B.TECH / BT /7TH SEM/ BIOT 4101/2017
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
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> 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) Trypan blue dye-exclusion is based on the concept that
       (a) viable cells are permeable to the dye
       (b) only the mitochondria of the viable cells take up the dye
       (c) dead cells are permeable to the dye
       (d) none of these.

   (ii) Range of osmolarity tolerated/accepted in mOsm/Kg of H_2O by mammalian cells is
       (a)150-300   (b)280-360   (c)300-325   (d)360-400.

   (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) Phenol red, commonly present in animal cell culture medium and it becomes
       (a) Yellow at pH = 6.5   (b) red at pH = 7.4
       (c) both (a) and (b)   (d) none of these.

   (vi) In animal cell culture medium serum provides
       (a) various salts   (b) hormones and growth factors
       (c) complex carbohydrates   (d) most of the lipid compounds.

   (vii) The cell line used for the production of recombinant polio vaccine is
       (a) Dog kidney cell line   (b) CHO cell line
       (c) Primate kidney cell line   (d) Mouse fibroblast cell line.

   (viii) Monod model is mathematically represented by an equation of the type
       (a) linear   (b) hyperbolic   (c) prabolic   (d) elliptical.

   (ix) Increased genetic diversity following extended time in a tissue culture is a problem called
       (a) gene alteration   (b) temporal modification
       (c) somaclonal variation   (d) culture shock.

   (x) In an animal cell reactor, cellmicrocarrier interaction can be reduced by
       (a) reducing impeller speed   (b) increasing viscocity
       (c) both (a) and (b)   (d) none of these.

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.

   (c) Write three important advantages of cold trypsinization.
                                                    (2+ 2)+ 6 + 2 = 12

3. (a) Compare the characteristics features of normal and transformed animal cells?

   (b) What are different condition required for growth of cell in animal cell culture?

   (c) Write the names of different instruments required for animal cell culture lab. Describe the features of three special unique instruments required for animal cell culture lab, with label diagram.
                                                    2 + 2 + (2 + 2 × 3) = 12

Group - C

4. (a) The following set of growth data is available for an animal cell:

t, hrs	0.0	0.5	1.0	1.5	2.0
X,dry (gm/L)	0.10	0.15	0.23	0.34	0.51

The above set of data is to be fitted to the model given below:

$dX/dt = kX(1-\beta X)$

where, $\beta = 1/X_S$ and X_S is the cell mass concentration in the stationary phase. Evaluate the constants k and β.

(b) How do you modify a conventional stirred tank reactor to be used for the fermentation of shear sensitive animal cells?

8 + 4 = 12

5. (a) In a fluidized bed bio-film reactor of average film thickness L = 0.5 mm, carbon compounds are to be removed with the help of bio-film reactor. The feed flow rate and the concentration of carbon compounds in the feed are F = 2 L/hr, and S_0 = 2000 mg/L. The diameter of the column, D = 10 cm. The kinetic constants of the cell fermentation r_m= 50 mg / cm³.(hr) and k_S= 25 mg/cm³. The specific surface area of the biofilm in the reactor is a = 2.5 cm²/cm³. Assume first order kinetics and effectiveness factor η = 0.7.

Determine the required height of the column, if the effluent carbon concentration S = 100 mg/L.

(b) Explain the role of microcarrier bead density, bead rigidity and bead porosity in animal cell culture.

8 + 4 =12

Group - D

6. (a) What is superovulation? How it is induced?

(b) Write the names different biopharmaceutical produced from transgenic animals.

(c) Describe the three major types of method of introduction of exogenous DNA into animal cells with label diagram.

(1 + 2) + 4 + 5 = 12

7. (a) What is gamete intrafallopian transfer (GIFT)? Describe each steps of GIFT with diagram.

(b) Describe the steps of generation of tissue specific knockout mice.

(c) Describe four basic types of gene expression vectors used to modulate gene expression.

(1 + 3) + 4 + 4 = 12

Group - E

8. (a) What is organ culture? What is its objective? How does it differ from organotypic culture?

(b) What are the limitation 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) Write the process of production of a subunit vaccine of tuberculosis.

(b) Describe the method of production of growth hormone using cell culture.

(c) Describe the method of production of monoclonal antibody by hybridoma technology.

4 + 4 + 4 =12