

Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VII (NEW) EXAMINATION – SUMMER 2024

Subject Code:3170418

Date:30-05-2024

Subject Name:Biomaterials

Time:02:30 PM TO 05:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

	Marks
Q.1 (a) Describe the characteristics of the nanofibrils on the outer surface of the abalone foot tissue, and how do they contribute to adhesion?	03
(b) How does humidity affect the adhesion forces of the abalone foot's nanofibrils on different substrates, and what mechanisms are proposed for this adhesion?	04
(c) What is biomimetic nanotechnology, and what disciplines does it draw inspiration from? Provide examples of biomimetic nanotechnology applications and how they mimic biological systems.	07
Q.2 (a) What is the evolutionary purpose of the serrations along the outer edge of the blade of pampas grass	03
(b) Explain the concept of biomimicry in developing a transparent, self-cleaning glass based on moth eyes.	04
(c) What are the key structural components of myosin motor proteins, and how do they vary among different isoforms?	07
OR	
(c) Explain the process of tissue engineering, highlighting the use of patient cells, polymer scaffolds, and the role of extra-cellular matrix (ECM).	07
Q.3 (a) What are the applications of DNA nanotechnology, and how can it be utilized in smart therapeutics and drug delivery?	03

- (b) Provide examples of LOC devices used for the detection of malaria, and how do they operate? **04**
- (c) What is viral nanotechnology? What are the advantages of using viral nanoparticles? How are viral nanoparticles made? **07**

OR

- Q.3** (a) Describe the process of electrospinning and its advantages in producing nano fibers for tissue engineering. **03**
- (b) Why use biological methods to synthesize nanoparticles? **04**
- (c) What are some of the applications of viral nanotechnology? **07**
- Q.4** (a) What is the widely accepted mechanism for synthesizing silver nanoparticles and which enzyme is involved? **03**
- (b) How are collagen dressings beneficial in wound healing, and what processes do they stimulate during the wound healing phase? **04**
- (c) How can microscopy be used as a means of characterization of nanoparticles? **07**

OR

- Q.4** (a) How are hydrogel dressings made, and what are the mechanisms of polymer cross-linking **03**
- (b) What makes hydrogels highly suitable for biological applications, and what are some of their diverse applications **04**
- (c) Explain structure properties and application of PCL (Polycaprolactone) **07**
- Q.5** (a) Explain the principle of AFM (Atomic Force Microscopy) **03**
- (b) What are the key advantages of PHB and P(HB-HV) as biomaterials? **04**
- (c) What is hyaluronic acid (HA)? How is HA synthesized? What are various applications of HA in tissue engineering and drug delivery? **07**

OR

- Q.5** (a) What are the mechanical properties of orb-web-spinning spider silks, and how do they compare to other materials? **03**

(b) Give examples of each plant fungi and yeast used to synthesise nanoparticles. **04**

(c) How hydrogels are made ? **07**
