SUCCESS KEY

TEST SERIES

CLASS

10

NOTES

SCIENCE & TECHNOLOGY

PART - 2

ENGLISH & SEMI ENGLISH MEDIUM

(MAHARASHTRA BOARD)

Smart Way of Learning



- Chapterwise Notes
- Important Points
- Diagrams & Tables
- Definitions
- Exam Oriented

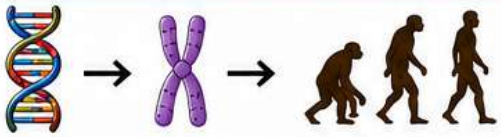
www.successkey.org | Whatsapp: 9503748132

SUCCESS KEY TEST SERIES

Class : 10 (Maharashtra Board) | Subject : Science & Technology – II

CHAPTER 1

HEREDITY AND EVOLUTION



HEREDITY

Definition

Transfer of biological characters from one generation to another via genes is called heredity.

Important Scientists

- ★ Gregor Johann Mendel – Father of Genetics
- ★ Hugo de Vries – Mutation Theory
- ★ Walter Sutton – Chromosome Theory
- ★ Oswald Avery, McCarty and McLeod – DNA as genetic material

IMPORTANT DEFINITIONS

Gene
Unit of heredity present on chromosome.

DNA
Genetic material present in living organisms.

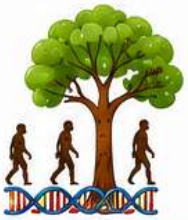
Chromosome
Thread-like structure carrying genes.

Mutation
Sudden change occurring in gene.

Genetics
Science dealing with heredity.

IN THIS CHAPTER

- ★ Heredity and Hereditary Changes
- ★ DNA, Genes and Chromosomes
- ★ Transcription
- ★ Translation
- ★ Mutation
- ★ Evolution
- ★ Darwin's Theory of Natural Selection
- ★ Lamarckism
- ★ Speciation
- ★ Human Evolution

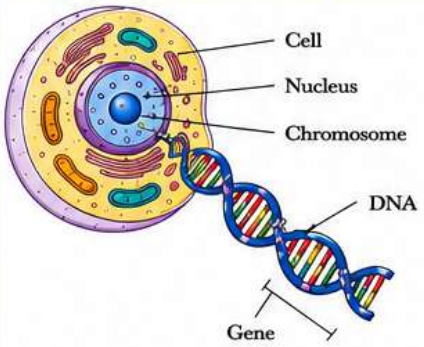


CENTRAL DOGMA OF LIFE

DNA → Transcription → mRNA → Translation → Protein → Characters of Organism

DNA controls protein synthesis through RNA. This process is called Central Dogma.

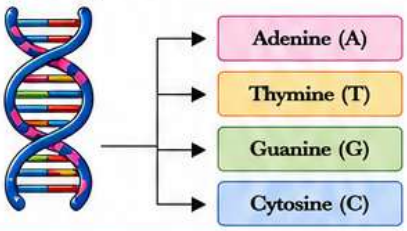
DNA – GENE – CHROMOSOME RELATIONSHIP



DNA COMPONENTS

DNA consists of :

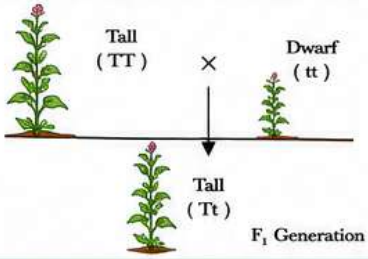
- ✓ Sugar (Deoxyribose)
- ✓ Phosphate Group
- ✓ Nitrogen Bases



MENDEL'S LAWS OF INHERITANCE

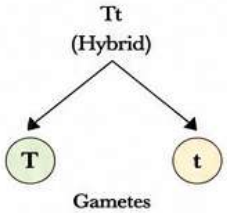
1. Law of Dominance

In a pair of contrasting characters, one is dominant and the other is recessive.



