

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI  
FIRST SEMESTER 2023-2024  
PHA G617: Advanced Drug Delivery Systems  
**Comprehensive Examination**

Maximum marks: 70

Weightage: 35%

Duration: 180 min

Date: 11/12/2022

Note:

- Please follow all the *Instructions to Candidates* given on the cover page of the answer book.
- All parts of a question should be answered consecutively.
- Assumptions made if any, should be stated clearly at the beginning of your answer.

<b>No. of Pages</b> = 2
<b>No. of Questions</b> = 10

**CLOSED BOOK**

- Q1. A small molecule is found to target the mitochondria. It is delivered using nanoparticles and showed an improved efficacy. [7 M]
- a. How will you prove the hypothesis that it targets the mitochondria using *in vitro* cell-based assays?
  - b. What considerations you have to take while performing the *in vivo* studies of the developed formulation?
- Q2. What is the Andersen Cascade Impactor? How is the particle size distribution obtained using this equipment? [7 M]
- Q3. Delivering the “difficult to deliver” small molecules *via* the oral route is a hot area of research, however, the oral route poses several challenges to their delivery. Some of these challenges could be overcome using the advanced delivery systems. Explain. [7 M]
- Q4. Write a note on: [9 M]
- a. Pegasys
  - b. Regal
  - c. Passive and active targeting

**OPEN BOOK**

- Q5. Write note on: [6 M]
- a. Inhalable insulins
  - b. Liposomes in the market
- Q6. Several products have been developed for the delivery of nucleic acids. However, these products differ in the use of different carriers. Elaborate on the carriers that have been utilized for delivering nucleic acids that have reached the market with a justification on their use in the formulation. [4 M]
- Q7. Write a comparative note on polymeric micelles and polymeric nanoparticles. [5 M]
- Q8. Different methods have been used for the preparation of polymeric micelles. Elaborate on the criteria you will follow for the selection of a suitable method of polymeric micelles preparation. [5 M]

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Q9. Justify/Comment:

[10 M]

- a. A drug has partial solubility in organic solvents (DCM and Ethyl acetate) and is insoluble in water. It is soluble in acetone, DMSO and DMF. How will you prepare the nanoparticles wherein the drug is efficiently loaded in PLGA polymer?
- b. A hydrophilic drug can be loaded in polymeric micelles.
- c. An increase in the molecular weight of the PLGA results in an increase in particle size of microparticles.
- d. Measurement of protein concentration in the formulation using UV/fluorescence spectroscopy.
- e. Microparticles prepared using spray drying method showed higher encapsulation and slower drug release.

Q10. You were asked to set up a drug release experiment for a microparticulate drug delivery system.

[10 M]

- a. Explain, the method you can use to perform the study.
- b. How will you select the release study conditions for performing this experiment.

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