

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF TEXTILE TECHNOLOGY

END OF SECOND SEMESTER EXAMINATION - MAY 2011

TXT 2221 - CHEMICAL ANALYTICAL AND TESTING TECHNIQUES

TIME: 3 HOURS

TOTAL MARKS: 100

INSTRUCTIONS

1. Answer **ANY FIVE** questions. Each question carries **20 marks**.
2. The first fifteen minutes should be spent reading the question paper and making notes.
3. Do not open your answer sheet until told to do so.
4. Marks will be awarded for skill in appreciating the scope of questions, clarity of argument and conciseness of presentation as well as for the knowledge displayed by the candidate.

QUESTION 1

- (a). Outline the principles of an optical microscope. **(10)**
- (b). Explain the procedure for preparing samples for microscope examination. **(5)**
- (c). Explain four important textile product properties which depend on fibre gross morphology. **(5)**

QUESTION 2

- (a). Outline the main principle of chromatography. **(5)**
- (b).
- i. Explain briefly how, high performance liquid chromatography (HPLC) is carried out. **(8)**
 - ii. Suggest TWO advantages of HPLC over thin layer chromatography. **(2)**

iii. State textile uses of HPLC. (2)

iv. State textile uses of TLC. (3)

QUESTION 3

A Scanning Electron Microscope (SEM) is a versatile instrument that can be used in textiles and forensic investigations. Explain its versatility and how it can be used to solve forensic problems. (20)

QUESTION 4

To fully appreciate the properties of fibres, a thorough knowledge of their molecular and morphological structures is required.

i. Describe the methods used to investigate the molecular and morphological structures of fibres. (8)

ii. Compare and contrast the differences in the morphological and molecular structures of one natural, regenerated and synthetic fibre respectively. (6)

iii. Select an appropriate textile end use of each of the fibres discussed in section (ii). Justify your choices. (6)

QUESTION 5

(a). Explain in detail how the molecular structure can influence the properties of wool and silk fibres. (8)

(b). Compare the morphological structure of flax and wool fibres. Outline the effect on each fibre's properties. (8)

(c). Describe the molecular and morphological changes that result from mercerization of cotton fibres. (4)

QUESTION 6

Briefly outline how the instruments listed below are used in textile and polymer materials structure elucidation.

i. Viscometry. (3)

ii. Thermal Gravitational Analysis. (4)

- iii. X-ray diffraction. (4)
- iv. Infrared Spectroscopy. (3)
- v. Nuclear Magnetic Resonance Spectroscopy. (3)
- vi. UV-Visible Spectroscopy. (3)

END OF EXAMINATION QUESTION PAPER