

TOPIC 1.1  
HOW DOES AN  
UNDERSTANDING  
OF DNA HELP US



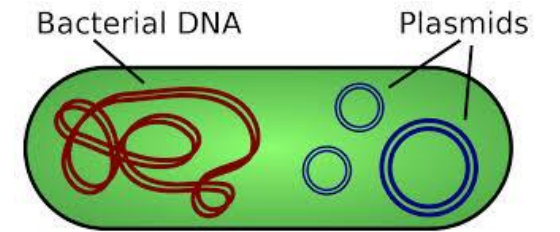
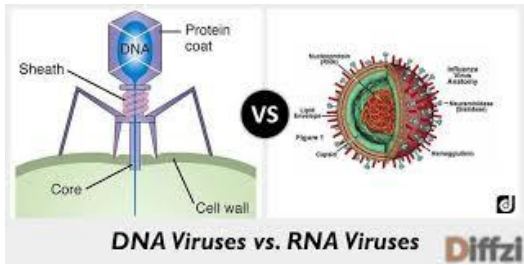
# THE VARIATION IN LIVING THINGS WE SEE AROUND US IS DUE TO DNA

Concept 1




## DNA

- all living things are closely linked by their DNA (molecule)
- DNA is genetic material that stores information
- DNA is responsible for variations among living things (influence appearance and life processes)
- How is DNA influencing the following diversity of this picture?
- DNA must be passed to the next generation (goal of living things)



# DNA

- Animals are multicellular the but differences in DNA results in the diversity that we see.
- Bacteria are single-celled and microscopic. It is estimated that there are over 100 000 difference species of bacteria in the world, their differences in DNA influence their roles in the environment.

