

**CET VIKASANA PROGRAMME –
2013**

MOLECULAR BIOLOGY

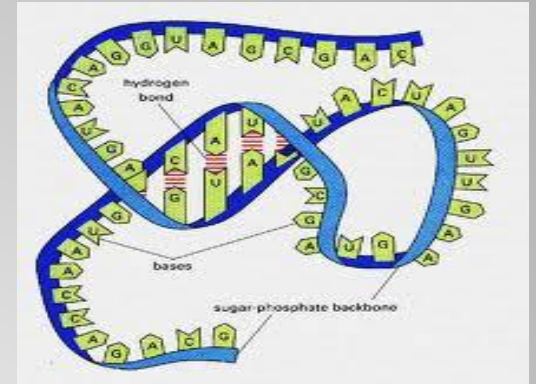


- **Molecular biology is the study of molecular underpinnings of the process of replication, transcription and translation of the genetic material.**

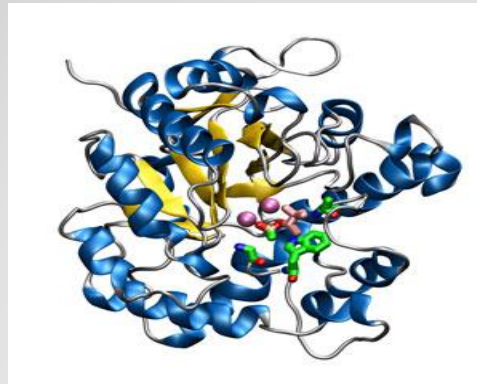
DNA



RNA

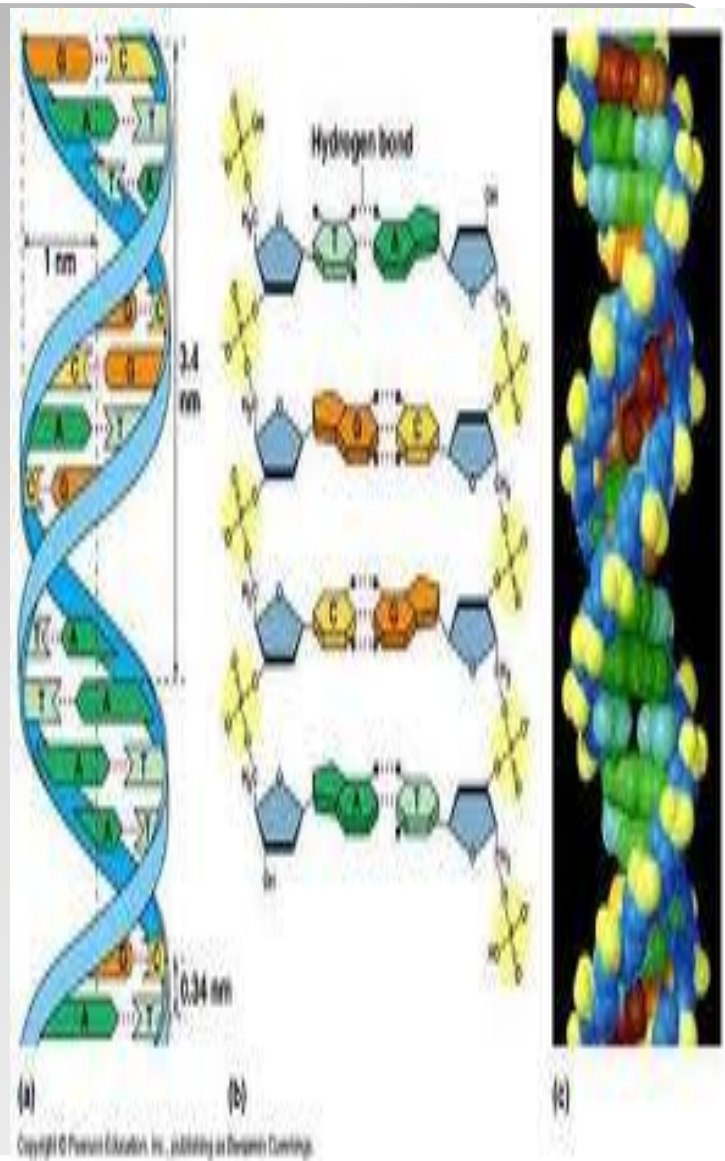


Protein



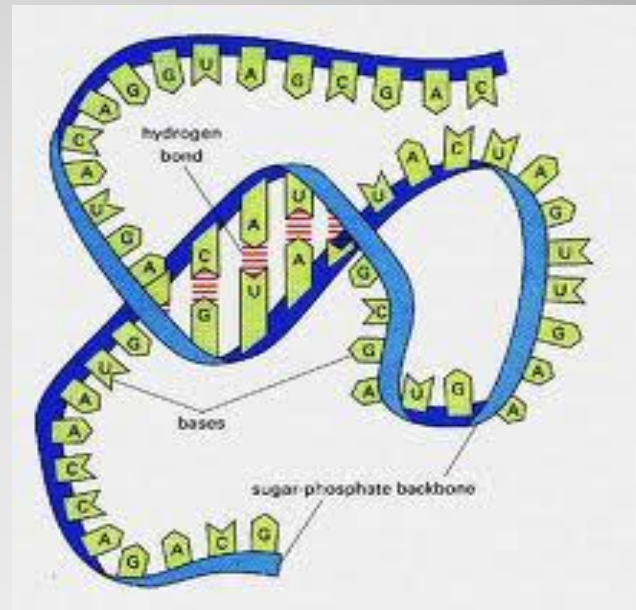
➤ DNA

- Two long strands makes the shape of a double helix.
- two strands run in opposite directions to each other and are therefore anti-parallel.
- Chemically, DNA consists of two long polymers of simple units called nucleotides, with backbones made of base, sugars and phosphate groups.



- **RNA** is a biologically important type of molecule that consists of a long chain of nucleotide units.
- Each nucleotide consists of a nitrogenous base, a ribose sugar, and a phosphate.

