B.Sc. Semester-V Examination, 2022-23

ZOOLOGY [Honours]

Course ID : 52611 Course Code : SH/ZOO/501/C-11

Course Title : Molecular Biology

Time : 1 Hour 15 Minutes Full Marks : 25

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

UNIT-I

1. Answer any **five** of the following questions: 1×5=5

a) Alfred Hershey and Martha Chase in 1952 conducted a series of experiments which led to the confirmatory proof that DNA and not protein is the genetic material using ^{35}sulphur and ^{32}phosphorus to label T2 Phage protein and DNA while infecting growing *E.coli* in culture. How these two chemical elements are used to label proteins and DNA of Phage?

b) In 1953 Watson and Crick published the article "Genetical implication of the structure of Deooxyribonucleic Acid "in the journal Nature and proposed semiconservative DNA replication and double helical structure of DNA. What was the basis of their proposal?

c) The validation of Chargaff's rules is the basis of Watson-Crick pair in the DNA double helix model. Justify the statement.

d) I II III IV V

DNA → DNA → RNA → DNA → RNA → Protein

Write down the names of above five processes by which the products are synthesized.

e) Three subunits of the enzyme complex RecBCD are composed of beta, gamma and alpha chains of proteins respectively. Write down the functions of these proteins in DNA repair mechanism.

f) Post-transcriptional processing by various modifications of eukaryotic pre-mRNAs are necessary and unique to be exported out of the nucleus and get translated into protein. What are these modifications in the processing event?

g) State the role of Excision repair in cells protection against mutagenesis.

h) Write the function of σ factor in RNA polymerase.

UNIT-II

2. Answer any **two** questions from the following : 5×2=10

a) DNA is synthesized continuously on the leading strand and discontinuously on the lagging strand. What do you mean by leading and lagging strands? How leading strand allows continuous synthesis and why lagging strand does not? What are Okazaki fragments of DNA during replication? 2+2+1

b) Mention the different steps involved in one cycle of a PCR reaction. Specify the underlying principle and uses of RT-PCR. 2+3

c) There are 64 codons in the genetic code. Of these codons 61 are amino acid coding and the other three do not code for any amino acid.

How 61 codons for 20 amino acids are allotted? Write down the name of amino acids encoded by only one triplet codon, four triplets, and six triplet codon sequence(s). 2+3

d) RNA editing is now known to be universal process to carry out mRNA editing using multitude of processes and one editing process involving Adenine/Uracil nucleotide addition / deletion discovered in the *Leishmania* mitochondrial mRNA. Write down the process in brief. 5

UNIT-III

3. Answer any **one** question from the following. 10×1=10

a) Genetic expression in prokaryotes occurs coordinately in cluster of genes called operon. Some of these operons are regulated in inducible manner and many in repressible fashion. Define inducible and repressible operons. Explain negative control mechanism of lac operon. Explain the mechanism of positive control of trp operon. 2+5+3=10

b) Describe the event of t-RNA charging during initiation of prokaryotic translation with an emphasis on detailed activity of Aminoacyl-tRNA Synthetase. Comment on Ts-Tu cycle. 8+2=10

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