Q.P. Code :20218

[Time: $2\frac{1}{2}$Hours] **[Marks: 75]**

Please check whether you have got the right question paper.

N.B:
1. **All** questions are **compulsory**.
2. Choice is **internal**.
3. Draw diagrams wherever necessary.
4. Non-programmable calculators are permitted.
5. **Figures** to the **right** indicate **full** marks.

Q.1 A) Choose the **MOST APPROPRIATE** answer **(any three)**: **03**

i) DNA replication *in vivo* is discontinuous due to_____.
a) sister chromatid exchange b) being restricted to synthesis in the 5' to 3' direction
c) topoisomerases cutting the DNA in a random fashion

ii) _____enzyme removes the RNA primer during replication.
a) RNA primase (b) DNA polymerase I (c) DNA ligase

iii) Suppose a mutation occurs in a cell such that normal Okazaki fragments were created during DNA replication but were not linked together into a continuous strand. The gene for which enzyme would you predict was altered by this mutation?
a) DNA polymerase (b) DNA helicase (c) DNA ligase

iv) Old and new strands of DNA in bacteria can be distinguished by_____.
a) DNA glycosylases (b) AP endonucleases (c) methylation patterns

v) Thymine dimers may be repaired by _____in humans.
a) photoreactivation (b) excision repair c) oxidative damage repair

vi) Cytosine undergoes deamination, and becomes ____
a) Uracil (b) Guanine (c) Adenine

B) Answer in brief **any one:** **02**
i) Theta mode of replication of DNA
ii) Recombination repair

C) Write a short note on **any one**: **04**
i) Mismatch repair (ii) Meselson-Stahl experiment

D) Answer **any one** of the following: **06**
i) Elaborate on the mechanism of replication in *E.coli*
ii) Write brief note on: (a) SOS repair (b) Photoreactivation.

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Q.2 A) Choose the **MOST APPROPRIATE** answer **any three:** **03**

i) In which of the following actions does RNA polymerase differ from DNA polymerase?
a) RNA polymerase binds to single-stranded DNA, and DNA polymerase binds to double-stranded DNA
b) RNA polymerase is much more accurate than DNA polymerase
c) RNA polymerase can initiate RNA synthesis, but DNA polymerase requires a primer to initiate DNA synthesis

ii) As a ribosome translocates along a mRNA molecule by one codon _____occurs.
a) the tRNA that was in the A site moves into the P site
b) the tRNA that was in the P site moves into the A site
c) the tRNA that was in the A site moves to the E site and is released

iii) Which of the following statement **is true** about protein synthesis in prokaryotes?
a) Extensive RNA processing is required before prokaryotic transcripts can be translated
b) Translation can begin while transcription is still in progress
c) Unlike eukaryotes, prokaryotes require no initiation or elongation factors

iv) _____is not directly involved in translation.
a) mRNA (b) DNA (c) rRNA

v) _____nucleotide base is not found in RNA.
a) Thymine (b) Guanine (c) Uracil

vi) The tRNA with 5'AUC3' will form a codon- anticodon base pairing interaction With _____mRNA codon.
a) 5'GUA3' (b) 5'GAU3' (c) 5'CUA3'

B) Answer in brief, **any one** of the following: **02**
i) Comment on the action of Puromycin
ii) Explain : Sense strand in transcription

C) Write short notes on **any one** of the following: **04**
i) Splicing (ii) Genetic code

D) Answer **any one** of the following: **06**
i) Discuss the mechanism of RNA formation in prokaryotes.
ii) Explain in detail initiation and termination phase of protein synthesis.

