ملخص دروس الأحياء للفصل الثاني منهج انسباير

تم تحميل هذا الملف من موقع المناهج الإماراتية	
موقع المناهج ⇦ المناهج الإماراتية ⇦ الصف الثاني عشر المتقدم ⇦ علوم ⇦ الفصل الثاني ⇦ ملفات متنوعة ⇦ الملف	
تاريخ إضافة الملف على موقع المناهج: 2026-02-05 13:00:10	
ملفات ا كتب للمعلم ا كتب للطالب ا اختبارات الكترونية ا اختبارات ا حلول ا عروض بوربوينت ا أوراق عمل منهج انجليزي ا ملخصات وتقارير ا مذكرات وبنوك ا الامتحان النهائي ا للمدرس	المزيد من مادة علوم:
إعداد: Salma	

التواصل الاجتماعي بحسب الصف الثاني عشر المتقدم					
صفحة المناهج الإماراتية على فيسبوك					
المواد على تلغرام	التربية الاسلامية	اللغة العربية	اللغة الانجليزية	الرياضيات	

المزيد من الملفات بحسب الصف الثاني عشر المتقدم والمادة علوم في الفصل الثاني	
1	مذكرة شاملة وحدات الفصل منهج انسباير
2	ملزمة شاملة الوحدة الرابعة علم الوراثة الجزيئية
3	حل تجميعة مراجعة وفق الهيكل الوزاري
4	المراجعة النهائية الشاملة للمقرر وفق الهيكل الوزاري
5	مذكرة في التكاثر الخلوي

L1 : DNA, RNA, and proteins

https://t.me/Biology_Explanations

Done By : Salma

Key Idea

- One gene codes for one polypeptide.
- DNA controls traits by directing protein synthesis.

DNA, RNA, and proteins work together to control the structure and function of living cells.

This process is explained by the **Central Dogma** of Biology:
DNA → RNA → Protein

DNA (Deoxyribonucleic Acid) :
DNA stores genetic information.
It is located in the nucleus of the cell.
DNA contains instructions for making proteins.
It is made of nucleotides with bases: A, T, C, G.

RNA (Ribonucleic Acid) :
RNA carries the instructions from DNA to make proteins.
RNA is single-stranded.
It contains uracil (U) instead of thymine (T).

Types of RNA :
mRNA (messenger RNA): carries the genetic code from DNA to the ribosome.
tRNA (transfer RNA): brings amino acids to the ribosome.
rRNA (ribosomal RNA): forms part of the ribosome.

Transcription

The process of making mRNA from DNA.
Occurs in the nucleus.
The enzyme RNA polymerase synthesizes mRNA.
DNA sequences called introns are removed.
Exons remain to form the final mRNA.

The Genetic Code

The genetic code is a three-base code.
Each group of three bases is called a codon.
Each codon codes for one amino acid or a stop signal.

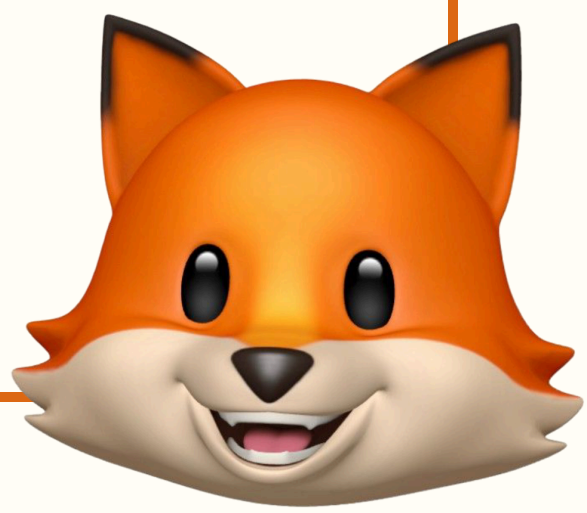
Translation

The process of making a protein from mRNA.
Occurs at the ribosome in the cytoplasm.
tRNA matches its anticodon with the mRNA codon.
Amino acids are joined to form a polypeptide (protein).

Proteins

Proteins are made of amino acids.
They perform many functions:

- Enzymes
- Hormones
- Structural support
- Defense (antibodies)



L2 : Gene Regulation and Mutation

https://t.me/Biology_Explanations

Done By : Salma

Gene Regulation

Gene regulation is the ability of a cell to control which genes are turned on or off and when proteins are produced.
This helps cells respond to environmental changes and perform specific functions.

Prokaryotic Gene Regulation

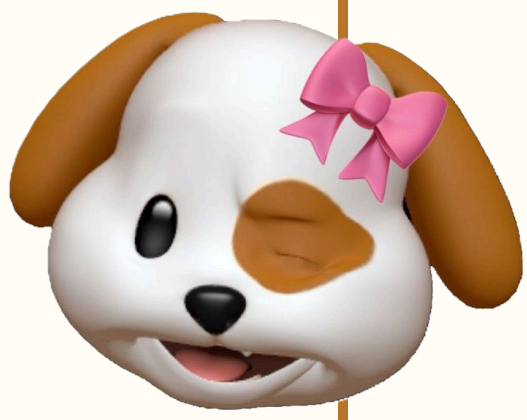
In prokaryotes, gene regulation occurs mainly through operons.

Operon :

A group of genes that work together and are controlled by a single promoter.

