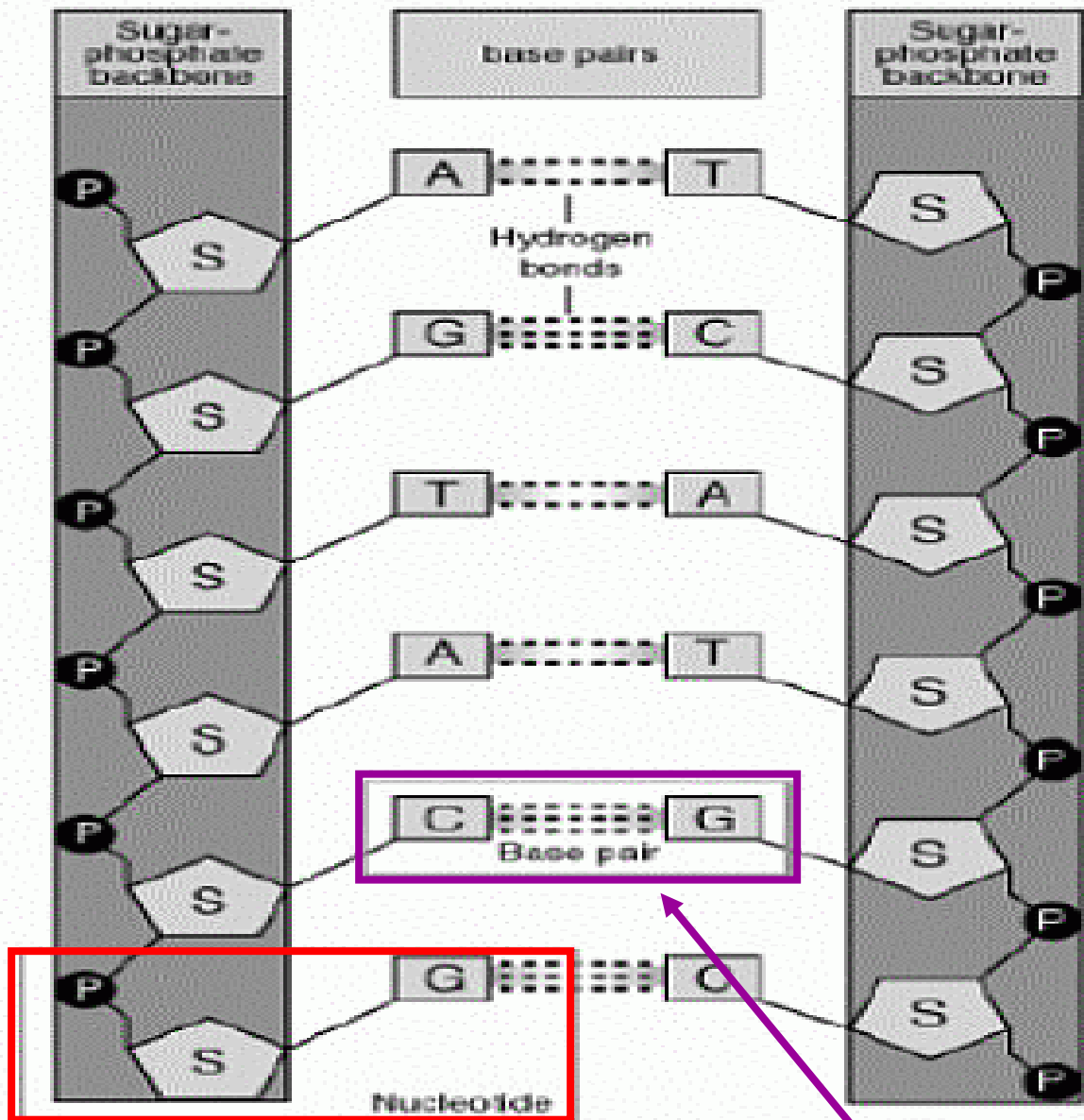
# DNA Double Helix



# Overall Structure of DNA

## Double Helix



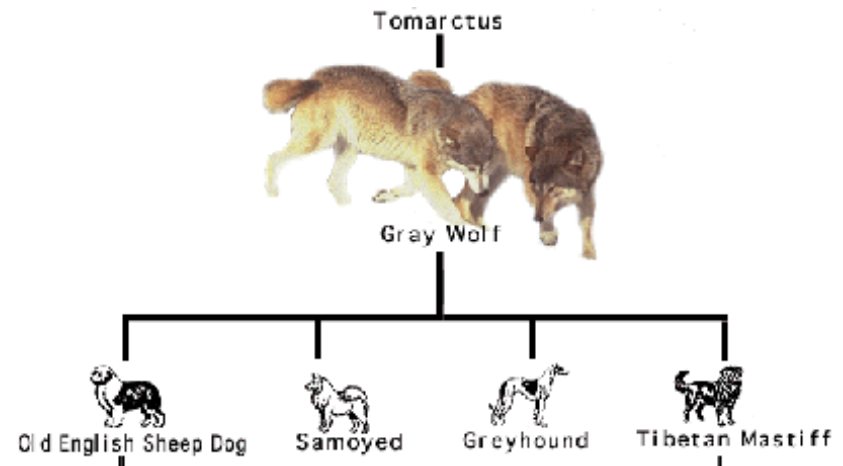
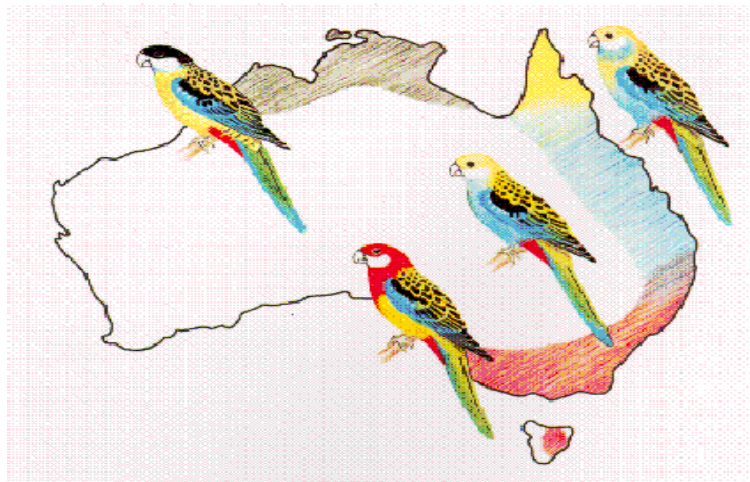


Nucleotide