Ribonucleic acid (RNA)



- Difference between RNA & DNA

RNA	DNA
RNA nucleotides contain ribose sugar	DNA contains deoxyribose
RNA has the base uracil	DNA has the base thymine
presence of a hydroxyl group at the 2' position of the ribose sugar.	Lacks of a hydroxyl group at the 2' position of the ribose sugar.
RNA is usually single-stranded	DNA is usually double-stranded

- **DNA replication**

DNA replication, the basis for biological inheritance, is a fundamental process occurring in all living organisms to copy their DNA.

- In the process of "replication" each strand of the original double-stranded DNA molecule serves as template for the reproduction of the complementary strand.
- Two identical DNA molecules have been produced from a single double-stranded DNA molecule.

C DNA



C RNA



general



special



protein

CENTRAL DOGMA OF MOLECULAR BIOLOGY

- Genetic code

		Second base					
		U	C	A	G		
First base	U	UUU } Phenyl-alanine UUC } UUA } Leucine UUG }	UCU } Serine UCC } UCA } UCG }	UAU } Tyrosine UAC } UAA } Stop codon UAG } Stop codon	UGU } Cysteine UGC } UGA } Stop codon UGG } Tryptophan	Third base	U
	C	CUU } Leucine CUC } CUA } CUG }	CCU } Proline CCC } CCA } CCG }	CAU } Histidine CAC } CAA } Glutamine CAG }	CGU } Arginine CGC } CGA } CGG }		C
	A	AUU } Isoleucine AUC } AUA } AUG } Methionine start codon	ACU } Threonine ACC } ACA } ACG }	AAU } Asparagine AAC } AAA } Lysine AAG }	AGU } Serine AGC } AGA } Arginine AGG }		A
	G	GUU } Valine GUC } GUA } GUG }	GCU } Alanine GCC } GCA } GCG }	GAU } Aspartic acid GAC } GAA } Glutamic acid GAG }	GGU } Glycine GGC } GGA } GGG }		G

Double helical model was proposed by

- a. Boysen and Jensen**
- b. Watson and Crick**
- c. Watson and Tatum**
- d. Schleiden and Schwann**



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Who among the following conclusively proved that DNA is the genetic material?

- a. O.T Avery. C. Macleod and McCarty
- b. Meselson and Stahl
- c. Hargobind Khorana. Holley and Nirenberg
- d. Tatum and Lederberg

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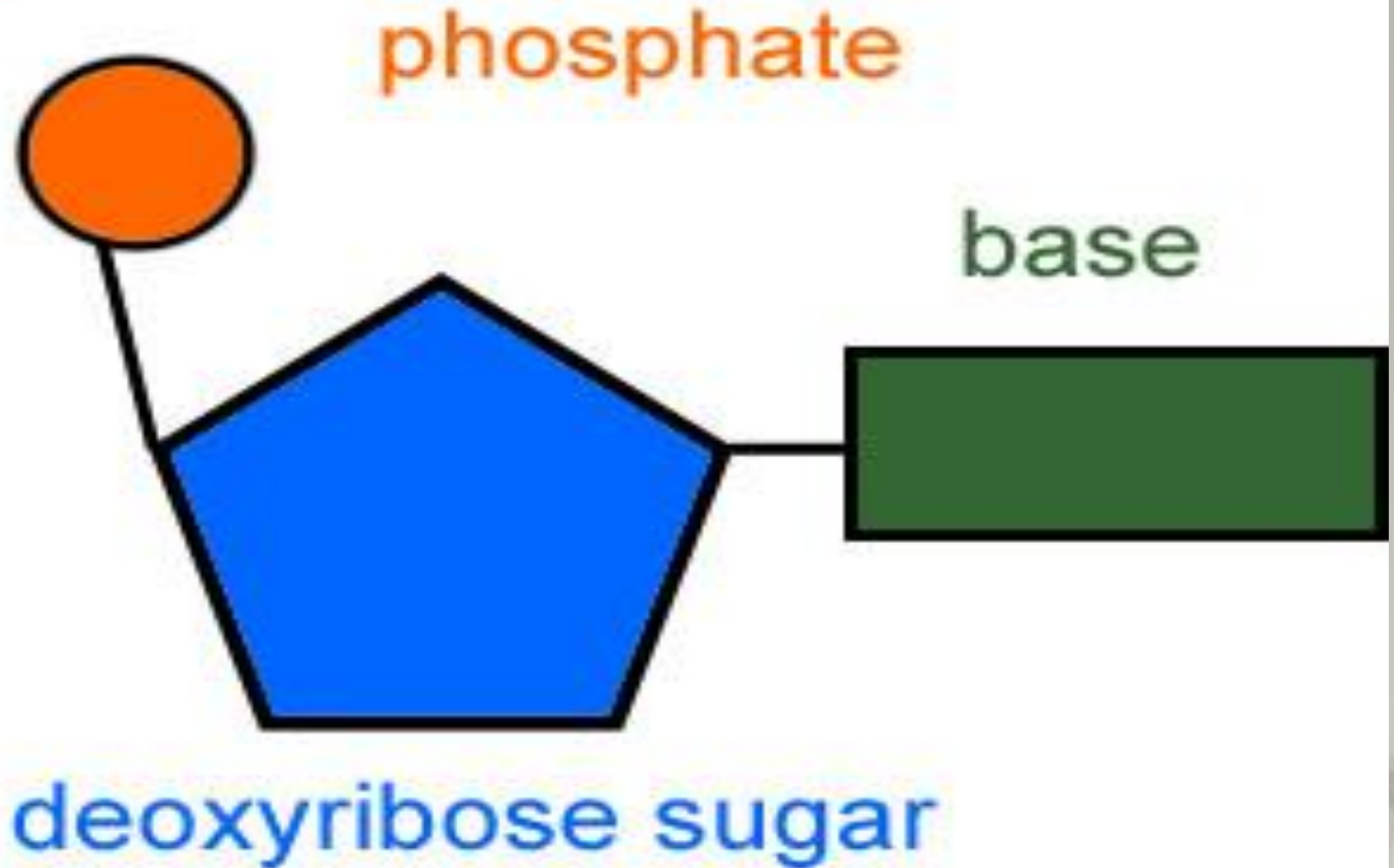
- a. O.T Avery. C. Macleod and McCarty**
- b. Meselson and Stahl
- c. Hargobind Khorana. Holley and Nirenberg
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A nucleotide consists of

