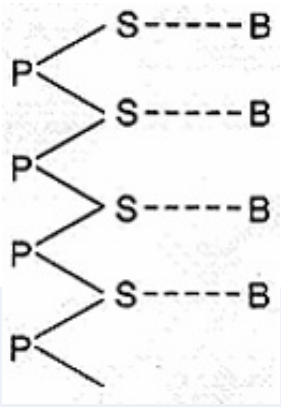
CBSE Test Paper 02

Ch-6 Molecular Basis of Inheritance

1. The nucleic acid synthesis takes place in
   a. Both ways
   b. Any direction
   c. 3'-5' direction
   d. 5'-3' direction
2. Statement I: DNA finger printing is highly reliable method of identification of individual involved in crimes.
   Statement II: DNA a fingerprinting is a sure method in solving paternity and maternity disputes.
   Statement III: DNA fingerprinting can be used to cure HIV infection.
   a. All statements are correct
   b. Statement I and II is correct
   c. Statement I and III is correct
   d. Statement II and III is correct
3. During replication of DNA, Okazaki fragments are formed in the direction of :
   a. $3' \rightarrow 3'$
   b. $5' \rightarrow 3'$
   c. $5' \rightarrow 5'$
   d. $3' \rightarrow 5'$
4. The human genome contains _____ nucleotide bases.
   a. 3164.7 million
   b. 1258.9 million
   c. 8976.8 million
   d. 2458.5 million
5. Assertion: Replication and transcription occur in the nucleus but translation occurs in the cytoplasm.
   Reason: mRNA is transferred from the nucleus into the cytoplasm where ribosomes and amino acids are available for protein synthesis.
   a. Both Assertion and Reason are true and the Reason is not the correct explanation of the Assertion

b. Both Assertion and Reason are false
c. Assertion is true, but Reason is false
d. Both Assertion and Reason are true and the Reason is the correct explanation of the Assertion

6. Mention the two additional processing which hnRNA needs to undergo after splicing so as to become functional.
7. Refer to the following diagram and answer the given question



What molecule is represented by S?

8. A Short length of a DNA molecule contains 120 adenine and 120 cytosine bases. What is the total number of nucleotides in that DNA fragment?
9. Name the enzyme that joins the short pieces in the lagging strand during synthesis of DNA?
10. What is meant by R cells and S cells with which Frederick Griffith carried out this experiments on Streptococcus pneumoniae? What did he prove from these experiments?
11. Group the following as nitrogenous bases and nucleosides: Adenine, Cytidine, Thymine, Guanosine, Uracil, and Cytosine.
12. Mention any four applications of DNA fingerprinting?
13. An mRNA strand has a series of codons out of which three are given below:
    (i) AUG (ii) UUU (iii) UAG
    (a) What will these DNA codons be translated into?
    (b) What are the DNA codons that would have transcribed these RNA codons?
14. Illustrate schematically the process of initiation, elongation and termination during transcription of a gene in a bacterium.
15. How is a nucleosome formed? Draw the diagram of a nucleosome.

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Answer

1. d. 5’-3’ direction, **Explanation:** 5’-3’ direction
2. b. Statement I and II is correct, **Explanation:** DNA finger printing is highly reliable method of identification of individual involved in crimes. DNA a fingerprinting is a sure method in solving paternity and maternity disputes.DNA fingerprinting cannot be used to cure HIV infection.
3. b. $5' \rightarrow 3'$, **Explanation:** During replication of double helix DNA, one strands having 3’ to 5’ polarity it is continuous and on other strand it is in small fraction called Okazaki fragments. The polarity of this strand is 5’ to 3’.
4. a. 3164.7 million, **Explanation: Important Features of Human Genome:**
   - The human genome contains 3164.7 million nucleotide bases.
   - The average gene consists of 3000 bases, but gene size vary greatly (the largest human gene is dystrophin containing 2.4 million bases).
   - The total number of genes in the genome is estimated at 30,000 and all (99.9 percent) nucleotide bases are exactly the same in all people
   - Functions of about 50% of the discovered genes are still unknown.
   - Less than 2% of the genes of the genome codes for proteins.
   - Chromosome1 has most genes (2968) and the Y has the fewest (231).
5. d. Both Assertion and Reason are true and the Reason is the correct explanation of the Assertion

   Explanation: Synthesis of RNA from DNA is called transcription and it occurs in the nucleus of eukaryotic cells.

   DNA replication occurs in the cytoplasm of prokaryotes and in the nucleus of eukaryotes. Regardless of where DNA replication occurs, the basic process is the same.

   Synthesis of protein from RNA is called translation and it occurs in the cytoplasm of eukaryotic cells.

   messenger RNA (mRNA) is a molecule in cells that carries codes from the DNA

in the nucleus to the sites of protein synthesis in the cytoplasma (ribosome) where they can be joined together in specific order to make a specific protein.