Base pair

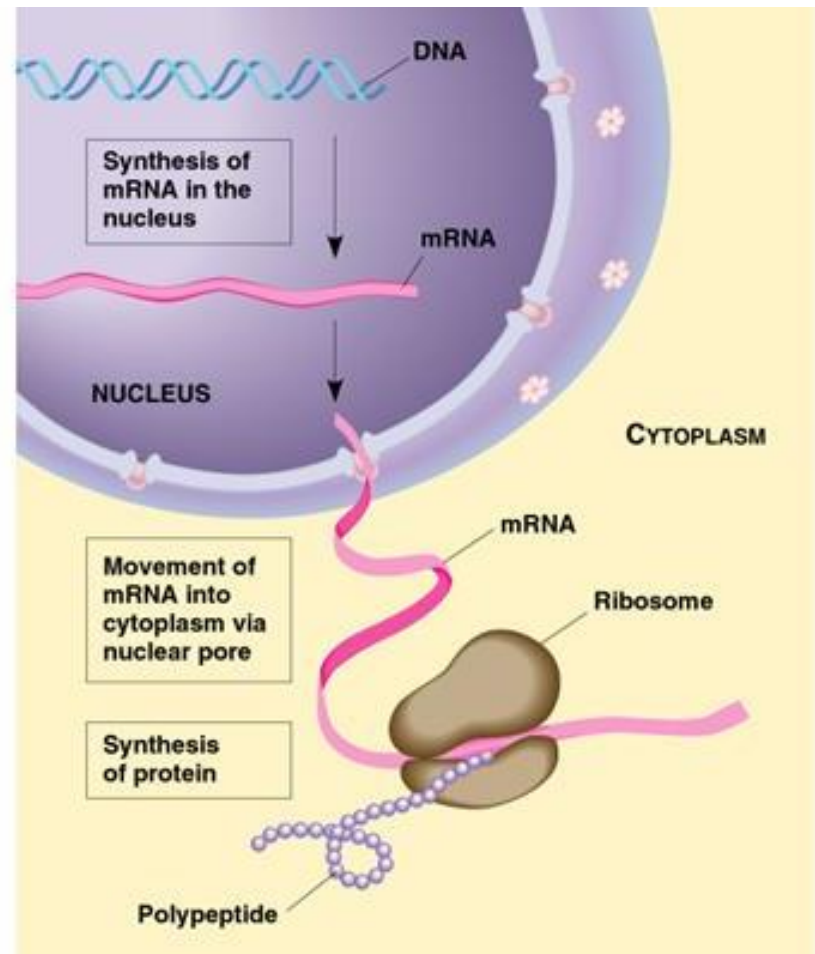
# Genetic Diversity

- Different arrangements of **NUCLEOTIDES** in a nucleic acid (DNA) provides the key to **DIVERSITY** among living organisms.



