



THE OPEN UNIVERSITY OF SRI LANKA  
DEPARTMENT OF TEXTILE AND APPAREL  
TECHNOLOGY

BACHELOR OF INDUSTRIAL STUDIES /  
BACHELOR OF TECHNOLOGY

FINAL EXAMINATION – 2005 / 2006

TTX5131 Structure and Properties of Fibres

037

DURATION - THREE HOURS

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DATE: 15<sup>th</sup> March 2006

TIME: 09.30 – 12.30 HOURS

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Total Number of Questions = 9      Number of questions to be answered = 06

Answer the question 1, which is compulsory and five (05) additional questions.  
Question 1 carries twenty five (25) marks and questions 2 to 09 carry fifteen (15) marks each.

**01. Compulsory Question**

- a) Illustrate the following types of polymers with simple sketches.  
Linear Chain, Branched Chain, Ladder Polymer
- b) What are the conditions to be fulfilled by polymer molecules to be suitable to form fibres?
- c) How can you define practically the degree of order of a polymer structure?
- d) Illustrate schematically “a folded crystal” and “a fringed crystal”.
- e) What do you understand by “Orientation” with respect to structure of fibre forming polymers?
- f) State four (4) occurrences taking place when textile fibres are subjected to single axis drawing.
- g) What do you understand by “Glass transition temperature “ of polymers?
- h) Melting of fibres is essentially an “irreversible process”. Explain Why?
- i) Distinguish between “chemical” and “structural” changes taking place in fibres due to heat.
- j) Distinguish between “Capillary Moisture” and “Bound Moisture”.
- k) Thermal conductivity of fibres varies with moisture regain. Draw a characteristic curve to show variation of thermal conductivity of textile fibres with moisture regain.

- l) Explain briefly the burning behaviour of cotton fibre.
02. a) What do you understand by “Thermosets” and “Thermoplastics”?
- b) ) Define the following three types of polymer chain configuration.
- (a) Monomer Orientation
  - (b) Geometric or Cis-trans isomerism
  - (c) Stereomerism or tacticity.
03. a) State the four requirements of a monomer to be able to polymerize and explain two of them in brief.
- b) Distinguish between “Condensation Polymerization” and “Addition Polymerization”.
04. a) What do you understand by crystallinity of Polymers? Illustrate with a diagram.
- b) What are the factors that favour the process of crystallization of fibre forming molecules?
05. Explain with the help of a suitable diagram how forces of attraction and repulsion of macro molecules vary with the distance between them. Explain also what you understand by “Energy Minimum State”.
06. Describe the dissolving behaviour of partly crystalline polymers giving all the stages of dissolving process.
07. a) What do you understand by “Heat Setting of Fibres”?
- b) Name and discuss the effect of different structural parameters on heat setting efficiency.
08. a) State the four theories that provide the basis for imparting flame-retardant treatments on textiles.
- b) Describe in brief the burning behaviour of the following fibres:
- I Nylon
  - II Polyester
  - III Wool
09. a) Describe the effect of moisture on static electricity charging of textile fibres.
- b) Discuss how moisture transmission properties of fibres are related to comfort.