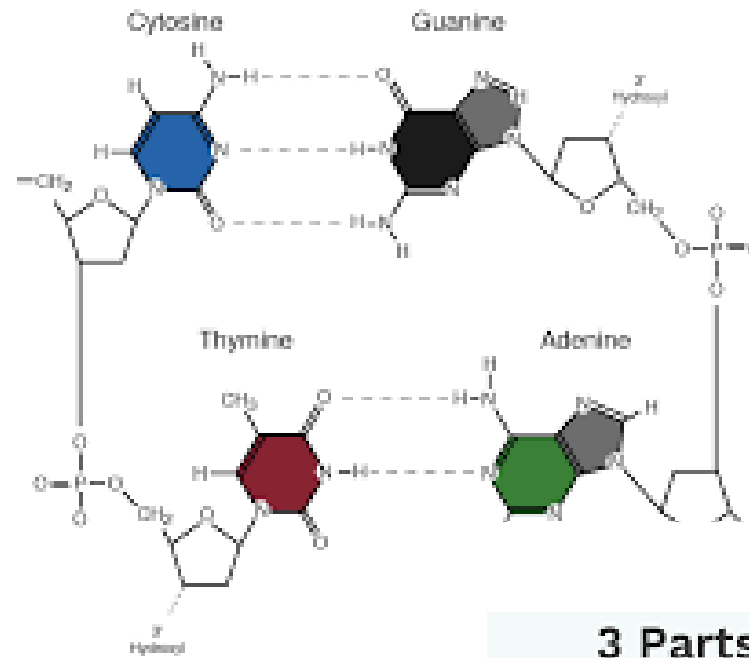


DNA IS MADE OF MANY  
NUCLEOTIDES LINKED  
TOGETHER IN A SPECIFIC  
ORDER

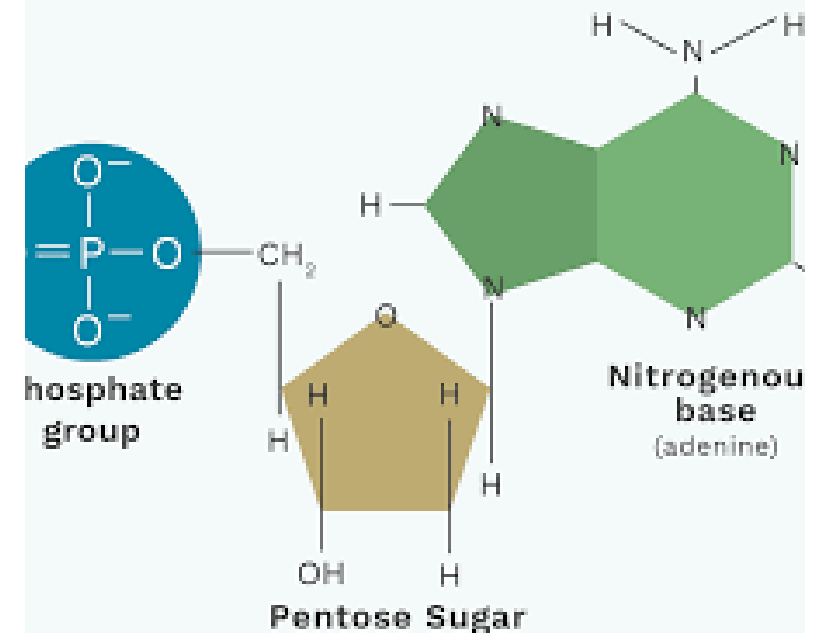
Concept 1.2

# Building blocks of DNA - Nucleotides

- General structure is composed of
  - Phosphate group
  - Sugar
  - Nitrogenous base
- There are 4 types of nucleotides in DNA
  - Adenine
  - Cytosine
  - Guanine
  - Thymine
- A always pairs with T
- C always pairs with G
- Uracil (U) (RNA) will take the place of T



## 3 Parts of a Nucleotide



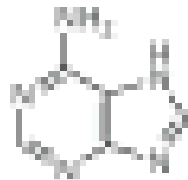
# THE CHEMICAL STRUCTURE OF DNA

## THE SUGAR PHOSPHATE 'BACKBONE'

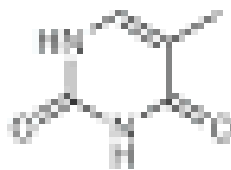


The backbone is made up of phosphate and deoxyribose. The phosphate groups are linked together by phosphodiester bonds. The deoxyribose sugars are linked together by hydrogen bonds.

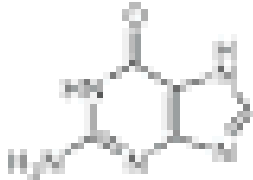
### A ADENINE



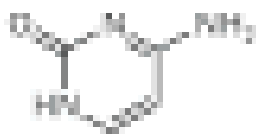
### T THYMINE



### G GUANINE

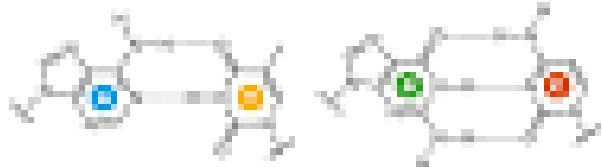


### C CYTOSINE



## WHAT HOLDS DNA STRANDS TOGETHER?

DNA strands are held together by hydrogen bonds between their individual strands. Adenine always pairs with Thymine and Guanine always pairs with Cytosine.



## FROM DNA TO PROTEINS

To make a single strand of DNA is easy. The hard bit is to make a protein. It's a long chain of amino acids.



Genes are instructions for making proteins. They are written in a code that the cell can read. The code is made up of three letters (A, T, C, G) and they are read in groups of three. Each group of three letters is called a codon. Each codon codes for a specific amino acid. The amino acids are then joined together to form a protein.



A molecule of protein is made up of a chain of amino acids. The amino acids are joined together by peptide bonds. The sequence of amino acids in a protein determines its shape and function.

