



WEST BENGAL STATE UNIVERSITY

B.Sc. Major 4th Semester Examination, 2026

ZOODSC404T-ZOOLOGY (MAJOR)

Time Allotted: 2 Hours

Full Marks: 50

*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

1. Answer any **nine** questions from the following:

2×9 = 18

- (a) What is a sarcomere?
- (b) What is malpighian corpuscle?
- (c) Define vital capacity.
- (d) What is aestivation?
- (e) Distinguish between horn and antler.
- (f) State the location and function of leydig cells.
- (g) What is syrinx? State its function.
- (h) Differentiate between electrical and chemical synapse.
- (i) What is filoplume?
- (j) What is cerebellum? Mention its two major functions.
- (k) State the location and function of uropygial gland.
- (l) Define cardiac output. Write its formula.

Handwritten calculations in the margin:

$$\begin{array}{r} 2132 \\ \times 2132 \\ \hline \end{array}$$
2. Answer any **four** questions from the following:

3×4 = 12

- (a) Draw and describe the structure of a mature Graafian follicle. 2+1
- (b) Classify vertebrae on the basis of the shape of centrum with examples. 3
- (c) Discuss the intrinsic pathway of blood coagulation. 3
- (d) Briefly describe the structure of a neuromuscular junction. 3
- (e) Write the location and function of the Aortic valve, Mitral valve and Tricuspid valve. 1+1+1
- (f) Mention the typical dental formula of an adult human and explain how to calculate the total number of teeth from it. 1+2
- (g) Differentiate between a mesonephros and a metanephros citing proper examples. 3

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

5×4 = 20

- (a) Explain the sliding filament theory of muscle contraction. 5
- (b) What is Bohr effect? State the molecular mechanism of oxygen transport by hemoglobin. 1+4

- (c) Give a comparative account of modification of aortic arches between reptiles and mammals. 5
- (d) Describe the ionic basis of resting potential in a neuron. What is the all-or-none law? 4+1
- (e) Define jaw suspension. Describe different types of jaw suspension found in vertebrates. 1+4
- (f) What is corpus callosum? Summarize the major evolutionary trend in the relative size and role of the Telencephalon (cerebrum) from fishes to mammals. 1+4
- (g) Write short notes on the following (any *two*): $2 \frac{1}{2} \times 2 = 5$
- (i) Appendicular skeleton
 - (ii) Venous heart
 - (iii) Visceral arches.

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1. Answer any **nine** from the following:

2×9 = 18

- ☒ (a) State Lindeman's law.
- ☒ (b) What do you mean by ecesis?
- ☒ (c) What is ecological equivalence?
- ☒ (d) Name two man-made ecosystems.
- ☒ (e) Distinguish between Autecology and Synecology.
- ☒ (f) What are unitary and modular populations?
- ☒ (g) Mention two utilities of life table.
- ☒ (h) What do you mean by ecosystem services?
- ☒ (i) Name the largest and smallest Ramsar sites of India.
- ☒ (j) What are sere on climax community?
- ☒ (k) What is edge effect?
- ☒ (l) What are meant by tertiary consumers?

2. Answer any **four** from the following:

3×4 = 12

- ☒ (a) Explain Allen's rule. Which Indian environmental act implies authorities with adequate powers for environmental protection? 2+1
- ☒ (b) Compare and contrast exponential and logistic growths of populations.
- ☒ (c) Define major and minor communities. What is biome? 2+1
- ☒ (d) Mention the major threats to mangrove ecosystems in India.
- ☒ (e) Differentiate between autogenic and allogenic succession.
- ☒ (f) Explain why the human survivorship curve is highly convex.
- ☒ (g) State the role of decomposers in an ecosystem.

3. Answer any **four** from the following:

5×4 = 20

☒ (a) Explain community dominance with example. What is keystone species? 4+1

☒ (b) Discuss the impact of water on ecosystem. Explain Shelford's law of tolerance. 3+2

- (c) (i) In a period, biologists capture and tag 40 Rabbits and released in population. During census, they recapture 35 Rabbits of which 14 were found tagged and the rest untagged. What is the probable sample size? 2+1+2
- (ii) Mention any two density independent factors that regulate population density.
- (iii) What are semelparous and iteroparous species?
- (d) What do you mean by top down and bottom up regulation of a population? Write a note on mutualism as biotic interaction. What is meant by guild in ecology? 2+2+1
- (e) Explain ecological compression and ecological release. Name the largest terrestrial biome of the world. 2+2+1
- (f) What do you mean by Ramsar wetlands? State the importance of wetland conservation in India. 2+3
- (g) What is solar constant? Discuss the 2nd law of thermodynamics in the context of energy transfer in a forest ecosystem. 1+4

