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Erasmusplus KA1, school staff mobility

Accordo n.2014_1_IT02_KA101_000949

Prof.ssa Clara Todisco

Modulo CLIL in lingua inglese di biochimica secondo il metodo educativo dello "Scaffolding"

Introduzione

Nel corso dell'attività didattica sempre più frequentemente viene utilizzato il metodo dello "scaffolding". Il termine si riferisce ad un progetto in cui gli insegnanti conducono lo studente verso un apprendimento, che avvalendosi del lavoro di gruppo, promuove il pensiero critico.

Il docente abbandona la lezione frontale in aula, cioè si allontana dal ruolo di divulgatore del sapere impartito dalla cattedra,per assumere quello del méntore , del tutor e del facilitatore dei processi di costruzione della conoscenza.

Con l'obiettivo di coinvolgere gli studenti , tramite la flipped classroom, il docente si incarica di formare gruppi di lavoro e aiutare ogni studente a costruire il proprio sapere favorendo le sue inclinazioni, capacità, talenti e interessi. Un primo importante punto su cui far leva è la responsabilizzazione degli studenti stessi. A questo fine è fondamentale il loro coinvolgimento nelle decisioni che riguardano i vari aspetti del processo educativo: argomenti,metodologie,modalità di valutazione,tempi delle attività didattiche. Naturalmente tutto ciò non comporta l'abdicazione del docente al proprio ruolo di progettista e supervisore dei processi dell'apprendimento. Sono infatti le scelte strategiche effettuate dal docente stesso a determinare l'impronta educativa e il clima socio-relazionale nel quale si trova a operare la classe. Occorre perciò promuovere un orientamento culturale per il quale gli alunni vengono apprezzati sia per le capacità cognitive e intellettive che mostrano di possedere sia per l'impegno e l'applicazione che dedicano alle attività scolastiche. Vengono così organizzati gruppi di lavoro eterogenei per capacità, genere, paese d'origine e status socio-economico i quali, grazie al confronto tra punti di vista diversi, rappresentano una ricchezza sul piano socio-relazionale e formativo dello studente. All'interno di essi vengono così stabiliti attività e ruoli ben precisi da assegnare ad ogni singolo membro. L'attribuzione di compiti e ruoli definiti permette di determinare "responsabilità individuali".

Si passa, quindi, ad un'attività di riflessione ed elaborazione dei contenuti supportati da mappe concettuali, grafici e/o diagramma di flusso.

Si propongono quindi argomenti che, discussi criticamente,permettono di sintetizzare e riassumere i contenuti, mettendone in luce gli aspetti salienti.

Definito così l'ambito si passa ad un elencazione di parole chiave in italiano e in inglese.

Vengono utilizzati motori di ricerca in rete che permettono di reperire contenuti e immagini necessarie a sviluppare la traccia di lavoro delineata con una rielaborazione costante del testo e una ridefinizione della ricerca che a poco a poco si raffina facendo emergere nuovi spunti e prospettive.

Gli studenti iniziano il lavoro in classe e lo alternano ad lavoro a casa. I gruppi, quindi, forniscono in tempi successivi le bozze dei lavori revisionate e valutate dal docente. Al termine del percorso il gruppo relaziona alla classe il lavoro effettuato con l'ausilio di mezzi audio-visivi in dotazione alla scuola.

L'attività si conclude con la fase di valutazione che non si esaurisce con una semplice attribuzione di un voto ma come strumento per orientare l'apprendimento.

CLIL Module

Teacher's name: prof.ssa Clara Todisco

Subject: Science

12th grade

Time: 8 h

Language: English

Prerequisites:

Science

- Chemical bonds
- Basic chemical elements
- Atom structure

English

- To understand simple written and spoken language (B1)
- To produce simple written texts
- To report on a given topic

Learning Outcomes and Objectives

- To learn how to work in a team
- To develop analysis, synthesis, reprocessing and abstraction skills
- To develop a scientific language
- To read short scientific texts and analyse information for operative purposes
- To understand simple instructions to carry on experiments
- To produce lab reports using a given scheme

Content Language

- To develop a technical language
- Specific vocabulary

Cognition:

- To develop thinking skills which link concept formation (abstract and concrete), understanding and language
- Comprehension of scientific texts
- Rework data via tabs, diagrams, maps etc.
- Collecting data

Culture Task:

- Exposure to alternative perspectives and shared understandings, which deepen awareness of otherness and self.

