

Topic :- MOLECULAR BASIS OF INHERITANCE

- (D) Telomeres, i.e., the ends of chromosome, have repetitive DNA sequences and are stable and resistant to exonuclease digestion hence, prevent chromosome loss.
- (C) Transcription factor is molecular basis of organ differentiation.
- (B) In eukaryotic cells, DNA is accommodated by super-coiling in nucleosomes.
- (B) Differentiation of organs and tissues in a developing organism is associated with differential expression of genes. In regulation of gene expression the chromosomal proteins are of two types, histones and non-histones. The regulation of gene expression involves an interaction between histones and non-histone.
- (A) The Okazaki fragment in DNA chain growth polymerise in the 5' to 3' direction. The replicated DNA results in transcription.
- (A) One gene-one enzyme relationship was initially proposed by Beadle and Tatum based on their experiments conducted on *Neurospora crassa*. They were awarded by Nobel Prize in 1958.
- (C) The steroid hormone receptor protein complex activate transcription of target gene by binding to specific DNA sequence.
- (B) The group of nucleotides that specifies one amino acid is a code word or codon. The nucleotides of mRNA are arranged as a linear sequence of codons, each codon consisting of three successive nitrogenous bases.
Three codons UAG, UAA and UGA are the termination codons. They do not code for any of the amino acids.
In most organisms AUG codon is the start or initiation codon, i.e., the polypeptide chain starts either with methionine or N-formylmethionine.
Leucine - UUA, UUG, CUU, CUC, CUA, CUG
Alanine - GUC, GcC, GCA, GCG
GUU - Valine
UCA - Serine

9. (A) The group of ribosomes together with the single mRNA molecules, they are translating is called polysome. They are formed by several ribosomes attached to a single mRNA.
In eukaryotic cells the ribosomes are attached to rough endoplasmic reticulum by ribophorin protein. Electron microscopy reveals that membranes of homogenised endoplasmic reticulum disrupt to form closed vesicles called microsomes. Microsomes derived from rough endoplasmic reticulum are studied with ribosomes and are called rough ribosomes.
10. (A) The existence of triplet code was simply an assumption till 1961, when Nirenberg and Matthaei proved its existence by experiments. They were able to synthesis artificial mRNA, which contained only one nitrogenous base, i.e., uracil.
This synthetic poly U sequence was then placed in a cell free system containing protein synthesising enzymes (extracted from bacterium E.coli) and 20 amino acids together with necessary ATP. During the process, a small polypeptide molecule was produced, which was formed by the linking of phenylalanine.
This suggested that UUU is the code for phenyl alanine. Nirenberg. got Nobel Prize for his contributions.
11. (A) The general features of genetic code are
(i) The genetic code is written in linear form, using the ribonucleotide bases that compose mRNA molecule as letters.
(ii) Each word of codon consists of three letters, i.e., the codon is triplet.
(iii) The genetic code inside the cell medium is said to be non-ambiguous.
(iv) The code is degenerate, i.e., a given amino acid can be specified by more than one codons.
(v) The codon contains 'start' and 'stop' signals.
(vi) The code is said to be commaless
(vii) The code is non-overlapping
12. (C) Statement II and IV are true about lac operon. In prokaryotes, a hypothesis was given in 1961 to explain the protein synthesis regulation. This hypothesis was given by F Jacob and J Monod and for this they were awarded Nobel Prize in 1965, the hypothesis was known by the name of Operon Model.
The operator gene is the segment of DNA, which exercise a control over transcriptions. In the absence of lactose, the repressor binds with the operator gene.
13. (C) Nucleosome appear as "beads-on-string" in the chromosomes. Nucleosome is sub-microscopic sub-unit of chromatin which is formed by wrapping of DNA over a core of histone proteins. The term was coined by Oudet, et. al (1975). It is oblate structure with a length of 10 nm and a thickness of 5-5.7 nm. Its core is called nu-body. The latter is formed of four pairs of histone molecules- H_2A , H_2B , H_3 and H_4 . DNA makes 1.75 turns over the octamer to form a nucleosome.
Two adjacent nucleosomes are connected by a short segment of unbound DNA called linker DNA. A fifth type of histone called H_1 is attached over the linker DNA.
14. (D) The primary transcript from a typical eukaryotic gene contains introns as well as exons. During RNA splicing, introns are removed and exons are joined in a defined order, to produce functional RNA.
15. (B) If one strand DNA has the nitrogenous base sequence as ATCTG, the complementary sequence of mRNA will be UAGAC.
16. (B) Nucleolus is the center for synthesis of ribosomal RNA (rRNA). Ribosomal proteins migrate to the nucleolus from their assembly sites in the cytoplasm and are packaged into ribonucleoproteins. These return to the cytoplasm where they become mature ribosome particles.
17. (A) Transcription unit consists of promoter, structural gene and terminator. The inducer (lactose/allolactose) is not a component of transcription unit.
18. (A) RNA polymerase III transcribes tRNA, therefore tRNA synthesis will be affected. RNA polymerase-II synthesises mRNA while, RNA polymerase-I synthesises rRNA in eukaryotes.

19. (A) β -galactosidase is a structural gene, which carry codes for the synthesis of protein. Mutation in the lac Y gene of E. coli needs residues of cytoplasmic enzyme β -galactosidase. Lactose permease is a membrane protein, which is a major facilitator superfamily. Transacetylase is an enzyme transferring acetyl groups from one compound to another.
20. (C) Central dogma is
DNA mRNA
Protein

PE

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	D	C	B	B	A	A	C	B	A	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	C	C	B	B	B	A	A	A	C

PE