# Structure of DNA

- DNA is a molecule made up of 2 strands linked together by hydrogen bonds
- The structure of DNA looks like a twisted ladder (double helix)
- **Assignment Notes**

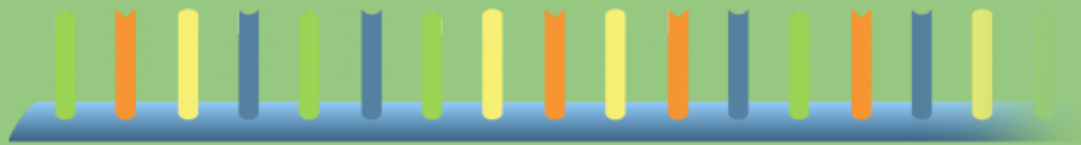
DNA



Transcription  
DNA → RNA



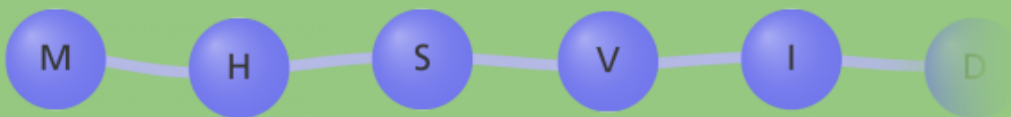
RNA



Translation  
RNA → Protein



Protein




 Adenine (A)

## Function of DNA – why is it important?

- DNA stores genetic information and that information is a sequence of bases
- Those base are the "code" to make proteins
- Proteins make up the cell structure of every cell
- Proteins also controls how a cell is formed and functions





DNA EXISTS IN  
CHROMOSOMES, WHICH  
CONTAIN THOUSANDS OF  
GENES

Concept 3

# DNA, chromatin and chromosomes

- Chromatin – fibres of DNA in its condensed form. The usual form of DNA during interphase
- Chromosomes – when a cell prepares to divide, DNA condenses into a visible form