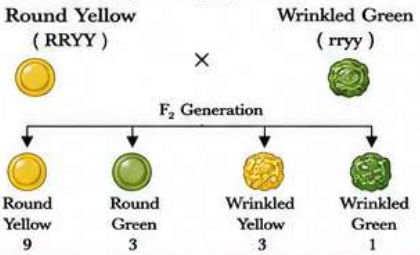
2. Law of Segregation

The two factors (alleles) of a gene separate during gamete formation.



3. Law of Independent Assortment

Genes for different characters assort independently during gamete formation.



TYPES OF MUTATION

Gene Mutation
Change in the sequence of nucleotides in a gene.

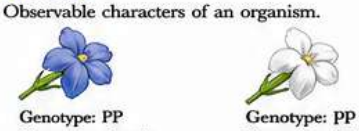
Chromosomal Mutation
Change in the structure or number of chromosomes.

Genomic Mutation
Change in the number of chromosome sets.

GENOTYPE AND PHENOTYPE

Genotype
Genetic makeup of an organism.

Phenotype
Observable characters of an organism.



Genotype: PP
Phenotype: Purple

Genotype: PP
Phenotype: White

PUNNETT SQUARE (Monohybrid Cross)

Cross : Tt × Tt

	T	t
T	TT	Tt
t	Tt	tt

Genotypic Ratio : 1 TT : 2 Tt : 1 tt

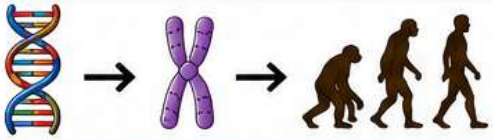
Phenotypic Ratio : 3 Tall : 1 Dwarf

QUICK REVISION

- ✓ DNA – Genetic material
- ✓ Gene – Unit of heredity
- ✓ Chromosome – Carries genes
- ✓ Transcription – DNA to mRNA
- ✓ Translation – mRNA to protein
- ✓ Mutation – Sudden change in gene
- ✓ Mendel – Laws of inheritance
- ✓ Heredity – Transfer of characters
- ✓ Evolution – Formation of new species

CHAPTER 1

HEREDITY AND EVOLUTION



DNA AND PROTEIN SYNTHESIS

CENTRAL DOGMA

DNA → Transcription → mRNA → Translation → Protein → Characters of Organism

IMPORTANT POINTS

- ★ DNA stores genetic information.
- ★ Proteins control structure, functions and appearance of organisms.
- ★ This process is called Central Dogma.

1. TRANSCRIPTION

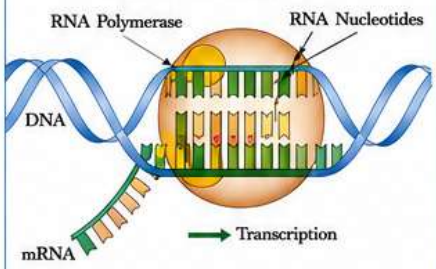
Definition

Synthesis of mRNA using DNA as a template is called transcription.

Important Points

- ✓ Occurs inside nucleus.
- ✓ One strand of DNA acts as template.
- ✓ mRNA is formed.
- ✓ RNA contains Uracil (U) instead of Thymine (T).

Fig. 1.1 Transcription



2. TRANSLATION

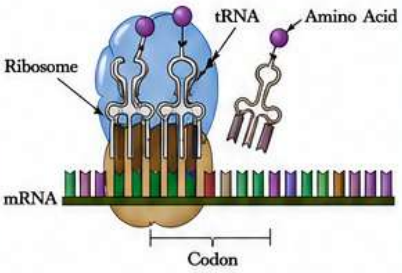
Definition

Process of synthesis of proteins using information carried by mRNA.

Important Points

- ✓ Codon contains three nucleotides.
- ✓ Called triplet codon.
- ✓ tRNA brings amino acids.
- ✓ Ribosome helps protein synthesis.
- ✓ Proteins are formed by peptide bonds.

