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UNIVERSITY INSTITUTE OF ENGINEERING

DEPARTMENT ACADEMIC UNIT 2

Bachelor of Engineering (Computer Science & Engineering)

Biology For Engineers 20SZT148

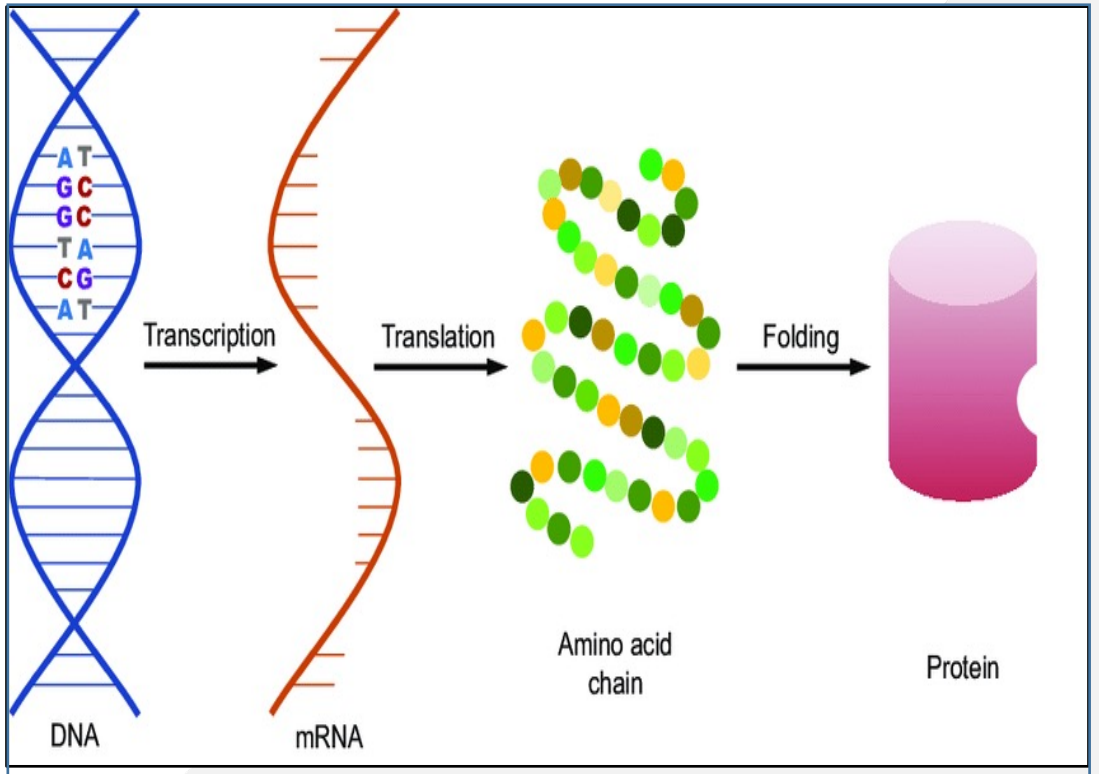
Genetic Information

By Shruti Sharma

GENETIC INFORMATION

Course Objective

- This subject is designed to impart fundamental knowledge on emerging fields of sciences like bioinformatics.
- It is designed to impart knowledge that how to apply different softwares in research.

