2023

BIOTECHNOLOGY

Paper : BITHC3056

(Molecular Genetics)

Full Marks : 60
Pass Marks : 24

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Choose the correct answer (any *five*) : 1×5=5

(a) Which of the following is not a nitrogenous base found in DNA?

(i) Adenine (A)

(ii) Thymine (T)

(iii) Cytosine (C)

(iv) Uracil (U)

(b) Which enzyme is responsible for synthesizing a new DNA strand during DNA replication?

(i) RNA polymerase

(ii) Helicase

(iii) DNA polymerase

(iv) Ligase

(c) In genetics, a change in DNA sequence of an organism is annoted by the term

(i) translation

(ii) mutation

(iii) replication

(iv) transcription

(d) What is the function of tRNA (transfer RNA) in protein synthesis?

(i) It carries amino acids to ribosome

(ii) It forms the backbone of the DNA molecule

(iii) It helps in DNA replication

(iv) It acts as a template for mRNA synthesis

(e) Which of the following is not a type of RNA involved in gene expression?

(i) mRNA (messenger RNA)

(ii) rRNA (ribosomal RNA)

(iii) tRNA (transfer RNA)

(iv) gRNA (genomic RNA)

(f) Where does transcription take place in eukaryotic cells?

(i) Ribosome

(ii) Nucleus

(iii) Mitochondria

(iv) Cytoplasm

(g) What is the term for the three-nucleotide sequence on mRNA that codes for a specific amino acid?

(i) Codon

(ii) Anticodon

(iii) Exon

(iv) Intron

(h) Which genetic disorder is caused by the absence of an enzyme responsible for breaking down phenylalanine?

(i) Cystic fibrosis

(ii) Hemophilia

(iii) Phenylketonuria (PKU)

(iv) Down's syndrome

(i) The central dogma outlines the

(i) DNA replication

(ii) flow of genetic information

(iii) RNA splicing

(iv) DNA recombination

(j) What is the process by which segments of DNA are cut and recombined to produce a new combination of genes called?

(i) Mutation

(ii) Recombination

(iii) Translation

(iv) Transduction

(Continued)

2. Answers any *five* of the following questions : 2×5=10

(a) Write any two properties of genetic material. 1+1=2

(b) What are replicons? 2

(c) What are DNA polymerases? Give examples. 1+1=2

(d) Write the names of two RNA polymerases and mention their functions. 1+1=2

(e) What are transcription factors? Write their functions. 1+1=2

(f) How do mutations contribute to genetic diversity? What are their potential effects on an organism? 1+1=2

(g) What is the role of RNA splicing in eukaryotic gene expression? 2

3. Write short notes on any *five* of the following : 5×5=25

(a) Evolution of genetic material

(Turn Over)

(b) Genome replication

(c) Ecogenetics

(d) Role of rRNA in translation

(e) Types of mutation

(f) Monogenic traits and complex traits

(g) Genetic code

(h) Genetic diseases

(i) DNA binding motifs

4. Answer any *two* of the following questions : 10×2=20

(a) What does the word genome mean? Describe the organization of eukaryotic genome. 1+9=10

(b) What is transcription? Explain the mechanism of transcription in prokaryotes with the help of a neat diagram. 1+9=10

(Continued)

(c) Explain the types of DNA damage. Discuss the mechanisms of DNA repair. 5+5=10

(d) Explain the different types of post-translational modifications. 10

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