Activities

http://star.mit.edu/media/uploads/biochem/exercises/version_2-3/macromolecules_exercise_ver8.pdf

a) How many carbon atoms are in the deoxyadenosine molecule? ________

b) How many oxygen atoms are in the deoxyadenosine molecule? ________

c) How many nitrogen atoms are in the deoxyadenosine molecule? ________

d) Describe the deoxyadenosine molecule’s structure.

❍ It is a ring
❍ It is a long hydrocarbon chain.
❍ It's a complex, multiple ring that contains nitrogen.
❍ It's a complex, multiple ring.
❍ None of the above.

Evaluation it's based on

•Knowledge of the main concepts
•Comprehension of the main concepts
•Ability in logical elaboration (analysis, synthesis, interpretation)
•Communication
•Use of a specific lexicon (CALP- Cognitive Academic Language Proficiency)

Assessment

In CLIL the primary focus of assessment is on content, even if language is always present. Language evaluation should be closely linked to the achievement of content objectives using performance-based assessments.

Assessment Test:

•Intermediate
•Final

NUCLEIC ACIDS

DNA was first isolated by Friedrich Miescher in 1869. Its molecular structure was identified by James Watson and Francis Crick in 1953, whose model-building efforts were guided by X-ray diffraction data acquired by Rosalind Franklin. DNA is used by researchers as a molecular tool to explore physical laws and theories.

Figura 1- Watson & Crick

The nucleic acids are the building blocks of living organisms. Genetic material varies in quantity from one species to another. It has the ability to replicate, and it also regulates the development of the cell.
You may have heard of DNA described the same way. DNA is just one type of nucleic acid. Some other types are RNA, mRNA, and tRNA. All of these "NAs" work together to help cells replicate and build proteins.

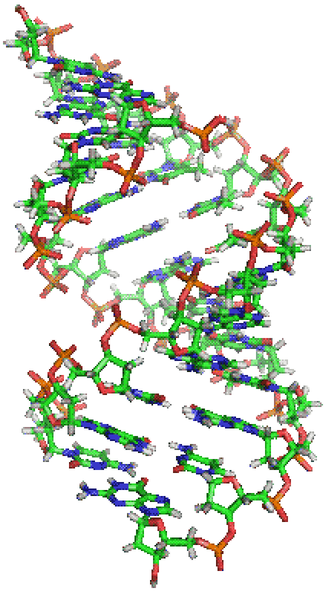


Figura 2- DNA double helix

There are two varieties of beings on our planet Earth. Inanimate or non living and animate or living. All living beings have life in them. Plants, animals from unicellular to macro bodies are formed from the repetition of these unique combination of elements. The amazing part of these living being is their ***capacity to absorb the energy, store, convert and utilize according to the needs and develop.***

However, long or short the living cells have a definite life for themselves. After that the living cell becomes again the individual elements that it is composed of. During the life time the activity of building and the activity of dying go simultaneously. The branch of chemistry that is dedicated to study these phenomenon is known as **biochemistry**. A number of scientists worked hard and unlocked so many avenues and found out the molecules and their structures, that help to sustain the vital force. Among those molecules one of the important group of compounds are called the **nucleotides**.

- **Nucleotide** is defined as the basic building block of nucleic acid with characteristic arrangement of the base units. A nucleotide is the *genetic message carrying unit*. The sugar and the base combination is called a ***nucleoside*** and with phosphorus addition it becomes a ***nucleotide***.

Nucleo proteins are found in every living cell. These are the polymers of nucleic acids. Nucleic acid molecules are poly ester chains called poly nucleotide chain.

Esters are the organic salts formed by the reaction between an alcohol and an acid.

If the sugar is D-ribose the nucleic acid is known as RNA and if the sugar is D-2- deoxyribose the nucleic acid is known as DNA.

A nucleotide contains three components:

- ✓ A pentose sugar unit (5-Carbon ring sugar)
- ✓ A nitrogen containing ring structure called a base.
- ✓ Two or three phosphategroups.

