

Molecular Basis of Inheritance

CHAPTER 6



ANSWERS

Topic 1

1. Nitrogenous bases : Adenine, Thymine, Uracil and Cytosine.

Nucleosides : Cytidine and Guanosine.

2. According to Chargaff's rule, in a double stranded DNA, the total number of cytosine molecules will be equal to the number of guanine molecules and the number of adenine molecules will be equal to number of thymine molecules. Therefore, if a double stranded DNA has 20 percent of cytosine then the guanine will also be 20 per cent. The remaining 60% will consist of adenine and thymine in equal amount. Thus, adenine will be 30%.

3. If the sequence of one strand of DNA is written as follows:

5' - ATGCATGCATGCATGCATGCATGC - 3'

The sequence of the complementary strand in 5' → 3' direction will be:

5' - GCATGCATGCATGCATGCATGCATGC - 3'

Topic 2

1. (a) Promoter : It is located at the 5' end of the transcription unit and provides site for attachment of transcription factors (TATA Box) and RNA polymerase.

(b) tRNA : It takes part in the transfer of activated amino acids from cellular pool to ribosome so that they can take part in protein formation.

(c) Exons : In eukaryotes, DNA is mosaic of exons and introns. Exons are coding sequences of DNA which are both transcribed and translated.

2. The types of nucleic acid polymerases required for synthesis of DNA and RNA are :

(i) DNA polymerase I, II and III – They help in replication of DNA.

(ii) RNA dependent DNA polymerase – It helps in synthesis of DNA from RNA (reverse transcription).

(iii) DNA dependent RNA polymerase – It helps in synthesis of RNA from DNA (transcription).

In eukaryotes, there are atleast three RNA polymerases in addition to those found in cell organelles.

– RNA polymerase I transcribes rRNA (28S, 18S and 5.8 S).

– RNA polymerase II transcribes the precursor of mRNA called heterogenous nuclear RNA (hnRNA).

– RNA polymerase III transcribes tRNA, 5S rRNA and snRNAs.

Topic 3

1. *Lac* operon is switched on, on adding lactose in medium, as lactose acts as inducer and makes repressor inactive by binding with it. When the *lac* operon system is switched on, β -galactosidase is formed, which converts lactose into glucose and galactose. As soon as all the lactose is consumed, repressor again becomes active and causes the system to switch off (shut down).

2. HGP (Human Genome Project) is called mega project because:

(i) It involved many countries (USA, UK, Japan, France, Germany, China) for determining the nucleotide sequences of genes.

(ii) It involved sequencing of 3×10^9 base pairs costing 9 billion US dollars.

(iii) It required bioinformatics data basing and other high speed computational devices for analysis, storage and retrieval of information.