- a. A nitrogen base and pentose sugar.
- b. A nitrogen base and phosphate
- c. A Pentose sugar and phosphate
- d. A nitrogen base, pentose sugar & phosphate

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Bacterial transformation was discovered by:

- a. Avery et al**
- b. Watson and Crick**
- c. Griffith**
- d. Hershey and Chase**



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RNA contains the following sugar:

- a. Glucose**
- b. Ribose**
- c. Hexose**
- d. Fructose**



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DNA is a polymer of:

- a. Proteins**
- b. RNA**
- c. Carbohydrates**
- d. Nucleotides**



DNA is a polymer of:

- a. Proteins**
- b. RNA**
- c. Carbohydrates**
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All of the following elements are present in DNA except:

- a. Phosphorous**
- b. Carbon**
- c. Sulphur**
- d. Nitrogen**

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The four nitrogenous bases found in DNA which forms its language are:

- a. UTAC**
- b. ACTU**
- c. AGTU**
- d. ATCG**



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BIOLOGY

The base that is not found in DNA but found in RNA is:

- a. Thymine**
- b. Uracil**
- c. Adenine**
- d. Guanine**



The base that is not found in DNA but found in RNA is:

- a. Thymine**
- b. Uracil**
- c. Adenine**
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Which purine is found in RNA?

- a. Guanine**
- b. Cytosine**
- c. Thymine**
- d. Uracil**



Which purine is found in RNA?

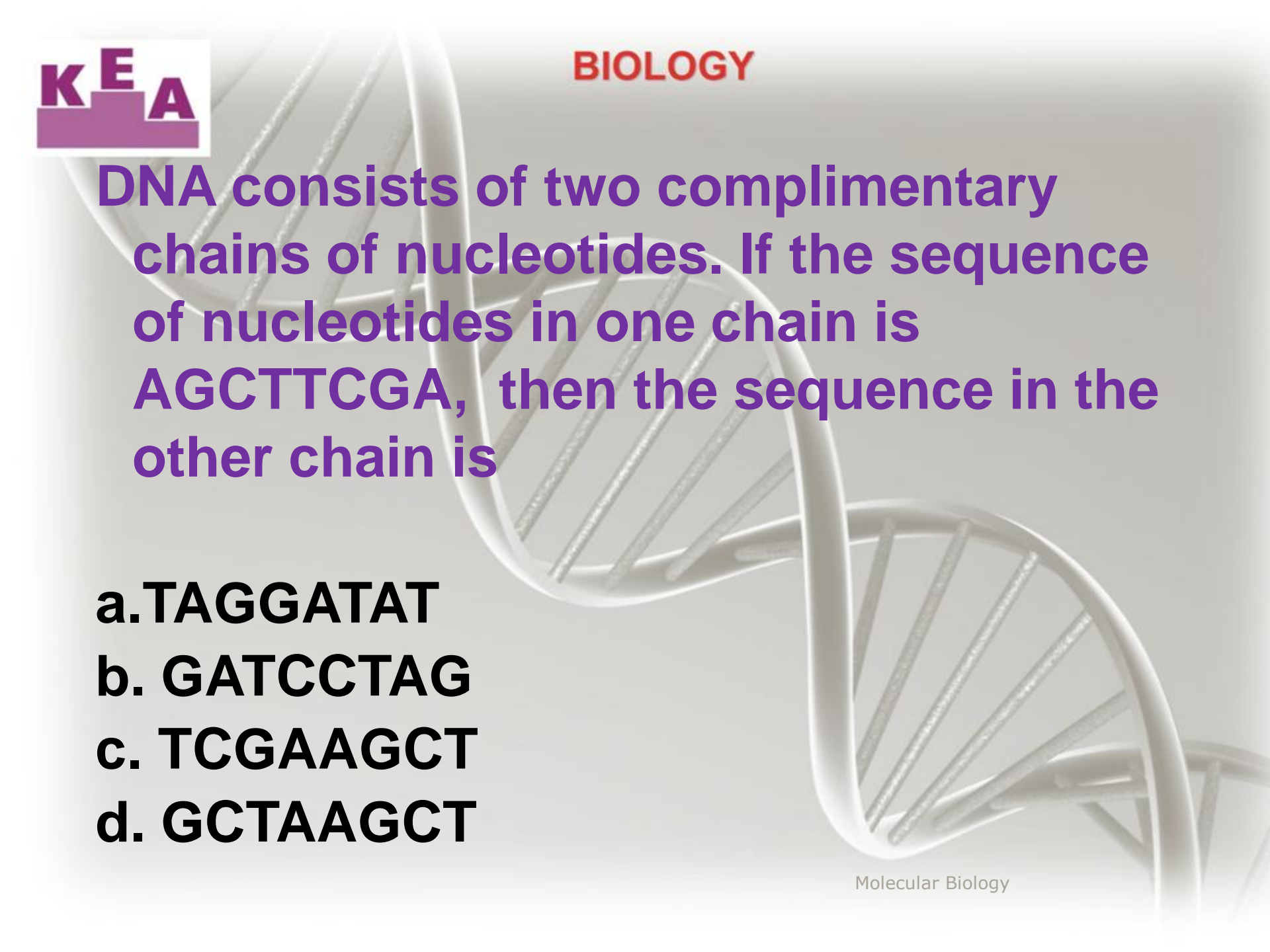
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- b. Cytosine**
- c. Thymine**
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Which sequence has four pyrimidines ?

- a. CATCAATGG**
- b. UAGCGGUAA**
- c. TGGATAACG**
- d. GCUAGACAA**

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A large, semi-transparent, light gray DNA double helix is shown in the background, winding across the slide from the top left towards the bottom right. The two strands are connected by horizontal rungs representing base pairs.

DNA consists of two complimentary chains of nucleotides. If the sequence of nucleotides in one chain is AGCTTCGA, then the sequence in the other chain is

- a. TAGGATAT**
- b. GATCCTAG**
- c. TCGAAGCT**
- d. GCTAAGCT**



BIOLOGY

DNA consists of two complimentary chains of nucleotides. If the sequence of nucleotides in one chain is **AGCTTCGA**, then the sequence in the other chain is

- a. TAGGATAT
- b. GATCCTAG
- c. **TCGAAGCT**
- d. GCTAAGCT

Which of the following is made up of single ring of atoms ?

