

1 (Sem-6/FYUGP) ZLG 61 MJ

2026

ZOOLOGY

(Major)

Paper : ZLG0600104

(Wildlife Conservation and Management)

Full Marks : 45

Time : 2 hours

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

1. Choose the correct option : 1×5=5

(a) Conservation ethics in wildlife emphasizes

(i) overuse of natural resources

(ii) protection and sustainable use of wildlife

(iii) commercial hunting

(iv) habitat destruction

(b) Which of the following is not an example of *in situ* conservation?

(i) National Park

(ii) Wildlife Sanctuary

(iii) Zoo

(iv) Biosphere Reserve

- (c) The footprint of a carnivorous animal like tiger or leopard is called

- (i) hoolmark
- (ii) pugmark
- (iii) burrow
- (iv) scat

- (d) The number of Biosphere Reserves in India is

- (i) 14
- (ii) 15
- (iii) 11
- (iv) 18

- (e) Which one of the following is correct as per Odum's definition of ecological succession?

- (i) It is predictable
- (ii) It is directional
- (iii) It results from the modifications of physical environment
- (iv) All of the above

2. Answer any five of the following : $2 \times 5 = 10$

- (a) "The presence of wetland is very important for any wildlife sanctuary or national park." Justify the statement.
- (b) Why is it important to regulate the introduction of invasive alien species?

- (c) Write a short note on flagship species.
- (d) What is an eco-sensitive zone (ESZ)?
- (e) Differentiate between crude density and ecological density.
- (f) Differentiate between wildlife preservation and wildlife conservation.
- (g) Explain the S-shaped growth model of population study and state its prevailing conditions.
- (h) Differentiate between GIS and remote sensing based on their working principles.
- (i) What are renewable natural resources and why is their proper management necessary?
- (j) How does the age structure influence the future growth of a wildlife population?

3. Answer any four of the following : $5 \times 4 = 20$

- (a) Explain how the local belief systems in sacred groves help in sustainable conservation strategies.
- (b) How will you differentiate a biosphere reserve from national park and wildlife sanctuaries?
- (c) Explain the different types of population growth patterns with suitable examples.

- (d) Evaluate the impact of population growth and development on wildlife loss in India.
- (e) Write a short note on the different approaches used for ecological restoration.
- (f) Discuss the importance of Deepor Beel as a Ramsar Site in Assam with reference to biodiversity conservation.
- (g) Write a short note on the working principle of remote sensing.
- (h) Explain the total count, line transect and point count methods used in direct wildlife population surveys.

4. Answer any *one* of the following :

10

- (a) Define carrying capacity. Discuss its types and explain the major factors affecting carrying capacity in a wildlife habitat.
- (b) Discuss the concept and challenges of wildlife protected areas in India in relation to conservation and sustainable development.
- (c) Define ecological succession. Describe in detail the three models of ecological succession with suitable examples.
- (d) Explain the concept of biosphere reserve under the MAB programme drawing out the character, functions, criteria and its structural design.

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ZOOLOGY

(Major)

Paper : ZLG0600204

(Molecular Biology)

Full Marks : 45

Time : 2 hours

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

1. Choose the correct answer : 1×5=5

(a) The repeat sequence of nucleotides in telomere is

- | | |
|--------------|-------------|
| (i) TTGGGA | (ii) GGGATT |
| (iii) TTAGGG | (iv) TTGAGG |

(b) What is the primary role of topoisomerase during the initiation of replication?

- (i) Breaking hydrogen bonds between nitrogenous bases to unzip the double helix
- (ii) Synthesizing a short RNA primer to provide a 3'—OH group

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- (iii) Connecting Okazaki fragments on the lagging strand
- (iv) Relieving torsional strain and preventing supercoiling ahead of the replication fork
- (c) A particular triplet of bases in the template strand of DNA is 5' AGT 3'. The corresponding codon for mRNA transcribed is
 - (i) 5' TCA 3'
 - (ii) 3' ACU 5'
 - (iii) 3' UCA 5'
 - (iv) either UCA or TCA, depending on wobble in the first base
- (d) In eukaryotes, the TATA box sequences required for initiation of transcription are present in
 - (i) 25 nucleotides upstream of transcription start site (TSS)
 - (ii) 10 nucleotides upstream of TSS
 - (iii) 10 nucleotides downstream of TSS
 - (iv) 25 nucleotides downstream of TSS
- (e) The nucleotide cap that is attached at the 5' end of mRNA during capping is
 - (i) 5-methyl guanosine
 - (ii) 7-methyl guanosine
 - (iii) 5-acetyl guanosine
 - (iv) 7-acetyl guanosine

