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)

(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)

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.

(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.

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

(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

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

(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

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) Secret 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

(Continued)

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.

(Turn Over)

(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.

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