KATHMANDU UNIVERSITY
End Semester Examination
July/August 2024

Level : B.Tech.
Year : II
Time : 2 hrs. 30mins.

15 JUL 2024

Course : BIOT 208
Semester : I
F. M. : 55

SECTION "C"
[3Q. × 7 = 21 marks]

Attempt *ANY THREE* questions.

1. Differentiate between spermatogenesis and oogenesis in mammals. Illustrate the role of retinoic acid in sexual differentiation of mammalian germ cells.

2. Describe "Townes and Holtfreter experimental analysis" and explain differential adhesion hypothesis in cell sorting.

3. Describe embryonic stem cells, adult stem cells and iPS cells? Discuss the role of the transcriptional factors inducing iPSCs?

4. What are the early meristem patterning factors for the shoot meristems and roots meristems? Illustrate the negative feedback loop operating between the organizing center and the central and peripheral zones maintaining totipotency in the shoot apical meristem.

SECTION "D"
[6Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

5. What is correct, Preformation or Epigenesis? Why?

6. Discuss the concept of genomic equivalence and provide an evidence for genomic equivalence.

7. Sea urchins release their gametes into the ocean which is shared with other species. How can sperm and egg of sea urchin meet in such a dilute concentration, and how can sperm be prevented from attempting to fertilize eggs of another species?

8. Explain the role of *sex-lethal* gene in the sex determination in *Drosophila*.

9. What type of regeneration occurs in Hydra? What happens when hydra's body column is cut into several pieces?

10. Differentiate between sporophyte and gametophyte body in plants. Describe haplo-diplontic life cycle.

11. Discuss the mechanisms by which DNA methylation blocks transcription.

P.T.O.

SECTION "E"

[5Q. × 2 = 10 marks]

12. Write short notes on (***ANY FIVE***).

a. Capacitation
b. Enhancers
c. Role of *Hox* genes in animal development
d. Mullerian duct differentiation in mammalian male and female
e. Genes involved in aging or its prevention
f. ABCDE model of flower development

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Time: 30 mins.

F. M. : 20

Registration No.:

Date : 15 JUL 2024

SECTION "A"
[10Q. × 1 = 10 marks]

Choose and encircle the most appropriate option from each set of choices

1. "All animals, even mammals, originate from eggs" was first hypothesized by
   a. von Baer b. Aristotle c. Marconi Malpighi d. William Harvey

2. When proteins synthesized by one cell diffuse over small distances to induce changes in neighboring cells, the event is called a
   a. autocrine interaction b. juxtacrine interaction
   c. paracrine interaction d. endocrine interaction

3. The sheep "Dolly" was created by the fusion of
   a. sperm and ovum
   b. adult cell and mammary gland cell
   c. somatic cell cytoplasm and oocyte nucleus
   d. somatic cell nucleus and oocyte cytoplasm

4. During male development, the Wolffian duct differentiates into the following EXCEPT
   a. testis b. epididymis c. vas deferens d. seminal vesicle

5. _____ prevents β-catenin's activation of ovary-producing genes in mammals.
   a. Wnt4 b. Sox9 c. Rspo1 d. Dax1

6. Which stem cells are able to give rise to bone, cartilage, muscle, and fat lineages?
   a. Hematopoietic stem cells
   b. Bone marrow-derived mesenchymal stem cells
   c. Epithelial stem cells in the lining of the digestive tract
   d. Skin stem cells occur in the basal layer of the epidermis

7. During anterior-posterior axis specification in *Drosophila*, the _____ protein gradient extends from anterior to posterior, while the _____ protein gradient extends from posterior to anterior.
   a. bicoid, nanos b. nanos, bicoid c. caudal, hunchback d. torpedo, gurken

8. The cadherin that is highly expressed on cells of the developing central nervous system and may play roles in mediating neural signals is
   a. P-cadherin b. E-cadherin c. N-cadherin d. R-cadherin

9. The type of pollination in which bats are the pollinating agents
   a. Malacophily b. Entomophily c. Chiropterophily d. Ornithophily

10. In the sporophytic self-incompatible plants, the pollen grains produced by an S_1S_2 plants are able to pollinate a pistil with
a. S_1S_2 genotype b. S_1S_3 genotype c. S_2S_4 genotype d. S_3S_4 genotype

SECTION "B"
[10Q. × 1 = 10 marks]

Fill in the blanks.

11. Extracellular matrix that forms a fibrous mat around the mammalian eggs is called _____

12. Most "identical" twins start life with very few differences in appearance or behaviors, but accumulate differences with age. This is due to differential _____ patterns in aging twins.

13. The core of sperm axoneme consists of two central microtubules surrounded by a row of _____ doublet microtubules.

14. Salamanders accomplish epimorphic regeneration by cell dedifferentiation to form _____, an aggregation of relatively dedifferentiated cells derived from the originally differentiated tissue, which then proliferates and redifferentiates into the new limb parts.

15. Hutchinson-Gilford progeria is the result of a dominant mutation in the gene that encodes _____, a nuclear membrane protein, and these same mutations can be seen in age-related senescence.

16. Cleavage in the *Drosophila* egg creates a _____, a single cell with many nuclei residing in a common cytoplasm.

17. During morphallaxis, regeneration occurs through the _____ of existing tissues, and there is little new _____.

18. _____is a sperm-attracting chemotactic peptide isolated from the egg jelly of the sea urchin *Arbacia punctulata*.

19. Gametic meiosis occurs in animals whereas _____meiosis occurs in plants.

20. _____ is a widely used model organism in plant development.