Question Paper

Exam Date & Time: 16-May-2024 (10:00 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

Computer Aided Drug Design [PCH-BP807ET-S1]

Marks: 75 **Duration: 180 mins.**

I Multiple Choice Questions (MCQs)

Answer all the questions. Section Duration: 30 mins

1) What is the primary goal of computer-aided drug design (CADD)? (1)

- To replace experimental drug discovery entirely
- To assist and enhance the drug discovery process
- To reduce the cost of drug manufacturing
- To eliminate the need for clinical trials

2) Which of the following is an example of a classic bioisosteric replacement? (1)

- Replacement of a carboxylic acid with a hydroxamic acid
- Replacement of a primary amine with a tertiary amine
- Replacement of a ketone with an ester
- Replacement of an alkene with an alkyne

3) Which of the following is NOT a common technique used in CADD? (1)

- Molecular docking
- Virtual screening
- X-ray crystallography
- Quantitative structure-activity relationship (QSAR) analysis

4) Which software is commonly used for molecular modeling and simulation in CADD? (1)

- Microsoft Excel suite
- Power point suite
- Schrödinger Suite
- Adobe Photoshop suite

5) What does QSAR stand for in the context of CADD? (1)

- Quantitative Structure-Activity Relationship
- Qualitative Structure-Activity Regulation
- Quantum Structure-Activity Relationship
- Quality Structure-Activity Relation

6) What is molecular docking? (1)

- A technique used to visualize protein structures
- A method for predicting the binding orientation of small molecules to a protein target
- A process for synthesizing new chemical compounds

A way to measure the binding affinity of protein-ligand interactions

7) Which of the following is NOT a step in the process of molecular docking? (1)

- Ligand preparation
- Target protein selection
- Virtual screening
- Cell culture experimentation

8) What is analogue-based drug design? (1)

- A method of drug discovery involving the use of digital simulations
- A method of designing drugs based on chemical analogues of known active compounds
- A process for analyzing gene expression data to identify drug targets
- A technique for directly synthesizing new drugs from scratch

9) Analog-based drug design involves: (1)

- Designing drugs with entirely novel chemical structures
- Modifying existing drugs to improve their properties
- Developing drugs from natural sources only
- Designing drugs based solely on computational simulations

10) Which of the following is NOT a strategy for modifying chemical analogues in drug design? (1)

- Adding functional groups to enhance binding affinity
- Removing aromatic rings to decrease lipophilicity
- Changing the stereochemistry to improve metabolic stability
- Increasing molecular weight to decrease bioavailability

11) Which computational method predicts the biological activity of a molecule based on its chemical structure? (1)

- Molecular dynamics
- Docking
- QSAR
- Pharmacophore

12) What does the partition coefficient (P) measure? (1)

- The solubility of a solute in a particular solvent
- The distribution of a solute between two immiscible phases
- The rate of diffusion of a solute across a membrane
- The concentration of a solute in a solution

13) In molecular docking, what does the ligand typically represent? (1)

- The target protein
- The solvent
- The drug molecule
- The cell membrane

14) What is the purpose of the Hansch equation? (1)

To predict the color of a compound
To predict the biological activity of a compound based on its structure
To predict the solubility of a compound in water
To predict the melting point of a compound

15) What does symbol P represents in QSAR (1)

pH
Plasma concentration
Partition coefficient
Ionization constant

16) The negative value of σ of a substituent indicates (1)

It is neutral
It is electron withdrawing
It is electron donating
It is hydrophobic

17) What does MR represent in a QSAR equation (1)

Molar refractivity, a steric factor
Substituent hydrophobicity
Partition coefficient
Ionization constant

18) Bioisosteres have (1)

Same physical properties
Same chemical properties
Similar biological properties
All the above

19) What is the significance of ADME profiling in drug discovery? (1)

It reduces the cost of clinical trials
It accelerates the synthesis of new chemical compounds
It helps in optimizing drug candidates for better therapeutic efficacy and safety
It eliminates the need for animal testing

20) Which type of information is commonly found in ADME databases? (1)

Protein sequences
Chemical structures of drugs
Clinical trial outcomes
Gene expression profiles

II Long Answers

Answer all the questions.

1) A. With a case study explain the development of antihypertensive drugs analogues to Clonidine using bio-isosteric replacement strategy. 5M (10)
B. Briefly explain various methods used in drug discovery 5M

2) A. What is Force field? Mention the various force field software used along with their applications. List out three methods of confirmation generations and explain them to anyone. 5M (10)

B. Mention any three databases and three software used in drug discovery. What are local energy minima and global energy minima? 5M

III Short Answers

Answer all the questions.

1)	Explain Rule of Five and other rule-based filters for lead likeness and drug likeness screening.	(5)
2)	How is Bioinformatics useful in new drug discovery program? Explain	(5)
3)	Explain Molecular Dynamics and Molecular Mechanics in CADD.	(5)
4)	What is HTS and Combinatorial chemistry? Give their principle and application.	(5)
5)	Explain the steps involved in QSAR studies. Write the equation and explain the co-ordinates for linear relationship between logP and log1/C.	(5)
6)	Explain various stages of protein-ligand docking.	(5)
7)	Explain π- substitution constant as an important parameter in QSAR studies	(5)

-----End-----