

1. What is ORF ? 2

The protein-coding region(s) of each mRNA is composed of a contiguous, nonoverlapping string of codons called an open reading frame (commonly known as an ORF). Each ORF specifies a single protein and starts and ends at internal sites within the mRNA. That is, the ends of an ORF are distinct from the ends of the mRNA.

2. What is RNA splicing ? 2

the primary transcripts of intron-containing genes must have their introns removed before they can be translated into proteins. The process of intron removal is called RNA Splicing.

It converts the prem RNA into mature mRNA containing only exons.

RNA Splicing must occur with great precision to avoid the loss, or addition, of even a single nucleotide at the sites at which the exons are joined.

3. What is spliceosome? 3

The transesterification reactions are mediated by a huge molecular “machine” called the Spliceosome. This complex comprises about 150 proteins and five RNAs and is similar in size to a ribosome. In performing even a single splicing reaction, the spliceosome hydrolyzes several molecules of ATP. Strikingly, it is believed that many of the functions of the spliceosome are performed by its RNA components rather than the proteins.

4. Write at least three loops tRNA ? 3

a. The ψ U Loop:

It is so-named because of the characteristic presence of the unusual base ψ U in the loop. The modified base is often found within the sequence 5'-TCUCG-3'.

b. The D Loop:

It takes its name from the characteristic presence of dihydrouridines in the loop.

c. The Anticodon Loop:

As its name implies, contains the anticodon, a three-nucleotide-long sequence that is responsible for recognizing the codon by base pairing with the mRNA.

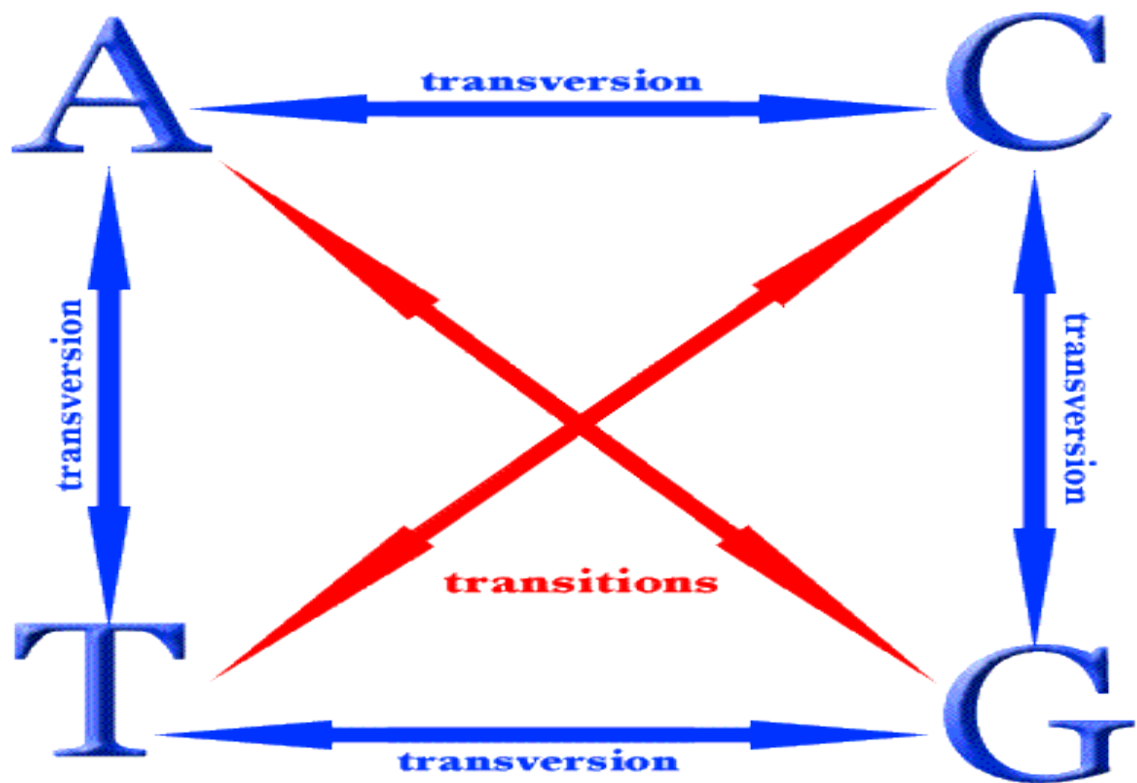
d. The Variable Loop:

It sits between the anticodon loop and the ψ U loop and, as its name implies, varies in size from 3 to 21 bases.

