

- (c) "Transgenic animal are Bioreactors for large scale production of substances of human welfare and improvement of production of traits" Justify the statement with examples.

(1 + 3) + (1 + 3) + 4 = 12

7. (a) Describe the steps of IVF with label diagram.
 (b) What are chimera? Define gene targeting and gene trapping.
 (c) Describe four types of Inhibitory "Anti-Gene" expression strategies as therapeutic agents.

3 + (1 + 2) + (4 × 1.5) = 12

Group - E

8. (a) What is organ culture? objective of it? How does it differ from organotypic culture?
 (b) What are the limitations of using adult stem cell?
 (c) What is regenerative medicine? How stem cells can be used as a source of neurons for transplantation in Parkinsonism's disease?

(1 + 3) + 3 + (1 + 4) = 12

9. (a) What is DNA vaccine? Write the mechanism for functioning of DNA vaccine. What are the advantages of DNA vaccine?
 (b) Describe eukaryotic expression vector system. What is the advantage of expression of eukaryotic gene in eukaryotic expression vecotor compared to prokaryotic expression vector?

(1 + 3 + 2) + (4 + 2) = 12

ANIMAL CELL CULTURE AND ANIMAL BIOTECHNOLOGY (BIOT 4101)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group - A (Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) For culturing, plasma from the adult chicken is preferred to mammalian plasma because
 (a) it forms a clear and solid coagulum even after dilution
 (b) it is too opaque
 (c) it doesn't produce solid clots
 (d) it forms a semi solid coagulum.
- (ii) Mammalian cells in active growth phase were seeded at a density of 1×10^5 cells/ml. After 72 hours, 1×10^6 cells/ml were obtained. The population doubling time of the cells in hours is _____.
 (a) 2 (b) 200 (c) 21 (d) 210.
- (iii) Disaggregating of cells can be achieved by
 (a) physical disruption (b) enzymatic digestion
 (c) treating with chelating agents (d) all of the above.
- (iv) Accumulation of lactate leads to
 (a) increase in pH
 (b) no change in pH
 (c) reduction in the pH of culture hence loss of cell viability
 (d) no loss of cell viability
- (v) Cell suspension is a non-Newtonian fluid of the type
 (a) Bingham plastic (b) pseudo plastic
 (c) dilatant (d) cassan equation.

- (vi) Which one of the following properties of the myeloma cells is used in the hybridoma technology to generate monoclonal antibody?
 (a) lack of thymidylate synthase
 (b) over-expression of hypoxanthine-guanine phosphoribosyltransferase
 (c) over-expression of inosine 5'-monophosphate cyclohydrolase
 (d) lack of hypoxanthine-guanine phosphoribosyltransferase.
- (vii) Monod model behaves as a reaction of the ----- type for small substrate conc.
 (a) First order (b) zero order
 (c) second order (d) pseudo first order.
- (viii) Which of the following is NOT an accepted method for sterilization?
 (a) Autoclaving (b) X-rays
 (c) Gamma rays (d) UV rays.
- (ix) For making transgenic animals in fertilized egg the best place to insert trans-gene is in
 (a) female pronuclei (b) cytoplasm,
 (c) male pronuclei (d) cleavage cell.
- (x) Which one of the following techniques is generally used to produce transgenic animals?
 (a) Processed mRNA containing only exons are introduced into blastocyst stage embryo.
 (b) Entire foreign nucleus is introduced in enucleated unfertilized egg.
 (c) Desired DNA is injected into fertilized eggs followed by implantation of embryo in foster embryo in a foster mother.
 (d) cDNA of desired gene is introduced into animal embryos and implanted in a foster mother.

Group - B

2. (a) What are the different types of methods used for disaggregation of animal tissue or organ fragment? What are different enzymes used for disaggregation of animal tissue or organ fragment?
- (b) Describe briefly the procedure involved in warm and cold trypsinisation for the preparation of primary culture from animal tissue or organ fragment. Write three important advantages of cold trypsinization over warm trypsinization.
- (c) Write the principle of MTT assay for testing of cytotoxicity of chemical X for animal cell culture.

(2 + 2) + 5 + 3 = 12

3. (a) Write names of common contaminants in animal cell culture. How these contaminants are prevented in animal cell culture?
- (b) Describe the techniques of detection of contamination of mycoplasma in animal cell culture.
- (c) Describe the growth cycle of cultured of animal cell with labelled diagram.

(2 + 2) + 4 + 4 = 12**Group - C**

4. (a) A 10 liter (height/dia = 1.40), 500 rpm, 1.0 vvm animal cell culture bioreactor is to be scaled up to 100 liter on similar geometry equal aeration basis. Compute the speed of agitation in the scaled up vessel.
- (b) Animal cells are growing in a 5 m³ CSTR with blood serum as feed. Feed substrate conc., $S_0 = 20 \text{ kg/m}^3$. Animal cell culture have the following characteristics: $\mu_{\max} = 0.45 \text{ hr}^{-1}$, $K_s = 0.8 \text{ kg/m}^3$, $Y_{x/s} = 0.8$. What feed flow rate is required to achieve 90 % conversion of the substrate?
- (c) Describe the main features of perfusion bio reactor used for animal cell culture with a label diagram.

4 + 4 + 4 = 12

5. A simple batch operation of animal cell culture is carried out in a BOD incubator. Batch operation data are tabulated below-

Time (hr)	0	2	4	8	10	12	14	16	18
X (gm/L)	0.20	0.211	0.305	0.98	1.77	3.2	5.6	6.15	6.2
S (gm/L)	9.23	9.21	9.07	8.03	6.8	4.6	0.92	0.077	00

A simple Monod model is to be fitted. Find out the parameters of the model.

12**Group - D**

6. (a) Write the names two techniques of animal cloning. Describe one technique of animal cloning which based on stem cell technology.
- (b) Describe the techniques of production of knock-out mice using homologous recombination discovery, which brought Nobel Prize in Physiology or Medicine 2007 to Mario R. Capecchi, Sir Martin J. Evans and Oliver Smithies.