1411E1191

Candidate's Seat No :_____

M.Sc. Sem.-3 Examination

502

C. E. & A. R. T.

November-2025

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

Q1A	Classify stem cells based on potency and developmental stage. Give suitable examples of each type.	7 Mark
Q1B	Differentiate between adult stem cells and embryonic stem cells with respect to origin, potential, and applications.	7 Mark
	OR	
Q1A	Explain the general procedure for isolation of stem cells from bone marrow, umbilical cord, and embryonic tissues.	7 Mark
Q1B	Discuss the techniques used for characterization of stem cells. Include morphological and molecular markers.	7 Mark
Q2A	Describe the process of generating induced pluripotent stem cells (iPSCs). What are their advantages and limitations?	7 Mark
Q2B	Explain the role of mesenchymal stem cells (MSCs) in tissue regeneration and repair.	7 Mark
	OR	
Q2A	What is stem cell transplantation? Differentiate between autologous and allogenic transplantation.	7 Mark
Q2B	Explains the procedure, indications, and risks associated with bone marrow stem cell transplantation.	7 Mark
Q3A	Explain the composition and role of inorganic salts in embryo culture media. How does osmolarity affect embryo development?	7 Mark
Q3B	Explain how amino acids regulate cellular homeostasis and embryonic growth in culture media.	7 Mark
	OR	
Q3A	Explain the role of antioxidants and chelating agents in maintaining cellular function and preventing oxidative stress in embryo cultures.	7 Mark
Q3B	Describe the role of pH and buffering systems in embryo culture media using Handerson-Hasselbach equaltion. Mention common buffers used and their importance in maintaining culture stability.	7 Mark

P.T.O

Q4A	Compare single-step and sequential culture systems. Discuss their advantages, disadvantages, and applications in human IVF laboratories.	7 Mark
Q4B	Explain how in vitro embryo culture conditions can influence epigenetic modifications. Discuss their implications for embryo health and long-term development	7 Mark
	OR	
Q4A	Discuss the importance of temperature, humidity, and CO_2 control in embryo incubators. How do deviations from optimal conditions affect development?	7 Mark
Q4B	Explain how culture media formulations have evolved over time to mimic the in vivo environment of the female reproductive tract.	7 Mark

Q5	**Answer the following questions (Any Seven)**	**14 Marks**
1.	Name two essential amino acids critical for embryo development.	
2.	Mention two macromolecules used in embryo culture media and their purpose.	
3.	What is the role of antioxidants in embryo culture?	
4.	What is embryo co-culture and why is it used?	
5.	State one advantage of low-oxygen culture conditions.	
6.	What is the purpose of mineral oil overlay in embryo culture dishes?	
7.	What is stem cell banking and why is it important?	
8.	Write two key markers used for identifying stem cells.	
9.	Name two Indian or international stem cell banks.	
10.	What are induced pluripotent stem cells (iPSCs)?	
11.	Mention two transcription factors involved in iPSC generation.	
12.	Draw the hierarchy of stem cell potency.	
13.	Differentiate between autologous and allogenic stem cell transplants.	
14.	Mention two diseases that can be treated using stem cell therapy.	