

2021**MOLECULAR BIOLOGY****[GENERAL]****Paper : II**

Full Marks : 100

Time : 3 Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.***GROUP-A****[Marks : 50]**

1. Answer any **four** of the following: $1 \times 4 = 4$
- Name one coenzyme which is involved in conversion of pyruvate to acetyl CoA.
 - What is RDA?
 - Name two glucogenic amino acids.
 - Name the active form of nicotinamide.
 - How many ATP molecules are utilized to metabolize one molecule of glucose in glycolysis?
 - Name one vitamin which contains a group of steroid.

- g) Name one vitamin that protects the unsaturated fatty acid from oxidation.
2. Answer any **six** of the following: $2 \times 6 = 12$
- What is hypervitaminosis? Does it happen to all vitamins?
 - What is deamination of amino acids?
 - Name one molecule which acts as an intermediate in TCA cycle as well as in gluconeogenesis.
 - What is the significance of pentose-phosphate pathway?
 - What are glycosidic linkages present in glycogen molecule?
 - Why some fatty acids are considered essential?
 - Name one molecule with only one high energy bond. Draw its structure.
 - Write down the symptoms of the deficiency of thyroxin hormone.
 - Is gluconeogenesis exact reversal of glycolysis? Explain.

3. Answer any **four** of the following: $6 \times 4 = 24$

- a) What is the function of vitamin-A in human vision cycle?
- b) State the role of pyridoxal phosphate in transamination.
- c) How is ATP formed in mitochondria in response to a proton gradient across the inner mitochondrial membrane?
- d) Briefly describe pentose-phosphate pathway.
- e) Write down the steps that convert oxaloacetate into oxalosuccinate in TCA cycle.
- f) Write down the steps that convert glucose into dihydroxyacetone phosphate during glycolysis.

4. Answer any **one** of the following: $10 \times 1 = 10$

- a) Describe how glycogen breakdown takes place to generate glucose.
- b) Explain how fatty acid is metabolized through β -oxidation.

GROUP-B

[Marks : 50]

5. Answer any **four** from the following questions:

$1 \times 4 = 4$

- a) What will be the effect on the molecular mass of an element after the emission of one alpha-particle?
- b) Give an example of Incomplete Dominance.
- c) What is 'transversion'?
- d) What are 'Okazaki' fragments?
- e) Define 'Curie' as a unit of radioactivity.
- f) What is a 'cistron'?

6. Answer any **six** from the following questions:

$2 \times 6 = 12$

- a) Describe the formation of 'Thymine dimer'.
- b) Mention some properties and uses of 'Gamma rays'.
- c) How can we use the concept of half-lives of radioactive substances to determine the age of fossils?
- d) Mention few protective measures to be adopted while working with a radioactive substance.

- e) ABO-Blood group is an example of 'Co-dominance' and 'Multiple Allelism'. Explain.
- f) State the modern concept of a gene.
- g) Describe the 'Law of Independent Assortment'.
- h) State the molecular basis of occurrence of 'Down's Syndrome'. Mention the characteristics of the affected individual.

1+1

7. Answer any **six** from the following questions:

4×6=24

- a) Describe the Initiation of transcription by explaining promoter and RNA polymerase interaction.
- b) What is a 'point mutation'? Mention all probable effects of point mutations at Molecular level. 1+3
- c) 'Chromosomal theory of Inheritance' is a reflection of 'Mendelian principles of Inheritance' at a higher level. Explain.
- d) Explain the functions of 'Hellicase', 'Topoisomerase' and 'DNA Ligase' during replication.

- e) Explain the working principle of a 'Scintillation Counter'.
- f) Derive the 'Radioactive Decay' equation and explain the 'Radioactive Decay' Law.
- g) Describe the mechanism of 'SOS Repair'.
- h) During a self-cross between 'Round-Yellow' seed (genotype-RrYy) pea plants, which genotype and phenotype would be most prevalent in the next generation and why?

8. Answer any **one** from the following questions:

10×1=10

- a) What do you understand by charging of tRNA? Describe the process of elongation of polypeptide chain and termination of translation in prokaryotes. 2+8
- b) Describe the functioning of a 'GM Counter' with a labelled diagram. State the applications of radioactive material in Biology and Medicine. 6+4