Fig. 1.2 Translation



3. TRANSLOCATION

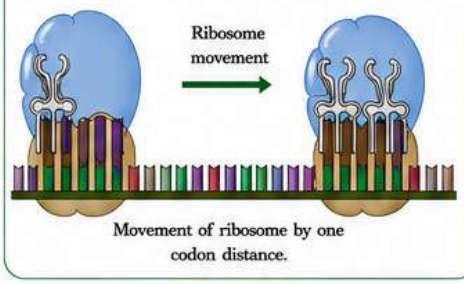
Definition

Movement of ribosome by one codon distance along mRNA during protein synthesis.

Important Points

- ✓ Ribosome moves step by step.
- ✓ Protein chain elongates.
- ✓ Essential step in translation.

Fig. 1.2 (Translocation Step)



GENETIC CODE

Term	Meaning
DNA	Genetic Material
mRNA	Messenger RNA
tRNA	Transfer RNA
Codon	Three-base sequence on mRNA
Anticodon	Complementary triplet on tRNA
Protein	End Product

TYPES OF RNA

- **mRNA** – Carries genetic information from DNA to ribosome.
- **tRNA** – Transfers amino acids to ribosome as per the mRNA code.
- **rRNA** – Forms the structure of ribosomes and helps in protein synthesis.

ANOTHER IMPORTANT POINTS

- ★ Only one strand of DNA is used for transcription.
- ★ mRNA is complementary to DNA strand.
- ★ Codon is a triplet of nucleotides.
- ★ Anticodon on tRNA is complementary to codon.
- ★ Amino acids are joined by peptide bonds.
- ★ Many amino acids form a polypeptide chain.
- ★ Polypeptide chains fold to form complex proteins.

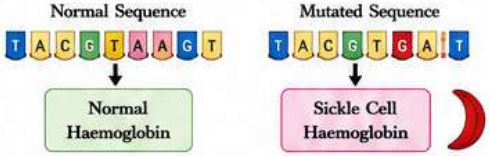
MUTATION

Definition : Sudden heritable change in gene or chromosome.

Important Points

- ✓ Creates variations.
- ✓ May be beneficial or harmful.
- ✓ Plays role in evolution.

Example : Sickle Cell Anaemia

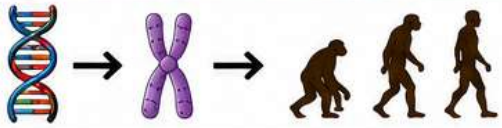


QUICK REVISION (FREE)

- ✓ DNA → Genetic Material
- ✓ Transcription → DNA → mRNA
- ✓ Translation → mRNA → Protein
- ✓ Translocation → Ribosome Movement
- ✓ Codon → Three Nucleotides
- ✓ Mutation → Sudden Genetic Change
- ✓ Proteins → Control body characters

CHAPTER 1

HEREDITY AND EVOLUTION



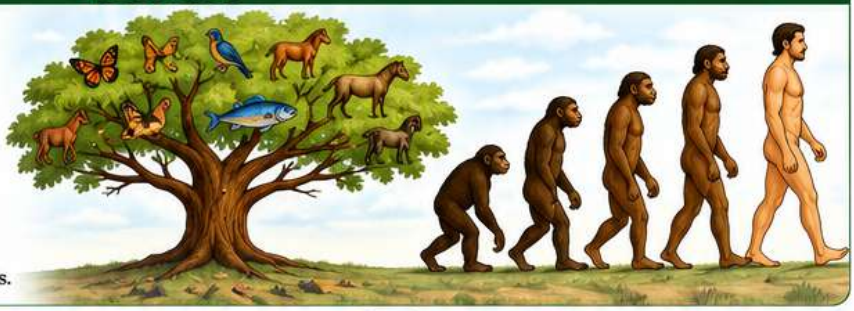
EVOLUTION

Definition

Evolution is the gradual change occurring in living organisms over a long period of time.

Important Points

- ✓ Evolution explains diversity of organisms.
- ✓ Evolution occurs through hereditary changes.
- ✓ Variations play an important role in evolution.
- ✓ New species arise through evolutionary processes.



