



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCE

DEPARTMENT OF APPLIED CHEMISTRY

POLYMER SCIENCE I

FOR SCH AND TTE STUDENTS

SCH 2107

Supplementary Examination Paper

August 2015

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements:

Examiner's Name: DR C T PAREKH

INSTRUCTIONS

1. Answer all questions in Section A and any three questions from Section B. Section A carries 40 marks and each question in Section B carries 20 marks.
2. Start each question on a new page.
3. Show mechanism, chemical steps or synthesis by means of curved arrow.

MARK ALLOCATION

QUESTION	MARKS
1.	40
2.	20
3.	20
4.	20
TOTAL	100

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SECTION A:-

1. (a) Illustrate the following **tacticity** structures using polypropylene:
- (i) isotactic
 - (ii) syndiotactic
 - (iii) atactic (9 Marks)
- (b) Give one example for each of the following classes of polymers:
- (i) natural polymer;
 - (ii) thermoset polymer;
 - (iii) condensation 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 structure of spandex and indicate the linkage. (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 the structure of Kevlar and suggest two uses of it. (4 marks)

SECTION B:-

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

- (i) emulsion 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 r_1 and r_2 and suggest the type of polymer that will be produced.

(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 can the initiation reaction be carried out in addition polymerisation?

(4 Marks)

- (b) Taking vinyl chloride as an example:
Write chemical equations for the cationic 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) Describe the process of manufacture of cellulose fibres from wood pulp.
Write chemical reaction for the process.

(10 Marks)

END OF QUESTION PAPER!!!!

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