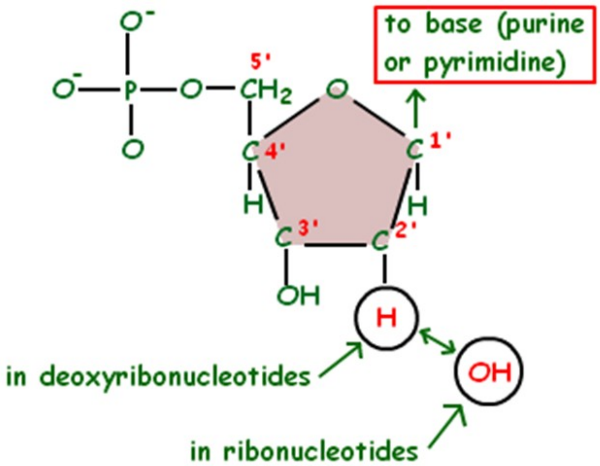


Figura 3- Nucleotide

In DNA the pentose sugar is D-2-deoxyribose. The base contains two purines and two pyrimidines.

- ✓ The sugar carbon atoms are numbered ***1 to 5***, with 1 being the point of attachment of the nitrogenous base, and 5 the point of attachment of the phosphate group. DNA polymers are built from individual nucleotides

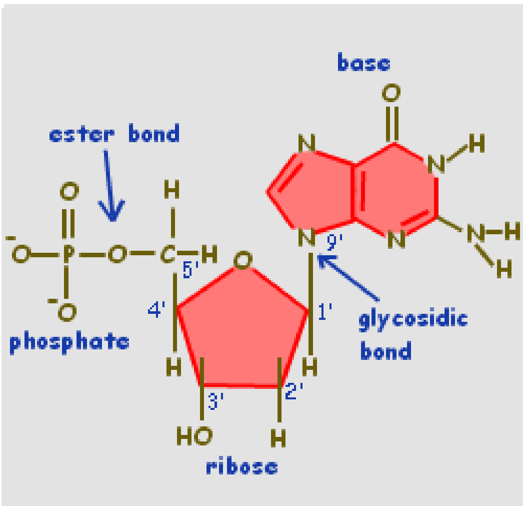


Figura 4- Pentose sugar in DNA

by linking the phosphate of one nucleotide to the #3 carbon of the neighboring nucleotide.

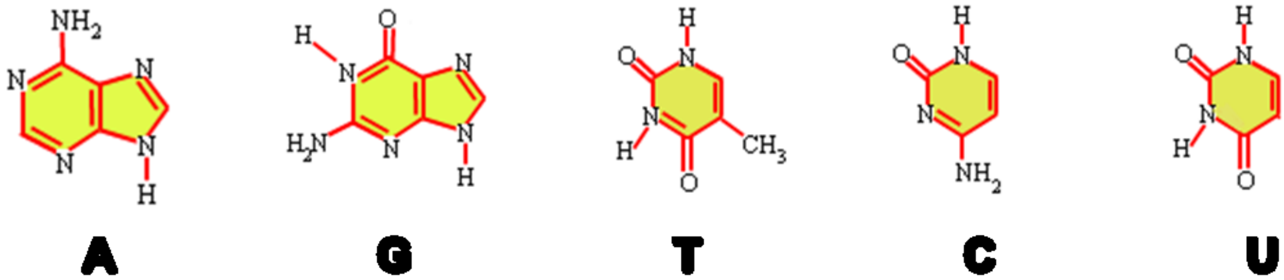
- ✓ The repeating pattern of phosphate, sugar, then phosphate again is commonly referred to as the backbone of the molecule.

The base contains two purines and two pyrimidines. The two purines are:

- ✓ **Adenine (A)**
- ✓ **Guanine (G)**

and the two pyrimidines are:

- ✓ **Thymine (T)**
- ✓ **Cytocine (C)**



In RNA the pentose sugar is D-ribose. The base contains two purines Adenine (A) and Guanine (G) and two pyrimidines Thymine (T) and Uracil(U). Both DNA and RNA are attached with three phosphate groups.