Parts of an operon :

- Promoter: Binding site for RNA polymerase
- Operator: On/off switch for transcription
- Regulatory gene: Produces a repressor protein
- Structural genes: Code for proteins



Types of Operons :

- trp operon (Repressible operon):
  Usually ON
  Turned OFF when tryptophan is present
  Controls amino acid synthesis
- lac operon (Inducible operon):
  Usually OFF
  Turned ON when lactose (allolactose) is present
  Controls lactose metabolism

Eukaryotic Gene Regulation

Eukaryotic gene regulation is more complex and involves:

- Promoters
- Enhancers
- Activators and repressors
- RNA interference

Hox Genes :

- Control body development and cell differentiation
- Determine which body parts develop in specific locations
- The order of Hox genes matches the order of body structures

RNA Interference

A process that uses small RNA molecules to block or reduce gene expression by preventing translation of specific mRNA molecules.

Effects of Mutations

- Can be harmful, beneficial, or neutral
- Affect protein structure and function

Example: Sickle-cell disease is caused by a single-point mutation

Causes of Mutations

- **E**rrors during DNA replication
- Mutagens

1 Chemical (cause base mispairing)

2 Physical (radiation)

Mutations

A mutation is a permanent change in DNA.

Types of Mutations :

- Substitution (Point mutation):
One base is replaced
Missense: Produces a different amino acid
Nonsense: Produces a stop codon

- Frameshift mutations:
Insertion: Adds a nucleotide
Deletion: Removes a nucleotide
Changes the reading frame → often harmful

- Duplication:
Extra copies of a gene or chromosome region

- Expanding mutation:
Repeated DNA sequences (for example Huntington's disease)

Somatic vs Sex-Cell Mutations

- Somatic mutations: Not inherited
- Sex-cell mutations: Passed to offspring

L3 : DNA Technology

https://t.me/Biology_Explanations

Done By : Salma

Genetic engineering is the manipulation of DNA to insert exogenous DNA (from another organism) into an organism's genome.

It allows scientists to increase or decrease gene expression and study individual gene functions.

An organism's **genome** is all the DNA found in the nucleus of each cell.

DNA Tools

- **Restriction enzymes**: Proteins that recognize specific DNA sequences and cut DNA at those sites (e.g., EcoRI cuts at GAATTC), often creating sticky ends that can join with complementary ends.
- **Gel electrophoresis**: Uses an electric current to separate DNA fragments by size; smaller fragments move farther toward the positive end of the gel.

These tools help isolate, identify, and analyze genes.

Recombinant DNA is formed by combining DNA from different sources.

Vectors (commonly plasmids or viruses) carry recombinant DNA into host cells.

DNA ligase joins DNA fragments to plasmids.

Gene cloning: Bacteria take up recombinant plasmids (transformation) and replicate, producing many identical copies (clones).

DNA sequencing determines the order of nucleotides using DNA polymerase, labeled nucleotides, and gel electrophoresis.

PCR (Polymerase Chain Reaction) rapidly amplifies a specific DNA region using primers, DNA polymerase, nucleotides, and cycles of heating/cooling—like a biological copy machine.

Biotechnology applies genetic engineering to solve problems.

Transgenic organisms contain genes from other species.

- **Animals**: Disease research, improved health, potential organ sources.
- **Plants**: Pest resistance, improved nutrition, reduced allergens, stress tolerance.
- **Bacteria**: Produce insulin/hormones, clean oil spills, reduce crop ice damage, decompose waste.

Key Takeaway

DNA technology combines precise tools (restriction enzymes, vectors, ligase), analytical methods (gel electrophoresis, sequencing), and amplification (PCR) to create and study recombinant DNA, enabling major advances in medicine, agriculture, and environmental science.

L4 : The Human Genome

https://t.me/Biology_Explanations

Done By : Salma

Main Idea

The Human Genome Project (HGP) was an international scientific effort completed in 2003 to sequence all human DNA and identify human genes.
It remains significant because it transformed medicine, genetics, and biotechnology.

Genomics

The study of an organism's entire genome.
Helps scientists identify genes and understand their functions.

Human Genome Project

Sequenced ~3 billion nucleotides in human DNA.
Humans have about 22,300 genes.
Less than 2% of DNA codes for proteins.
Most DNA consists of noncoding sequences with regulatory or unknown roles.

Sequencing the Genome

DNA from 46 chromosomes was broken into fragments.
Fragments were cloned, sequenced, and reassembled using computers.
Automated sequencing machines were used.

Identifying Genes

Scientists look for Open Reading Frames (ORFs):
At least 100 codons
Begin with a start codon and end with a stop codon

Bioinformatics

Manages and analyzes large biological data sets.
Uses databases to:
Identify genes
Predict protein structure and function

DNA Typing

Separates DNA fragments to create unique patterns.
Used for:
Crime investigations
Paternity testing
Identifying human remains

DNA Microarrays

Chips containing thousands of DNA fragments.
Used to analyze gene expression.
Help determine whether genes are affected by genetics or environment.

Applications of the Human Genome Project

1. Single Nucleotide Polymorphisms (SNPs)

Variations in one nucleotide.
Linked to diseases.
Over 99% of DNA is identical among humans.

2. HapMap Project

Studies haplotypes (groups of linked SNPs).
Helps locate genes associated with diseases.

3. Pharmacogenomics

Studies how genes affect drug response.
Benefits:
Personalized medicine
Safer drugs
Correct drug dosage
[Not the same as gene therapy].

4. Gene Therapy

Inserts a normal gene to replace a mutated one.
Aimed at treating genetic diseases.

5. Proteomics

Study of all proteins (proteome).
Based on the central dogma (DNA → RNA → Protein).
Important because proteins do the actual work in cells.
Helps develop new drugs.

Why the HGP Is Still Important

- Improves disease diagnosis and treatment
- Enables personalized medicine
- Advances genetic research and biotechnology