(c) Describe the process and purpose of a heat seal strength test. (5×3=15)

5. (a) Describe the mechanism of modified atmosphere packaging (MAP). What specific gases are used, and how do they help preserve food quality by altering the product's environment?

(b) What are common additives used in plastics for packaging? Describe the function of at least three different types of additives, such as plasticizers, UV stabilizers, and antioxidants.

(c) Why are some polymers, such as PET (polyethylene terephthalate), used exclusively in the packaging of carbonated drinks? Give an explanation of the characteristics that make PET appropriate for this use. (5×3=15)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5852 **K**

Unique Paper Code : 6092013503

Name of the Paper : Polymers in Packaging

Name of the Course : **B.Sc. (H) Polymer Science (UGCF)**

Semester : V

Duration : 2 Hours Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **four** questions in all.
3. Question No. **1** is compulsory.

1. (a) Why are vacuum-packaged items required to be refrigerated or frozen?

(b) How do multi-layered structures, like those in a retort pouch or Tetra Pak, improve the barrier properties in polymer packaging?

(c) Explain why amorphous polymers are easier to thermoform than crystalline polymers.

(d) How does bursting strength ensure the integrity of a pouch or bag filled with a pressurized or heavy product?

(e) Differentiate between general-purpose polystyrene (PS) and its expanded form (EPS). (3×5=15)

2. (a) Differentiate between rigid and plasticized (flexible) PVC and describe their respective applications in packaging. For what specific packaging formats are these different forms of PVC used?

(b) Describe the key properties of polypropylene (PP) that make it suitable for packaging. How does the biaxial orientation process used to make BOPP film enhance its mechanical, optical, and barrier properties compared to standard PP film?

(c) Describe the specific packaging considerations for food types, such as oily snacks and fresh produce. (5×3=15)

3. (a) Explain why PC is a material of choice for durable, reusable packaging like large water cooler bottles. How does its impact resistance and rigidity contribute to its longevity in this application?

(b) How is the water vapor transmission rate (WVTR) typically measured for a polymer package?

(c) Explain how a polymer packaging container can be tested for leakage. What factors must be considered to ensure a container remains leak-proof during transport? (5×3=15)

4. (a) Compare and contrast shrink packaging and pouch packaging based on their purpose, materials, oxygen permeability, and typical applications.

(b) Define "performance properties" of packaging materials. Discuss tensile strength and explain how it is measured.