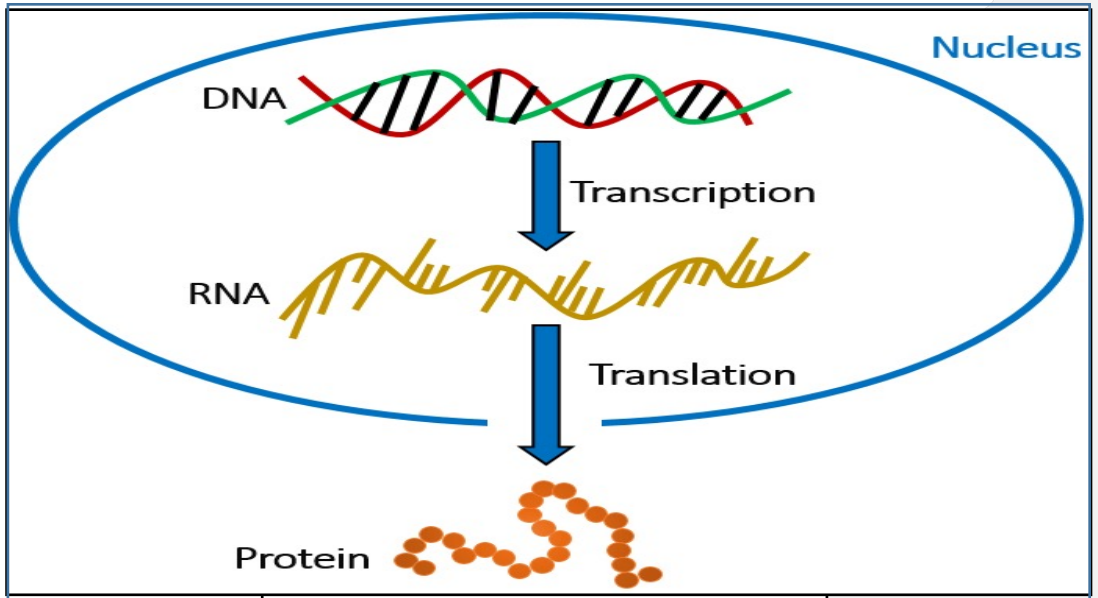


https://www.researchgate.net/profile/Anna_Cichonska/publication/330998908/figure/fig2/AS:724777140514817@1549811744060/The-central-dogma-of-molecular-biology-The-genetic-information-encoded-in-the-DNA-is.png

GENETIC INFORMATION

Course Outcome

CO Number	Title	Level
CO1	To apply knowledge of cell biology to identify, formulate, and solve problems.	**Remember**
CO2	To excel in career as researcher in both traditional and emerging fields of science .	**Understand**
CO3	To apply knowledge of molecular biology, biosensors and immunology to excel in areas such as entrepreneurship, medicine, government, and education	Understand
CO4	To think critically and creatively, especially about the use knowledge about biology of cancer and new areas of biology to address local and global problems	Understand



Will be covered in this lecture

Fig 1
https://www.researchgate.net/profile/Radin_Tahvildari/publication/313798200/figure/fig1/AS:462661172371457@1487318427401/1-Overview-of-the-central-dogma-shows-the-flow-of-genetic-information-inside-a.png

GENES

- A **gene** is a sequence of nucleotides in DNA or RNA that encodes the synthesis of a gene product, either RNA or protein.
- During gene expression, the DNA is first copied into RNA. The RNA can be directly functional or be the intermediate template for a protein that performs a function.
- The transmission of genes to an organism's offspring is the basis of the inheritance of phenotypic trait. These genes make up different DNA sequences called genotypes.

GENETIC INFORMATION

GENETIC CODE

- Genetic information is encoded as a sequence of non overlapping three nucleotides known as codons
- The gene determines the sequence of bases along the length of an mRNA molecule