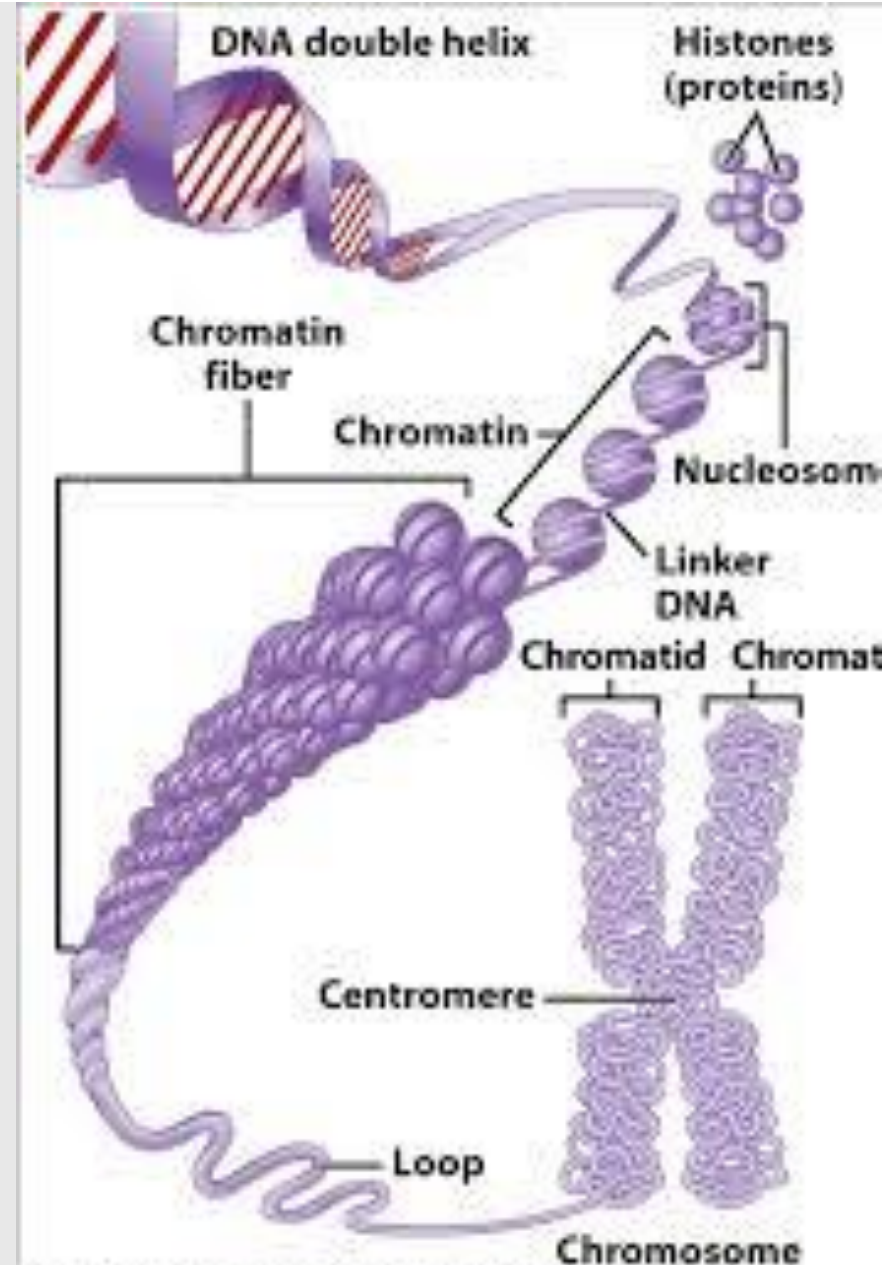
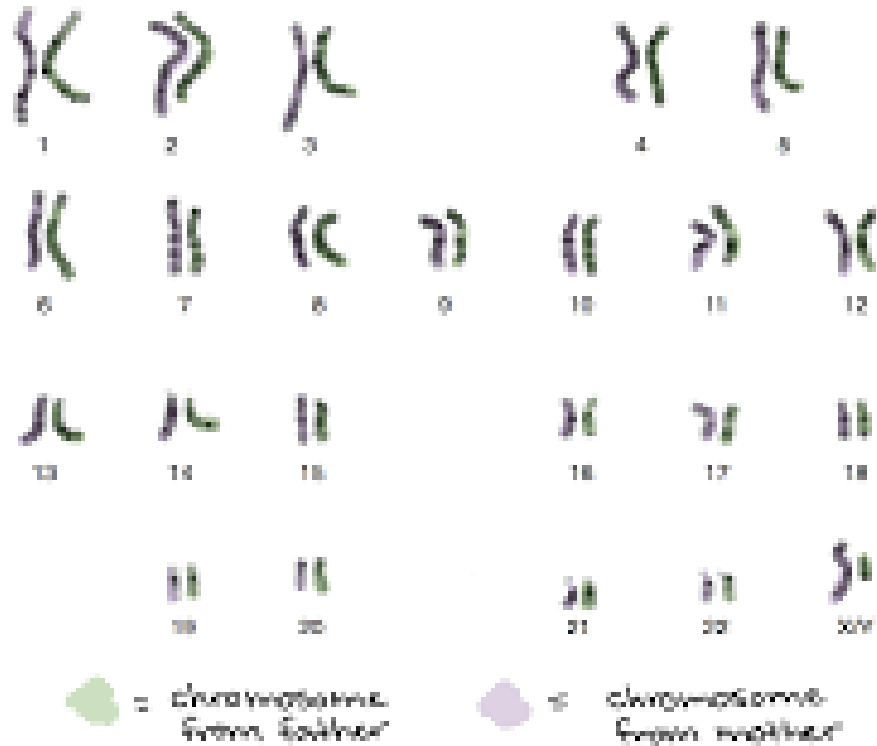


