Eastern University, Sri Lanka

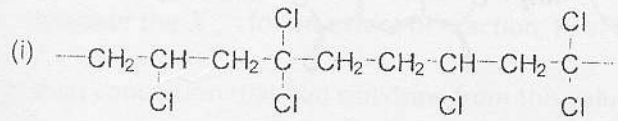
First Year Second Semester Examination in Science

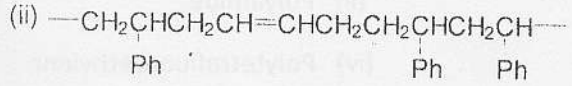
2007/2008 (August / September 2009)

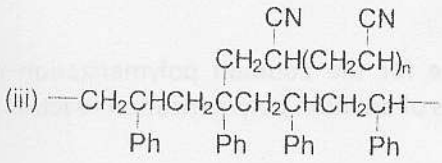
CH 105 Introduction to Polymer Chemistry

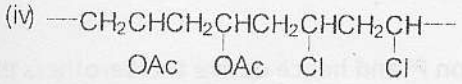
Time Allowed: ONE HOUR

1. (a) Classify the following as random, alternating, block and graft polymers.

(i) 

(ii) 

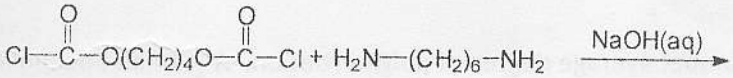
(iii) 

(iv) 

20marks

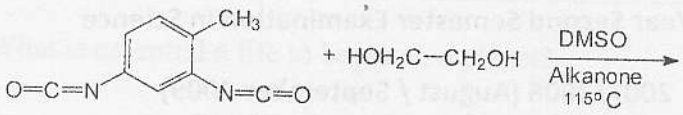
(b) Identify the repeat units that could be obtained by the following polymerization reactions

(i)

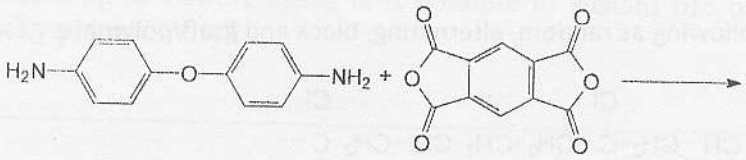


P.T.O

(ii)



(iii)



30 **marks**

(c) Give the structures of each of the following categories of polymers.

(i) Polyester

(ii) Polyamide

(iii) Polymethylmethacrylate

(iv) Polytetrafluoroethylene **20 marks**

(d) Write down the general reaction scheme for the addition polymerization reaction and indicate how this varies with various classes of addition polymerization reactions.

30 marks

2. (a) Define the term 'extend of polymerization P' and hence derive the Carothers equations,

$$\bar{X}_n = \frac{1}{(1-p)}$$, where $\bar{X}_n$ is the number average degree of polymerization

35 marks

(b) Calculate the number average degree of polymerization, $\bar{X}_n$ of an equimolar mixture of hexamethylene diamine and adipic acid for the extents of reaction P, 0.5, 0.90, 0.99, 0.999, and 0.9999.

35 marks

(contd.....)

(c) Following equation is the modified Carothers equation applicable if equal numbers of functional groups are not used.

$$\bar{X}_n = \frac{(1+r)}{(1+r-2rp)}$$ where r is the ratio of the number of molecules of the two types of reactants.

Suppose there is 5 percent more diamine molecules than diol molecules present in the polymerization process

(i) Calculate the value 'r'

(ii) Calculate the $\bar{X}_n$ for an extent of reaction, P, of 0.999 using the latter equation.

(iii) What conclusion that you can draw from this value?

30 marks