

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

**DEPARTMENT OF TEXTILE TECHNOLOGY
SUPPLEMENTARY EXAMINATIONS JULY 2005
TEXTILE DYEING TXT 2116
TIME: 3 HOURS**

INSTRUCTIONS

Answer any FOUR questions

Answer any **FOUR** questions in this Section.

1. (a) Explain the basic principles used to apply each of the following types of dye to cotton.
- i. direct dyes
 - ii. acid dyes
 - iii. direct yes
 - iv. sulphur dyes

In each case describe briefly the major chemical and/or physical processes taking place and the expected wet fastness properties. Detailed chemical structures of large dyestuff molecules are not required. (16 marks)

- (b) Write short notes on desizing of cotton materials. (4 marks)

2. (a) Briefly explain your understanding of the following terms:
- (i) exhaustion
 - (ii) depth of shade
 - (iii) stripping
 - (iv) liquor ratio
 - (v) surfactant

(5 marks)

- (b) Using the following recipe, describe a dyeing process that could be used to dye a 10g sample of a 50/50 polyester/cotton and yield good levels of wet fastness. Your answer should include the volumes of stock solutions of dyes and chemicals use, an outline of the dyeing sequence and the washing sequence and the wash-off process adopted.

Recipe:

1.30% o.w.f. C.I. Disperse Red 167

0.14% o.w.f. C.I. Disperse Blue 79
1.74% o.w.f. C.I. Reactive Red 120
0.61% o.w.f. C.I. Reactive Blue 171

Please note:

- o.w.f. refers to the % of a dye applied to the total weight of the fibre blend.
- The reactive dyes used are hot dyeing (80 C) monochlorotriazinyl(MCT) type.

Stock solutions:

Disperse dyes 1% (i.e. 1gm in 100ml solution)

Reactive dyes 1%

Dispersing agent 1%

Salt 200g/l

Soda Ash 100g/l

(15 marks)

3. (a) Give a detailed account of bleaching with hydrogen peroxide. Your discussion must show and explain
- i. the typical recipe
 - ii. the reactions thought to take place
 - iii. function(s) of the assistants used.
 - iv. the problems that may be encountered when bleaching using hydrogen peroxide. Suggest possible solutions to some of these problems. (12 marks)
- (b) Write short notes on bleaching using:
- i. Sodium hypo chlorite
 - ii. Sodium chlorite (6 marks)
- (c) Mercerising, when carried out correctly confers some economically useful characteristics to cotton fabrics. Explain. (2 marks)
4. In most dyeing processes, either the substrate passes through the dye liquor or dye liquor is circulated through the substrate or both the substrate and the liquor moves. Describe with the aid of drawings, one machine for each circulatory system, taking your three examples from the following machines: package, hank, beam, jet, jig, winch, and pad roll. For each of these three machines you have chosen, indicate :
- i. The functions of the main components
 - ii. Any faults that may arise during the dyeing process, including the precaution necessary to avoid them. (20 marks)
5. (a) With reference to the dyeing of cellulose fibres with sulphur dyes, give brief accounts of the importance of the following:
- (i) antioxidants
 - (ii) wetting agents

- (iii) rinsing and soaping agents (6 marks)
- (b) Write an account of the dyeing of polyester fibres with disperse dyes. Include in your answer details of the dyeing mechanism and properties of the dyeings and explain the influence that the fibre treatments can have on disperse dye uptake. (14 marks)
- 6 (a) Write an essay on “ the application procedures of reactive dyes and their fastness properties”. (15 marks)
- (b) Explain why reactive dyes containing two reactive groups per molecule have become important in recent years. (5 marks)
7. Compare and contrast direct and acid dyes. Your comparison must consider the following aspects: the dye chemistry, modes of dye fibre attachments, suitable substrates, dyeing methods and fastness properties. (15 marks)
8. With aid of drawings, outline the major features of two (2) machines available for dyeing woven fabrics. Your outline must show clearly the modes of circulation of either the liquor or the fabric or both. (15 marks)

END OF QUESTION PAPER