6. Capping and tailing
7. Sugar
8. 480 nucleotides
9. DNA ligase joins okazaki fragments in lagging strands.
10. The bacterium Streptococcus pneumoniae has two strains virulent and non virulent. The virulent strains causes pneumonia, whereas the non-virulent do not produce the disease. Its virulent strain is known as S type because when grown on a suitable medium they form smooth colonies. The non-virulent type of bacteria form irregular or rough colours and therefore called R-type. By this experiments Griffith concluded that the R-strain bacteria (non-virulent) has somehow been transformed by the heat killed S-type (virulent type), which must be due to the transfer of the genetic material. Griffith proposed that the transforming principle is a chemical substance released by heat killed bacteria which changed the R-bacteria into S-bacteria.
11.

Nitrogenous Bases	Nucleosides Bases
Adenine, Thymine, Uracil, Cytosine	Cytidine, Guanosine.

12. DNA fingerprinting is a method used to identify an individual from a sample of DNA by looking at unique patterns in their DNA.

    DNA fingerprinting is used in:
    (i) DNA forensics, for identification of criminals
    (ii) DNA fingerprinting, for solving paternity disputes
    (iii) Determining population and genetic diversities
    (iv) Studying the breeding patterns of animals facing the danger of extinction.

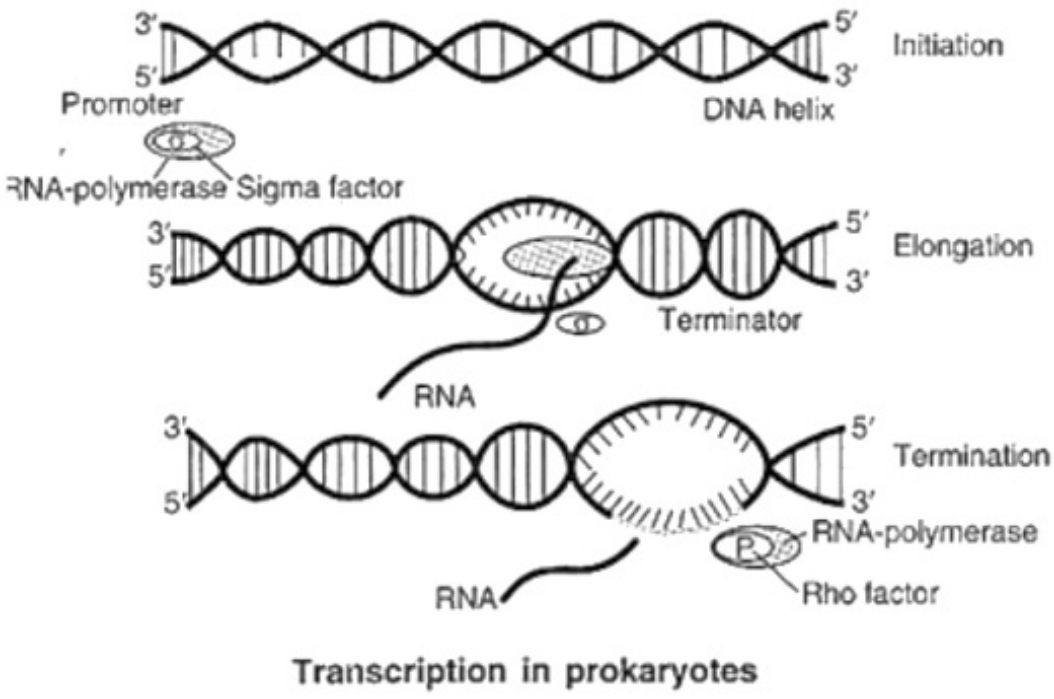
13. (a) (i) AUG signals the synthesis of polypeptide (start signal) and codes for the amino acid methionine

(ii) UUU codes for phenylalanine

(iii) UAG do not specify any amino acid and hence is called nonsense codon. It signals the termination of polypeptide chain (stop signal)

(b) TACAAAATC

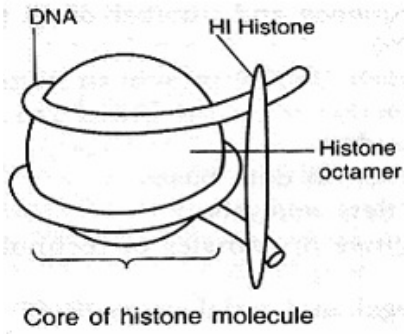
14.



Transcription in prokaryotes

15. DNA packing in eukaryotes is carried out with the help of lysine and an Argentine rich basic protein called histones. The unit of compaction is nucleosome.

   i. Histones are organized to form a unit of eight molecules called histone octamer.
   ii. The negatively charged DNA is wrapped around the positively charged histone octamer, form a structure called nucleosome.



Core of histone molecule