Seat No. : _____

NI-156

November-2025

M.Sc., Sem.-III

504 : Zoology

(EA : Cell Biology, Cytogenetics & Molecular Biology – II)

Time : 2:30 Hours] **[Max. Marks : 70**

1. (A) Describe briefly the stages of cell signaling with an example. **7**

1. (B) Write a short note on the cAMP pathway and its role in cellular signaling. **7**

OR

1. (A) Discuss the different types of receptors and their characteristics. **7**

1. (B) Explain autophosphorylation, its mechanism and significance in signaling. **7**

2. (A) Explain the types and applications of Nanosensors. **7**

2. (B) Briefly describe the principle, mechanism and applications of DLS. **7**

OR

2. (A) Discuss the types of nanoparticles and their applications. **7**

2. (B) What is the importance of liposomes in the first FDA-approved nanodrug ? **7**

3. (A) What are MSCs ? Write down any two applications of MSCs in detail as regenerative medicine. **7**

3. (B) Write a short note: Techniques used for stem cell characterization. **7**

OR

3. (A) What is Regenerative Medicine ? Write down the application of stem cell therapy in neuronal diseases. **7**

3. (B) Write a note : Magnetic Activated Cell Sorting (MACS) and Fluorescence-Activated Cell Sorting (FACS) techniques for stem cell isolation. **7**

4. (A) Discuss the main factors or criteria necessary for effective gene therapy. **7**

4. (B) Write the advantages and limitations of DNA vaccines. **7**

OR

4. (A) Describe the various non-viral methods for delivering DNA into target cells. **7**

4. (B) Explain the various PCR variants and their applications in molecular biology. **7**

5. Answer any **seven** out of **twelve** : **14**

(1) Define an antagonist and its primary role in receptor activity.

(2) Give the full form of "Hsp90" and mention its role.

(3) What are eicosanoids and their primary function ?

(4) Which phenomenon gives gold nanoparticles their optical properties ?

(5) Name the two examples of proteins for biological nanopores.

(6) Give the full form of "LFIA" and mention its role.

(7) Define the different classes of stem cell potency.

(8) Write down the full name of ICMR and DGRI.

(9) Which density gradient medias are used for stem cell isolation ?

(10) Give the names of four commonly used gene therapy strategies.

(11) Mention the full forms of SMART and ZMW as applied in PacBio NGS technology.

(12) Name the four major platforms used in second-generation sequencing.

Seat No. : _____

NI-156

November-2025

M.Sc., Sem.-III

504 : Zoology

(EB : Endocrinology & Reproductive Technology – II)

Time : 2:30 Hours] **[Max. Marks : 70**

1. (A) Explain the genetic and hormonal mechanisms involved in sex determination of humans. **7**

1. (B) Discuss the disorders of gonadal differentiation with suitable examples. **7**

OR

1. (A) Describe the development of gonads, accessory sex organs, and the external genitalia. **7**

1. (B) Discuss the different prenatal diagnostic techniques used in detecting sex and chromosomal disorders. **7**

2. (A) Describe placental development and discuss its function as an endocrine organ. **7**

2. (B) Explain the hormonal control of lactation and changes in the mammary glands during pregnancy. **7**

OR

2. (A) Describe the hormonal regulation of the menstrual cycle and the roles of FSH, LH, estrogen, and progesterone. **7**

2. (B) Discuss menopause, its physiological effects, and hormone replacement therapy. **7**

3. (A) Describe the process of spermatogenesis and its hormonal control. **7**

3. (B) Explain the structure of sperm and various sperm tests. **7**

OR

3. (A) Explain the structure and functions of Sertoli and Leydig cells. **7**

3. (B) Describe testicular anomalies and changes in male reproductive function during puberty and senescence. **7**

4. (A) Describe the process of collection and preservation of gametes. **7**

4. (B) Explain the principle, methodology and significance of hybridoma technology. **7**

OR

4. (A) Discuss the applications of PCR and DNA sequencing in reproductive technology. **7**

4. (B) Describe the process and importance of mitochondrial replacement therapy in preventing inherited disorders. **7**

5. Answer any **seven** out of **twelve** : **14**

(1) What are Combined Oral Contraceptive Pills (COCPs) ?

(2) What are the functions of Müllerian and Wolffian ducts ?

(3) Write the roles of prostaglandins in reproduction.

(4) Define intersex.

(5) Write a note on the chemiluminescence technique.

(6) What are the non-steroidal regulators of ovarian function ?

(7) Define cryptorchidism and its effect on fertility.

(8) What is ovarian hyperstimulation ?

(9) What organ/s produce progesterone during pregnancy ?

(10) What are the components of semen ?

(11) Write a short note on embryo transfer.

(12) Differentiate between monoclonal and polyclonal antibodies.

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NI-156

November-2025

M.Sc., Sem.-III

504 : Zoology

(EC : Ecotoxicology & Wildlife Forensic – II)

Time : 2:30 Hours] **[Max. Marks : 70**

1. (A) Write a note on people associated with the wildlife crime scene. **7**

1. (B) Write a note on the documentation of a wildlife crime scene. **7**

OR

1. (A) Explain the process of collecting evidence from a wildlife crime scene. **7**

1. (B) Write a note on Remains in the aquatic environment. **7**

2. (A) Write a short note on the use of DNA barcoding in forensic entomology. **7**

2. (B) Explain the importance of analyzing insect mouthparts. **7**

OR

2. (A) Describe the setup and maintenance of a laboratory insectarium. **7**

2. (B) Discuss the key areas of forensic entomology and their significance. **7**

3. (A) Explain the surface morphology of hair for wildlife forensics. **7**

3. (B) Explain the role of CITES in restricting the use of reptilian skin products. **7**

OR

3. (A) Explain the use of the internal structure of hair for wildlife forensics. **7**

3. (B) Write a note on reptile skin products. **7**

4. (A) Write a note on the use of silica columns for the isolation of DNA. **7**

4. (B) Write a note on RFLP. **7**

OR

4. (A) Write a note on the use of mitochondrial genes in speciation. **7**

4. (B) Write a note on the Ideal layout for the PCR facility. **7**

5. Answer any **seven** out of **twelve** : **14**

(1) Briefly explain the conflicts of the leopard.