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CELL BIOLOGY

Time Allotted: 2 Hours

Full Marks: 50

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1. Answer any **nine** questions from the following: 2×9 = 18
- (a) What is prion? Give an example.
 - (b) Write two differences between genomic DNA and mitochondrial DNA.
 - (c) What are RTK and non-RTK receptors?
 - (d) What is restriction point in cell cycle?
 - (e) Differentiate between SER and RER.
 - (f) What are desmosomes?
 - (g) What is Mycoplasma? Mention one characteristic feature. 1+1
 - (h) Distinguish between endocrine and paracrine signalling.
 - (i) What is synaptonemal complex?
 - (j) Distinguish between carcinoma and sarcoma.
 - (k) Name the most heterogeneous type of cytoskeleton filament. Give an example of a microfilament inhibitor. 1+1
 - (l) What are SH2 domains? Why are they crucial in cell signalling dynamics? 1+1
2. Answer any **four** questions from the following: 3×4 = 12
- (a) State the role of Golgi Complex in cellular transport.
 - (b) Distinguish between protooncogene, oncogene and tumour suppressor gene.
 - (c) Differentiate between mitosis and meiosis. Why is meiosis called reduction division? 1+2
 - (d) Describe the intrinsic pathway of apoptosis with a suitable diagram. 2+1
 - (e) Describe the role of Cyclin-Cdks in cell cycle.
 - (f) Explain the role of peroxysome in cellular metabolism.
 - (g) Describe the structure of GPCR molecule. What do you mean by receptor dimerisation? 2+1

3. Answer any *four* questions from the following: 5×4 = 20
- (a) Describe the chemical composition of plasma membrane. How does the Fluid Mosaic model of Singer-Nicholson differs from the Unit membrane model of Robertson? 3+2
 - (b) What are lysosomes? Differentiate between endocytosis and exocytosis. 2+3
 - (c) What is signal transduction? Explain the role of nitric oxide as a cellular signalling molecule. 3+2
 - (d) Describe the structure of nuclear lamina with a suitable diagram. What is the major function of the nuclear envelope? 2+2+1
 - (e) What is the cell theory? Who observed a living cell for the first time with a microscope? What is the major distinctive difference between prokaryotic and eukaryotic cells? 3+1+1
 - (f) Explain the sliding filament theory. What is the role of Ca^{2+} ions in contraction and relaxation of muscles? 3+2
 - (g) Describe how the flow of electrons through the electron transport chain is translated into ATP synthesis.

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1. Answer any **nine** questions from the following:

2×9 = 18

- (a) What is Chargaff's rule?
- (b) Distinguish between aldose and ketose sugars with one example of each.
- (c) Define isomerism.
- (d) What is saponification number?
- (e) What is an allosteric enzyme?
- (f) Name two buffers of the biological system.
- (g) State the significance of sphingolipids.
- (h) What do you mean by hyperchromaticity of DNA?
- (i) Mention the net ATP production in the pathway of glycolysis.
- (j) What are isoenzymes? Give example.
- (k) Name the electron carriers found in the Electron Transport System.
- (l) Distinguish between homo and heteropolysaccharides.

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

3×4 = 12

2+1

- (a) Describe the structure of tRNA with a suitable diagram.
- (b) Discuss how ribose sugar is synthesised via the pentose phosphate pathway.
- (c) What are triglycerides? How are they formed?
- (d) Classify amino acids based on the polarity of their R-group giving an example of each class.
- (e) What is Lineweaver-Burk equation? State its advantage over Michaelis-Menten equation.
- (f) Discuss the significance of pH in the biological system.
- (g) Name the different types of RNA and mention their functional significances.

1+2

2+1

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

5×4 = 20

- (a) Define K_m . What are the factors affecting the rate of enzyme reaction?

1+4

- (b) What is transamination? Name the enzyme group that catalyses this reaction. 1+1+3
What happens to the amino group of an amino acid during oxidative deamination?
- (c) Describe the pathway of Krebs Cycle with a flowchart. 3+2
- (d) Describe the different types of tertiary structure of protein. Differentiate between domain and motif. 3+2
- (e) Classify enzymes on the basis of IUBMB system with example from each class. 4+1
What is EC number?
- (f) Discuss the steps of gluconeogenesis. Justify that it is an energy loss process. 3+2
- (g) Write short notes on (any *two*): $2\frac{1}{2}+2\frac{1}{2}$
- (i) Z-DNA
 - (ii) Uncompetitive enzyme inhibition
 - (iii) Zwitterion.

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