Figure 3-25 Principles of Anatomy and Physiology, 11/e  
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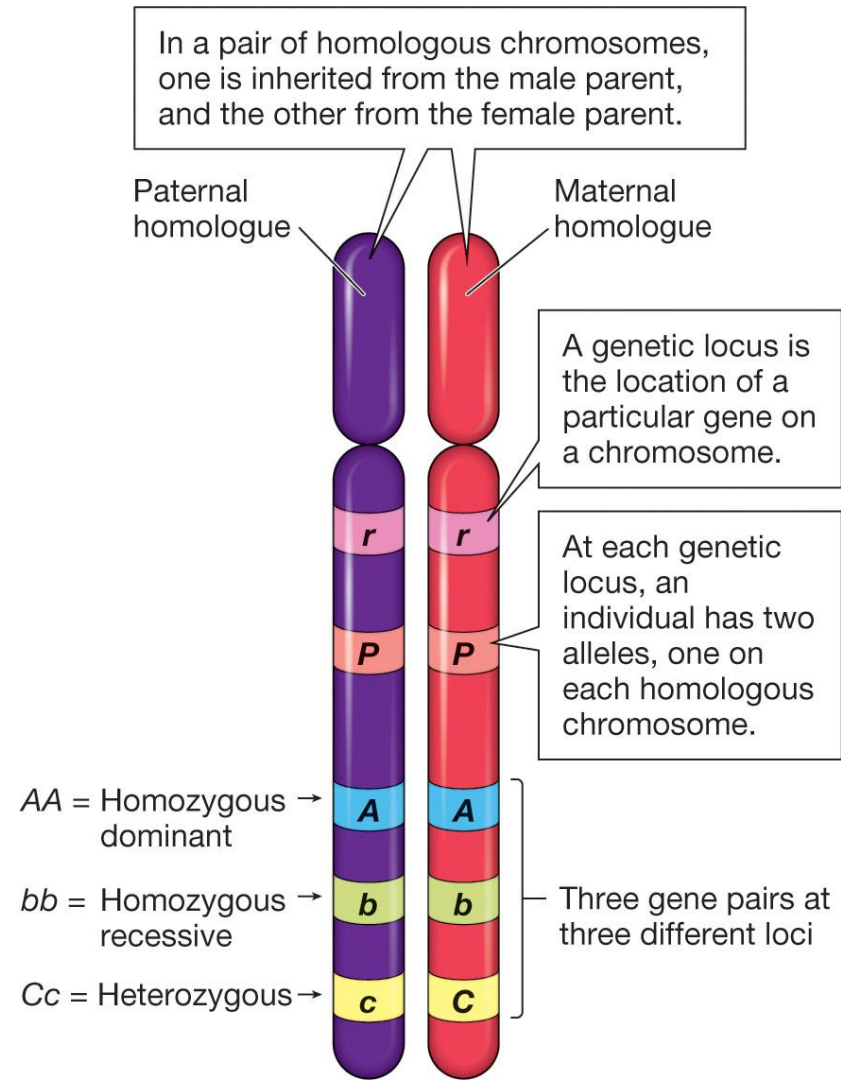
# Pairing of Chromosomes

- Somatic cells are composed of 46 chromosomes or 23 pairs
- For each pair, one chromosome is from the sperm and the other from the egg
- One of the chromosome pairs is the sex chromosome that determines genetic sex (X = female, Y = male)



# Homologous Chromosomes are responsible for the traits you see and inherit

- A homologous chromosome contains the same sequence of genes as another chromosome
- Genes are parts of a chromosome that contains the information for the inheritance of specific traits
- Alleles are different forms of the same genes