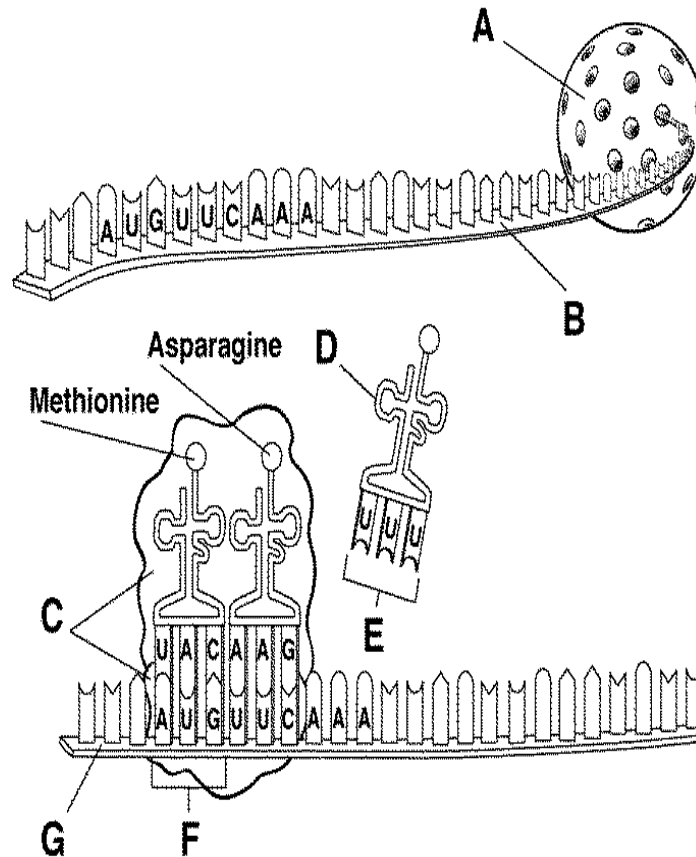
# DNA Transcription

- DNA can “unzip” itself and **RNA** nucleotides match up to the DNA strand.
- Both DNA & RNA are formed from **NUCLEOTIDES** and are called **NUCLEIC** acids.



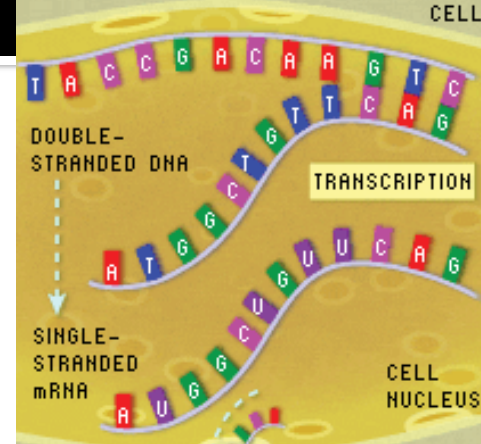
# DNA Translation

- The cell uses information from “**messenger**” RNA to produce proteins

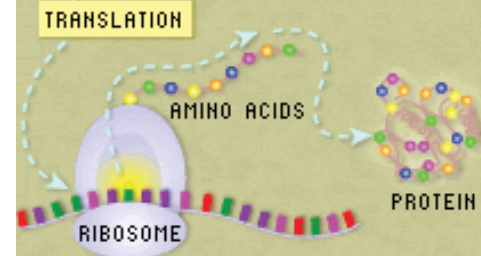


## TRANSCRIPTION AND TRANSLATION

**TRANSCRIPTION:** In the nucleus, the cell's machinery copies the gene sequence into messenger RNA (mRNA), a molecule that is similar to DNA. Like DNA, mRNA has four nucleotide bases - but in mRNA, the base uracil (U) replaces thymine (T).



The mRNA travels from the nucleus to the cytoplasm.



**TRANSLATION:** The protein-making machinery, called the ribosome, reads the mRNA sequence and translates it into the amino acid sequence of the protein. The ribosome starts at the sequence AUG, then reads three nucleotides at a time. Each three-nucleotide codon specifies a particular amino acid. The "stop" codons (UAA, UAG and UGA) tell the ribosome that the protein is complete.