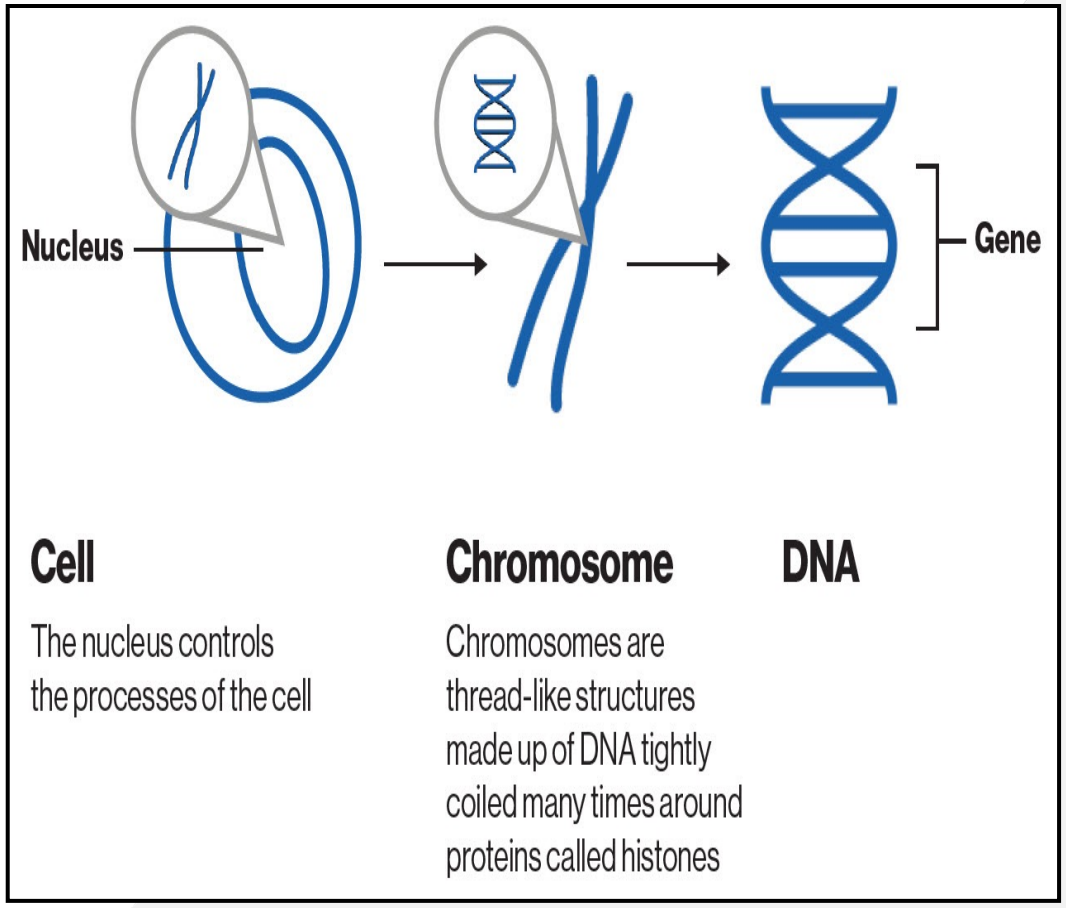


Fig 2
https://www.novartis.com/sites/www.novartis.com/files/cell-chromosome-dna-explanation-image.jpg

GENETIC INFORMATION

Genetic Information

- The genetic information of an organism is stored in DNA molecules.
- There are only four bases found in DNA: G, A, C, and T.
- The sequence of these four bases can provide all the instructions needed to build any living organism.
- The human genome (all the DNA of an organism) consists of around three billion nucleotides divided up between 23 paired DNA molecules, or chromosomes.

GENETIC INFORMATION

What is Genetic Information?

- The central dogma illustrates the flow of genetic information in cells, the DNA replication, and coding for the RNA through the transcription process and further RNA codes for the proteins by translation.

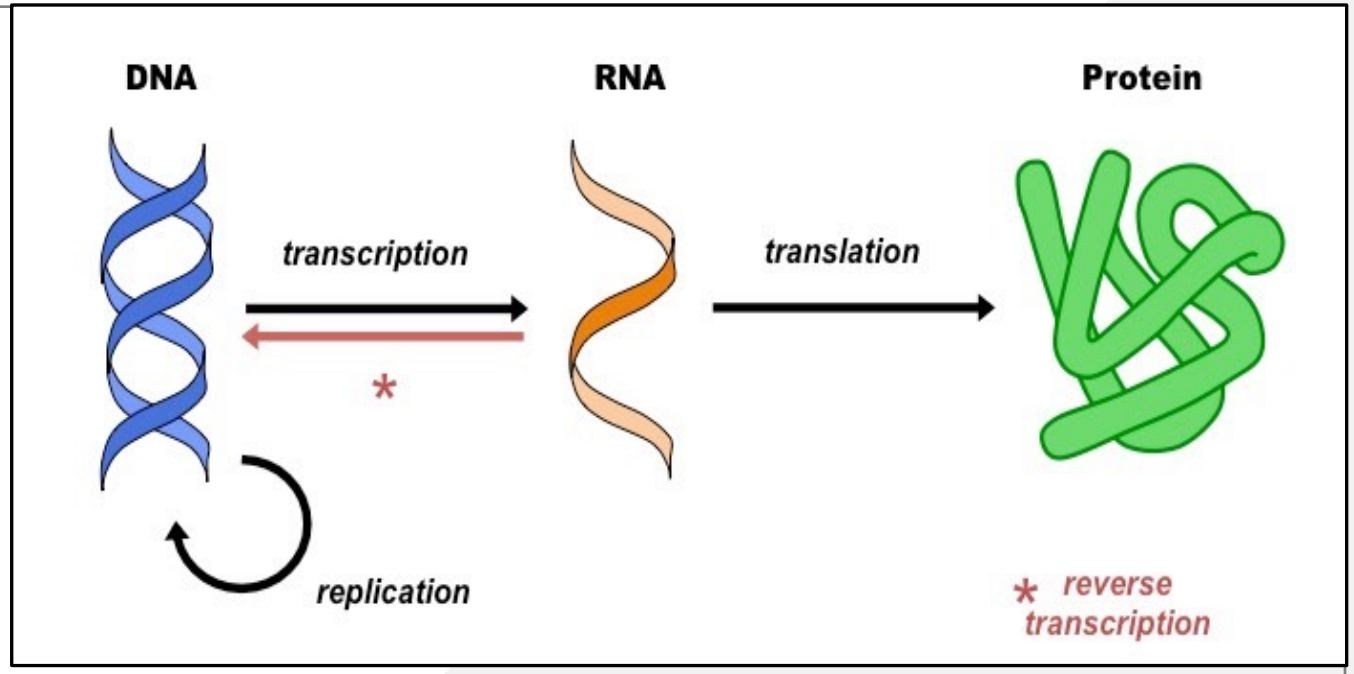


Fig3
https://ib.bioninja.com.au/_Media/central-dogma_med.jpeg

GENETIC INFORMATION

Central Dogma Steps

- The central dogma takes place in two different steps:

Transcription

- Transcription is the process by which the information is transferred from one strand of the DNA to RNA by the enzyme RNA Polymerase.
- The DNA strand which undergoes this process consists of three parts namely promoter, structural gene, and a terminator.

TRANSCRIPTION

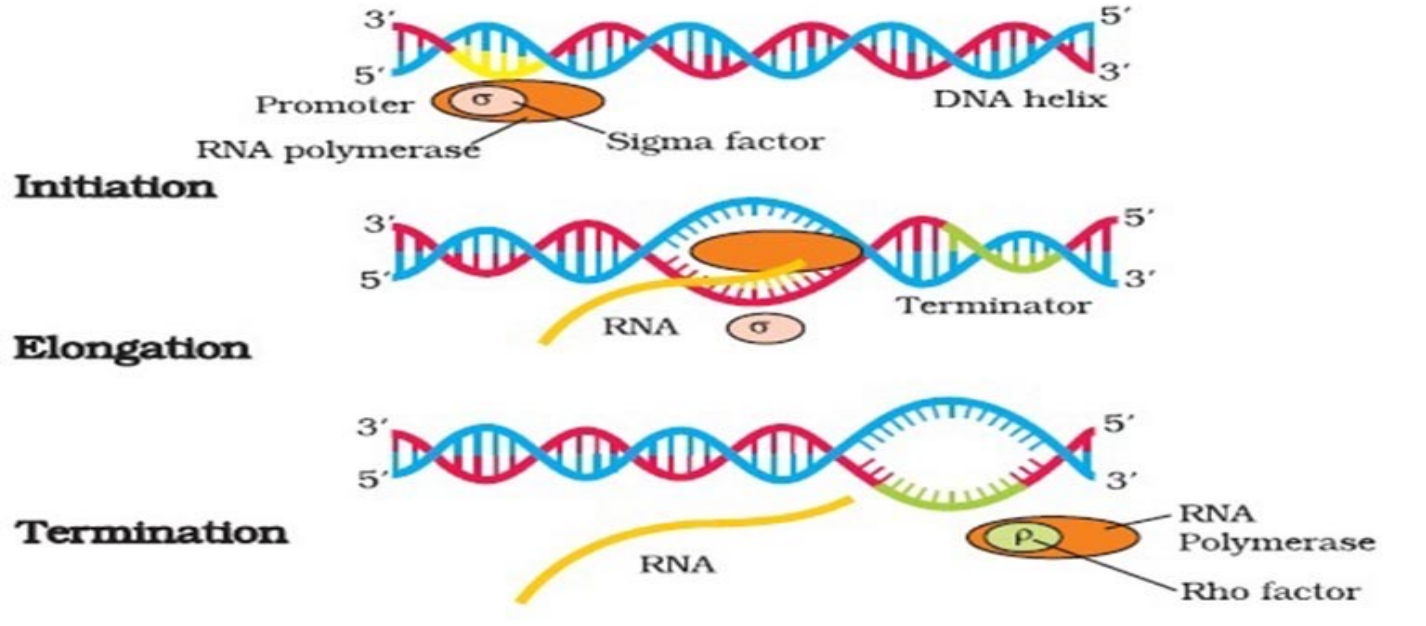


Fig 5 Transctiption
https://163602-560839-raikfcquaxqncofqfm.stackpathdns.com/wp-content/uploads/2018/08/Prokaryotic-Transcription-Enzymes-Steps-Significance.jpg

GENETIC INFORMATION

Translation

- Translation is the process by which the RNA codes for specific proteins.
- Ribosomes initiate the translation process. The ribosomes consist of a larger subunit and a smaller subunit.
- Thus, two codons are held by two tRNA molecules placed close to each other and a peptide bond is formed between them.
- As this process repeats, long polypeptide chains of amino acids are synthesized.

