NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMETN OF APPLIED CHEMISTRY

SUPPLEMENTARY EXAMINATION – JUNE 2014

POLYMER SCIENCE I – SCH 2107

FOR SCH AND TTE STUDENTS

TIME : THREE (3) HOURS

INSTRUCTION TO CANDIDATES:

1. **ANSWER ALL QUESTIONS IN SECTION A AND ANY THREE QUESTIONS FROM THE SECTION B.**

2. **SECTION A CARRIES 40 MARKS AND IN SECTION B EACH QUESTION CARRIES 20 MARKS. MARKS ARE INDICATED IN BRACKET.**

3. **SHOW MECHANISM, CHEMICAL STEPS OR SYNTHESIS BY MEANS OF CURVED ARROW.**

THIS QUESTION PAPER CONSISTS OF *THREE PRINTED PAGES* (ON ONE SIDE ONLY) INCLUDING THE TOP PAGE WITH THE INSTRUCTIONS.

SECTION A:- 40 Marks (answer ALL questions)

1. (a) Illustrate the following **tacticity** structures using polypropylene:

(i) isotactic
(ii) syndiotactic
(iii) atactic (6 marks)

(b) Give one examples for each of the following classes of polymers:

(i) natural polymer;
(ii) Thermoset polymer;
(iii) Addition polymer;
(iv) thermoplastic polymer (4 marks)

(c) Give the **repeating unit** of each of the following polymers:

(i) polystyrene,
(ii) poly(methyl methacrylate),
(iii) polypropene (6 marks)

(d) Draw the repeating unit of spandex. (4 marks)

(e) (i) Define the concept '*degree of polymerisation*'. (2 marks)

(ii) If the average weight of a given PVC sample is 275000g/mol, what is the degree of polymerisation of the sample? (4 marks)

(f) Give **five** factors that characterise step-growth polymerisation. (5 marks)

(g) (i) Differentiate between monomer and repeating unit. (2 marks)

(ii) Draw a possible structure of ABS if it is described as……'a graft of styrene and acrylonitrile on a butadiene backbone.' (5marks)

(h) When can Q – e method be used? (2 marks)

SECTION B:- 60 Marks (Answer three questions)

2. (a) Write short notes on EACH of the following polymerisation techniques also indicate advantages and disadvantages.
   (i) Solution polymerisation
   (ii) Suspension polymerisation

(2x10 Marks)

3, (a) Given following pairs:

Compound	Q	e
acrylonitrile	+0.06	+1.20
Vinyl acetate	+2.36	-1.05

Calculate r1 and r2 and suggest the type of polymer will produce.

(10 Marks)

(b) Taking ethene as an example:
write chemical equations for the
   (i) initiation
   (ii) propagation
   (iii) termination steps which are involved in an anionic polymerisation.

(10 Marks)

4. (a) How many ways the initiation reaction can be carried out in addition polymerisation?

(4 Marks)

(b) Taking vinylchloride as an example:
Write chemical equations for the anionic polymerisation of polyvinylchloride.

(10 Marks)

(c) Describe the art of latex tapping.

(6 Marks)

5. (a) Write reaction mechanism for the synthesis of nylon 6.6 and PET.

(10 Marks)

(b) Write synthetic steps with the reaction conditions for the formation of carbon fibres from acrylonitrile. Suggest two uses of carbon fibres.

(10 Marks)

END OF QUESTION PAPER!!!!