Mahindra University, Hyderabad
École Centrale School of Engineering
Minor-II

Program: B. Tech. **Branch: CSE, CM, AI, NT**

Year: 2022 (CSE, CM, AI) and 2021 (NT) **Semester: II (CSE, CM, AI) and IV (NT)**

Subject: Introduction to Biology (BI1201)

Date: 29.04.2023 **Start Time: 2:00 PM**

Time Duration: 1:30 Hours **Max. Marks: 25**

Instructions:

1) Answer all questions from section I, II & III

2) Answer any 5 questions from section IV

3) Draw diagrams wherever necessary

Section-I. Match the following. Only write the number and matching letter (e.g. 1-A)
(10 x 0.5= 5 marks)

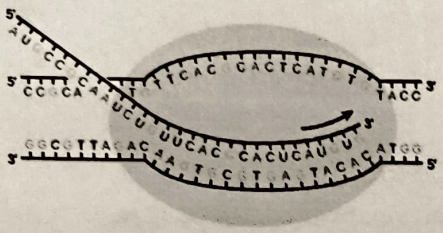
1. Nucleosomes	A. Multiple alleles (3)
2. Down Syndrome	B. Transfer RNA (tRNA) (9)
3. ABO Blood type	C. Introns (4)
4. Restriction enzymes	D. Lagging strand (7)
5. Eukaryotic gene	E. Trisomy (2)
6. Thomas Morgan	F. Operons (8)
7. Okazaki fragments	G. Promoter (10)
8. Prokaryote	H. Histone (1)
9. Anticodon	I. DNA cleavage (5)
10. RNA polymerase	J. Sex-linked inheritance (6)

Section-II. Choose the correct option. **10 x 0.5= 5 marks**

1. Which of these enzymes are NOT required for DNA replication?
   a. Ligase
   b. Restriction endonuclease
   c. Topoisomerase
   d. DNA polymerase

2. If the codon on a messenger RNA molecule contains the base sequence AUG, what will be the base sequence of the corresponding anticodon on the transfer RNA?
   a. TAC
   b. AUG
   c. UAC
   d. TTC

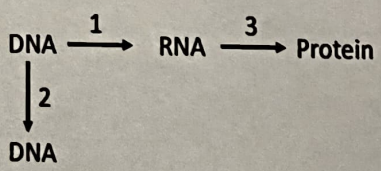
3. Which process is illustrated in the figure?



   a. Replication
   b. Mutation
   c. Transcription
   d. Translation

4. Hemophilia is:
   a. Autosomal dominant disorder
   b. Autosomal recessive disorder
   c. Sex-linked dominant disorder
   d. Sex-linked recessive disorder

5. In eukaryotes, which of the following step(s) in the figure occur in the nucleus?



   a. 1 and 2
   b. Only 2
   c. Only 1
   d. 1 and 3

6. If the genotype contains only one type of allele, it is called.
   a. Homozygous
   b. Heterozygous
   c. Polyallelic
   d. Diallelic

7. Which of the following is NOT the Mendel's principle of inheritance?
   a. Principle of Dominance
   b. Principle of Independent Assortment
   c. Principle of Segregation
   d. Principle of Incomplete Dominance
8. One similarity between DNA and messenger RNA molecules is that they both contain
   a. The same sugar
   b. Genetic codes based on sequences of bases
   c. A nitrogenous base known as uracil
   d. Double-stranded polymers
9. A recombinant DNA molecule is produced by joining together
   a. One mRNA with a DNA segment
   b. One mRNA with a tRNA segment
   c. Two mRNA molecules
   d. Two DNA segments
10. Which organism was used to produce recombinant insulin?
   a. Cyanobacteria
   b. E. coli
   c. Saccharomyces cerevisiae
   d. B. subtilis

Section-III. State if the following statements are TRUE or FALSE. **10 x 0.5= 5 marks**

1. Test cross can be performed to determine the genotype of an individual of an unknown genotype. T
2. If a DNA molecule is found to be composed of 35% guanine, 20% thymine would be expected. F
3. In each chromosome multiple threads of DNA molecules are wrapped around the nucleosomes. T
4. The two DNA strands are anti-parallel and non-complementary. F
5. During DNA replication one strand is synthesized continuously whereas the other strand is synthesized discontinuously. T
6. DNA polymerase requires an RNA primer to start the synthesis of DNA. T
7. Transcription of DNA and translation of mRNA both occur in the cytoplasm in eukaryotic cells. F
8. There are ~20000 genes present in the human genome. All the genes must be expressed at the same efficiency. F
9. To make an enzyme, first the gene for the enzyme is transcribed to make a mRNA copy of the gene, and then the mRNA is translated to make the enzyme's protein. T
10. Transgenic organisms refer to the organisms whose genome has been altered by the introduction of foreign DNA sequences from another species. T

Section-IV. Answer any 5 questions. **5 x 2= 10 marks**

1. Explain the difference between the following terms:
   a. Gene and genome
   b. Genotype and phenotype
2. The characteristics of a liver cell or a brain cell are determined by the gene expression pattern in the two cells. Describe three levels of gene expression controls which can contribute to the differences in the gene expression pattern in the two cell types.
3. What is RNA transcription? Describe different steps of transcription.
4. People with color blindness are unable to tell the difference between certain colors. If a carrier woman married a man with color blindness, what would be the genotypes and phenotypes of their children? Describe using the Punnett square.
5. Describe three major components required to accomplish protein translation.
6. What is chromosomal abnormality? Describe different types of chromosomal abnormalities.
7. A massive amount of DNA is packaged in a compact form to fit in the nucleus. Describe how DNA packaging in achieved in the cell.