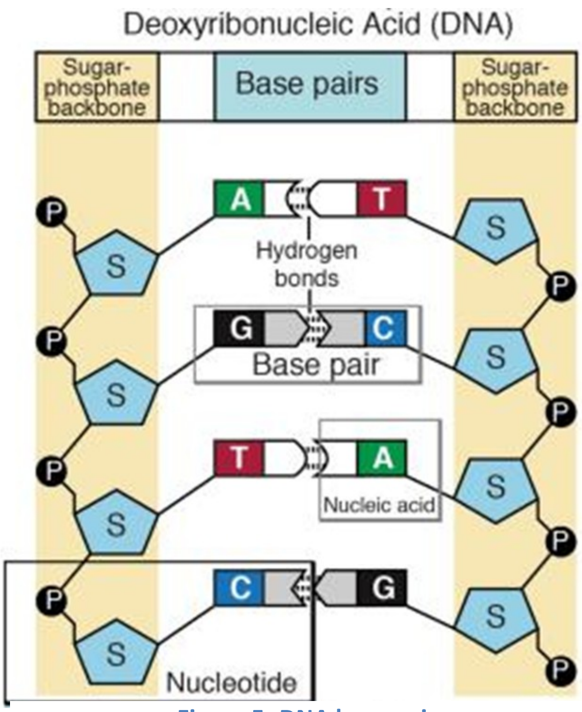
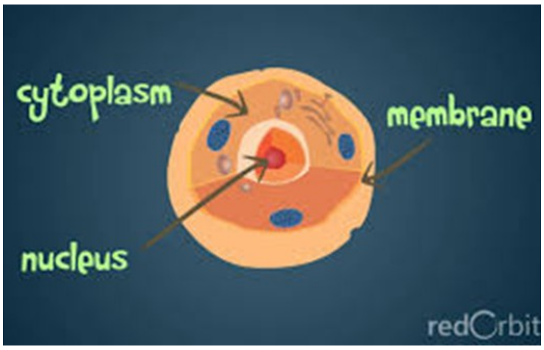


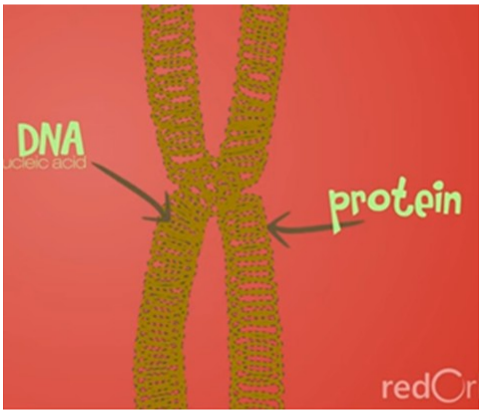
Figura 5- DNA base pairs

DNA consists of two long polymers of nucleotides. These two strands run in opposite directions to each other and are therefore anti-parallel. The sequence of the four bases along the backbone encodes information and comprises the genetic code.

The ends of DNA strands are called the 5′(five prime) and 3′ (three prime) ends. The 5′ end has a terminal phosphate group and the 3′ end a terminal hydroxyl group. One of the major structural differences between DNA and RNA is the sugar, with the 2-deoxyribose in DNA being replaced by ribose in RNA. DNA (deoxyribonucleic acid) is the genomic material in cells that contains the genetic information used in the development and functioning of all known living organisms. Most of the DNA is located in the nucleus, although a small amount can be found in mitochondria (mitochondrial DNA).

Within the nucleus of eukaryotic cells, DNA is organized into structures called chromosomes. The complete set of chromosomes in a cell makes up its genome; the human genome has approximately 3 billion base pairs of DNA arranged into 46 chromosomes. The information





carried by DNA is held in the sequence of pieces of DNA called genes.

"DNA makes RNA makes protein." This general rule emphasizes the order of events from transcription through translation and provides the basis for much of the genetic code research in the post double helix 1950s. The central dogma is often expressed as the following: "DNA makes RNA, RNA makes proteins, proteins make us". Protein is never back translated to RNA or DNA. Furthermore, DNA is never translated directly to protein.

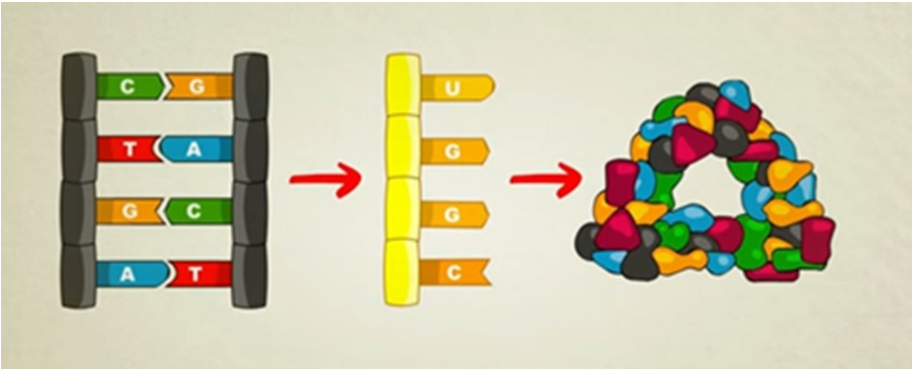


Figura 6.- Protein generation

Cell division is essential for an organism to grow, but, when a cell divides, it must replicate the DNA in its genome so that the two daughter cells have the same genetic information as their parent. The double-stranded structure of DNA provides a simple mechanism for DNA replication. Here, the two strands are separated and then each strand's complementary DNA sequence is recreated by an enzyme called DNA polymerase. This enzyme makes the complementary strand by finding the correct base through complementary base pairing, and bonding it onto the original strand. As DNA polymerases can only extend a DNA strand in a 5′ to 3′ direction, different mechanisms are used to copy the antiparallel strands of the double helix. In this way, the base on the old strand dictates which base appears on the new strand, and the cell ends up with a perfect copy of its DNA.

