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B.Tech DEGREE EXAMINATION, NOVEMBER 2023

Seventh Semester

18BTE418T - DEVELOPMENTAL BIOLOGY IN TISSUE ENGINEERING

(For the candidates admitted during the academic year 2020 - 2021 & 2021 - 2022)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks)

Answer **all** Questions

		Marks	BL	CO
1.	Notochord expresses the following cadherin type (A) Protocadherin (B) E-Cadherin (C) N-Cadherin (D) C-Cadherin	1	1	1
2.	Identify the following one is not a second messenger (A) Estrogen (B) Diacyl Glycerol (C) cAMP (D) Ca2+	1	1	1
3.	Identify the protein involved in Integrin and Actin linkage (A) Collagen (B) Fibronectin (C) Talin (D) Laminin	1	1	1
4.	Identify from the following structure that directly connects the cytoplasm of adjacent animal cells (A) Plasmodesmata (B) Gap junctions (C) Tight junctions (D) Middle lamella	1	1	1
5.	Identify the type of cell fate specification observed in *Drosophila melanogaster* (A) Autonomous specification (B) Conditional specification (C) Syncytial specification (D) Differentiation	1	1	2
6.	Hypoxia inducible factor 1α(HIF-1α) is stabilized by the following condition (A) Low oxygen level (B) High oxygen level (C) Normal oxygen level (D) Acidic pH	1	1	2
7.	Identify the process that involves the conversion of one mature somatic cell type to another mature cell type without an intermediate progenitor (A) Specification (B) Differentiation (C) Transdifferentiation (D) Autonomous specification	1	1	3
8.	Neural tube is observed in the following stage (A) Morula (B) Gastrulation (C) Neurulation (D) Somitogenesis	1	1	3
9.	Somites are derived from the following germ layers (A) Axial mesoderm (B) Ectoderm (C) Lateral mesoderm (D) Paraxial mesoderm	1	1	3
10.	Metanephrogenic mesenchyme secretes the following growth factors to induce ureteric bud during kidney development (A) GDNF & HGF (B) VEGF (C) PDGF (D) BMP	1	1	4

11.	Epithelial lining of glands, digestive system and respiratory tract is derived from (A) Endoderm (B) Mesoderm (C) Ectoderm (D) Lateral mesoderm	1	1	4
12.	Development of mouse paw involves the following developmental process (A) Apoptosis (B) Cell proliferation (C) Self-renewal (D) Differentiation	1	1	4
13.	Ureteric bud and the metanephrogenic mesenchyme—interact and reciprocally induce each other to form the kidney. The metanephrogenic mesenchyme tissue forms nephron (renal tubules and Bowman's capsule), while the ureteric bud becomes the following. (A) Collecting tubule (B) Bowman's capsule (C) Nephrons (D) Bladder	1	1	4
14.	Identify the source of germ layer that develops into heart (A) Mesoderm (B) Endoderm (C) Ectoderm (D) Lateral plate mesoderm	1	1	4
15.	Identify the following site which is not involved in fetal hematopoiesis (A) Yolk sac (B) Liver and spleen (C) Bone marrow (D) Thymus	1	1	5
16.	Lungs develop from the following gut region (A) Pharyngeal gut (B) Foregut (C) Midgut (D) Hindgut	1	1	5
17.	In the process of aging, the stem cell pool will be (A) Increased (B) Decreased (C) Highly proliferative (D) Dormant	1	1	6
18.	Following theory states that aging is driven by genetic process (A) Soma theory (B) Subtheory (C) Programmed theory (D) Antagonistic pleiotropy	1	1	6
19.	Mice with loss-of-function mutations of the insulin signaling pathway (A) Have increased life span (B) Have reduced life span (C) Lethal (D) No effect	1	1	6
20.	Senescence cells stays in the following cell cycle phase (A) G1 phase (B) G0 phase (C) S phase (D) G2/M phase	1	1	6

PART - B (5 × 4 = 20 Marks)

Answer **any 5** Questions

		Marks	BL	CO
21.	Explain homophilic binding of cells with a neat sketch	4	1	1
22.	Draw a neat sketch and explain autonomous specification	4	2	2
23.	Briefly discuss the function of Hox genes and their role in insect segment identity	4	2	3
24.	Provide a short note on vasculogenesis and angiogenesis.	4	1	4
25.	Explain senescence and aging	4	1	2
26.	Explain different derivatives of endoderm germ layer.	4	1	1
27.	Explain different modes of communications between cells. Name major families of paracrine factors involved in development.	4	2	1

PART - C (5 × 12 = 60 Marks)

Answer **all** Questions

		Marks	BL	CO

28.	(a) Provide a neat sketch and explain morphogen gradient in cell type specification. Discuss in detail about role of major family of paracrine factors during development.	12	2	1
	(OR)			
	(b) Explain induction and competence. Provide a neat sketch and elaborate on inductive interaction in lens formation.			
29.	(a) Write an essay on bone marrow-derived pluripotent stem cells (HSCs and MSCs) and applications.	12	2	3
	(OR)			
	(b) Elaborate on different phases of cell commitment. Provide a neat sketch and explain in detail about condition specification.			
30.	(a) Provide a neat sketch and explain reciprocal induction in mammalian kidney development.	12	1	4
	(OR)			
	(b) Provide a neat diagram and explain pattern embryogenesis in *Drosophila.* Explain the role of Hox genes in segments identity.			
31.	(a) Discuss in detail about developmental aspects of vasculogenesis and angiogenesis with appropriate sketch	12	2	5
	(OR)			
	(b) Write an essay on haematopoietic stem cell niche			
32.	(a) Elaborate the connection between insulin signaling cascade and aging.	12	3	6
	(OR)			
	(b) Write an essay on stem cells and aging process.			

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