



The Open University of Sri Lanka
B Sc Degree/ Stand Alone courses in Science – Level 5
Final Examination – 2007/2008
CHU 3238/CHE 5238 – Polymer Chemistry – Paper II

Duration : 3 hours

Date : Saturday 10th June 2008

Time : 1.30 pm – 4.30 pm

Gas Constant (R)	=	8.314 J K ⁻¹ mol ⁻¹
Avogadro Constant (L)	=	6.023 x 10 ²³ mol ⁻¹
Planck Constant (h)	=	6.63 x 10 ⁻³⁴ Js
Velocity of light (C)	=	3.0 x 10 ⁸ ms ⁻¹
Atmospheric Pressure (π)	=	10 ⁵ Pa (Nm ⁻²)
Faraday constant (F)	=	96,500 C mol ⁻¹
Log _e (X)	=	2.303 log ₁₀ (X)

Instructions to candidates:

Answer any four questions out of six.

If more than four questions are answered only the first four answers will be marked.

The use of a non-programmable calculator is permitted.

04. (a) A polydisperse sample of polystyrene is prepared by mixing three monodisperse samples in the following proportions.

1 g 10,000 molecular weight ;

2 g 50,000 molecular weight ;

2 g 100,000 molecular weight

Using this information calculate the

(i) number average molecular weight

(ii) weight average molecular weight

(iii) poly dispersity index

of the mixture.

(70 marks)

(b) What structural parameters influence the melting point of crystalline and amorphous polymers.

(c) List the factors affecting crystallinity and T_m of a polymer.

(30 marks)

05. (a) Write down the mathematical expressions for the following terms;

(i) relative viscosity

(ii) specific viscosity

(iii) intrinsic viscosity

(30 marks)

(b) Fractions of a polymer when dissolved in an organic solvent gave the following intrinsic viscosity values at 25°C.

M / g mol ⁻¹	34,000	61,000	130,000
[η]	1.02	1.60	2.75

Determine K and α .

(50 marks)

(c) Give reasons for non-ideal behaviour of polymer solutions.

(20 marks)

06. (a) Write down the basic steps involved in polymerization of monomer (M) with a free radical initiator (I).

(40 marks)

(b) The rate equation for free radical polymerization is given by,

$$\frac{-d[M]}{dt} = R_p = k_p \sqrt{\frac{k_i}{k_t}} [M][I]^{1/2}$$

(i) Identify all the terms given in the above equation

(ii) What are the four assumptions considered in deriving the rate equation for free radical polymerization.

(iii) Give the relationship of R_p with temperature.

(60 marks)