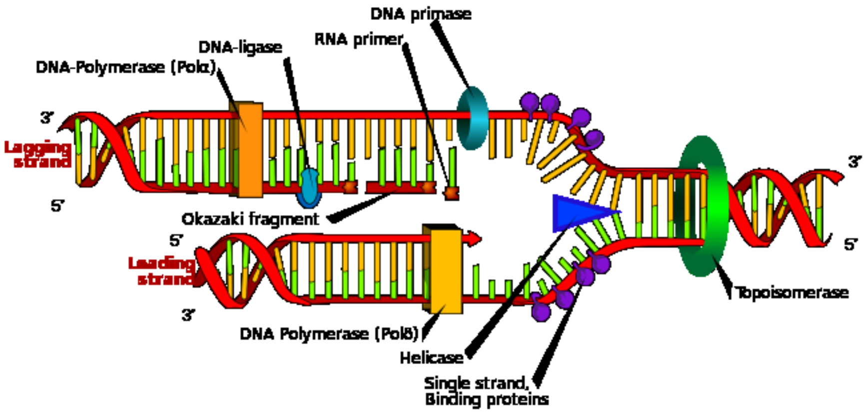


Figura 7- Cell replication

When a cell divides, it must correctly replicate the DNA in its genome so that the two daughter cells have the same genetic information as their parent.

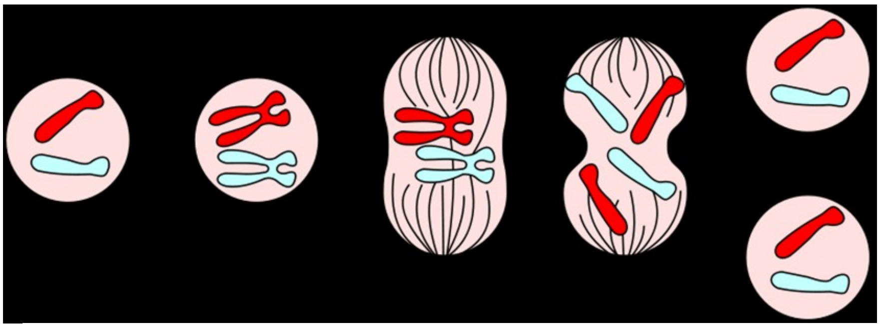
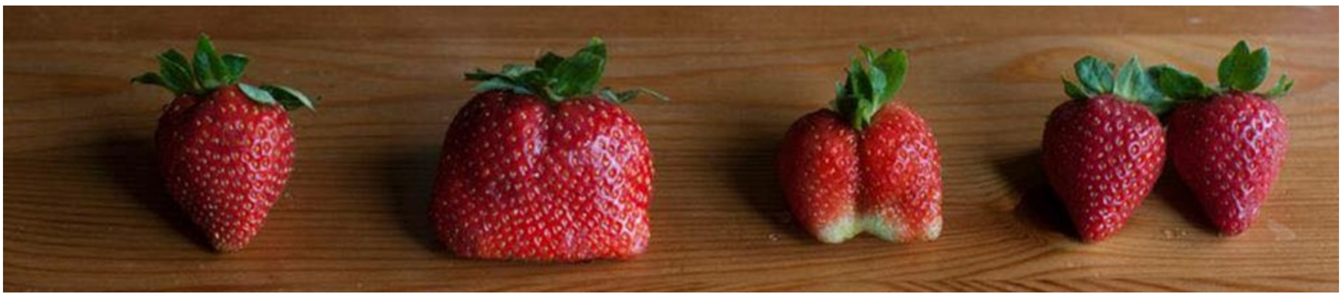
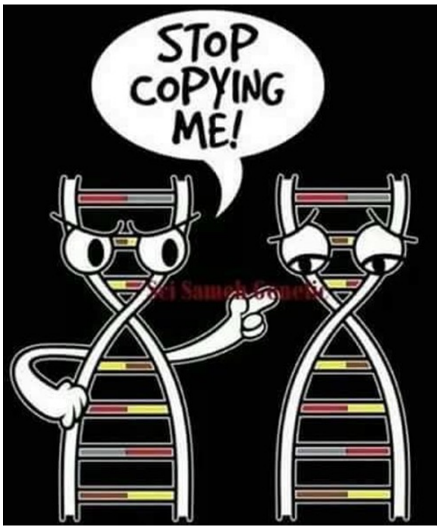


