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Paper: Molecular Biology

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Section: (A) fill in the blanks

- 1) **Watson** and **crick** discover the double helical structure of the DNA molecules
- 2) Watson and crick were awarded noble prize in **1962**
- 3) **Nucleic acid** store, transmit, and help express hereditary information
- 4) The amino acid sequence of a polypeptide is programmed by a unit of inheritance called **gene**
- 5) Hundreds of y- shape region of replicating DNA molecules were new stands are grooving called **Replication Fork**
- 6) **Topoisomerase** are enzyme which relieve stress on the DNA molecule by allowing free rotation around a single stand .
- 7) **Genetics code** is a dictionary that corresponds with sequence of nucleotide and sequence around a single stand
- 8) **Charging** is the process of covalently attaching an amino acid to the tRNA.
- 9) **Single- strand Binding protein** are proteins which attach and help keep the separated strand apart.

Section: B

Q no 2 : write short notes on the following.

Ans: common tools on molecular biology: Nucleic acid fractionation

: polymerase chain reaction

: probes, Hybridization

: vector, molecular cloning

: nucleic acid enzymes

: Microarray

: DNA sequencing

: Electrophoretic separation of nucleic acid detection of genes;
: DNA; southern blotting; insitu hybridization; FISH technique
: RNA; northern blotting
: protein; western blotting, immunohistochemistry.

Nucleic acid: nucleic acids were first isolated by Friedrich Miescher (1869) from pus cells.

: They were named nuclein.

: Hertwig (1884) proposed nuclein to be the carrier of hereditary traits.

: Because of their acidic nature they were named nucleinic acids and then nucleic acids Altmann, 1899.

:Nucleic acid store, transmit, and help express hereditary information.

:The amino acid sequence of a polypeptide is programmed by a unit of inheritance called a gene.

:Gene are made of DNA, a nucleic acid made of monomers called nucleotides.

Chargaff's Rule: Adenine must pair with Thymine.

Guanine must pair with Cytosine

Their amounts in a given DNA molecule will be about the same.

Wobble hypothesis: Crick postulated the 'Wobble hypothesis' to account for the degeneracy of genetic code. According this hypothesis, the first two bases of a codon pair according to the normal base pairing rules with the last two bases of the anticodon. Base- pairing at the third position of codon is Wobble.

Names of two main steps in translation and transcription:

Name of steps of transcription: The formation of mRNA from DNA is called transcription.

Steps: Initiation phase

B) Elongation phase

C) Termination phase

Names of steps of translation: The formation of protein with help of RNAs is translation.

Steps: Activation of amino acid

B) formation of initiation complex

C) polypeptide elongation

D) Termination

QUESTION NO 3 ANS: DNA Replication:

Origin of replication: 1) Replication fork: Hundreds of Y-shaped regions of replication DNA molecules where new strands are growing
2) Replication Bubbles: a) Hundreds of replicating bubbles (Eukaryotes)
b) single replication fork (bacteria)

Strand separation:

Helicase: unwinding and separation (breaking- H Bonds) of the parental double helix.

Single- strand binding proteins: proteins which attach and help keep the separated strand apart.

Topoisomerase: Enzyme which relieves stress on the DNA molecule by allowing free rotation around a single strand.

Priming:

RNA primer: Before new DNA strands can form, there must be small pre-existing primers RNA present to start the addition of new nucleotide (DNA polymerase)

Primase: Enzyme that polymerizes (synthesizes) the RNA primer

Synthesis of new DNA strands

1) DNA polymerase: with RNA primer in place DNA polymerase enzyme catalyzes the synthesis of new DNA strand in the 5 to 3 direction

Synthesis of the new DNA strands

2) Leading strand: synthesized as a single polymer in the 5 to 3 direction.

Synthesis of new DNA strands:

3) Lagging strand: Also synthesized in the 5 to 3 direction but discontinuously against overall direction of replication.

Synthesis of new DNA strand:

4) Okazaki fragments: series of short segments on the lagging strand.

Synthesis of new DNA strands:

5) DNA ligase: A linking enzyme that catalyzes the formation of covalent bond from the 3 to 5 end of joining strands

Examples: joining two Okazaki fragments together.

Synthesis of new DNA strands

6) proofreading: Initial base-pairing errors are usually corrected by DNA polymerase.