



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B. Tech ( BT )/SEM-7/BT-703D/2011-12**

**2011**

**MOLECULAR MODELLING AND DRUG DESIGN**

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 × 1 = 10

- i) Of the following which is NOT a minimization algorithm ?
  - a) Steepest descent
  - b) Conjugate gradient
  - c) Newton-Raphson
  - d) Modified Neglect of Diatomic Overlap.
- ii) The Boltzmann factor is given by
  - a)  $\exp ( - E / RT )$
  - b)  $\exp ( - x^2 )$
  - c)  $\exp ( - kT )$
  - d) none of these.



iii) Which of the following is NOT a force field ?

- a) AMBER                                      b) CHARMM
- c) OPLS                                        d) GEO.

iv) In Lipinski rule the molecular weight varies

- a) 350 to 500                                  b) 100 to 150
- c) 400 to 500                                  d) 230 to 250.

v) In drug design IND means

- a) International New Drug
- b) Investigation of New Disease
- c) Investigational New Drug
- d) Indian New Disease.

vi) In drug design MTD means

- a) Maximum Treated Dose
- b) Maximum Tolerated Dose
- c) Maximum Time Does
- d) Measurement to Treated Dose.



- vii)  $IC_{50}$  means
- a) concentration of a drug that is required for 50 per cent inhibition in an assay
  - b) concentration of a drug that is required for 50 per cent activation in an assay
  - c) 50 mg of a drug that is required for 50 per cent inhibition in an assay
  - d) 50  $\mu$ g of a drug that is required for 50 per cent activation in an assay.
- viii) A pharmacophore is defined as
- a) a molecule that carries essential features responsible for a drug's biological activity
  - b) a molecule without biological activity
  - c) a molecule that carries non-essential biological information
  - d) a kinetically fast reacting molecule.
- ix) A method for protein structure determination from which data is incorporated into the Brookhaven protein data bank is
- a) Nuclear magnetic resonance spectroscopy
  - b) Fluorescence spectroscopy
  - c) Infrared spectroscopy
  - d) Atomic force microscopy.



x) Generally in Phase 1 the number of total human subjects is in the range of

- a) 20 to 80                                      b) 50 to 100
- c) 200 to 300                                      d) 500 to 1000.

xi) 'QSAR' stands for

- a) Quantum Structure Action Relationship
- b) Quantitative Structure Activity Relationship
- c) Quantum Similarity Activity Relationship
- d) None of these.

xii) Lead is a

- a) Molecule with no property
- b) Starting molecule of docking
- c) Molecule with biological and pharmacological property
- d) A software tool.



**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following.

3 × 5 = 15

2. What is meant by 'ADME' of a drug ? How is it useful in drug-design ?  
2 + 3
3. Define the following :
  - a)  $ED_{50}$
  - b)  $LD_{50}$
  - c) Pharmacokinetics
  - d) Pharmacodynamics
  - e) QSPR.
4. Briefly describe the advantages and disadvantages of QSAR in drug-design.  
 $2\frac{1}{2} + 2\frac{1}{2}$
5. What is a Lennard-Jones potential ? What are some of the microscopic parameters that are obtained from simulation results that are then compared to experimentally obtained results.  
2 + 3
6. Briefly describe the 'Steepest descent' method used in energy minimization.

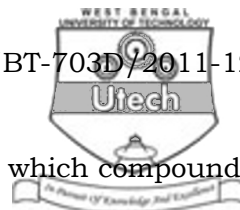


**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. "Protein stability and folding plays an increasingly important role in the search of biopharmaceuticals (i.e. protein-based drugs)." Elaborate on the statement with the use of the following 3 informational categories :
- (i) Ramachandran-Sasisekharan plot
  - (ii) The phenomenon of protein folding itself
  - (iii) The hydrophobic effect.  $5 + 5 + 5$
8. a) Give a step-wise description of the Metropolis Monte Carlo algorithm. What makes this algorithm unique ?
- b) To what types of biological system processes have Monte Carlo simulations been successfully applied ?
- c) What is simulated annealing and what is it ideally suited for ?
- d) What are the factors that decide choice between Monte Carlo and molecular dynamics for carrying out a molecular simulation ?  $5 + 2 + 4 + 4$
9. a) What is one of the biggest advantages of combinatorial chemistry over classical synthetic chemistry ? Elucidate with an example from medicinal chemistry.



- b) Briefly describe the three methods by which compounds in a combinatorial chemical library are identified. 6 + 9
10. Ludi is one of the approaches of De novo Drug designing.
- a) Briefly describe what methodology it follows.
- b) Briefly enumerate the functional steps of Ludi.
- c) What are the major differences of Ludi and Ludi/CAP methods ? 4 + 8 + 3
11. a) Name four physico-chemical parameters and their mathematical representation that can be referred to as molecular descriptors specific to drug-design.
- b) Use a flow-chart to depict the drug discovery process.
- c) Briefly describe how clinical trial of a drug is conducted.

6 + 4 + 5

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