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2022
ZOOLOGY

(Honours)

Paper : ZOO-HC-5016

(Molecular Biology)

Full Marks : 60

Time : Three hours

**The figures in the margin indicate
full marks for the questions.**

1. Choose the correct answer : (any seven)
 $1 \times 7 = 7$

(i) The number of base pair per turn is 11
in

(a) Z-DNA

(b) A-DNA

(c) B-DNA

(d) C-DNA

Contd.

(ii) During splicing

- (a) Introns are removed and exons are joined together
- (b) Exons are removed and introns are joined
- (c) Both introns and exons are removed
- (d) Both introns and exons are joined

(iii) DNA replication is

- (a) conservative
- (b) dispersive
- (c) semiconservative
- (d) repulsive

(iv) RNA primers are synthesized with the help of the enzyme

- (a) RNA polymerase
- (b) Primase
- (c) Topoisomerase
- (d) Ligase

(v) The factor involved in initiation of transcription in prokaryotes is

- (a) alpha factor
- (b) beta factor
- (c) sigma factor
- (d) None of the above

(vi) Poly A tail is attached at the

- (a) 3' end of DNA
- (b) 5' end of DNA
- (c) 3' end of RNA
- (d) 5' end of RNA

(vii) The release factor(s) involved in termination of polypeptide in prokaryotes is/are

- (a) RF1
- (b) RF2
- (c) RF3
- (d) RF1, RF2 and RF3

(viii) The *lac* operon in *E. coli* was discovered by

- (a) Meselson and Stahl
- (b) Jacob and Monod
- (c) Barbara McClintock
- (d) Watson and Crick

(ix) A miRNA is

- (a) a small coding RNA
- (b) a small coding tRNA
- (c) a small non-coding RNA
- (d) a small rRNA

(x) The process by which a given gene is spliced into more than one type of mRNA molecule is called

- (a) exon shuffling
- (b) alternative splicing
- (c) intron shuffling
- (d) spliceosome machinery

(xi) The site of protein synthesis is

- (a) Nucleolus
- (b) Ribosome
- (c) Mitochondria
- (d) Nucleus

(xii) If the sequence of bases in the mRNA codon is CAU, then the anticodon sequence in the corresponding tRNA will be

- (a) GTA
- (b) AUG
- (c) GUG
- (d) GUA

2. Write short notes on the following :
(any four) $2 \times 4 = 8$

- (a) Chargaff's rule
- (b) Replication fork
- (c) RNA interference
- (d) DNA dependent RNA polymerase
- (e) Transcription factors

- (f) Shine-Dalgarno sequence
- (g) Role of aminoacyl-tRNA synthetases
- (h) Methylation of DNA

3. Answer **any three** questions from the following : $5 \times 3 = 15$

- (a) What is a telomere? Write a note on replication of telomere. $1 + 4 = 5$
- (b) Write the steps involved in the replication of linear ds-DNA.
- (c) What do you mean by degeneracy of the genetic code? Define Wobble hypothesis with suitable example. $2 + 3 = 5$
- (d) Briefly explain the process of rho-independent and rho-dependent termination in prokaryotes. $3 + 2 = 5$
- (e) Comment on the structure of globin mRNA with proper illustration.
- (f) What do you mean by initiation factor and elongation factor in eukaryotic translation? Name those eukaryotic initiation and elongation factors. $1 + 2 + 2 = 5$

- (g) What is a silencer in the context of regulation of gene expression? Elaborate on the location of silencer within the genome. $2 + 3 = 5$

- (h) What is photoreactivation repair of DNA? Write the steps involved in the process of photoreactivation repair of thymine dimer in DNA molecule. $2 + 3 = 5$

4. Answer **any three** from the following : $10 \times 3 = 30$

- (a) Briefly explain the mechanism of rolling circle DNA replication.
- (b) What do you mean by 5'UTR and 3'UTR? Elaborate the mechanism of transcription in eukaryotes with appropriate diagrams. $2 + 8 = 10$
- (c) What are protein synthesis inhibitors? Explain the inhibition mechanism of protein synthesis inhibitors with examples. $2 + 8 = 10$
- (d) Write the difference between prokaryotic and eukaryotic translation.

(e) What is RNA splicing? Explain the mechanism of t-RNA splicing pathway. $2+8=10$

(f) What is regulation of gene expression? Discuss the regulation of tryptophan synthesis in prokaryotes. $2+8=10$

(g) Describe the salient features of genetic code.

(h) Briefly explain the structure and assembly of a prokaryotic ribosome. $4+6=10$