Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B. Tech (BT)/SEM-7/BT-701/2011-12

2011
ANIMAL CELL CULTURE & MOLECULAR MODELLING

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) During passaging, for detachment of adherent cells we generally use

      a) Trypsin and EDTA b) Collagenase

      c) DNase and EDTA d) EDTA.

   ii) One example of Balanced salt solution which can maintain the desired pH when equilibrated with air is

      a) EBSS b) HBSS

      c) ESSS d) PBS.

iii) Selection of cell fusion hybrid cells after a (rodent × human) fusion can be achieved by

a) HGPRT b) TK

c) PEG d) Ouabain.

iv) Which of the cell adhesion mechanisms is calcium dependent ?

a) CAM

b) Cadherin

c) Integrin

d) Transmembrane glycoprotein.

v) Prions can be removed from cell culture media by using virus filters having pore size of

a) 0·1 μm b) 0·4 μm

c) 0·2 μm d) 15 nm.

vi) Which of the following is an ECM ?

a) Polyglucose b) Lignin

c) Geniticin d) Matrigel.

vii) An advantage of hidden markov model (HMM) over profile is

a) Probability modelling in HMM depends on the Boltzmann distribution

b) Insertion and deletion gap penalties are unequal

c) Probability modelling in HMM has more predictive power

d) HMMs cannot be used for protein family classification.

viii) Which of the following is true about secondary structure prediction ?

a) Chow-Fasman b) PAM

c) BLOSUM d) PSSM.

ix) Protein secondary structure prediction algorithms typically calculate the likelihood that a protein

a) Forms α helices

b) Forms α helices and β sheets

c) Forms α helices, β sheets and coils

d) Forms α helices, β sheets, coils and multimers.

x) To predict 3 D structure from sequence in the absence of homology is

a) Homology modeling

b) Ab-initio structure modeling

c) Threading

d) Model verification.

xi) Fold recognition is also known as

a) Comparative modeling

b) Docking

c) Threading

d) HMM.

xii) QSAR is a statistical method used to determine how the structural features of a molecule are related to

a) Chemical activity b) Physical activity

c) Biological activity d) None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Write short notes on the following : 3 + 2
   a) Mycoplasma
   b) Lipofection
3. Explain how perfusion reactor functions to achieve the best performance in the animal cell reactor with respect to product formation.
4. a) Write the names and concentrations of common antibiotics used in animal cell culture medium.
   b) What are the advantages and disadvantages of SFM in animal cell culture ? 2 + 3
5. What are the two stepwise requirements for effective fold recognition by threading ? Briefly outline in quantitative terms the steps for an effective scoring method in threading. 2·5 + 2·5
6. Define a quantitative structure-activity relationship (QSAR). Use an actual example of a drug to define a specific QSAR equation with appropriate definition of the terms. 2 + 3
7. Write Neural Network approach to predict secondary structure of a protein.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

8. a) What type of thermodynamic properties do molecular simulations like Monte Carlo and molecular dynamics calculate that are not accessible by static molecular mechanics approaches ?

   b) Using two examples, one of the protein-ligand and the other of a protein-nucleic acid interaction, explain how solvent accessible/buried area calculations of such interactions assist in lead modification aspects of drug design.

   c) Morphine has been used as a regulated painkiller but is also an addictive drug. Use the structure of morphine to briefly elucidate itemwise how lead modification methodologies have been used to dissect analgesic action from addictive pharmacology. 4 + 6 + 5

9. Write short notes on any *three* of the following : 3 × 5

   a) Monte Carlo

   b) Force fields

   c) Protein-ligand interaction

   d) Cold trypsinization

   e) DNA fingerprinting

10. a) What is the objective of protein structural classification ?
    b) Describe SCOP classification with one example.
    c) What is the goal of docking ?
    d) Write down the different technologies that are used in lead identification ?
    e) What is the full form of HMM ?
    f) Write down the criteria for synthesizing drugs.

    3 + 4 + 2 + 3 + 1 + 2

11. a) What is primary culture of animal cells ?
    b) What is subculture or passage ?
    c) Write short notes on the following :
        i) Clonal culture
        ii) Organ culture
        iii) Histotypic culture
    d) Briefly explain total and percent viable cells by Haemocytometer counting.
    e) Why serum is used during trypsinization of animal tissue culture ?

    2 + 2 + 2 + 2 + 2 + 3 + 2

12. a) How are you going to freeze cells grown in suspension culture ?
    b) Write down the procedure for thawing and recovering cells from a frozen sample.
    c) Briefly explain the advantages and disadvantages of monolayer culture over suspension culture.
    d) Write a short note on microcarrier culture. 2 + 5 + 5 + 3

13. a) How could you define a Basal Media ?

b) Name one most commercially available pH indicator used in culture medium and its principal drawbacks.

c) Glucose is being utilized as the major energy source used by culture cells, but still it is being substituted by galactose and fructose in several cases; why ?

d) Although antibiotics are used widely for protection in laboratory-scale tissue culture, still their uses are restricted in industrial-scale cell culture; why ?

e) What is Serum Free Medium (SFM) for animal cell culture ?

f) Which component of the serum prevents proteolytic damage to cells and their products ?

g) Write two main approaches generally followed in designing a serum free medium. 2 + 2 + 2 +2 +2 + 2 + 3