- a. Alanine**
- b. Adenine**
- c. Guanine**
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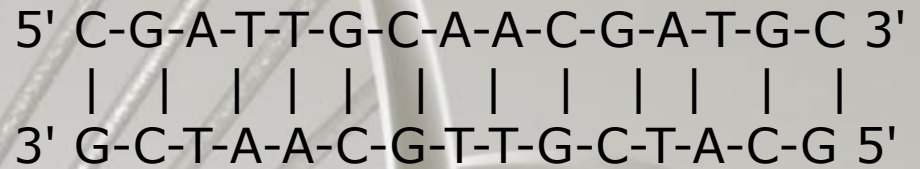
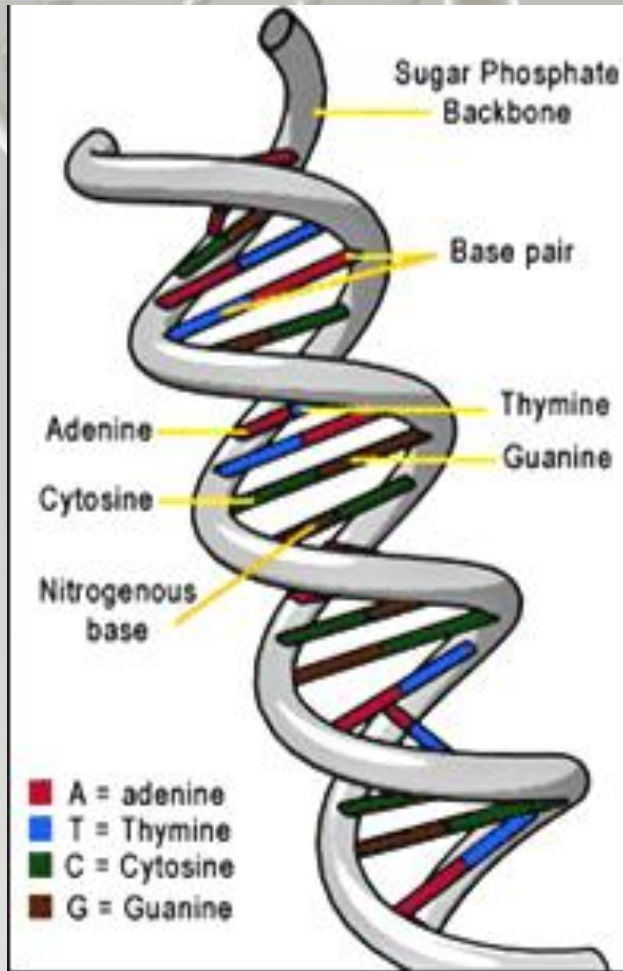
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- c. Guanine**
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The two strands of DNA are:

- a. Similar and parallel**
- b. Similar and antiparallel**
- c. Complementary and antiparallel**
- d. Complementary and parallel**

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DNA acts as a template for:

- a. Proteins**
- b. DNA**
- c. RNA**
- d. Both DNA and RNA**



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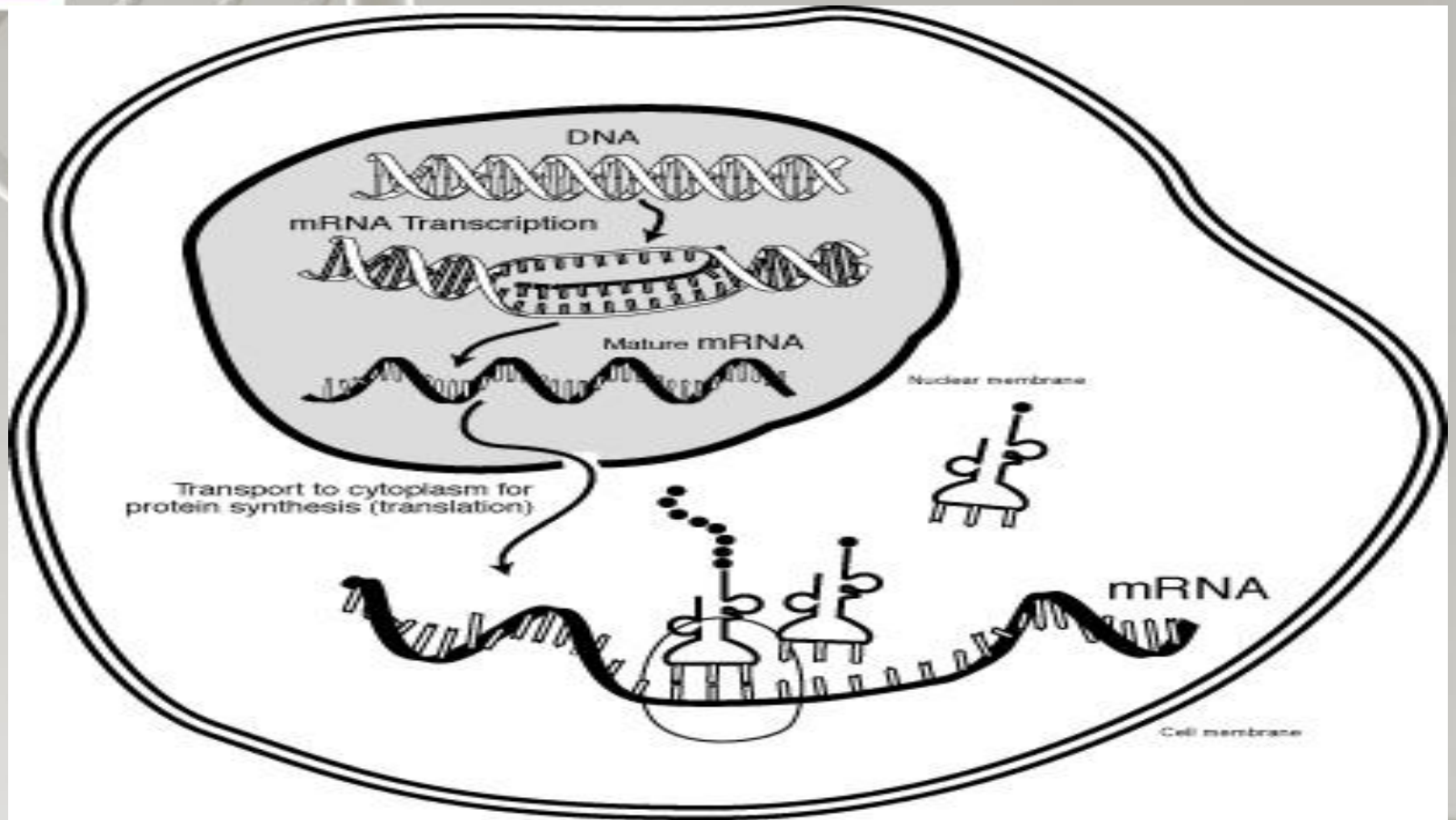
Formation of RNA from DNA is called:

- a. Transcription**
- b. Translation**
- c. Replication**
- d. Recombination**



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TRANSCRIPTION (DNA-RNA)

Inheritable gene mutation takes place in

- a. Nuclear DNA**
- b. Mitochondrial DNA**
- c. Chloroplast DNA**
- d. All the above**



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mRNA is synthesized on
DNA in which direction:

- a. $5' \rightarrow 3'$
- b. $3' \rightarrow 5'$
- c. $5' \rightarrow 3'$ and $3' \rightarrow 5'$
- d. $3' \rightarrow 5'$ and $5' \rightarrow 3'$

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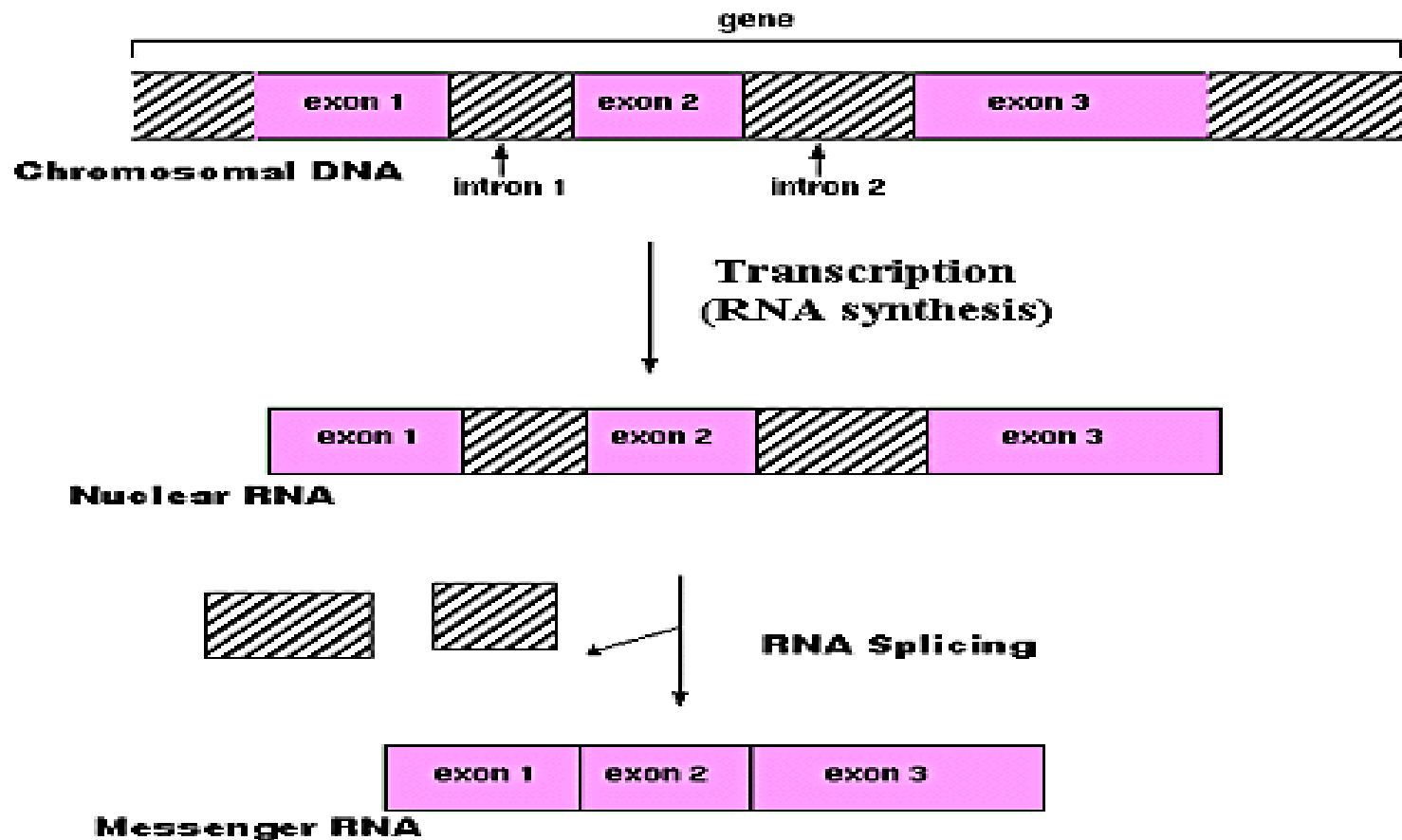
Split genes were discovered by

- a. Watson and Crick**
- b. Lederberg and Tatum**
- c. Jacob and Monod**
- d. Sharp and Roberts**



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RNA synthesis and processing



Molecule into which the coded information is transcribed is:

- a. mRNA**
- b. tRNA**
- c. rRNA**
- d. hnRNA**



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BIOLOGY

The two strands of DNA are held together by _____ bonds:

- a. Nitrogen
- b. Hydrogen
- c. Oxygen
- d. Carbon



BIOLOGY

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- a. Nitrogen
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Hydrogen bonds present between Cytosine and Guanine are:

- a. 2**
- b. 3**
- c. 1**
- d. 4**

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- b. 3**
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- d. 4



The ratio of purine and pyrimidine bases in a DNA molecule is always around one. This is known as:

- a. Wobble hypothesis**
- b. Teminism**
- c. Chargaff's rule**
- d. Colinearity**



BIOLOGY

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BIOLOGY

In a double stranded DNA molecule, the percentage of Cytosine is 18 what is the percent of Adenine ?

