一、Which of the following statements is correct? (20 pts)

(1). Which of the following methods would be used to measure the weight-average molecular weight of a polydisperse specimen of polymer?
(a) viscometry  (b) cryoscopy  (c) light scattering  (d) membrane osmometry. (5 pts)

(2). Hardening of plastics often involves cross-linking. This process is called? (5 pts)
(a) Curing  (b) Vulcanisation  (c) Compounding  (d) Plasticization.

(3). Polyurethanes are prepared by reacting: (5 pts)
(a) phenols and aldehydes  (b) alcohols and isocyanates  
(c) amines and isocyanates  (d) epoxides and alcohols.

(4). In emulsion polymerization, the initiator is: (5 pts)
(a) Soluble in monomer  (b) Soluble in water  
(c) Insoluble in both  (d) Soluble in both.
三、 Please explain the following meaning or definition. (20 pts)

(1). Atactic macromolecule? (5 pts)

(2). Flory-Huggins interaction parameter( )? (5 pts)

(3). Second-order transition? (5 pts)

(4). Rheology? (5 pts)

三、 (1). Explain the difference between: (a) tensile stress and tensile modulus, (b) creep and stress relaxation? (10 pts)
(2). What thermal instrumental technique would we use to determine Tg? (10 pts)
四、An osmotic pressure measurement of a solution of poly(vinyl chloride) ($c=1.5 \times 10^{-3} \text{ g/cm}^3$) in toluene at 25°C ($\rho=0.867 \text{ g/cm}^3$) in the apparatus indicated a difference of 4.67 mm in the heights of the solution and solution levels. (a) What is the osmotic pressure of the solution? (7 pts) (b) If the second Virial coefficient for poly(vinyl chloride) in toluene is $B=200 \text{ cm}^3 / \text{g}$, calculate the number-average molecular weight of the polymer? (8 pts)

五、In your own words, explain the difference between step-reaction polymerization and chain-reaction polymerization. (10 pts)
六． Speculate on why polyester clothing is more wrinkle resistant than cotton. Why is a hot iron used to press out the wrinkles? (5 pts)

七． What is the average degree of polymerization of a sample of polyester prepared from 4-hydroxybenzoic acid if the acid number, determined with standard KOH solution, is 11.2? (10 pts)