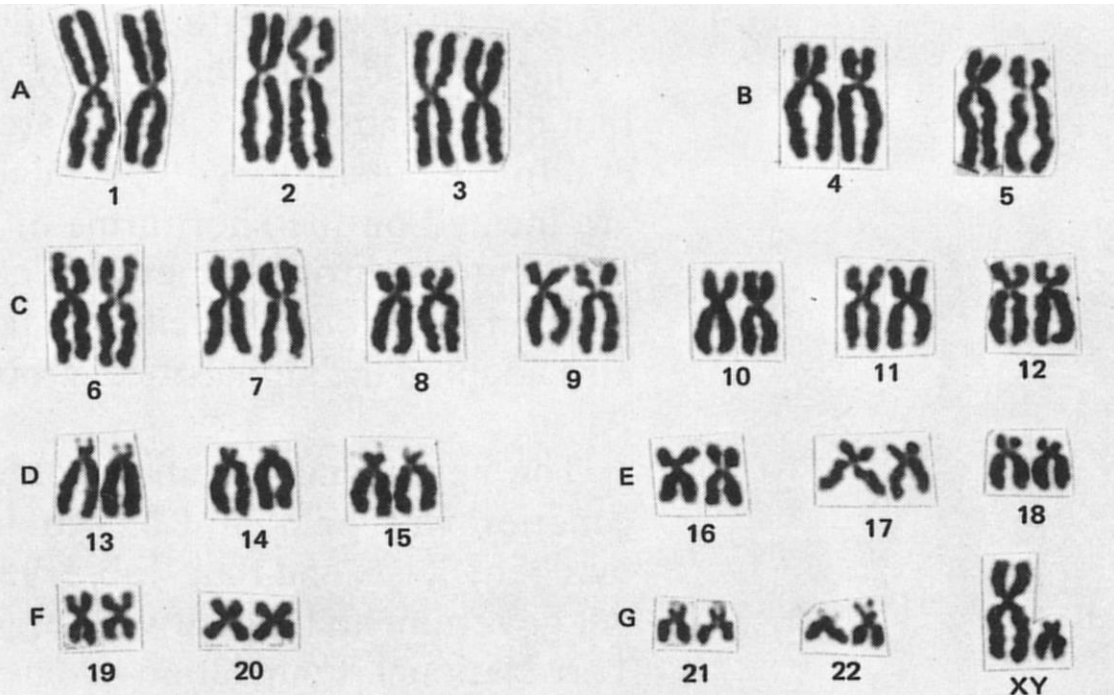





# Examining Chromosomes

A particular set of chromosomes that an organism has is called a Karyotype

Chromosomes are stained, separated, sorted and paired.