1. MORPHOLOGICAL EVIDENCES

Definition

Similarities in external features of different organisms indicate common ancestry.

Examples (Animals)



Dog | Sheep | Fox

Examples (Plants)



Mango | Sapota | Guava

Important Point

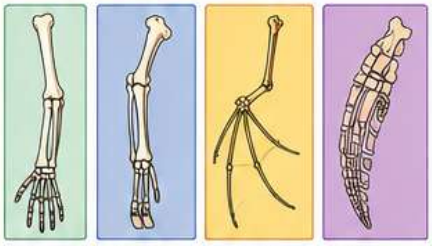
External similarities suggest evolutionary relationships.

2. ANATOMICAL EVIDENCES

Definition

Similarity in internal structure of organs indicates common ancestry.

Homologous Organs – Examples



Human Hand | Foreleg of Ox | Patagium of Bat | Flipper of Whale

Important Point

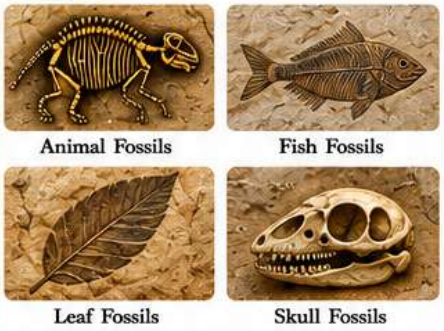
Functions may differ but basic structure remains similar.

3. PALAEONTOLOGICAL EVIDENCES

Definition

Fossils preserved in earth's crust provide evidence of evolution.

Examples



Animal Fossils | Fish Fossils | Leaf Fossils | Skull Fossils

Importance

Help understand extinct organisms and evolutionary history.

4. VESTIGIAL ORGANS

Definition

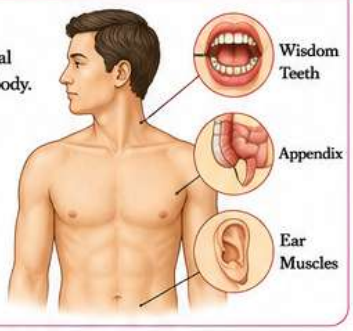
Organs which have lost their original function but remain present in the body.

Examples

- ✓ Appendix
- ✓ Wisdom Teeth
- ✓ Ear Muscles

Significance

Provide evidence of evolution.



5. CONNECTING LINKS

Definition

Organisms showing characteristics of two different groups.

Examples

- ✓ Peripatus (Annelida + Arthropoda)
- ✓ Lungfish (Fish + Amphibia)

Importance

Show evolutionary transition.



Peripatus



Lungfish

6. FOSSILS AND CARBON DATING

Fossils

Preserved remains or impressions of ancient organisms.

Carbon Dating

Used to determine age of fossils.

Important Point

Older fossils are generally found in deeper rock layers.

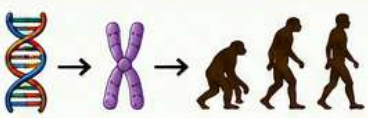


7. IMPORTANT FACTS

- ★ Morphological evidences are based on external characters.
- ★ Anatomical evidences are based on internal structures.
- ★ Fossils provide direct evidence of evolution.
- ★ Vestigial organs indicate evolutionary changes.
- ★ Connecting links support evolutionary relationships.

QUICK REVISION (FREE)

- Evolution → Gradual change
- Morphological Evidence → External similarity
- Anatomical Evidence → Internal similarity
- Fossils → Direct evidence
- Vestigial Organs → Reduced function
- Peripatus → Connecting Link
- Carbon Dating → Age determination



SUCCESS KEY TEST SERIES

Class : 10 (Maharashtra Board) | Subject : Science & Technology – II

CHAPTER 1

HEREDITY AND EVOLUTION

IMPORTANT DEFINITIONS

Evolution

Gradual change occurring in living organisms over a long period of time is called evolution.

Natural Selection

Process by which organisms possessing favourable variations survive and reproduce.