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2. Answer/Write on any *five* of the following in brief : 2×5=10
- (a) Differentiate between introns and exons.
 - (b) Differentiate between Z-DNA and B-DNA.
 - (c) Define miRNA and siRNA.
 - (d) What is nucleosome?
 - (e) What is globin mRNA?
 - (f) Write a short note on post-transcriptional gene silencing.
 - (g) Role of reverse transcriptase
 - (h) Function of telomerase
 - (i) Write briefly on bidirectional DNA replication.
 - (j) Name some inhibitors of protein synthesis.
3. Answer any *four* of the following : 5×4=20
- (a) Why are RNA primers needed? Briefly describe the RNA priming event during DNA replication with special emphasis on primosome. 1+4=5
 - (b) Briefly discuss the differences between prokaryotic transcription and eukaryotic transcription.
 - (c) What are the key regions that define a transcription unit? Mention their functions.

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- (d) Discuss the salient features of Watson and Crick model of DNA.
- (e) Write a short note on excision repair mechanisms of DNA damage.
- (f) How do activator and silencer regulate the process of eukaryotic gene expression?
- (g) What is spliceosome? Describe the process of mRNA splicing. $1+4=5$
- (h) Explain the structure of tRNA.
4. Answer any one of the following : 10
- (a) Briefly explain the mechanism of DNA replication in eukaryotes. How does it differ from prokaryotic replication? $7+3=10$
- (b) What is an operon? Briefly describe about regulation of trp operon in *E. coli*. How do mutations in leader sequence affect regulation process? $2+6+2=10$
- (c) Define genetic code. Write the characteristics of genetic code. Explain degeneracy of genetic code with special reference to 'wobble hypotheses'. $1+4+5=10$
- (d) Give a detailed account of the mechanism of translation in eukaryotes. How do inhibitors of protein synthesis affect translation process? $8+2=10$

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ZOOLOGY

(Major)

Paper : ZLG0600304

**(Biochemistry of Metabolic Processes
and Regulation)**

Full Marks : 45

Time : 2 hours

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

**1. Choose the correct answer/Write True or
False : 1×5=5**

**(a) What is the substrate for the last step of
glycolysis?**

- (i) Glyceraldehyde 3-phosphate**
- (ii) Phosphoenolpyruvate**
- (iii) 1,3-bisphosphoglycerate**
- (iv) None of the above**

(b) β -oxidation of fatty acid occurs in

- (i) cytoplasm**
- (ii) nucleus**
- (iii) mitochondria**
- (iv) All of the above**

(2)

- (c) Oxidative phase of pentose phosphate pathway is non-reversible phase.
(Write True or False)
- (d) From which toxic substance urea is formed?
- (i) Ammonia
 - (ii) Uric acid
 - (iii) Carbon dioxide
 - (iv) None of the above
- (e) In which reaction of the Krebs' cycle FAD is reduced?
- (i) Isocitrate to oxaloacetate
 - (ii) Succinyl-CoA to succinate
 - (iii) Fumarate to malate
 - (iv) Succinate to fumarate
2. Answer any five of the following in brief :
2×5=10
- (a) Define metabolism.
 - (b) Why is ATP called the energy currency of the cell?
 - (c) What are co-factors?
 - (d) Why is TCA cycle called amphibolic pathway?
 - (e) What is the significance of pentose phosphate pathway?

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- (f) Define deamination.
 - (g) Define substrate-level phosphorylation.
 - (h) What is coupled reaction? State its significance.
 - (i) What is redox reaction? How does redox reaction contribute in ATP production?
 - (j) Define glycogenolysis.
3. Answer any four of the following : 5×4=20
- (a) What is gluconeogenesis? Briefly describe the metabolic reaction of gluconeogenesis. 1+4=5
 - (b) Explain chemiosmotic hypothesis.
 - (c) Describe the process of urea cycle.
 - (d) Explain the process of glycogenesis and add a note on its regulation.
 - (e) What is omega oxidation? Write about its significance.
 - (f) Write a note on inhibitors of respiratory chain.
 - (g) Explain the fate of C skeleton of glucogenic amino acid.
 - (h) Describe schematically the process of ketogenesis.