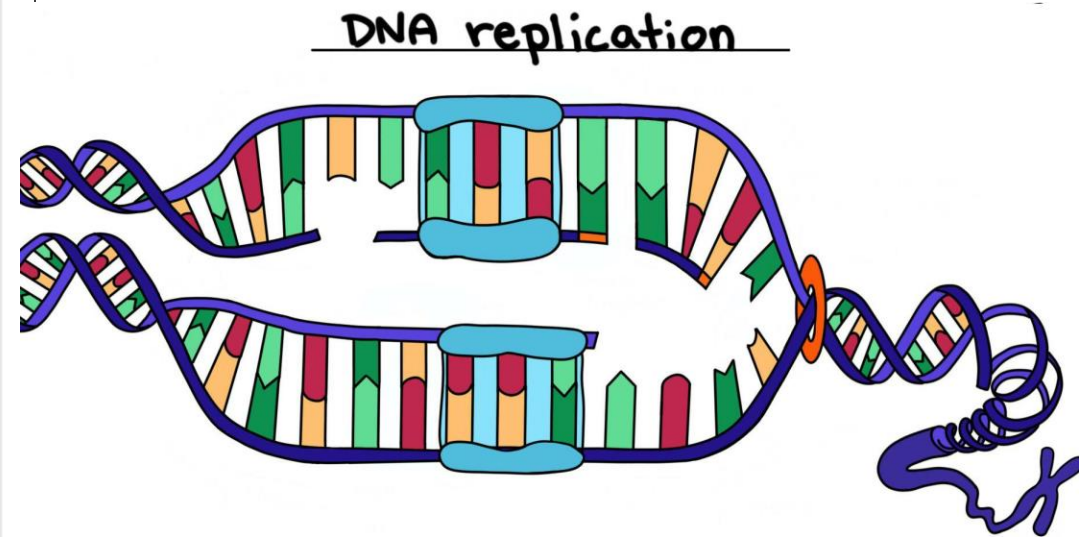




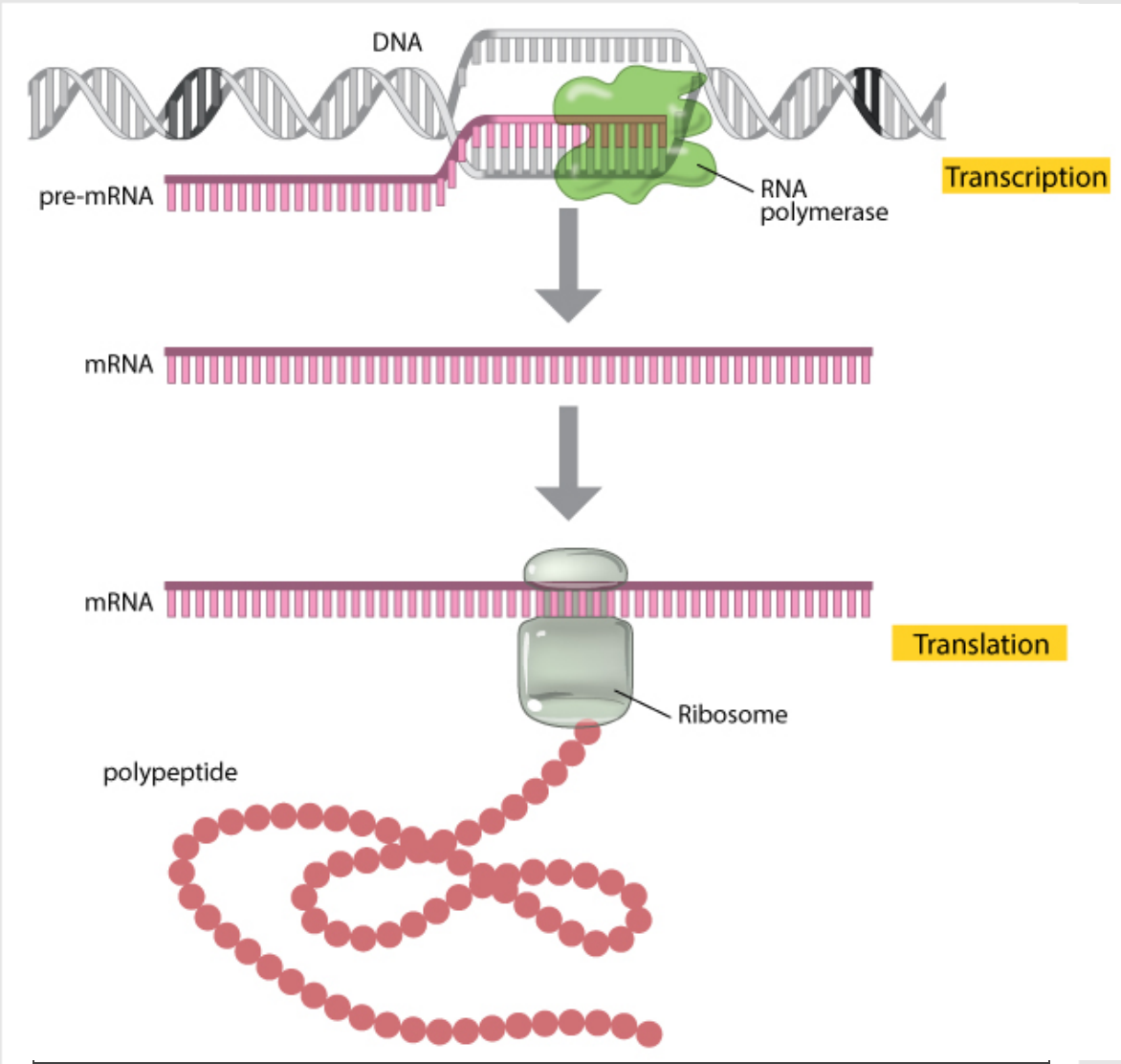
# THE STRUCTURE OF DNA IS IMPORTANT TO PASSING ON GENETIC INFORMATION

Concept 1.4

# DNA Replication




- Replication is the process of creating an exact copy of a molecule of DNA
- During replication, the human cell has an error rate of 1 per 1B nucleotide pairs
- This replication process is completed by very specific proteins called enzymes



# Translation

- After DNA replicates, the genetic code is copied to RNA and "translated" to make proteins
- This RNA strand is used to produce the correct sequence of amino acids to build the protein