Q.3 A Choose the **MOST APPROPRIATE** answer **any three:** **03**

i) _____is derived from proteolytic cleavage of DNA pol I.
a) DNA Pol III b) Reverse Transcriptase c) Klenow fragment

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ii) A technique that measures degree of genetic similarity between pools of DNA sequences is called_____.
a) annealing b) denaturation c) hybridization

iii) In restriction endonuclease EcoRI, "co" stands for_____.
a) colon b) coenzyme c) coli

iv) EcoRl cleaves DNA at_____.
a) $^{5'}$G↓AATTC$^{3'}$ b) $^{5'}$GTT↓AAC$^{3'}$ c) $^{5'}$C↓AATTG^{3}

v) When two DNA pieces cut with the same restriction enzyme are combined, sticky ends will_____.
a) anneal by covalent bonds b) anneal by DNA ligase
c) anneal by complementary base pairing and hydrogen bonds

vi) Which arrangement of the following four enzymes represents the order in which they would be used in a typical gene-cloning experiment resulting in the insertion of a cDNA into a bacterial plasmid? Begin with the gene's mRNA transcript.
a) Restriction enzyme, reverse transcriptase, DNA polymerase, DNA ligase
b) Reverse transcriptase, DNA polymerase, Restriction enzyme, DNA ligase
c) Reverse transcriptase, Restriction enzyme, DNA polymerase, DNA ligase

B) Define and explain **any one** of the following in brief: **02**
i) Blunt end cutter (ii) Expression vector

C) Answer **any one** of the following: **04**
i) Describe use of RDT for pest resistant crops and for therapy of diabetes.
ii) If a gene needs to be isolated from a source and has to be inserted into another gene, discuss the enzymes employed for the same

D) Answer **any one:** **06**
i) Justify: "Shuttle vectors are more efficient as compared to cloning vectors."
ii) Justify in detail: "Vectors are one of the most essential tools for RDT'

Q.4 A) **Choose the MOST APPROPRIATE answer (any three):** **03**
i) An ampicillin-sensitive culture of *E. coli* is transformed with a plasmid that contains the gene of interest plus an ampicillin-resistance gene. If it is then plated on an ampicillin-containing growth medium_____.
a) it will form blue colonies b) it will form white colonies c) it will not form any colonies

ii) Virus mediated gene transfer is known as_____.
a) transduction b) transfection c) transformation

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iii) Chemical used in transformation is _____.
a) PEG b) $CaCl_2$ c) $MgC1_2$

iv) Introduction of DNA using a hypodermic needle is known as_____.
a) macroinjection b) micromanipulation c) microinjection

v) _____are used for introduction of genes in plants.
a) Walled cells b) Protoplast c) Spheroplasts

vi) _____mutants are used in *Lac* selection.
a) Autotrophic b) Auxotrophic c) Mexotrophic

B) Define and explain **any one** of the following: **02**
i) DNA fingerprinting (ii) Transformation

C) Attempt **any one** of the following: **04**
i) Discuss the technique and advantages of gene transfer that involves the use of electric current
ii) Give E.M. Southern's contribution to the field of RDT"

D) Answer **any one**: **06**
i) Elaborate cell-free molecular cloning.
ii) Mahesh has inserted the gene of interest in a plasmid in the tetracycline resistant gene, Discuss the method for selection of the transformant.

Q.5 A) Write a note on **any one** of the following: **03**
i) Write a note on DNA Polymerase I
ii) Justify: "A single dimer of Polymerase III can simultaneously conduct replication on both leading and lagging strands"

B) Answer in brief **any one** the following: **03**
i) Charging of tRNA
ii) Give the significance of rho factor and sigma factor

C) Answer in brief **any one** the following: **03**
i) Discuss the different techniques of probe labelling.
ii) Depict the structure of pBR322, with a neat-labelled diagram ONLY.

D) Answer in brief **any one**: **03**
i) Elaborate on the different types of genomic libraries.
ii) Discuss the use of liposomes for gene transfer.

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E) State true or False: **(any three)** **03**

i) Replication is not dispersive in prokaryotes.
ii) Cystine dimers form in UV light.
iii) Polycistronic RNA are only observed in prokaryotes.
iv) Protein synthesis takes place in the the cytosol.
v) pUC 18 is only a cloning vector.
vi) Bt cotton is resisitant to *B. thuringenesis.*

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