

M.Sc. BIOTECHNOLOGY  
First Semester  
Cell and Molecular Biology  
(MBT - 01)

Duration: 3Hrs.

Full Marks: 70

Part-A (Objective) =20

Part-B (Descriptive)=50

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins.

Marks: 50

1. Answer in brief the following questions (any five)

2×5=10

- a) What do you mean by Molecular motor?
- b) What is Homeodomain protein?
- c) What are the two transcription factors needed in the *Petunia* sporophyte for normal endosperm development?
- d) What do you mean by okazaki fragments? What is the significance of ligase in replication?  
1+1=2
- e) What is the function of Rec A recombinase?  
2
- f) Write the chemical reaction involved in the formation of 5' cap of RNA?
- g) What is central dogma?

2. Answer the following questions (any five)

3 × 5=15

- a) Draw and explain the structure of Nuclear envelope.
- b) Define cellular polarity? Write any one hypothesis regarding origin of cellular polarity.
- c) Write the difference between Active and Passive transport of the cell membrane.
- d) Define Intermediate filament? Explain briefly the types of Intermediate filament.
- e) What do you mean by alternative splicing? What is its significance?  
2+1=3
- f) Explain the chemical constituents of DNA.
- g) What do you mean by DNA renaturation? If species 1 contain 1000 G and 100 A in one strand of DNA and species 2 has 1000 A and 100 G. DNA of which species will have higher melting temperature?

**3. Answer the following questions (any five)**

- a) Write about the two regions of *Drosophila* chromosomes-3 that contains the homeotic gene? What will happen when homeotic gene undergoes mutation? What will be the cause of *Ultrabithorax* gene is deleted. **3+1+1=5**
- b) What are the different developments found during asymmetrical cell division in later angiosperm development? What are the different phenomena takes place during dormancy of seed from early to ending phase of embryogenesis. **2+3=5**
- c) What do you mean by cell signalling? How extracellular molecule acts during cell signalling. How can you classify the cell surface receptor responsible for cell signalling? **1+2+2=5**
- d) What is Lac operon? What is the role of lactose in this regulation system? **4+1=5**
- e) What do mean by DNA replication? Explain the process with all the enzymes required in the process. **1+4=5**
- f) What do mean by mean by DNA methylation? Explain the mechanism of DNA methylation process. **1+4=5**
- g) Write the mechanism of Rho independent termination of protein synthesis? How amino and carboxy terminal post translational modification takes place? **3+2=5**

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*(The figures in the margin indicate full marks for the questions)*

**Duration: 20 minutes**

**Marks – 20**

**PART A- Objective Type**

**I. Choose the correct answer:**

**1×20=20**

1. In plasma membrane, carbohydrate is present in
  - a) Both the layer of lipids
  - b) Only on the cytoplasmic side of lipid layer
  - c) Only on the non- cytoplasmic side of lipid layer
  - d) None of the above
  
2. Which subunit of trimeric G-protein acts as GTPase switch protein subunit
  - a)  $\alpha$
  - b)  $\beta$
  - c)  $\gamma$
  - d)  $\beta\gamma$
  
3. Cyclin dependent Kinase (cdk) activity increases steadily during G2 as a result of
  - a) Phosphorylation of mitotic cyclin by cdk
  - b) Activation of mitotic cdk-cyclin through the activity of a phosphatase
  - c) Phosphorylation of cdk at a point not located inside the catalytic site of cdk-cyclin complex
  - d) Transient increase in the cytosolic GTP concentration
  
4. Glucose-6-phosphate inhibits which of the following enzymes
  - a) Glucokinase
  - b) Hexokinase
  - c) Phosphorylase Kinase
  - d) Fructose-1,6-biphosphate

5. The two photosystem I and photosystem II during non-cyclic photophosphorylation acts in
- Parallel
  - Series
  - Both Parallel and Series
  - None of the above
6. Which of the following suspensor mutant of *Arabidopsis* have provided genetic evidence that the suspensor has the capacity to develop embryo like structure
- Sus 1*
  - Sus 2*
  - Raspberry 1*
  - All of the above
7. Which of the following gene/genes is repressed by the gap gene proteins Hunchback and Kruppel
- abdA
  - AbdB
  - Both abdA and AbdB
  - None of the above
8. Crossing over at the time of meiosis I will cause
- Independent assortment of genes
  - Recombination of linked genes
  - Both independent assortment and recombination of genes present on non-homologous chromosomes
  - Linked between genes
9. Microtubules are not involved directly in which of the following
- Motion of whole cells via flagella
  - Movement of mitotic spindle
  - Amoeboid movement
  - Maintain reticular architecture in the Endoplasmic reticulum
10. Which of the following is not a characteristics of intermediate filament
- They form the nuclear lamina
  - They provide mechanical stability to animal cells
  - Their protein composition is tissue specific
  - They are composed of globular monomers that polymerize to form fibre
11. Releasing factor are required for termination of
- Transcription
  - Translation
  - Replication
  - They are not involved in termination process
12. The mutant for repressor in Lac operon will lead to
- Production of enzymes at every moment
  - Enzymes are not formed at all
  - Enzymes are made when they are required
  - All are correct

13. Initiation factors in translation process are
- IF I, IF II
  - IF II, IF III
  - IF I, IF III
  - All of the above
14. 5' and 3' exonuclease activities are shown by
- Pol I
  - Pol II
  - Pol III
  - Pol IV
15. The number of nucleotides in Lox P sequences is
- 43
  - 44
  - 45
  - 34
16. The enzyme expressed from lac Z is
- Permease
  - Thiogalactosidase
  - Transacetylase
  - Kinase
17. Amino acid is attached at the .....of the tRNA
- Tip
  - Bottom
  - Side loop ( right)
  - Side loop ( left)
18. DNA denaturation temperature is used in PCR to separate the DNA strands. The temperature of this process is
- 56<sup>0</sup> C
  - 94<sup>0</sup> C
  - 72<sup>0</sup> C
  - 66<sup>0</sup> C
19. Jumping gene was discovered by
- Barbara McClintok
  - Fred Sanger
  - Beadle and Tatum
  - Griffith
20. Genetic code is universal because
- Same codon codes for different amino acids at same speed
  - Same codon codes for same amino acid all living organisms
  - Same codon codes for different amino acids at same frequency
  - Same codon codes for same amino acid in plants and animals