

1 (Sem-5/FYUGP) ZLG 41 MJ

2 0 2 5

ZOOLOGY

(Major)

Paper : ZLG0500104

(Cell 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) Cytoskeleton consists of
- (i) microtubules
 - (ii) microfilaments
 - (iii) intermediate filaments
 - (iv) All of the above
- (b) Gap junctions are absent in
- (i) sperm cells
 - (ii) brain cells
 - (iii) heart cells
 - (iv) liver cells

(c) Which of the following is the largest single membrane-bound intracellular compartment?

- (i) Ribosomes
- (ii) Golgi complex
- (iii) Nucleus
- (iv) Endoplasmic reticulum

(d) Cristae in mitochondria serves as sites for

- (i) oxidation reduction reaction
- (ii) protein synthesis
- (iii) macromolecules breakdown
- (iv) flavoproteins are phosphorylated

(e) During 'X' phase of cell division centriole divide, DNA replicate and synthesis of histone protein takes place. What is 'X'?

- (i) G₀ phase
- (ii) G₁ phase
- (iii) G₂ phase
- (iv) S phase

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

2×5=10

- (a) Differentiate between Viroids and Prions.
- (b) What is euchromatin?
- (c) Describe the structure of lysosome.
- (d) What is ubiquinone?
- (e) Draw the structure of polytene chromosome.
- (f) Write the important functions of microtubule.
- (g) What is cyclin-dependent kinase (CDK)?
- (h) Mention two differences between mitosis and meiosis.
- (i) Define cell signalling.
- (j) What is necrosis?

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

5×4=20

- (a) What are the different modes of transport that a cell has to rely on in order to function properly?
- (b) Discuss about anchoring junctions and their functions.
- (c) What is nucleosome? Describe its structure and significance.

(4)

- (d) Explain the structure and function of plasma membrane according to the fluid mosaic model.
- (e) Discuss the components of the endomembrane system.
- (f) Which hypothesis explains the origin of mitochondria?
- (g) Elucidate the different modes of chemical signaling with supporting diagram.
- (h) Discuss the role of cytoskeleton in cell shape and motility.

4. Answer any *one* from the following questions : 10

- (a) What is apoptosis? Explain the mechanism of apoptosis. 2+8=10
- (b) What is oxysome? What is mitochondrial electron transport chain (ETC)? What are the various complexes of ETC? 2+3+5=10
- (c) What are second messengers? How are IP3 and DAG generated? Elucidate the roles of IP3 and DAG as second messengers. 2+3+5=10
- (d) What are the various stages of meiotic prophase-I? Enumerate the chromosomal events during each stage. 3+7=10

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1 (Sem-5/FYUGP) ZLG 42 MJ

2 0 2 5

ZOOLOGY

(Major)

Paper : ZLG0500204

(Fundamentals of Biochemistry)

Full Marks : 45

Time : 2 hours

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

1. Fill in the blanks : 1×5=5
- (a) ____ atom is called chiral carbon.
 - (b) ____ is the building block of protein.
 - (c) The optimum temperature for enzyme action in the human is ____.
 - (d) Sucrose is an example of ____ sugar.
 - (e) ____ form of DNA is left handed.
2. Answer any *five* of the following : 2×5=10
- (a) What is aldose sugar?
 - (b) Draw the ring structure of glucose or fructose.

(2)

- (c) What is compound lipid?
- (d) What is stereoisomerism?
- (e) Explain briefly the protein denaturation.
- (f) Differentiate between nucleotide and nucleoside.
- (g) Write about allosteric enzymes.
- (h) Write about the Chargaff's rule.
- (i) What are the factors affecting enzyme activity?
- (j) Define isoenzymes with example.

3. Answer any *four* of the following in short :

5×4=20

- (a) Discuss reducing and non-reducing sugars with examples.
- (b) Write the different forms of DNA.
- (c) Explain glycoconjugate with examples.
- (d) Write the characteristics of lipids.
- (e) Discuss the simple and conjugated proteins with examples.
- (f) Write the characteristics of amino acids.

(3)

- (g) Classify enzymes with example.
- (h) Explain the Koshland's theory of enzyme-substrate complex formation.

4. Answer any *one* of the following questions : 10

- (a) Illustrate the level of protein organization.
- (b) Discuss the double-helical structure of DNA with a labelled diagram.
- (c) Explain essential and non-essential types of fatty acids with example.
- (d) Discuss in detail the Michaelis-Menten model of enzyme kinetics.

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1 (Sem-5/FYUGP) ZLG 43 MJ/(A)/(B)/(C)

2025

ZOOLOGY

(Major)

Full Marks : 45

Time : 2 hours

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

*Answer the questions from either Option—A or
Option—B or Option—C*

OPTION—A

Paper : ZLG0500304A

(Reproductive Biology)

1. Answer the following as directed : 1×5=5

(a) Sertoli cells are responsible for

(i) testosterone production

(ii) nourishment of sperms

(iii) secretion of progesterone

(iv) secretion of estrogen

(Choose the correct answer)

(2)

(b) The diminished cumulus oophorus surrounding the oocyte is called _____.

