The Open University of Sri Lanka

B.Sc Degree/Stand Alone courses in Science – 2008/2009

CHU 3238/CHE 5238 – Polymer Chemistry – Level 5

Assignment Test – III

Duration : 1½ Hours

Date : Date: 26th March 2009 **Time: 4.00-5.30 pm**

- Answer all questions.
- Choose the most correct answer to each question and mark this answer with an "X" on the answer script.
- Use a **PEN** (not a pencil) in answering.
- Any question with more than one answer will NOT be counted.
- **1/6th marks** will be deducted for each incorrect answer.
- The use of a **non- programmable** electronic calculator is permitted.
- Logarithm tables will be provided.

Gas Constant (R)	=	**8.314 J mol^{-1} K^{-1}**
Avogadro Constant (L)	=	**6.023×10^{23} mol^{-1}**
Planks Constant (h)	=	**6.63×10^{-34} Js**
Velocity of light (C)	=	**3.0×10^{8} ms^{-1}**
Atmospheric Pressure (Л)	=	**10^5 Pa (Nm^{-2})**
Faraday constant (F)	=	**96,500 C mol^{-1}**
Log_e (X)	=	**2.303 log_{10}(X)**

PART A - MCQ

01. A sample contains three distinct polymer fractions having molar masses 10, 15 and 20 kg/mol. If the molar ratio of these polymer fractions are 1:2:1, what is the number average molar mass, $\overline{M}_n$?

1) 10 kg/mol. 2) 15 kg/mol. 3) 20 kg/mol. 4) 25 kg/mol.
5) None of the above.

02. The weight average molar mass, $\overline{M}_w$ of above polymer sample is

1) $\frac{12}{98}$ kg/mol 2) $\frac{12}{98}$ kg/mol 3) $\frac{95}{6}$ kg/mol 4) 1) $\frac{6}{95}$ kg/mol
5) None of the above.

03. Polydispersity factor of above sample is
1) 18/19 2) 100/9 3) 19/100 4) 19/18 5) None of the above.

04. Polymer is soluble only if
a) $\Delta H_m > T\Delta S_m$ b)) $\Delta G_m < 0$ c)) $\Delta H_m < T\Delta S_m$

The correct statement/s is/are
1) a only 2) b only 3) c only 4) a and b only 5) a and c only

05. Weight average molar mass, $\overline{M}_w$ can be determined using
a) Light scattering method b) Osmometry method c) Ultracentrifuge technique

The correct statement/s is/are
1) a only 2) b only 3) c only 4) a and b only 5) a and c only

06. Mark-Houwink equation is
1) $[\eta] = K/M\alpha$ 2) $[\eta] = KM^{\alpha}$ 3) $[\eta] = M^{\alpha}/K$ 4) $[\eta] = 2KM^{\alpha}$ 5) $[\eta] = KM^{-\alpha}$

07. The flow rates of a solvent and a dilute polymer solution using the same solvent are 500s and 1500s respectively. η_{sp} is

1) $1500 - 500$ 2) $1500 + 500$ 3) $\frac{1500-500}{1500}$ 4) $\frac{1500-500}{500}$
5) None of the above

08. End group analysis can be used to determined
1) weight average molar mass 2) number average molar mass 3) viscosity average molar mass 4) intrinsic viscosity 5) solubility of a polymer.

09. Polymer solubility depends on
1) the nature of the solvent. 2) the temperature 3) the interactions between the polymer and solvent molecules. 4) the chemical nature of the polymer
5) All of the above.

10. Root mean square distance of polyethylene having a degree of polymerization of 1000 and the C-C bond length is of 1.26Å is

1) 1.26/1000 2) 1000/1.26 3) $1000\sqrt{1.26}$ 4) $1.26\sqrt{1000}$

5. None of the above.

11. Swelling of polymer depends on

a) stirring b) temperature c) interaction between solvent and polymer molecules.

The correct statement/s is/are

1) a only 2) b only 3) c only 4) a and b only 5) a and c only

12. Intrinsic viscosity can be determined using

a) viscometry method b) light scattering method c) end group analysis

The correct statement/s is/are

1) a only 2) b only 3) c only 4) a and b only 5) a and c only

13. The degree of polymerization

a) increases with increase in temperature. b) decreases with increase in temperature.

c) does not affect by temperature.

The correct statement/s is/are

1) a only 2) b only 3) c only 4) a and b only 5) a and c only

14. At ceiling temperature

1) $k_{dp}[M] = k_p$ 2) $k_{dp}[M] = 2k_p$ 3) $k_{dp}[M] < k_p$ 4) $k_p[M] = k_{dp}$

5) $k_{dp}[M] > k_p$

15. When transfer agents are used at the termination step, the chain length of polymers

a) increases b) decreases c) doesnot change

The correct statement/s is/are

1) a only 2) b only 3) c only 4) a and b only 5) a and c only

16. Ceiling temperature is useful in

1) the production of dipped products. 2) casting polymer products 3) moulding

4) regenerating monomers from monomers. 5) none of the above.

17. Termination reaction can occur by

1) combination. 2) disproportionation 3) transfer to solvents.

4) transfer to monomer molecules. 5) all of the above.

18. Kinetic chain length is defined as

1) length of repeat unit and number of repeat units.

2) rate of initiation/rate of termination.

3) rate of propagation/rate of initiation.

4) root mean square end to end distance.
5) None of the above.

19. At ceiling temperature
1) rate of initiation is maximum. 2) rate of polymerization is maximum.
3) rate of termination is maximum.
4) rate of initiation = rate of propagation.
5) rate of polymerization = rate of depolymerization.

20. Derivation of rate equation for free radical and ionic polymerization differ only in
1) propagation step. 2) initiation step. 3) termination step. 4) initiation and propagation steps. 5) in all three steps.