(2) What type of wildlife conflicts are observed around the Ratanmahal forest ?

(3) What type of strategies are adopted by the people living in the Sunderbans to avoid conflict with tigers ?

(4) Who is considered the father of forensic entomology ?

(5) What is Putrefaction ?

(6) What is Holometabolous ?

(7) Why is SEM used for the hair surface morphology ?

(8) Name the various pigments present in the hair.

(9) Explain the process for obtaining a hair surface impression.

(10) Explain the uncertainty surrounding the definition of species in wildlife forensics.

(11) How is lysis performed during the isolation of DNA ?

(12) What are Chaotropic salts? Why are they used for DNA isolation ?

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NI-156

November-2025

M.Sc., Sem.-III

504 : Zoology

(EE : Genetic Counselling – II)

Time : 2:30 Hours] **[Max. Marks : 70**

1. (A) Explain the technique of amniocentesis. **7**

1. (B) Write a note on the use of ultrasound in prenatal diagnosis. **7**

OR

1. (A) Write a detailed note on NIPT. **7**

1. (B) What are the goals & indications of invasive prenatal testing ? Discuss. **7**

2. (A) Write a note on the techniques used in direct testing for known mutations. **7**

2. (B) Discuss the use of linkage analysis in genetic diagnosis. **7**

OR

2. (A) Discuss : the criteria, importance, advantages & limitations of population screening. **7**

2. (B) Write a note on the techniques used in DNA profiling. **7**

3. (A) What are the different reasons for couples seeking reproductive counselling ? Discuss. **7**

3. (B) Giving examples of late-onset diseases, write a note on genetic counselling. **7**

OR

3. (A) What are the medico-legal issues in paternity testing ? Discuss. **7**

3. (B) Explain the risk factors, types and diagnostic challenges of rare diseases. **7**

4. (A) What is the importance of providing supervision to a new genetic counsellor ? Explain. **7**

4. (B) What are ELSI in clinical trials ? Discuss. **7**

OR

4. (A) What is the impact of genetic disease on patients & families ? Discuss. **7**

4. (B) Explain therapeutic cloning and the ethical issues raised in the process. **7**

5. Answer any **seven** out of **twelve** : **14**

(1) What is newborn screening ?

(2) When is the ideal time for CVS ?

(3) What is Chordocentesis ?

(4) Define : Exome sequencing.

(5) What is optical genome mapping ?

(6) Differentiate between biochemical & molecular tests.

(7) What is secondary infertility ?

(8) Give two examples of congenital disorders.

(9) Define : PGT

(10) What are direct to consumer tests ?

(11) Define : Bioethics.

(12) Define : Transgenic models

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Seat No. : _____

NI-156

November-2025

M.Sc., Sem.-III

504 : Zoology

(EF : Toxicology – II)

Time : 2:30 Hours] **[Max. Marks : 70**

1. (A) Describe the single-cell gel electrophoresis assay and its significance in genotoxicity testing. Also, write its advantages and disadvantages. **7**

1. (B) Explain the principle, method, applications, advantages and limitations of the LPO assay. **7**

OR

1. (A) Describe the principle, procedure, uses, advantages and disadvantages of the SRB assay. **7**

1. (B) Write about the sister chromatid exchange assay as a tool for genotoxicity testing. **7**

2. (A) Write a detailed note on ecotoxicogenomics along with the conceptual framework. **7**

2. (B) Enlist and explain the disease caused by exposure to contaminated food. **7**

OR

2. (A) Explain in detail the principles of toxicology. **7**

2. (B) Enlist and explain the disease caused by exposure to contaminated soil. **7**

3. (A) What is soil pollution ? Write down the types of soil pollutants, sources, environmental impact, tests, prevention, and treatment of it. **7**

3. (B) Write a note : Outdoor air pollutants. **7**

OR

3. (A) What are cyanotoxins and briefly explain their different types, environmental risk factors, health risks of exposure and monitoring and detection methods. **7**

3. (B) What is heavy metal toxicity ? Explain arsenic, lead and mercury toxicity in detail. **7**

4. (A) Give a note on "ICH Guidelines". **7**

4. (B) Explain briefly : the importance of guidelines and standards in toxicology. **7**

OR

4. (A) Give a note on one occupational disease with its cause and prevention. **7**

4. (B) Describe the preparation and purpose of a regulatory dossier. **7**

5. Answer any **seven** out of **twelve** : **14**

(1) Write the differences between programmed cell death and uncontrolled cell death.

(2) Give the complete names of the abbreviations HPRT and TFT.

(3) Give the equation used to determine cytotoxicity (%) using LDH release.

(4) The book "Silent Spring" was written by _____. The author is also known as the _____ of Environmental Toxicology.

(5) Write the full form of AhR and PAH.

(6) What is the common name of the disease Coccidioidomycosis ? What is the route of exposure for Coccidioidomycosis ?

(7) Define : Bioaccumulation.

(8) What are the methods used for the measurement of trace metals ?

(9) What is photochemical smog ?

(10) Define a “teratogen” and give its effect.

(11) What is the role of the VICH GL23 (R) guideline in veterinary drug safety ?

(12) Give the full form of ‘GAP’ and describe its role in farming operations.

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