- a. 64%
- b. 32%
- c. 18%
- d. 46%



BIOLOGY

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BIOLOGY

A short length of DNA molecule contains 120 Adenine and 120 Cytosine bases. The total number of nucleotides in this DNA segment is:

- a. 60**
- b. 120**
- c. 240**
- d. 480**



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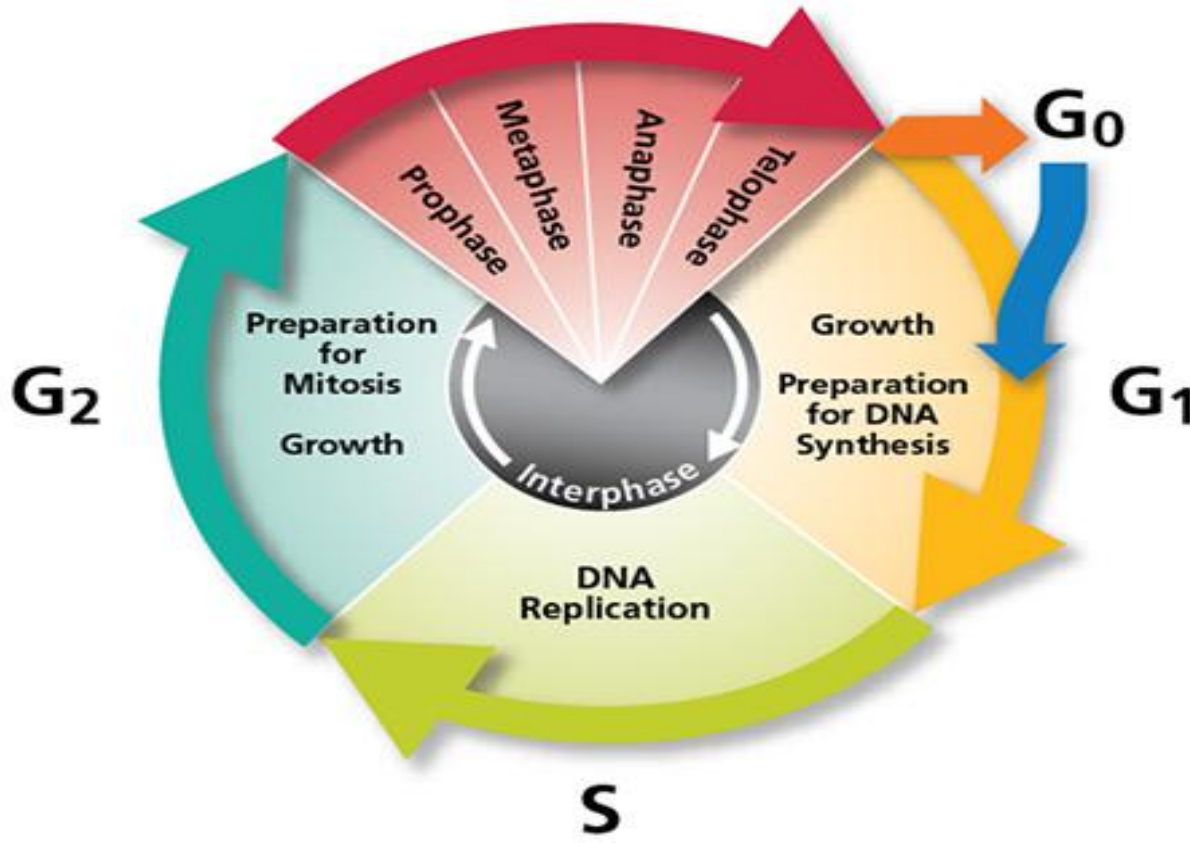
The replication of nuclear DNA occurs in:

- a. G1 - phase**
- b. G2 - phase**
- c. S - phase**
- d. M - phase**

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M

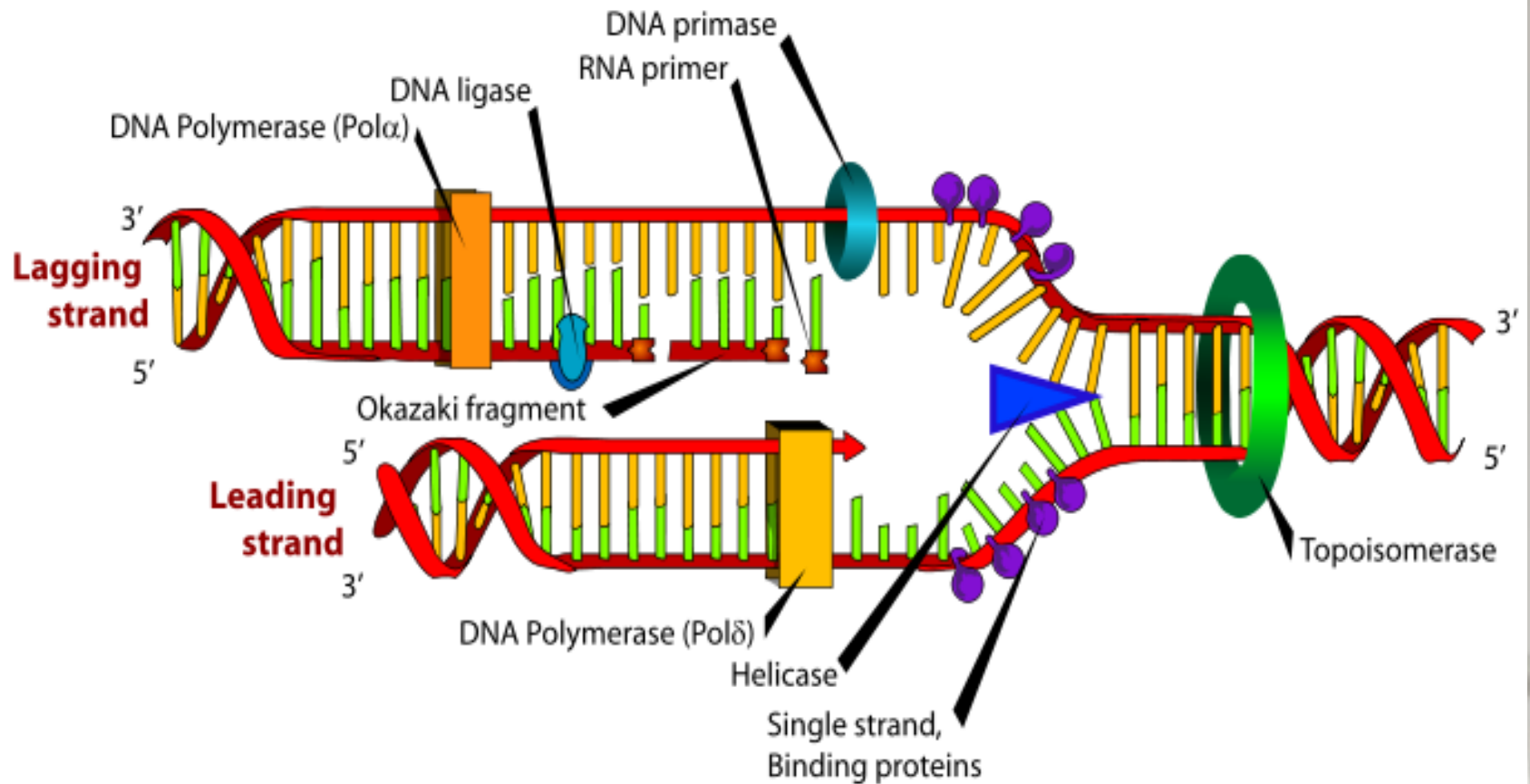


The process of multiplication of DNA from DNA is known as:

- a. Replication**
- b. Mutation**
- c. Transcription**
- d. Translation**

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**The term triplet code
and genetic code were
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- a. Watson and Crick**
- b. Nirenberg**
- c. Gamow**
- d. Friederich Meischer**



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Match the nucleotide triplets given in column 1 and their common names listed in column 2, choose the answer with correct combination of alphabets of the 2 columns

	Column 1(stop codon)		Column 2 (function)
A	UAA UAG UGA	p	Amber codon
B	UAA	q	Initiator codon
C	UAG	r	Ochre codon
D	AUG	s	Terminator codon



BIOLOGY

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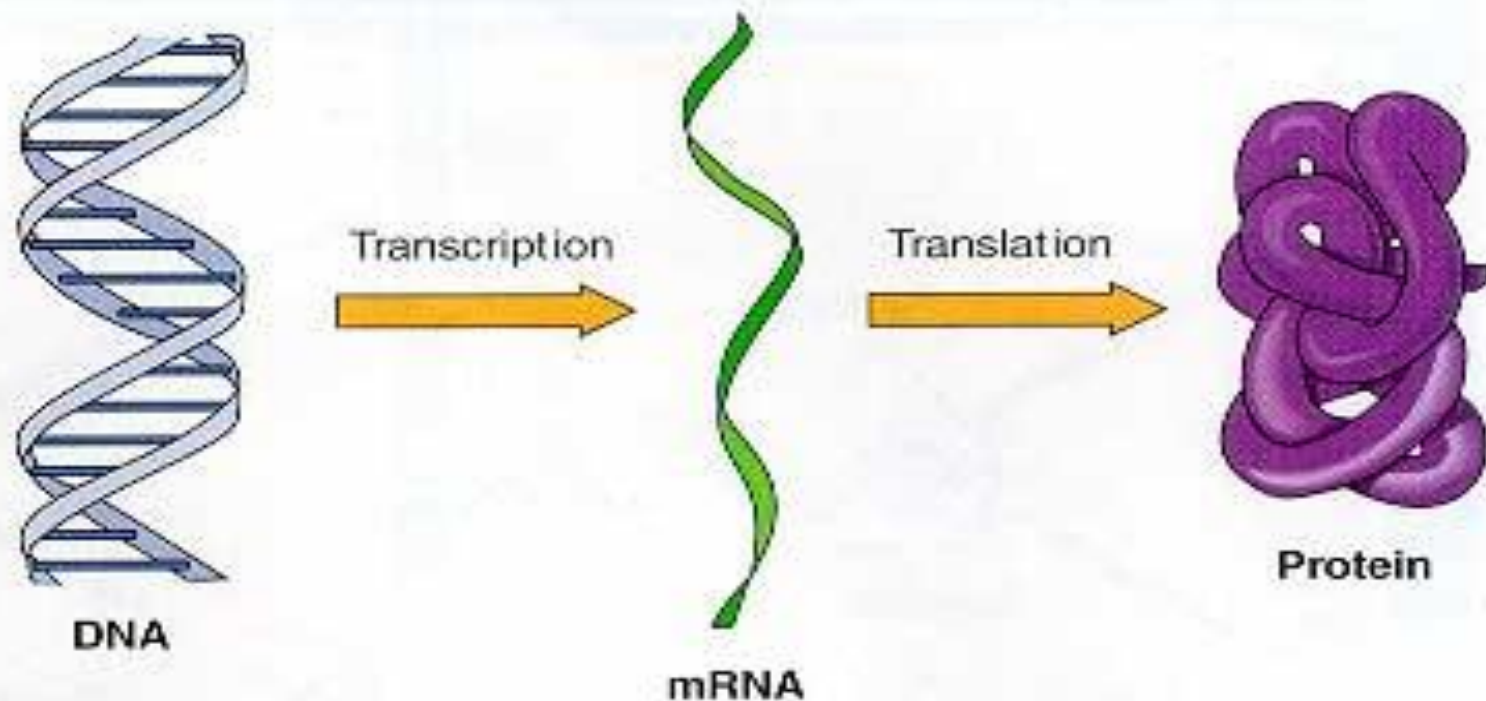
Information flow or central dogma of molecular biology is:

- a. RNA → Proteins → DNA
- b. Proteins → DNA → RNA
- c. RNA → DNA → Proteins
- d. DNA → RNA → Proteins



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Central Dogma of Gene Expression.

Through the production of mRNA (transcription) and the synthesis of proteins (translation), the information contained in DNA is expressed.

