

Get Ready to Crack CSIR-NET 2021 (Most Important Questions On Genetics)



1. An open reading frame is one that has-

- A. No start and stop codon
- B. A start & stop codon
- C. No start but stop codon
- D. A start but no stop codon

2. A recessive mutation is that-

- A. Not expressed
- B. Expressed only when heterozygous
- C. Expressed only when homozygous or hemizygous
- D. Eliminated by natural selection

3. In many situations it has been found that the nucleotide sequences of two highly homologous proteins are different. It may be due to use of

- A. different amino acids
- B. non-overlapping genes
- C. different strands of DNA for encoding gene
- D. synonymous codons due to degeneracy

4. DNA binding protein that prevents transcription are

- A. Activators
- B. Operators
- C. Repressors
- D. Silencers

5. Who discovered that DNA is the genetic material?

- A. Arthur Kornberg
- B. James Watson
- C. Oswald Avery
- D. Severo Ochoa

6. What is the main damaging effect of UV radiations on DNA?

- A. Depurination
- B. Formation of thymine dimers
- C. Single-strand break
- D. Double-strand break

7. TATA box and Pribnow box are components of

- A. Operators
- B. Promoters
- C. Enhancers
- D. Activators

8. Housekeeping genes are-

- A. inducible genes
- B. expressed only in tumour cells
- C. expressed in all cells
- D. do not express at all

9. Fibronectin is a protein found in

- A. RER

- B. Extracellular matrix
- C. SER
- D. Nuclear membrane

10. The consensus sequence of 5' and 3' splice junctions in eukaryotic mRNA contains

- A. GU-GA
- B. GU-AG
- C. AG-GU
- D. CG-AG

ANSWER

- 1. D
- 2. C
- 3. D
- 4. A
- 5. C
- 6. B
- 7. B
- 8. C
- 9. B
- 10. B

Solutions:

Solution 1: An open reading frame is a portion of a DNA molecule that is translated into amino acids, and contains no stop codons. A reading frame is a sequence of nucleotide triplets that are read as codons specifying amino acids; a single strand of DNA sequence has three possible reading frames. Long ORFs may indicate candidate protein-coding regions in a DNA sequence.

Solution 2: A recessive mutation is expressed only when homozygous or hemizygous. While lethal mutations are usually eliminated by natural selection.

Solution 3: Each codon is specific for only one amino acid, the genetic code is denoted as degenerate or redundant because a single amino acid can be coded for more than one codon. Also, the genetic code does not overlap i.e. each nucleotide is part of only one codon, therefore a single nucleotide cannot be part of two adjacent codons.

Solution 4: Repressors are DNA binding proteins that binds to silencer regions of DNA and prevent transcription. While activators promote the transcription and operators are signals for repressor binding on the DNA.

Solution 5: Oswald Avery validated the biochemical nature of transforming substances found in Griffith's experiment. Therefore, Avery and his colleagues discovered DNA as the genetic material, not protein as contested earlier.

Solution 6: UV light causes molecular crosslinks to form between two pyrimidine residues, commonly two thymine residues that are positioned consecutively within a strand of DNA. Two common UV products are cyclobutane pyrimidine dimers (CPDs) and 6,4-dimer photoproducts. These pre-mutagenic lesions alter the structure and possibly the base-pairing. Up to 50–100 such reactions per second might occur in a skin cell during exposure to sunlight but are usually corrected within seconds by photolyase reactivation or nucleotide excision repair. Uncorrected lesions can inhibit polymerases, cause misreading during transcription or replication, or lead to the arrest of replication. While Depurination occurs due to hydrolysis of nitrogenous bases and strand break occurs due to exposure to ionizing radiation from radioactive decay or cosmic rays.

Solution 7: A TATA box is a type of promoter sequence that specifies transcription machinery where transcription begins. And Pribnow box (also known as the Pribnow-Schaller box) is a sequence of six

nucleotides (5'-TATAAT-3'), which is an essential part of a promoter site on DNA for transcription promotion in bacteria.

Solution 8: Housekeeping genes are constitutive i.e. expressed in all cells. These are required for the maintenance of basal cellular functions that are essential for the existence of a cell, irrespective of the tissue or organism. While inducible genes have the condition and tissue-specific expression profiles.

Solution 9: Fibronectin is a multifunctional adhesive glycoprotein that plays an important role in tissue repair, regulating cell attachment and motility, and embryogenesis. It is a high-molecular-weight (~500 kDa) protein of the extracellular matrix that binds to membrane-spanning receptors such as integrins. They also bind to other extracellular matrix proteins such as collagen, fibrin, and heparan sulfate proteoglycans (e.g. syndecans).

Solution 10: The consensus sequence is found at the 5' and 3' ends of introns. Most commonly, the removed RNA sequence begins with the dinucleotide GU at its 5' end and ends with AG at its 3' end. These consensus sequences at splice junctions are known to be critical because changing one of the conserved nucleotides results in inhibition of splicing.

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