

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF APPLIED CHEMISTRY
END OF SEMESTER EXAMINATIONS - DECEMBER 2000
ORGANIC INDUSTRIAL CHEMISTRY II - SCH 4115
TIME - (3) HOURS

INSTRUCTIONS TO CANDIDATES

Answer **ALL** questions in Section A and **ANY THREE** questions in Section B.

SECTION A (40 marks)

1. (a) Define the following terms:
- (i) **Blooming**
 - (ii) **Compounding**
 - (iii) **Coagulation**
- (6 marks)
- (b) What are:
- (i) **Special purpose rubbers**
 - (ii) **Oil resistant rubbers**
 - (iii) **Oil extended rubbers**
 - (iv) **SMR rubbers**
- (4 marks)
- (c) Name the person associated with the discovery of:
- (i) **Mastication**
 - (ii) **Vulcanisation**
 - (iii) **Pneumatic tyre**
 - (iv) **Polymerisation of butadiene**
 - (v) **The term 'rubber'**
- (5 marks)
- (d) Name **FIVE** different types of fillers. (5 marks)
- (e) For the construction of a light truck tyre, what rubber would you use for:
- (i) **Tread**
 - (ii) **Carcass**
 - (iii) **Side wall**
 - (iv) **Inner liner**
 - (v) **Bead covering**
 - (vi) **Breaker coating**
- (6 marks)

(f) Explain the difference(s) between *SOAPS* and *DETERGENTS*. (5 marks)

(g) Give *ONE* compounding ingredient you would use as:

- (i) **Flame retarder**
- (ii) **Colorant**
- (iii) **Dusting agent**
- (iv) **Extender**
- (v) **Stabiliser** (5 marks)

(h) Distinguish carefully between distribution and dispersion of reinforcing fillers in a rubber mix. (5 marks)

SECTION B (60 marks)

2. (a) Describe *IN DETAIL* the process of latex tapping. (10 marks)

(b) Outline the basic principles in the process of latex concentration and give *TWO* examples of commercial methods used. (10 marks)

3. (a) Emulsion polymerisation is the preferred technique for elastomer production. Outline the essential ingredients in any emulsion polymerisation system and discuss the advantages attributed to this technique. (15 marks)

(b) What different technique of polymerisation is used in the production of EPM/EPDM? Why is this technique appropriate for this polymer? (5 marks)

4. (a) Define vulcanisation. (2 marks)

(b) Give three *DIFFERENT* types of vulcanisation *SYSTEMS*. (3 marks)

(c) The general vulcanisation of rubbers passes through a number of stages. Describe what occurs in each of these stages. (10 marks)

(d) How does vulcanisation time affect tensile strength in most rubbers? (5 marks)

5. With the aid of a clear flow chart, describe the commercial production of IIR, covering adequately: raw material production, polymerisation recipe and process, vulcanisation of the rubber, properties and applications of the rubber. (20 marks)
6. (a) Draft a compound, with no less than *FIVE* ingredients, for making vehicle tubes and explain the functions of each of the ingredients in the formulation. (10 marks)
- (b) Assign reasonable estimate values of densities of each ingredient in (a) and calculate the final compound density. What would you charge for each tube and why? (10 marks)

END OF QUESTION PAPER!!!