Speciation

Formation of new species from existing species.

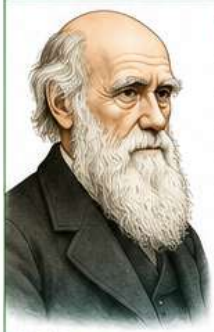
Adaptation

Changes that help an organism survive in its environment.

Organic Evolution

Gradual development of simple organisms into complex organisms over generations.

1. DARWIN'S THEORY OF NATURAL SELECTION



Main Concepts

- ✓ Overproduction of offspring
- ✓ Struggle for existence
- ✓ Survival of the fittest
- ✓ Natural selection
- ✓ Inheritance of favourable variations

Important Point

Natural selection is the most accepted explanation of evolution.



2. LAMARCKISM

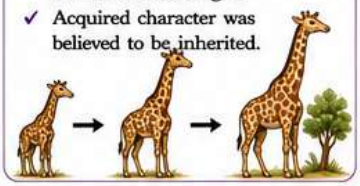
Theory of Inheritance of Acquired Characters

Acquired Characters

Characters developed during lifetime due to environment or use and disuse of organs.

Example – Giraffe

- ✓ Ancestors had short necks.
- ✓ Continuous stretching increased neck length.
- ✓ Acquired character was believed to be inherited.



3. SPECIATION

Definition

Formation of new species from existing species.

Causes

- ✓ Geographical Isolation
- ✓ Reproductive Isolation
- ✓ Genetic Drift
- ✓ Natural Selection

Variation → Isolation → Accumulation of Changes → Speciation

4. MODERN SYNTHETIC THEORY

Important Points

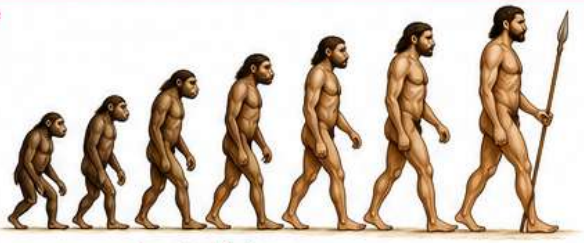
- ✓ Mutation creates variation.
- ✓ Natural selection acts on variation.
- ✓ Heredity transfers favourable traits.
- ✓ Evolution occurs gradually.
- ✓ Speciation results from accumulated genetic changes.



5. HUMAN EVOLUTION

Evolutionary Sequence

Dryopithecus → Ramapithecus → Australopithecus → Homo habilis → Homo erectus → Neanderthal Man → Cro-Magnon Man → Modern Human



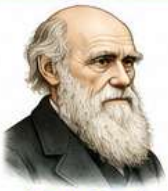
Important Features

- ✓ Brain size increased gradually.
- ✓ Upright posture developed.
- ✓ Tool-making ability improved.
- ✓ Intelligence increased.

6. IMPORTANT SCIENTISTS



Gregor Johann Mendel
Father of Genetics



Charles Darwin
Father of Evolution



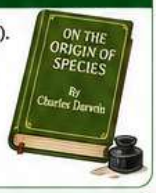
Jean Baptiste Lamarck
Proposed Lamarckism

7. COMPARISON OF THEORIES

	Lamarckism	Darwinism
Basis	Acquired characters inherited	Natural selection acts
Important Factor	Use and disuse important	Variation important
Level of Change	Individual changes	Population changes
Time	Earlier theory	Accepted theory

8. IMPORTANT FACTS

- ★ Darwin published 'On the Origin of Species' (1859).
- ★ Natural selection explains adaptation.
- ★ Isolation promotes speciation.
- ★ Evolution is a continuous process.
- ★ Human evolution occurred over millions of years.



9. QUICK REVISION (FREE)

- Evolution → Gradual change
- Adaptation → Survival advantage
- Natural Selection → Survival of the fittest
- Speciation → Formation of new species
- Isolation → Evolutionary change
- Lamarck → Acquired characters
- Darwin → Evolution theory
- Mendel → Genetics