



# Avinashilingam Institute for Home Science and Higher Education for Women

Deemed to be University Estd. u/s 3 of UGC Act 1956, Category 'A' by MHRD (now MoE)

Re-accredited with an 'A++' Grade by NAAC CGPA 3.65/4, Category I by UGC

Coimbatore - 641 043, Tamil Nadu, India

## Continuous Internal Assessment Test II – October 2025

### Semester V

Class : III UG

Major: Biochemistry and Biotechnology

23BBTC05 Recombinant DNA Technology and Nanobiotechnology

Time: 2 hours

Max.marks: 60

#### Course Outcomes:

CO1: Understand the basic steps in a cloning experiment.

CO2: Acquire knowledge about how to isolate a DNA segment, clone it into a suitable vector, introduce into a host and identify the recombinant from non-recombinants. The expression vectors and their importance in Biotechnology will be studied.

CO3: Know the theoretical basis for selection, screening, and construction of libraries and expression of genes. Production of insulin using recombinant DNA technology, transgenic crops – merits and demerits will be studied.

CO4: Learn the principles of various genetic engineering techniques as well as their applications.

CO5: Acquire a fundamental understanding of the basic principles of nanobiotechnology.

#### Part A- Answer all questions

(6X1 = 6 Marks)

1. RAPD is best described as CO3K1
  - a. A blotting technique to detect RNA
  - b. A method for detecting protein-protein interactions
  - c. A sequencing method using chain termination
  - d. A PCR-based method for detecting DNA polymorphism
2. What is the main purpose of CRISPR-Cas9 technology in genome editing? CO3K2
  - a. To amplify DNA fragments
  - b. To cut DNA at specific target sites
  - c. To separate DNA based on size
  - d. To detect RNA molecules
3. An example of the bottom-up approach in nanomaterial synthesis is CO4K2
  - a. Mechanical milling
  - b. Chemical vapor deposition (CVD)
  - c. Lithography
  - d. Etching
4. A researcher wants to know the average crystallite size of nanoparticles. The best technique would be CO4K3
  - a. DLS, because it measures Brownian motion
  - b. UV-Visible spectroscopy
  - c. XRD, using Scherrer's equation
  - d. Transmission Electron Microscope
5. Nano drugs are preferred in treatment because they CO5K2
  - a. Decrease drug bioavailability
  - b. Increase drug toxicity
  - c. Enhance solubility and stability of drugs
  - d. Prevent drugs from reaching target sites
6. In nano drug delivery, targeted release helps to CO5K3
  - a. Reduce side effects on healthy tissues
  - b. Increase random distribution of drugs
  - c. Decrease therapeutic efficiency
  - d. Block the absorption of drugs

#### Part B

3 x 6 = 18

#### Answer the following

Answers should not exceed 200 words or one page

7. a. Explain the applications of recombinant DNA technology in medicine and agriculture with suitable examples CO3K2

(Or)
7. b. Discuss the importance of biosafety and bioethics in recombinant DNA technology CO3K2
8. a. Classify nanomaterials based on their dimensionality and discuss their properties CO4K3

(Or)
8. b. Review the working principle of UV-Visible Spectroscopy with examples of its applications CO4K2
9. a. Illustrate the concept of nano drugs with examples and explain their significance in medicine CO5K2

(Or)
9. b. Analyze the concept of bioformulation and explain how its components and preparation methods influence applications in medicine CO5K3

**Part C**

**3 x 12 = 36**

**Answer the following not exceeding 700 words or four pages**

10. a. Compare the molecular techniques RFLP and RAPD used for detecting DNA polymorphisms, highlighting their principles, procedures, and applications. **CO3K3**  
(Or)
10. b. Elucidate CRISPR technology and its application in genome editing. Include its mechanism, types, tools involved, advantages, and potential applications **CO3K3**
11. a. Illustrate the working principle of SEM and TEM and its application **CO4K2**  
(Or)
11. b. Summarize the role of DLS and XRD techniques in nanotechnology research **CO4K2**
12. a. Elaborate any two nano analytical tools used for nanomaterial detection, highlighting their principle, working mechanism, and applications **CO5K2**  
(Or)
12. b. Explain the principle and working mechanism of enzyme-based biosensors with suitable examples **CO5K2**

**Staff in-charge:**

**Aided Programme : Dr. S.Gayathri Devi, Dr. A.Gayathri**

**SF Programme : Dr.K.V.Shalini**

**Total Number of QP: 55(aided)+35(SF)**