(Fill in the blank)

(c) Which structure in the male reproductive system stores sperm temporarily?

(i) Seminal vesicle

(ii) Vas deferens

(iii) Epididymis

(iv) Prostate gland

(Choose the correct answer)

(d) The outer layer of the blastocyst that helps in implantation is the

(i) epiblast

(ii) trophoblast

(iii) hypoblast

(iv) endoderm

(Choose the correct answer)

(e) Which of the following glands secrete(s) prostaglandins?

(i) Prostate gland

(ii) Seminal vesicle

(iii) Bulbourethral glands

(iv) Cowper's glands

(Choose the correct answer)

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(Continued)

(3)

2. Answer any five of the following briefly :

2×5=10

(a) What is the role of FSH in females?

(b) What are spermatogonial stem cells (SSCs)?

(c) Name the four stages of the estrous cycle in rats.

(d) What happens if fertilization does not occur after ovulation?

(e) What are epididymal proteins and their role in fertilization?

(f) What is the function of scrotum?

(g) What is luteolysis?

(h) Explain the role of SRY gene and testis-determining factor (TDF) in gonadal differentiation.

(i) What are spermatids, and how do they differ from spermatozoa?

(j) Write the functions of human chorionic gonadotropin (hCG).

3. Answer any four of the following questions :

5×4=20

(a) Write the role of dihydrotestosterone (DHT) in the development of male external genitalia.

(b) Describe briefly the structure and function of the epididymis.

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(Turn Over)

(4)

- (c) State the cytological features of each stage of the estrous cycle in rats.
- (d) Explain the mechanism of hypothalamic-pituitary-gonadal (HPG) axis in the control of male reproduction.
- (e) Enumerate the accessory reproductive glands of the male.
- (f) Elucidate the roles of glycoprotein hormones (GPHs) and prostaglandins in biological processes.
- (g) Describe the histological structure of Graafian follicle with diagram.
- (h) Write the role of corpus luteum in maintaining pregnancy.
4. Give elaborate answers to the following (any one) : 10
- (a) Describe the development of gonads from the indifferent (bipotential) stage to the differentiated testis and ovary.
- (b) Describe the biosynthetic pathway of testosterone synthesis in Leydig cells.
- (c) Describe with proper illustration, the pathway of sperm transport from the seminiferous tubules to the urethra.
- (d) Describe the process of folliculogenesis in human female ovary with suitable diagram.

(5)

OPTION—B

Paper : ZLG0500304B

(**Developmental Biology**)

1. Choose the correct answer of the following : 1×5=5
- (a) The only human system that is derived from all the three germ layers is
- (i) nervous system
- (ii) digestive system
- (iii) respiratory system
- (iv) excretory system
- (b) How many cleavages are completed in the 16-celled stage of an egg?
- (i) 12
- (ii) 8
- (iii) 4
- (iv) 3
- (c) Which part of sperm holds the haploid chromatin?
- (i) Acrosome
- (ii) Head
- (iii) Tail
- (iv) Neck

(6)

(d) The daughter cells formed as a result of cleavage of a zygote are called

(i) blastocysts

(ii) blastula

(iii) blastomeres

(iv) blastocoel

(e) The embryo is derived from

(i) uterine wall

(ii) trophoblast

(iii) inner cell mass

(iv) blastocoel

2. Write briefly on the following (any five) :

2×5=10

(a) Cell theory

(b) Polar bodies

(c) Centrolecithal eggs

(d) Zona pellucida

(e) Blastula

(f) Epiboly

(g) Incubation

(h) Primary organizer

(i) Functions of placenta

(j) Significance of parthenogenesis

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(Continued)

(7)

3. Answer any four of the following questions :

5×4=20

(a) Describe the structure of mammalian sperm with neat and labelled diagram.

(b) What is polyspermy? Describe how it is prevented in marine and aquatic species.

(c) Write a note on the epithelial-mesenchymal interactions with example.

(d) What is gastrulation? Describe the process of gastrulation in frog embryos.

(e) Describe the physiology of human placenta.

(f) Describe the role of hormones in insect metamorphosis.

(g) Describe the process of biological theories of aging.

(h) Describe how environmental chemicals act as teratogen.

4. Answer any one of the following questions : 10

(a) Describe the mechanism of fertilization in mammals with neat and labelled diagram.

7+3=10

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(Turn Over)

(8)

- (b) Describe the process of development of vertebrate eye with labelled diagram.
7+3=10
- (c) Describe the structure and functions of extraembryonic membranes in birds.
6+4=10
- (d) Describe the process of morphallactic regeneration found in *Hydra*. 10

(9)

OPTION—C

Paper : ZLG0500304C

(Immunology)

1. Choose the correct answer of the following :
1×5=5
- (a) What is the primary function of a Cytotoxic T Lymphocyte (CTL)?
- (i) Secrete antibodies to bind to pathogens
 - (ii) Engulf and digest foreign invaders (phagocytosis)
 - (iii) Kill infected cells, tumor cells and foreign grafts directly
 - (iv) Release hormones to regulate the body's metabolism
- (b) Which group of cells is classified as professional Antigen-Presenting Cells (APCs)?
- (i) Neutrophils, red blood cells and platelets
 - (ii) Hepatocytes (liver cells), fibroblasts and epithelial cells
 - (iii) Cytotoxic T cells, natural killer (NK) cells and plasma cells
 - (iv) Dendritic cells, macrophages and B lymphocytes

(c) The classical pathway of the complement system is primarily activated when its initiating component, C1, binds to which of the following molecules?