TRANSLATION

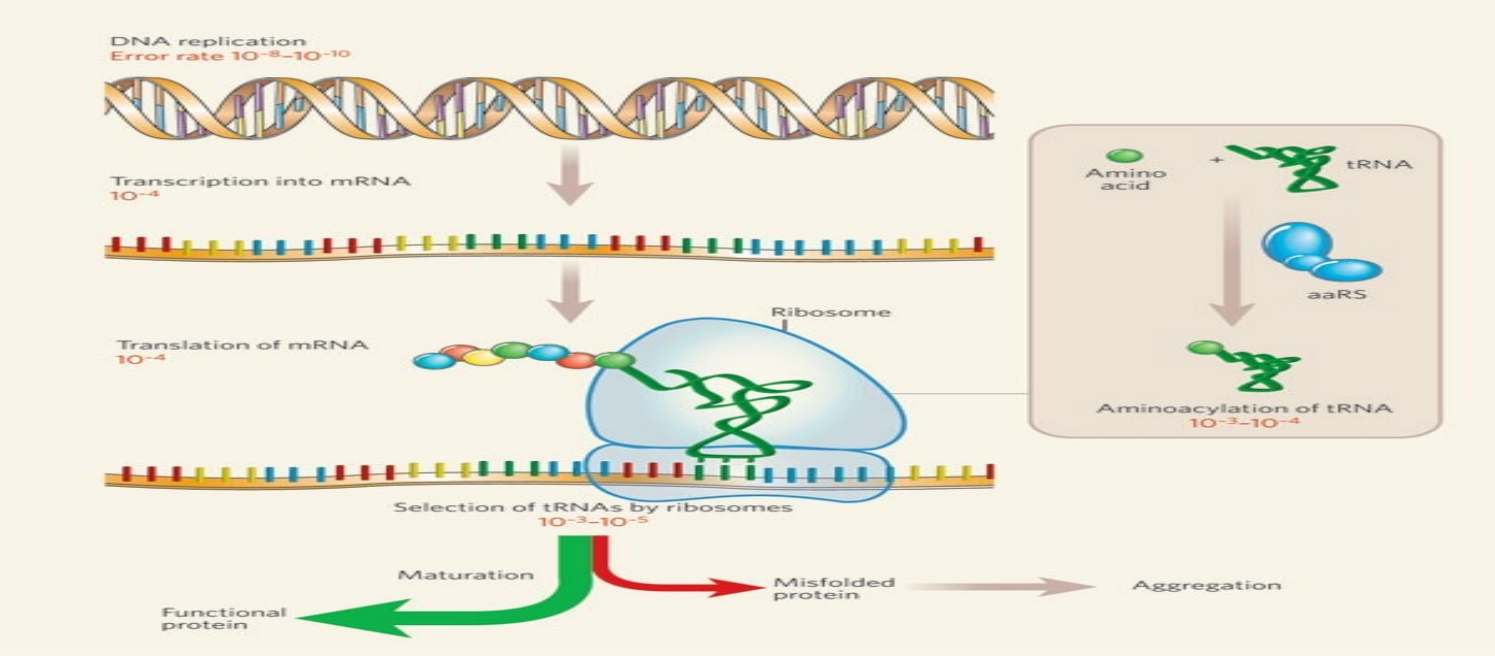


Fig 6 Translation
https://media.springernature.com/full/springer-static/image/art%3A10.1038%2Fnature05002/MediaObjects/41586_2006_Article_BFnature05002_Fig1_HTML.jpg

GENETIC CODE

Genetic Code

- Genetic code contains the information of the protein manufactured from RNA.
- There are basically three nucleotides and four nitrogenous bases, which collectively form a triplet codon that codes for one amino acid.
- The number of possible amino acids range to 4 x 4 x 4 = 64 amino acids. There are 20 naturally existing amino acids.
- Out of the 64 codons, 3 are stop codons which stop the process of transcription and one of the codons is an initiator codon i.e. AUG coding for Methionine.

CONCLUSION

- The central dogma illustrates the flow of genetic information in cells
- A **gene** is a sequence of nucleotides in DNA or RNA that encodes the synthesis of a gene product, either RNA or protein.
- The central dogma takes place in two different steps:

Transcription

Translation

HOME WORK

Q.1. Discuss about the Genetic Information.

Q.2 What is Central Dogma of Information ?

Q3.Discuss in detail different steps of Genetic information.

APPLICATIONS

•The study of Genetic Information will pave way for advance studies in the heredity.

•It will give thorough knowledge of the central Dogma to enable students to disseminate knowledge in pursuing excellence in academic areas.

REFERENCES

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2. https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_Introductory_Biology_(CK-12)/04%3A_Molecular_Biology/4.01%3A_Central_Dogma_of_Molecular_Biology#:~:text=The%20central%20dogma%20of%20molecular%20biology%20states%20that%20DNA%20contains,DNA%20to%20RNA%20to%20Protein.
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THANK YOU

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