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4. Answer any one of the following :

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- (a) Explain the process of β -oxidation of saturated fatty acid with even number of carbon atom. Give the energetics involved in the process. $7+3=10$
- (b) Describe the process of glycolysis. Explain the regulatory steps of glycolysis and its energetics. $5+3+2=10$
- (c) Describe the various components of electron transport chain with diagrammatic illustration of electron flow and ATP producing sites. $7+3=10$
- (d) Describe the reactions of citric acid cycle. Explain the regulatory mechanism of citric acid cycle. $5+5=10$

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ZOOLOGY

(Major)

Paper : ZLG0600404 (A/B/C)

Full Marks : 45

Time : 2 hours

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

Answer the questions from any one Option.

OPTION—I

Paper : ZLG0600404A

(Fundamentals of Bioinformatics)

1. Answer/Fill in the blanks of the following : $1 \times 5 = 5$
 - (a) Which scoring matrix is based on global alignment?
 - (b) Which algorithm is used for local alignment?

(2)

- (c) The study of small molecules within cells, tissues or organisms is known as _____.
- (d) Which matrix method is used to measure the genetic distance between sequences?
- (e) The tree which represents taxonomic relationships between organisms is _____.
2. Answer any *five* of the following : $2 \times 5 = 10$
- (a) What is genomics?
- (b) What is a database? Give an example.
- (c) What are the different scoring matrices used to align sequences?
- (d) Define transcriptomics.
- (e) What is phylogenetics?
- (f) What is FASTA?
- (g) What is BLAST?
- (h) What is human genome project?
- (i) What is bootstrapping?
- (j) What are patents?

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(3)

3. Answer any *four* of the following : $5 \times 4 = 20$
- (a) What are the different databases used in bioinformatics?
- (b) Differentiate between sequence similarity and identity with examples.
- (c) Describe the process of next generation sequencing.
- (d) What are the different tree building methods?
- (e) What are the prerequisites for a molecule to be considered a drug?
- (f) Describe the emergence and types of omics in bioinformatics.
- (g) What are the different types of protein structures?
- (h) What is the importance of molecular docking in drug discovery?
4. Answer any *one* of the following : 10
- (a) Perform a local alignment for the given sequences using Smith-Waterman algorithm :
- Match = +1 ; Mismatch = -1 ; Gap = -2
- ATCTGCT
ATGTGCT

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(4)

- (b) Perform a global alignment for the given sequences using Needleman-Wunsch algorithm :
Match = +1 ; Mismatch = -1 ; Gap = -2
CGTATGA
CGTACGA
- (c) Describe in detail the process of DNA sequencing with a diagram.
- (d) Describe the different methods used to predict the structure of proteins.

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OPTION—II

Paper : ZLG0600404B

(Advanced Entomology)

1. Choose the correct option : 1×5=5
- (a) Tracheae open to the outside of the insect body through
- (i) ostia
 - (ii) taenidia
 - (iii) spiracles
 - (iv) alary muscles
- (b) Which structure in the insect foregut acts as a gizzard to grind food using chitinous teeth?
- (i) Pharynx
 - (ii) Crop
 - (iii) Proventriculus
 - (iv) Mesenteron
- (c) What type of circulatory system is found in most insects?
- (i) Closed circulatory system
 - (ii) Open circulatory system
 - (iii) Semi-closed circulatory system
 - (iv) Double circulatory system

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(d) The use of ladybird beetles to control aphids is an example of

- (i) chemical control
- (ii) biological control
- (iii) pheromonal control
- (iv) mechanical control

(e) Which stage of life cycle of Eri silkworm can produce silk?

- (i) 5th instar larva
- (ii) Moth
- (iii) Pupa
- (iv) Cocoon

2. Answer any five of the following : $2 \times 5 = 10$

- (a) What is the function of the spermatheca in female insects?
- (b) Why are most insects uricotelic?
- (c) What is the difference between Ovaries and Ovarioles?
- (d) What is the difference between Prohemocytes and Plasmotocytes?
- (e) What is the 'subesophageal ganglion' and what does it control?
- (f) Distinguish between Perennial and Occasional pests.

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(g) What do you mean by the Economic Threshold Level (ETL)?

(h) State the damaging stage and host of *Papilio demoleus*.

(i) Mention the four stages of silkworm's life cycle with correct sequence of their development.

(j) Distinguish between male and female moth of *Muga* silkworm.

