Avinashilingam Institute for Home Science and Higher Education for Women

Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD (now MoE)
Re-accredited with A++ Grade by NAAC. CGPA 3.65/4, Category I by UGC
Coimbatore - 641 043, Tamil Nadu, India

Master's Degree Examination – May 2025
II Semester

Class : I P.G. **Time: 3 Hours**
Major : Zoology **Max. Marks: 100**

23MZOC09 Developmental Zoology

Course Outcomes:
CO1: Compare and contrast the developmental stages amongst the variety of animal phyla.
CO2: Understand the mechanism of fertilization, cleavage and gastrulation.
CO3: Describe the cellular control in the development of the embryo
CO4: Knowledge on the potential role of stem cells and its research applications
CO5: Understand the human menstrual cycle, implantation, parturition, birth defects and test tube baby

Part A **10 x 1 = 10**
Choose the Correct Answer

1. Which of the following represents the correct order of spermatogenesis? CO1K2
   a. Spermatogonia → Spermatid → Primary spermatocyte → Spermatozoa
   b. Spermatogonia → Primary spermatocyte → Secondary spermatocyte → Spermatid → Spermatozoa
   c. Spermatid → Secondary spermatocyte → Primary spermatocyte → Spermatozoa
   d. Spermatogonia → Spermatid → Spermatozoa

2. During oocyte maturation, what happens to the primary oocyte? CO1K2
   a. It divides into two secondary oocytes
   b. It becomes a mature ovum
   c. It resumes meiosis and completes the first meiotic division
   d. It becomes a polar body

3. The primary function of the cleavage stage during early development CO2K1
   a. To allow differentiation of the embryo
   b. To divide the zygote into smaller cells while maintaining overall size
   c. To form the three germ layers
   d. To initiate organ formation

4. The fate map used for in developmental biology is CO2K1
   a. To track the movement of cells during fertilization
   b. To predict the differentiation pathways of cells in the embryo
   c. To determine the genetic makeup of the embryo
   d. To visualize the location of gametes in the reproductive tract

5. How did John Gurdon's nuclear transplantation experiments in Xenopus challenge the idea of irreversible differentiation? CO3K1
   a. They showed that a differentiated nucleus could reprogram and direct complete development
   b. They proved that nuclear DNA is lost during differentiation
   c. They demonstrated that cytoplasmic factors have no role in development
   d. They showed that only embryonic cells contain genetic material

6. Which specific proteins, often acting as cytoplasmic determinants, are critical for the anterior-posterior axis formation in Drosophila embryos? CO3K1
   a. Actin and myosin b. Bicoid and Nanos
   c. Cyclins and CDKs d. Histones and chaperones

7. In Spemann and Mangold's experiment……..embryonic structure was identified as the primary organizer CO4K2
   a. Neural plate b. Notochord c. Dorsal lip of the blastopore d. Primitive streak

8. In embryonic stem cells,……..molecular mechanism allows them to remain undifferentiated CO4K3
   a. High levels of pluripotency factors like Oct4, Sox2, and Nanog
   b. Complete absence of transcriptional activity
   c. Permanent activation of differentiation genes
   d. Selective loss of chromosomes associated with differentiation

9. A key difference in the regenerative capacity of urodele amphibian compared to anurans is CO5K4
   a. Urodeles can regenerate limbs, while anurans cannot
   b. Urodeles lack a thyroid gland, so they do not undergo metamorphosis
   c. Anurans regenerate limbs faster than urodeles
   d. Anurans regenerate only in early developmental stages, while urodeles retain regenerative ability in adulthood

10. A neural tube defect like spina bifida is caused during pregnancy by deficiency CO5K1
   a. Vitamin D b. Folic acid c. Calcium d. Iron

Part B 5 x 6 = 30

Answer ALL questions

Each answer should not exceed 400 words or two pages

11.a. Summarize the functions of sertolicells in spermatogenesis. CO1K2

(or)

11.b. Describe the hormonal control of vitellogenesis. CO1K1

12.a. Explain the mechanism of fertilization in animals. CO2K4

(or)

12.b. Point out the molecular changes that occur during cleavage. CO2K4

13.a. Discuss about enucleation experiments. CO3K3

(or)

13.b. Explain the cytoplasmic control of the nucleus during development. CO3K2

14.a. Describe the competence in embryology. CO4K1

(or)

14.b. Discus the lineage restriction during cell differentiation. CO4K2

15.a. Compare the types of metamorphosis in animals. CO5K5

(or)

15.b.Demonstrate the process of menstrual cycle. CO5K2

Part C 5 x 12 = 60

Answer ALL questions

Each answer should not exceed 800 words or four pages

16.a. Compare and contrast the hormonal regulation of spermatogenesis and oogenesis. CO1K5

(or)

16.b. Explain the process of vitellogenesis and its regulation in vertebrates and invertebrates. CO1K4

17.a. Discuss the biochemical and molecular aspects of cleavage. CO2K2

(or)

17.b. Explain the method of construction of fate map and add its significance. CO2K3

18.a. Discuss nuclear transplantation and its applications in cloning and medicine. CO3K2

(or)

18.b. Explain enucleation experiments and their significance in developmental biology. CO3K4

19.a. Explain the concept of embryonic induction and its types. CO4K4

(or)

19.b. Summarize the role of signaling molecules and transcription factors in embryonic cell differentiation. CO4K5

20.a. Describe the hormonal mechanisms involved in amphibian metamorphosis. CO5K2

(or)

20.b. Discuss the causes of birth defects and their prevention. CO5K4

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