



MUEO

MOI UNIVERSITY

OFFICE OF THE DEPUTY VICE CHANCELLOR
(ACADEMICS, RESEARCH & EXTENSION)

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER EXAMINATION

FOR THE DEGREE OF

BACHELOR OF ENGINEERING

IN

INDUSTRIAL & TEXTILE ENGINEERING

COURSE CODE: MIT 321

COURSE TITLE: TEXTILE CHEMISTRY

DATE: 23RD FEBRUARY, 2018 **TIME:** 9.00 A.M. - 12.00 NOON.

INSTRUCTIONS TO CANDIDATES

- SEE INSIDE.

THIS PAPER CONSISTS OF (3) PRINTED PAGES

PLEASE TURN OVER

Instructions:

1. This paper contains seven questions, all carrying equal marks.
2. Attempt any five questions.
3. Do not write anything on the question paper.
4. Unauthorized electronic gadgets e.g. mobile phones are not allowed in the exam room.
5. Examination duration is 3 hours.

Question 1

With regard to plant cell wall:

- (a) Using a labelled diagram, show the general structure 5 marks
- (b) Discuss the functions of any three of the components 9 marks

Question 2

- (a) Using a diagram describe plant cellulose structure and show the glucose chains in the structure 5 marks
- (b) Explain hemicellulose as an elemental composition of plant fibre 3 marks
- (c) With the help of a molecule structure describe pectin 4 marks
- (d) List the sub-groupings of plant fibres depending on the part of plant it originates 2 marks

Question 3

- (a) Differentiate between Cellulose I and Cellulose II 3 marks
- (b) With regards to hydrogen bonds
 - (i) Diagrammatically show them in cellulose 3 marks
 - (ii) Explain their importance 3 marks
- (c) Elaborate the significance of crystalline and amorphous regions in fibres 5 marks

Question 4

- (a) List the agents most likely to degrade cotton during processing 3 marks
- (b) Mention two types of carbonyl groups that may be introduced into cotton during degradation 2 marks
- (c) Discuss copper number with reference to cellulose 4 marks
- (d) Using molecular structural diagram, discuss the three stages of cotton degradation by an acid 5 marks

Question 5

- (a) Diagrammatically show the potential sites of chemical reaction in a cellulose molecule 2 marks
- (b) Describe multilayer adsorption of water on the cotton structure relative to different relative vapour pressures (RVP) 3 marks
- (c) Discuss fibre saturation point 3 marks
- (d) State the changes in the fine structure that occur when cotton is mercerized 4 marks
- (e) Liquid ammonia is one of the swelling agents for cotton cellulose; state the influences it has on fibres. 2 marks

Question 6

- (a) Give the general formulae of protein fibre indicating the peptide link 2 marks
- (b) Name two types of commercially produced, regenerated protein fibres 2 marks
- (c) Name the simplest of alpha amino acid and show a condensation reaction of two units of the amino acid 3 marks
- (d) State the difference between alpha Keratins and Beta Keratins 3 marks
- (e) Explain the action of alkali on wool 4 marks

Question 7

- (a) Give an elemental composition of wool fibres (water free) 3 marks
- (b) Outline the effect of chlorination of wool 2 marks
- (c) Describe the different groups in which amino acids are classified based on the composition of their side-chains 5 marks
- (d) Explain how extraction of protein can be done 4 marks