KUMARAGURU
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M.TECH DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

First Semester

BIOTECHNOLOGY

P18BTE0008**:** Drug Delivery Principles and Engineering

COURSE OUTCOMES

CO1: Understand the principle of pharmacokinetics, Bioavailabilty & Elimination

CO2: Understand the basic requirement on the material for drug delivery

CO3: Classify the different types of materials used for drug delivery

CO4: Evaluate the infection associated with the various delivery routes

CO5: Understand the principles of drug implants

CO6: Identify the suitable vaccines, drug delivery routes and related responses

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Find the sequence of biopolymer degradation   CO1   [K3]

   1.   Assimilation

   2.   Bio-ragmentation

   3.   Mineralization

   4.   Bio-deterioration

   a)   2-3-4-1   b)   1-3-2-4

   c)   3-4-2-1   d)   4-2-1-3

2. Which one of the following is not an objective of bioavailability studies?   CO1   [K2]

   a)   Control the quantity of the drug to be   b)   Determination of the influence of
        administered   excipients, patient-related factors, etc

   c)   Development of new formulations of   d)   Primary stages of development of
        the existing drugs   suitable dosage form for new drug

3. Which of the following will be a pharmaceutical application of prodrugs?   COL   [K2]

   a)   Enhancement of bioavailability   b)   Reduction of toxicity

c) Improvement of odour   d) Site-specific drug delivery

4. Match the biopolymers with their application.   CO2   [K₃]

Biopolymers	Applications
A. Polylactic acid (PLA)	i. Compost bag, consumer packaging
B Polyhydroxybutyrate	ii. Cigarette filters, Wound dressing
C. Cellulose acetate	iii. Medical implants
D. Polyhydroxy alkanoate	iv. Bone plates, Bone screws etc.,

a)   A-ii   B-i   C-iii   D-iv   b)   A-iii   B-iv   C-ii   D-i

c)   A-iv   B-i   C-iii   D-iii   d)   A-iii   B-ii   C-i   D-iv

5. Which of the following drugs cannot be given as transdermal administration?   CO3   [K₂]

a) Drugs with very short half-lives   b) Drugs with narrow therapeutic indices

c) Easy removal and termination   d) Drugs against peptic ulcer

6. …….. is a network of polymer chains that are hydrophilic.   CO3   [K₂]

a) Hydrogel   b) Alginate

c) Starch   d) Amylose

7. Assertion (A): Liposomes are small artificial vesicles of spherical shape that can be   CO4   [K₃] created from cholesterol and natural non-toxic phospholipids.
Reason (R): Due to their size and hydrophobic and hydrophilic character (besides biocompatibility), liposomes are promising systems for drug delivery.

a) Both A and R are true and R is the correct explanation of A   b) Both A and R are true but R is not a correct explanation of A

c) A is true but R is false   d) A is false but R is true

8. …….. is one of the most important aspects of biomaterial-tissue interactions.   CO4   [K₂]

a) Bioavailability   b) Biocompatibility

c) Bioequivalence   d) Bioluminescence

9. The current problems in drug delivery are   CO5   [K₄]

   1. High initial release

   2. Low initial release

   3. Loss of bioactivity

   4. Delivery to incorrect sites

a) 1 and 4 only   b) 2 and 3 only

c) 1, 3 and 4 only   d) 1, 2 and 3 only

10. What kind of disease can be cured with the help of gene therapy?   CO6 [K₂]

    a) Infectious   b) Hereditary

    c) Physiological   d) Acute

PART B (10 x 2 = 20 Marks)

11. What are the factors that affect pharmacokinetics?   CO1 [K₂]
12. Define bioavailability.   CO1 [K₁]
13. Provide the advantages of polymer-drug conjugates   CO2 [K₂]
14. Distinguish between synthetic biopolymer and natural biopolymer   CO2 [K₄]
15. List the advantages and disadvantages of bio-degradable system   CO3 [K₂]
16. Why is liposomes used in drug delivery?   CO3 [K₃]
17. Enlist the factors influencing the selection of the drug delivery routes   CO4 [K₂]
18. Name any two approved nano-carriers for cancer   CO4 [K₂]
19. What is a targeted drug delivery?   CO5 [K₂]
20. List a condition in which a gene is deleted.   CO6 [K₂]

PART C (6 x 5 = 30 Marks)

21. Explain the pharmacokinetic parameters in drug development.   5   CO1 [K₂]

22. Discuss the biocompatible and biodegradable polymers in controlled release drug   5   CO2 [K₂]
    delivery.

23. What are hydrogels? Explain any one method of synthesis with neat sketch.   5   CO3 [K₂]

24. Sketch the bio-erodible and non-erodible matrix system for sustained release of   5   CO3 [K₃]
    drug delivery and explain it.

25. Why is protein adsorption important? Discuss with neat sketch.   5   CO4 [K₃]

26. The implant-associated infections (IAIs) are infections associated with the   5   CO5 [K₄]
    implants which are generally used to treat/manage patients. Substantiate the
    statement.

Answer any FOUR Questions
PART D (4 x 10 = 40 Marks)

27. Drug elimination is the sum of the processes of removing an administered drug   10   CO1   [K3]
    from the body. Justify the statement and explain in detail with neat sketch.

28. PEGylation is a process of polyethylene glycol (PEG) polymer chain attachment   10   CO2   [K3]
    to other molecule through covalent binding or adsorption. Explain and sketch the
    process with suitable example.

29. Enumerate the micelles and liposomes usage in targeted drug delivery system   10   CO3   [K2]

30. Explain the various route of specific delivery drug.   10   CO4   [K2]

31. Discuss the gene delivery process with suitable example.   10   CO6   [K2]

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