5. What are transitions and transversions mutation explain with diagram ? 5

Transitions are pyrimidine-to-pyrimidine and purine-to-purine substitutions, such as thymine (T) to cytosine (C) and adenine (A) to guanine (G).

Transversions are pyrimidine-to-purine and purine-to-pyrimidine substitutions, such as T to G or A and A to C or T.



6. Write a note on the elongation of transcription? 5

Once the RNA polymerase has synthesized a short stretch of RNA (10 bases), it shifts into the elongation phase.

During elongation, the enzyme performs an impressive range of tasks in addition to the catalysis of RNA synthesis.

- 1) It unwinds the DNA in front and reanneals it behind.
- 2) It dissociates the growing RNA chain from the template as it moves along.
- 3) And it performs the proofreading functions.

Recall that during replication, in contrast, several different enzymes are required to catalyze a similar range of functions.

7. Write the elements of Pol II core promoter? 5

The elements found in Pol II core promoter include the TFIIB recognition element (BRE), the TATA element (or box), the initiator (Inr), and the downstream promoter elements (known as DPE, DCE, and MTE).

8. Write the name of polymerases found in Eukaryotes included plants? 2

RNA polymerase performs essentially the same reaction in all cells, from bacteria to humans that is the synthesis of RNA.

From bacteria to mammals, the cellular RNA polymerases are made up of multiple subunits.

Bacteria have only a single RNA polymerase, whereas eukaryotic cells have three: RNA polymerases I, II, and III (RNA Pol I, II, and III).

Recently, two more DNA-dependent RNA polymerases have been identified in recent years, and have been called as Pol IV and Pol V.

These are found only in plants, where they transcribe small interfering RNAs.

9. Write a detail note on DNA mutation? 10

- ✓ DNA mutation can be defined as a permanent transmissible change in the genetic material (DNA/RNA).
- ✓ In other words, it is a permanent change in the nucleotide sequence of the genome of an organism.
- ✓ DNA can be easily damaged even under normal physiological conditions.

- ✓ Many different kinds of chemical and physical agents can damage DNA.
 - ✓ Some of these agents are endogenous which are produced inside the cells as a result of normal metabolic pathways.
 - ✓ While some others are exogenous agents which come from the surrounding environment.
 - ✓ On one hand, DNA stability is required to ensure that the genetic information may pass accurately from one generation to the next
 - ✓ It is also required for the correct functioning of thousands of genes.
 - ✓ On the other hand the genetic variation is needed to drive evolution.
 - ✓ If this variation would be lacking, the new species, including humans, would have not arisen.
 - ✓ So the life and biodiversity depend on a happy balance between DNA damage (mutation) and its repair.
- ✓ DNA mutations may be very simple (single base change) or very complex and may include several thousands of nucleotides.
 - ✓ The simplest mutations are switches of one base for another. There are two kinds of such mutations which include:-
 - **Transitions**
 - **Transversions**
 - ✓ Transitions are pyrimidine-to-pyrimidine and purine-to-purine substitutions, such as thymine (T) to cytosine (C) and adenine (A) to guanine (G).
 - ✓ Transversions are pyrimidine-to-purine and purine-to-pyrimidine substitutions, such as T to G or A and A to C or T.
 - ✓ Other simple mutations are insertions or deletions of a nucleotide or a small number of nucleotides.
 - ✓ All such mutations that alter a single nucleotide are called point mutations.
 - ✓ Other kinds of mutations cause more drastic changes in DNA, such as extensive insertions and deletions and gross rearrangements of chromosome structure.

10. Write the names of three classes of RNA splicing found in the cell? 3

- ✓ Self-Splicing Introns Reveal That RNA Can Catalyze RNA Splicing.
- ✓ There are total three classes of splicing found in the cells:-
 1. **Nuclear pre-mRNA**
 2. **Group II introns**
 3. **Group I introns**
- ✓ Thus far, we have dealt only with nuclear pre-mRNA splicing, that mediated by the spliceosome found in all eukaryotes.
- ✓ The so-called Group I and Group II are self-splicing introns.