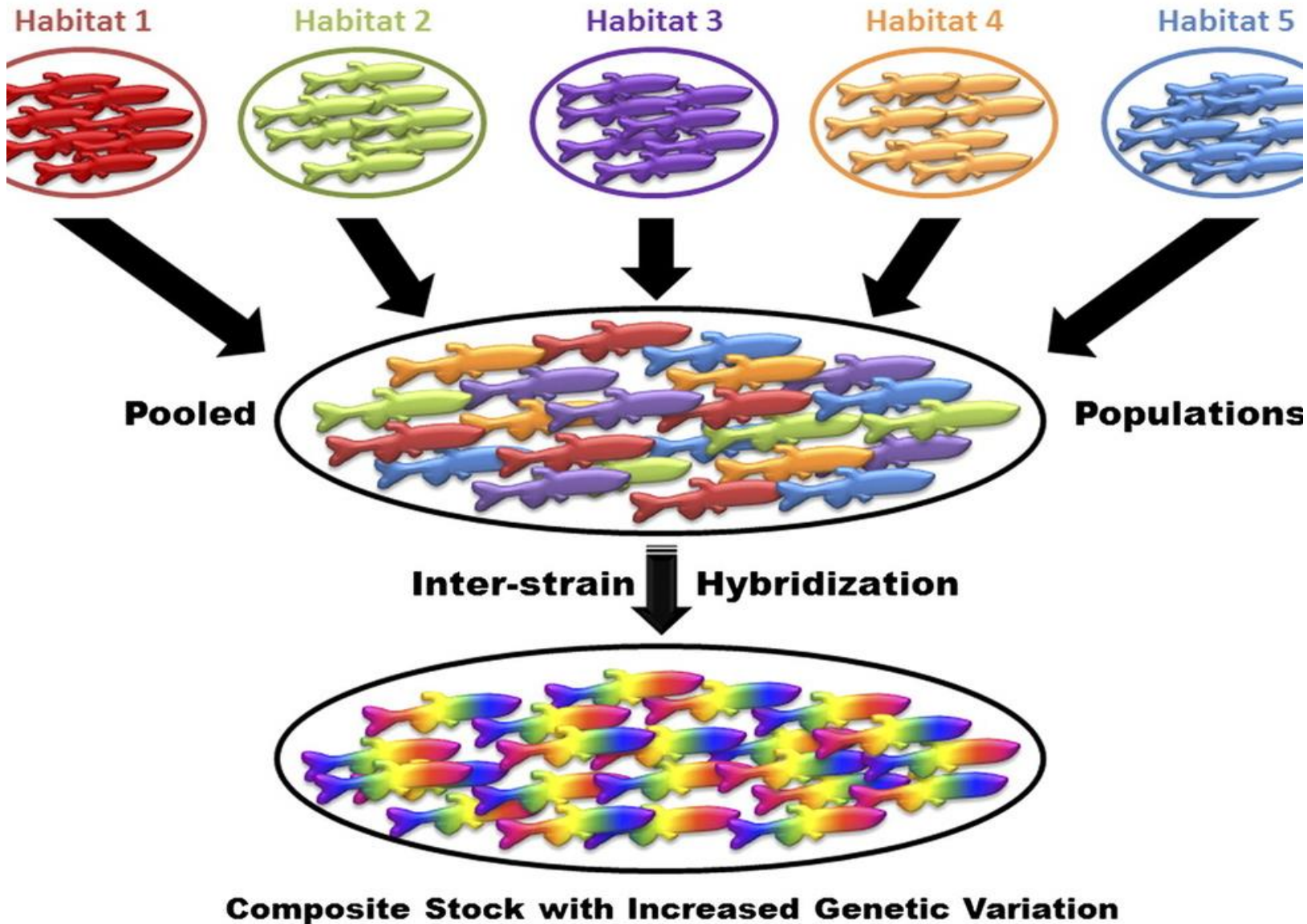




THE DIFFERENT GENETIC MAKE-  
UP OF ORGANISMS IS  
REFLECTED IN THE DIVERSITY OF  
LIFE

Concept 5

## Composite Population Creation



## Genetic Diversity

Species diversity is the variety and abundance of species in a given area

Genetic diversity is evident in the variety of inherited traits within a species

Variation among individuals in a population is largely a result of their genes