BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – M.Sc.(BT)-2025
Course Name – Drug Design
Course Code - MBT20406A
(Semester II)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Identify the primary factor responsible for the transition from empirical drug discovery to rational drug design.
   a) Advances in formulation science
   b) Development of high-throughput screening
   c) Understanding of molecular targets and structure–activity relationships
   d) Increased regulatory requirements

(ii) Indicate the historical event that most significantly accelerated modern drug discovery?
   a) Discovery of antibiotics
   b) Development of molecular docking
   c) Introduction of combinatorial chemistry
   d) Human Genome Project

(iii) Identify the strategy commonly used to improve conformational rigidity in peptidomimetics.
   a) Increasing peptide length
   b) Removal of side chains
   c) Addition of hydrophilic carriers
   d) Incorporation of non-natural amino acids

(iv) Identify the drug design approach primarily associated with retrometabolic drug design.
   a) Soft drugs
   b) Hard drugs
   c) Prodrugs
   d) Mutual prodrugs

(v) Identify the best definition of a drug target.
   a) Any chemical compound causing a biological response
   b) A biological entity involved in disease pathology
   c) A therapeutic formulation
   d) A clinical symptom

(vi) Indicate the main purpose of using siRNA in target validation.
   a) Activate gene expression
   b) Silence specific mRNA
   c) Enhance protein stability
   d) Improve drug solubility

(vii) Recall the stage of the drug discovery pipeline that precedes hit discovery.
   a) Lead optimization
   b) Preclinical studies
   c) Target identification and validation
   d) Clinical trials

(viii) Point out the role of receptor antagonists in pharmacological responses.

a) By increasing receptor synthesis
b) By blocking ligand–receptor interaction
c) By enhancing receptor internalization
d) By activating downstream signaling

(ix) Compare ion channel blockers with receptor antagonists in terms of target specificity.

a) Ion channels are less specific
b) Receptors lack defined binding sites
c) Receptor antagonists block electrical signals
d) Ion channels directly alter membrane conductance

(x) Analyze the consequences of poor target validation on late-stage drug failure.

a) Increased assay throughput
b) High attrition due to lack of efficacy
c) Improved patient compliance
d) Faster regulatory approval

(xi) Analyze the resistance challenges associated with gp41 inhibitors.

a) Host toxicity
b) Poor oral bioavailability only
c) Enzyme redundancy
d) Viral mutations altering fusion domains

(xii) Assess the translational success of gp41 inhibitors in HIV therapy.

a) Limited due to instability
b) Clinically effective in combination therapy
c) Ineffective in humans
d) Restricted to in vitro use

(xiii) Select the statement that best describes the concept of transition state stabilization.

a) Stabilizing enzyme structure
b) Stabilizing substrate ground state
c) Preferential binding to transition state
d) Preventing enzyme–substrate complex

(xiv) Identify the hallmark of mechanism-based enzyme inactivation.

a) Immediate enzyme blockade
b) Enzyme-catalyzed formation of reactive species
c) Competitive binding
d) pH-dependent inhibition

(xv) Apply enzyme inhibition principles to protease drug design.

a) Target substrate only
b) Block active site catalysis
c) Increase protease expression
d) Destabilize protein folding

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Define a prodrug and state any two objectives of prodrug design. (3)
3. Illustrate the concept of a carrier-linked prodrug with a suitable example. (3)
4. Explain the importance of target validation in the drug discovery process. (3)
5. Evaluate the therapeutic index as a criterion for drug safety. (3)
6. Analyze the advantages of irreversible inhibitors over reversible inhibitors in drug design. (3)

OR

Correlate the measurements of drug potency and efficacy with pharmacological responses in pharmacodynamics. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Outline how drug discovery transitioned from ancient serendipity to modern evidence-based scientific research. (5)
8. Explain how nineteenth-century biological theories established the foundations for targeted drug therapies. (5)
9. Critically assess soft drug design as a safer alternative to prodrug strategies and analyze the pharmacokinetic advantages of soft drugs over hard drugs. (5)
10. Compare carrier-linked and bio-precursor prodrugs, and critically evaluate the classification of Tolmetin–glycine as a bipartite carrier-linked prodrug. (5)
11. Describe the concept of essential medicines and explain the importance of the National List of Essential Medicines (NLEM). (5)

12. Analyze the concept of prodrug design and explain how different prodrug strategies are used to overcome pharmacokinetic and pharmacodynamic limitations of drug molecules. (5)

OR

Analyze the role of peptidomimetics in overcoming the pharmacokinetic limitations of peptide drugs. (5)

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