Figura 8- Cell division



The double-stranded structure of DNA provides a simple mechanism for DNA replication. The two strands are separated and then an enzyme called DNA polymerase recreates each strand's complementary DNA sequence. This enzyme makes the complementary strand by finding the correct base through complementary base pairing. As DNA polymerases can only extend a DNA strand in a 5′ to 3′ direction, different mechanisms are used to copy the antiparallel strands of the double helix. In this way, the base on the old strand dictates which base appears on the new strand, and the cell ends up with a perfect copy of its DNA. This process typically takes place during S phase of the cell cycle.



The process by which DNA achieves its control of cell life and function through protein synthesis is called gene expression. A gene is a DNA sequence that contains genetic information for one functional protein. Proteins are essential for the modulation and maintenance of cellular activities.

The amino acid sequence of each protein determines its conformation and properties. Directed protein synthesis follows two major steps: gene transcription and transcript translation.

- ✓ Transcription is the process by which the genetic information stored in DNA is used to produce a complementary RNA strand. The DNA base sequence is first copied into an premessenger RNA molecule, by messenger RNA polymerase. Premessenger RNA has a base sequence identical to the DNA coding strand.

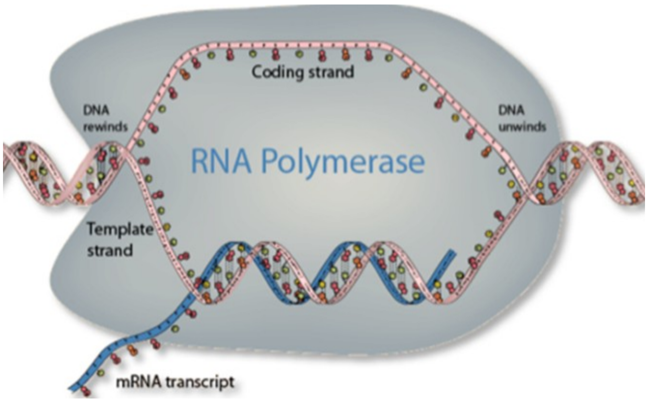


Figura 9 - RNA Polymerase

- ✓ Genes consist of sequences encoding mRNA that are interrupted by introns, non-coding sequences of variable length. Introns are removed and exons joined together before translation begins in a process called mRNA splicing.

- ✓ mRNA splicing has proved to be an important mechanism for greatly increasing the versatility and diversity of expression of a single gene. It takes place in the nucleus in eukaryotes.

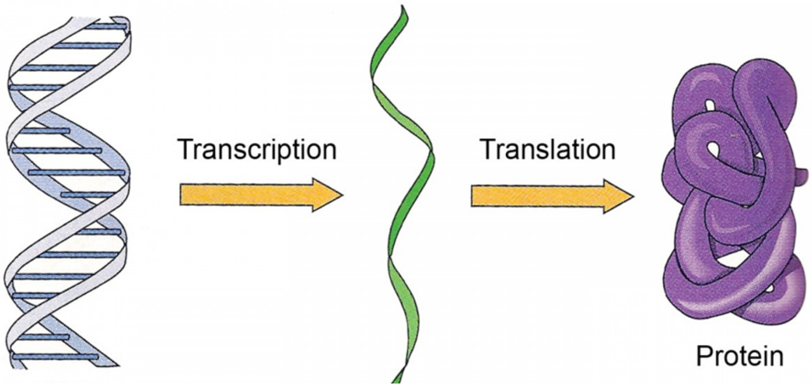


Figura 10 - Protein transcription

Several different mRNA and protein products can arise from a single gene by selective inclusion or exclusion of individual exons from the mature mRNA products. This phenomenon is called alternative mRNA splicing. It permits a single gene to code for multiple mRNA and protein products with related but distinct structures and functions. Once introns are excised from the final mature mRNA molecule, this is then exported to the cytoplasm through the nuclear pores where it binds to protein-RNA complexes called ribosomes.