3. Answer any four of the following : $5 \times 4 = 20$

- (a) Describe the general structure of the male reproductive system in insects.
- (b) How does the tracheal system enable gas exchange in insects without the use of blood?
- (c) Discuss the open circulatory system of insects, highlighting the role of the dorsal vessel and hemolymph.
- (d) Mention the commercial and medicinal applications of lac and honey.
- (e) Explain the life history of the pulse beetle (*Callosobruchus chinensis*).
- (f) Discuss the various stages of host-plant selection by phytophagous insects.

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(g) Discuss the life history of the tea mosquito bug (*Helopeltis theivora*) and the nature of damage caused by it on young tea leaves. 4+1=5

(h) Discuss the role of pheromones in Integrated Pest Management (IPM).

4. Answer any one of the following : 10

(a) Give a detailed account of the anatomical structure of the insect alimentary canal with suitable diagrams. Describe the process of digestion occurring in the midgut. 7+3=10

(b) Describe the structural organization of the nervous system in insects.

(c) Define the term 'pest' and classify them based on their damage potential. Write about the cultural and biological control of pests. 1+2+4+3=10

(d) Mention the order and family of Eri silkworms. Describe its life history with suitable diagrams. Write the applications of silk. 1+7+2=10

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OPTION—III

Paper : ZLG0600404C

(**Animal Cell Culture and Genetic Engineering**)

1. Choose the correct option : 1×5=5

(a) Which of the following is essential for animal cell culture?

(i) Sterile environment

(ii) Soil medium

(iii) Sunlight exposure

(iv) High salt concentration

(b) Why is Taq polymerase specifically used in PCR?

(i) It is resistant to high temperatures

(ii) It has proofreading activity

(iii) It binds RNA primers

(iv) It terminates DNA chains

(c) DNA microarray technology is mainly used for

(i) protein purification

(ii) gene expression analysis

(iii) cell viability testing

(iv) DNA ligation

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- (d) Electroporation introduces DNA into cells by
- (i) heat shock
 - (ii) high-voltage pulses
 - (iii) enzyme digestion
 - (iv) centrifugation
- (e) How does next-generation sequencing (NGS) improve over Sanger sequencing?
- (i) NGS uses ddNTPs exclusively
 - (ii) NGS sequences millions of fragments simultaneously
 - (iii) NGS requires radioactive labelling
 - (iv) NGS produces longer reads
2. Answer any five of the following : $2 \times 5 = 10$
- (a) List two essential requirements for maintaining sterility in animal cell culture.
 - (b) Differentiate between monolayer and suspension cultures.
 - (c) Name two parameters commonly measured to assess cell growth in culture.
 - (d) What is the role of primers in PCR?
 - (e) Differentiate between Southern blotting and Northern blotting.

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- (f) What is the function of restriction enzymes in gene cloning?
 - (g) Mention two characteristics of plasmids that make them suitable cloning vectors.
 - (h) How can DNA microarray be used to study gene expression?
 - (i) Explain how ddNTPs terminate DNA synthesis in Sanger sequencing.
 - (j) How are genomic and cDNA libraries screened using colony or plaque hybridization?
3. Answer any four of the following in brief : $5 \times 4 = 20$
- (a) Describe the basic requirements for establishing and maintaining animal cell culture.
 - (b) Discuss the methods used to measure cell viability and parameters of growth in cultured cells.
 - (c) Explain the principle and applications of cell proliferation assays in bioassays.
 - (d) Explain the principle and applications of Polymerase Chain Reaction (PCR).
 - (e) Discuss the role of DNA fingerprinting in forensic science and biomedical research.

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- (f) Discuss the importance of expression vectors and their roles in protein production.
- (g) Describe the steps involved in constructing a cDNA library and its applications in functional genomics.
- (h) Write a note on harvesting and maintenance of cell lines.

4. Answer any *one* of the following :

10

- (a) Evaluate the challenges of maintaining sterility in animal cell culture compared to microbial culture and propose strategies to minimize contamination.
- (b) Restriction enzymes and DNA modifying enzymes are central to recombinant DNA technology. Critically assess how their specificity and limitations influence cloning strategies.
- (c) Genomic and cDNA libraries are powerful tools. Critically evaluate their constructions, screening methods, and applications, highlighting how they differ in utility for functional genomics.
- (d) Explain the principles, procedures and applications of Southern, Northern and Western blotting techniques.

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