

Bago University
Department of Chemistry
Second Semester Examination, September 2019

Third Year BSc
Chemistry Specialization
Answer any six Questions

Chem 3108
Physical Chemistry IV
Time Allowed: (3) hours

1. (a) Fill in the blanks with the correct word(s), unit(s), and etc., as necessary.
- (i) Nylons, acetals and polyester are made by _____ polymerization.
 - (ii) Engineering polymers have higher strength and _____ resistance.
 - (iii) In the _____ system, a surface-active material is added to the solution to form micelles.
 - (iv) Hamiltonium function is _____.
 - (v) In _____ mechanic the term expectation value often used as average value.
 - (vi) In Michelson's interferometer, radiation falls on a partially _____ mirror.
- (b) Select the correct statement(s), word(s), unit(s) and etc., given in the followings.
- (i) DNA composed of a variety of (nucleotide, peptide, amine) subunits.
 - (ii) Block copolymers have two or more homopolymer subunits linked by (ionic bonds, covalent bonds, dative bonds).
 - (iii) Polymerization is usually (endothermic, exothermic, heat absorbing).
 - (iv) (Δq , Δp , Δt) is the root mean square uncertainty in position.
 - (v) Leakage by penetration through a classically forbidden region is called (average values, wave function, tunneling).
 - (vi) The molecular vibration spectrum is obtained from (microwave, infrared, ultraviolet) region.
2. (a) (i) How many main classes of biopolymers? What are they?
(ii) Explain the characteristic linkage of protein and polypeptide.
- (b) What is polymerization? And explain the isotactic, syndiotactic and atactic configuration.
3. (a) Discuss chain growth anionic polymerization with example.
- (b) (i) Define heterogeneous polymerization and copolymer.
(ii) In a vapour phase osmometer, a solution of polypropylene ($M_n = 0.85 \text{ kg mol}^{-1}$) with concentration of 0.005 kg dm^{-3} is used as a standard, ΔR reading 2.5. If a solution of polystyrene ($M_n = 1.25 \text{ kg mol}^{-1}$) is used in the same apparatus, ΔR value is found to be 3.0. Find the concentration.

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4. (a) How do you understand by the term TGA? What are common applications of TGA?
- (b) (i) What do η_r and η_{red} represent? Express the equations.
(ii) What is M_v for a polymer with $[\eta] = 0.812$, $K = 0.20 \times 10^{-4}$ and $a = 0.74$?
5. (a) Calculate the energy (i) in Einsteins and (ii) Joules for 7.25×10^{15} photons of $5.37 \times 10^{14} \text{ s}^{-1}$ frequency. ($h = 6.626 \times 10^{-34} \text{ Js}$, $N_A = 6.02 \times 10^{23}$)
- (b) Write short notes on Michelson's interferometer with relevant diagram.
6. (a) Illustrate the energy distribution in a black-body cavity at several temperatures and explain about it.
- (b) Define the following terms.
(i) de Broglie Principle
(ii) Heisenberg Uncertainty Principle
(iii) Eigen function and Eigen value
7. (a) What are the characteristics of the photoelectric effect?
- (b) Calculate the de Broglie wavelength of an electron accelerated from rest through a potential difference of (i) 100 V, (ii) 1.0 kV, (iii) 100 kV.
(1 eV = $1.60 \times 10^{-19} \text{ J}$, $h = 6.626 \times 10^{-34} \text{ Js}$, $m_e = 9.1 \times 10^{-31} \text{ kg}$).
