

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 6 – EXAMINATION – SUMMER 2026

Subject Code: 3162316

Date: 26/05/2026

Subject Name: Bioplastics

Time: 10:30 AM TO 01:00 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.**

- Q.1**
- (a)** List at least four advantages of Biopolymers over synthetic polymers. **03**
 - (b)** Differentiate between bioplastics and petroplastics based on origin and environmental footprint. **04**
 - (c)** Describe the life cycle of bioplastics stage by stage. Explain each stage and draw a simple flow diagram. **07**

- Q.2**
- (a)** Define: (i) Bioplastics, (ii) Biodegradability, and (iii) Compostable plastics. **03**
 - (b)** Classify different ways to produce bio-based polymers. **04**
 - (c)** Give a detailed classification of biodegradable polymers. List the key standards used to certify them. **07**

OR

- Q.2**
- (c)** Draw the molecular structure of starch. Give properties of starch-based polymers along with its types and applications. **07**

- Q.3**
- (a)** Explain the process for Respiration Test for determining biodegradation. **03**
 - (b)** Explain various soil environment: surface and underground factors for soil burial degradation. **04**
 - (c)** Explain Oxo-degradable plastics and describe their general degradation mechanism in detail. **07**

OR

- Q.3**
- (a)** List various modes and corresponding factors of degradation. **03**
 - (b)** Explain the following two tests used to check biodegradability of biopolymers: **04**
 - (i) Enzyme Assay (ii) Plate Test
 - (c)** Explain the Soil Burial Test used to measure biodegradability of plastics. Write about its procedure, measurements taken, and any two reasons why this test is important. **07**

- Q.4**
- (a)** List the factors affecting biodegradability of polymers under two groups: (i) Polymer structure factors (ii) Environmental factors. **03**
 - (b)** Write any four differences between aerobic and anaerobic biodegradation of polymers. Give one example of a polymer that degrades in each environment. **04**
 - (c)** Explain the manufacture of Poly Lactic Acid (PLA). Draw its chemical structure. List two advantages and two disadvantages of PLA in practical applications. **07**

OR

- Q.4**
- (a)** What are bacterial polyesters? Write any three importance that make them suitable for use as bioplastics. **03**
 - (b)** Explain how biopolymers degrade in real liquid environments. Write about any three liquid environments with one example of a biopolymer that degrades in each environment. **04**
 - (c)** Discuss the various commercial applications of Bioplastics in modern industry. **07**
- Q.5**
- (a)** Give full name of: CA, CAP, CAB. **03**
 - (b)** Write a short note on Polyhydroxyalkanoates (PHA). Include its source, key properties, and its applications. **04**
 - (c)** Name any one natural source of Chitin. Draw Chemical structure and give properties of (a) chitin and (b) chitosan. Give their medical applications. **07**
- OR
- Q.5**
- (a)** List any three barriers to commercialization of biopolymer. **03**
 - (b)** Write a brief note on Polycaprolactone (PCL). State its full form, structure, and any two applications. **04**
 - (c)** Define Ecotoxicology. Write any four reasons why ecotoxicology testing is important for biopolymers. Give one suitable example for each reason. **07**