Removal of introns and joining the exons in a defined order in a transcription unit is called:

- a. Tailing**
- b. Transformation**
- c. Capping**
- d. Splicing**

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BIOLOGY

Number of punctuation codons are:

- a. 4**
- b. 2**
- c. 1**
- d. 5**



BIOLOGY

Number of punctuation codons are:

- a. 4**
- b. 2**
- c. 1**
- d. 5**

Genetic code is degenerate because:

- a. codons have same energy level**
- b. Each codon has a different meaning**
- c. Each codon has many meanings**
- d. Many codons have same meaning**

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DNA polymerase takes part in:

- a. Transcription**
- b. Splicing**
- c. Replication**
- d. Teminism**

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The genes that keep changing their location on chromosomes are:

- a. Jumping genes**
- b. Split genes**
- c. Duplicate genes**
- d. Pleiotropic genes**

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BIOLOGY

Number of base pairs in each turn of ZDNA helix is:

- a. 10**
- b. 11**
- c. 12**
- d. 15**



BIOLOGY

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Continuous DNA synthesis occurs during replication in:

- a. The leading strand**
- b. The lagging strand**
- c. The strands where Okazaki fragments are formed**
- d. Both leading and lagging strands**

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Eukaryotic mRNA has:

- a. G cap nucleotide**
- b. Poly A tail**
- c. Both G cap and poly A tail**
- d. Saturated fats**



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Teminism is:

- a. Translation**
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Central dogma in protein synthesis of teminiuous organisms is:

- a. gRNA → DNA → mRNA → Proteins
- b. DNA → DNA → mRNA → Proteins
- c. mRNA → gRNA → DNA → Proteins
- d. DNA → gRNA → mRNA → Proteins



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- b. DNA → DNA → mRNA → Proteins
- c. mRNA → gRNA → DNA → Proteins
- d. DNA → gRNA → mRNA → Proteins

The segment of DNA which participates in crossing over is:

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- b. Recon**
- c. Cistron**
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What is true about ori ?

- a. One in all organisms
- b. Several in all organisms
- c. One in eukaryotes and several in prokaryotes
- d. One in prokaryotes and several in eukaryotes

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Codogen is triplet of:

- a. Template strand of DNA**
- b. Non-template strand of DNA**
- c. mRNA**
- d. tRNA**

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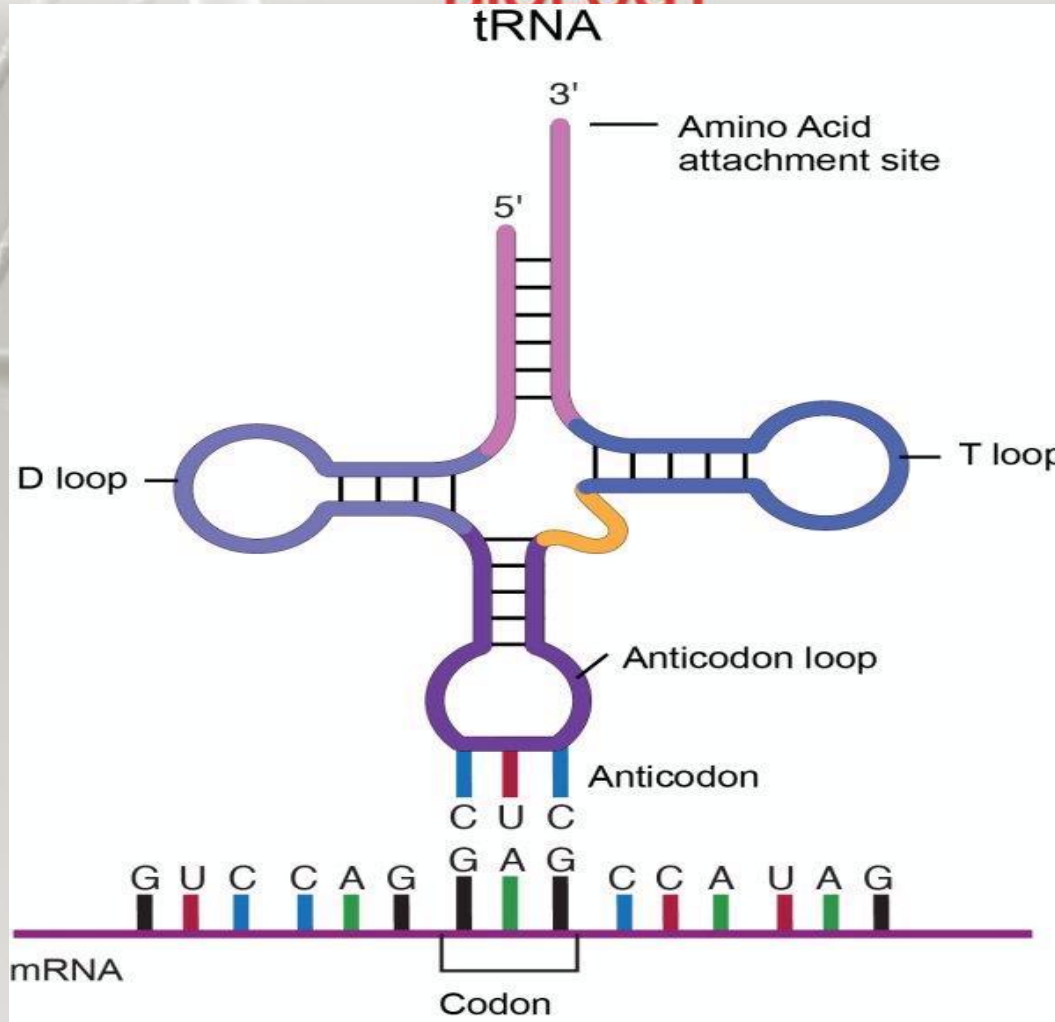
Anticodons occur in:

- a. tRNA**
- b. mRNA**
- c. mtDNA**
- d. rRNA**



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Exons and Introns are present in:

- a. Prokaryotic mRNA**
- b. Eukaryotic mRNA**
- c. The Lac operon**
- d. Mt RNA**



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Okazaki fragments give rise to:

- a. Master strand**
- b. Sense strand**
- c. Lagging strand**
- d. Leading strand**

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Which RNA is called soluble RNA:

- a. tRNA**
- b. mRNA**
- c. rRNA**
- d. snRNA**

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Sequence of structural genes in lac operon concept is:

- a. Lac Y, Lac Z and Lac A**
- b. Lac Z, Lac Y, Lac A**
- c. Lac A, Lac Y, Lac Z**
- d. Lac A, Lac Z, Lac Y**

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The operator gene of Lac operon is turned on when inducer molecule binds to:

- a. Promoter site**
- b. Operator gene**
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