11. DNA helicase.

Primase activity is dramatically increased when it associates with another protein that acts at the replication fork called **DNA Helicase**.

DNA polymerases are unable to separate the two strands of duplex DNA.

Therefore a third class of enzymes, called DNA Helicases catalyze the separation of the two strands of duplex DNA at the replication fork. DNA helicases are hexameric proteins that assume the shape of a ring.

- This ring encircles one of the two single strands at the replication fork adjacent to the single-stranded:double-stranded junction.
- DNA helicases found at replication forks exhibit high processivity because they encircle the DNA.
- They associate with the DNA and unwind multiple base pairs of DNA.
- Release of the helicase from the DNA therefore requires the opening of the hexameric protein ring, which is a rare event.
- However, the helicase can dissociate when it reaches the end of the DNA strand.
- Of course, this arrangement of enzyme and DNA poses problems for the binding of the DNA helicase to the DNA strand in the first place.
- Each DNA helicase moves along ssDNA in a defined direction.
- This property is referred to as the polarity of the DNA helicase.
- DNA helicases can have a polarity of either 5' → 3' or 3' → 5'. This direction is always defined according to the strand of DNA bound rather than the strand that is displaced.

12 Alternating splicing??

Alternative splicing strategy enables a gene to give rise to more than one polypeptide product.

□ These alternative products are called **isoforms**. □ It is estimated that 90% or more of the protein-coding genes in the human genome are spliced in alternative ways to generate more than one isoform.

Zoo505(Cell and Molecular biology) Mcqs

Q1: The synthesis of DNA is catalyzed by.....

Ans# DNA polymerase

Q2: All DNA Polymerases require a..... with a free 3' OH.

Ans# primer

Q3: Each DNA helicase moves along..... In a defined direction.

Ans# ssDNA

Q4: Supercoils are removed by the action of.....

Ans# Topoisomerases

Q5: The..... Protein involved in the initiation of replication .

Ans# initiator

Q6: specifically elongates the 3'OH of telomeric ssDNA sequence.

Ans# telomerase

Q7: The basic processes responsible for gene expression include.....

Ans# transcription, RNA processing, translation/All

Q8: Bacteria have single RNA polymerase while Eukaryotes have.....

Ans# 3

Q9: performs proof reading of RNA.

Ans# elongation

Q10: In some cells, well characterized sequence triggers.....

Ans# Termination

Q11: RNA polymerases initiates transcription at.....

Ans# Promoters

Q12: Open complex has..... Channels.

Ans# 5

Q13: In addition to Pol I initiation requires.....

Ans# SL1 and UBF

Q14: Non coding sequence is called.....

Ans# Introns

Q15: stop codon sequence is.....

Ans# UAA

Q16: RBS means.....

Ans# ribosome-binding site

Q17: is the binding site for amino acylated tRNA.

Ans# A-site

Q18: publish a report on the cellular basis of animal life.

Ans# Theodor Schwann

Q19: Fluid mosaic model is proposed by.....

Ans# S.Jonathan singer and Garth Nicolson

Q20: Sphingolipids consists of sphingosine linked to a fatty acid is.....

Ans# Ceramide

Q21: is a spontaneous process in which a substance moves from a region of high concentration to low.

Ans# Diffusion

Q22: LDL contains..... Cholesterol molecules.

Ans# 1500

Q23: Intermediate filaments are encoded by approximately..... Different genes.

Ans# 70

Q24# Phospholipid molecule travels from one end to the other in.....

Ans# 1sec

Q25: ER in most eukaryotic cells stores.....

Ans# calcium

Q26: is a major site of carbohydrate synthesis.

Ans# Golgi complex

Q27: Lysosomes contain..... Types of hydrolytic enzymes.

Ans# 40

Q28: Peroxisomes are multifunctional organelles containing more than..... Enzymes.

Ans# 50

Q29: model for DNA replication proposed that the two parental strands separate and serves as template for new progeny strand.

Ans# Watson-Crick

Q30: Okazaki fragments in bacteria varies from.....

Ans# 1000-2000

Q31: The..... is defined as cisacting DNA sequence

Ans# Replicator

Q32: have the ability to break a dsDNA.

Ans# Type II topoisomerases

Q33: RNA polymerases does not need a.....

Ans# Primer

Q34: tRNA is..

Ans# transfer RNA

Q:35:

transesterification reactions are mediate by a machine

Ans# splicosome