- (i) Factor B and properdin
- (ii) Bacterial cell walls directly
- (iii) Antigen-antibody complexes (immune complexes)
- (iv) Mannose-Binding Lectin (MBL)

(d) Which T-cell co-receptor recognizes antigens presented on MHC class II molecules?

- (i) CD1
- (ii) CD4
- (iii) CD8
- (iv) TCR

(e) How does a vaccine mainly provide immunity?

- (i) By neutralizing toxins already in the body
- (ii) By killing all pathogens immediately
- (iii) By producing non-specific defense cells
- (iv) By introducing antigens that help form memory cells

2. Answer/Write short notes on any *five* of the following : 2×5=10

- (a) Name the cells involved in immune system.
- (b) Differentiate between innate and adaptive immunity.
- (c) Functions of primary lymphoid organs
- (d) Differentiate between antigen and antibodies.
- (e) Differentiate between B and T cell epitopes.
- (f) Working principles of vaccines
- (g) Functions of MHC
- (h) Basic properties of cytokines
- (i) What are the components of immune system?
- (j) Write the basic concepts of immunology.

3. Answer any *four* of the following questions : 5×4=20

- (a) Write briefly about adaptive immune system with examples.
- (b) Describe how secondary lymphoid organs work in human body.

- (c) Describe the lectin or alternative pathway of the complement system.
- (d) Classify antigens with example.
- (e) Write the basic properties and functions of cytokines.
- (f) Write briefly about various types of vaccines.
- (g) What are the monoclonal antibodies? Write the types of monoclonal antibodies based on functions.
- (h) Describe briefly the components of the complement system.

4. Answer any *one* of the following questions : 10

- (a) Discuss about the antigen-antibody interactions as tools for research and diagnosis.
- (b) Explain exogenous and endogenous pathways of antigen presentation and processing.
- (c) Describe the classical pathway of the complement system.
- (d) Describe the structure of haptens and adjuvants with their functions.

2025

ZOOLOGY

(Major)

Paper : ZLG0500404

(Entomology and Fisheries)

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) Insects are characterized by having
- (i) three pairs of legs and three body regions
 - (ii) two pairs of legs and three body regions
 - (iii) three pairs of legs and two pairs of antennae
 - (iv) three pairs of legs and four body regions
- (b) Siphoning type of mouthpart is found in
- (i) mosquitoes (ii) cockroaches
 - (iii) grasshoppers (iv) butterflies

- (c) *Labeo rohita* (Rohu) is an omnivore and according to its feeding zone it is
- surface feeder
 - column feeder
 - bottom feeder
 - All of the above
- (d) In extensive fish culture, the main source of food for fish is
- artificial feed
 - natural plankton and detritus
 - mixed diet
 - chemical fertilizers
- (e) Soft bodied insects and immature life stages of the insect pests are preserved in
- 70–75% ethyl alcohol
 - glycerine
 - 5% formalin
 - All of the above

2. Answer the following questions (any five) :

2×5=10

- What is meant by a plant pest? Mention any two ways by which insects damage plants.
- Differentiate between Apterygota and Pterygota.

- Write about impact of climate change on marine fisheries.
- What do you mean by pollen basket?
- Name the different types of scales found in fishes based on their morphology and development.
- Mention the role of swim bladder in buoyancy.
- Define intensive fish culture.
- Distinguish between pen culture and cage culture.
- Name two important Fisheries Acts.
- Briefly write about the role of insects as vectors of human diseases.

3. Answer the following questions (any four) :

5×4=20

- Distinguish between Chondrichthyes and Osteichthyes with examples.
- Explain the role of insects in pollination with suitable examples.
- Write about the application of GIS and Remote Sensing in fisheries resource management.
- Discuss the biological and structural factors responsible for the success of insects on earth.

- (e) Give an account of the major byproducts obtained from the fishery industry along with their uses in various fields.
- (f) Describe the structure of the insect integument with proper diagram.
- (g) What is metamorphosis? Illustrate the role of hormones in insect moulting.
- (h) Why Zebrafish is considered as an ideal organism in scientific research?

4. Answer the following question (any one) : 10

- (a) Describe the collection and preservation techniques of insects used in entomological studies and write about their scientific importance.
- (b) Discuss in detail the structure and function of compound eyes in insects with appropriate diagrams.
- (c) What do you mean by induced breeding? Explain the techniques and methods used in induced breeding of Indian major carps. Add a note on advantages of induced breeding.
- (d) Give an account of the different types of fishing gears and crafts of India along with their mode of operation.

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