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THE OPEN UNIVERSITY OF SRI LANKA
B.SC DEGREE/STAND ALONE COURSES IN SCIENCES - 2006/2007
CHU 3238/CHE 5238 – POLYMER CHEMISTRY – LEVEL 5
ASSIGNMENT TEST - I

DURATION: 1½ Hours

Date: 2nd October 2006

Time: 3.30 p.m. - 5.00 p.m.

- 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 ¹ mol ⁻¹ K ⁻¹ |
| Avogadro constant (L) | = 6.023 x 10 ²³ mol ⁻¹ |
| Planks 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) |

Part A

Answer all questions.

1. If 14.00 kg of ethylene is polymerized by free radical initiator (I^*) of molar mass 77g/mol, What is the molar mass in g/mol of the polymer formed only by combination. Assume only one molecule of polymer is formed.
- (1) 14,000 (2) 14,007 (3) 14077
(4) 140154 (5) 7154

2. Thermoset polymers can be
- (a) dissolved in solvents
(b) decomposed at high temperature
(c) soften at high temperature

The correct statement/s are,

- (1) a only (2) b only (3) c only 4) a b only (5) b c only

3. Thermoplastics have
- (a) linear structure
(b) slightly branched structure
(c) highly branched structure

The correct answer is

- (1) a (2) b (3) b c (4) a b (5) a b c

4. Which monomer polymerized readily by free radicals,
- (1) $CH_2=CH_2$ (2) $CH_2=CH-CH_3$ (3) $CH_2=C-(CH_3)_2$
(4) $CH_3-CH=C(CH_3)_2$ (5) $(CH_3)_2-C=C-(CH_3)_2$

5. Which free radical is the most stable
- (1) $C_6H_5^*$ (2) $(CH_3)_3C^*$ (3) $(CH_3)_2-\dot{C}-CN$
(4) $(C_2H_5)_3-C^*$ (5) $(C_6H_5)_3C^*$

6. When 101 molecules of $HO-CH_2-CH_2-COOH$ are polymerized to form only one polymer by condensation, the molar mass (in g/mol) of the polymer is; (assume 100% monomer conversion)

- (1) 10890 (2) 9090 (3) 1800 (4) 7290
(5) 9990

7. Zeigler Natta catalyst is,
- (a) a mixture of $TiCl_3$ and $Al(C_2H_5)_3$
(b) decomposed at the end of the polymerization
(c) is used to prepare stereo regular polymers

The correct statements are,

- (1) ab (2) ac (3) bc (4) abc (5) none of a b c

8. What is the amount of HCHO needed for the complete polymerization of 94 g of phenol
(1) 30 (2) 60 (3) 90 (4) 45 (5) 75
9. Which monomer or monomer pair is suitable in manufacturing polymer as an elastomer, a binder for surface coatings, a plastic or a fiber
(1) phenol/HCHO (2) toluene di isocyanate
(3) styrene-butadiene (4) phthalic acid/glycol
(5) maleic anhydride and glycol
10. Melting point of nylon can be increased by introducing
(1) benzene ring to the polymer backbone
(2) more aliphatic groups
(3) aliphatic diammine
(4) aliphatic dicarboxylic acids
(5) an inhibitor
11. In Bulk polymerization,
(1) heat dissipation is difficult
(2) viscosity increases with time
(3) temperature increases
(4) results narrow molar mass distribution curve
(5) monomer act as the solvent
12. Polymers differ from simple compounds in,
(a) molecular masses
(b) formation of saturated solution
(c) solubility, forming viscous solution with solvents
- The correct statements are,
(1) a b (2) b c (3) ac (4) a b c
(5) none of the above
13. Vinylidene cyanide [$\text{H}_2\text{C}=\text{C}(\text{CN})_2$] can be easily polymerized by
(1) free radicals (2) anions (3) cations
(4) both free radical and anion (5) both anion and cation
14. A polymer is formed by free radical polymerisation of 4.20 kg of propylene ($\text{CH}_3\text{CH}=\text{CH}_2$). The degree of polymerization is,
(1) 100 (2) 50 (3) 99 (4) 49 (5) 10

15. Polyvinyl alcohol
 (a) is insoluble in water
 (b) is prepared by free radical polymerization of vinyl alcohol
 (c) is prepared by hydrolysis of polyvinyl acetate

The correct statement/s is/are,

- (1) a (2) b (3) c (4) a b (5) a c

16. Viscose fiber
 (a) is a regenerated product of cellulose
 (b) has same structure as cellulose
 (c) is produced by reacting conc HNO_3 with cellulose

The correct statements are,

- (1) a b c (2) a b (3) b c (4) ac (5) c only

17. Which monomer pair is suitable to prepare the better thermally stable polymer
 (1) glycol with adipic acid
 (2) adipic acid and hexamethylene diammine
 (3) styrene and butadiene
 (4) bis-phenol with carboxyl anion
 (5) Isoprene and styrene

18. When di-isocyanate $[\text{R}-(\text{NCO})_2]$ reacts with di carboxylic acid $[\text{R}-(\text{COOH})_2]$, the repeat unit link of the polymer is,

- (1) $\sim\sim\sim \text{NH-CO-O} \sim\sim\sim$
 (2) $\sim\sim\sim \text{NH-CO-NH} \sim\sim\sim$
 (3) $\sim\sim\sim \text{NH-CO-O-CO} \sim\sim\sim$
 (4) $\sim\sim\sim \text{NH-CO} \sim\sim\sim$
 (5) $\sim\sim\sim \text{NH-CO-NH-CO} \sim\sim\sim$

19. Co-polymerisation is important to study,
 (a) the reactivity of different monomers.
 (b) reaction mechanism of free radical, carbanions and carbonium ions
 (c) suitable monomers for a Co-polymer of desired properties

The correct statements

- (1) a only (2) a b (3) a c (4) b c (5) a b c

20. The important properties to be considered in polymerization techniques are,
 (a) chain length (b) molar mass distribution
 (c) chemical homogeneity (d) molecular structures

The correct answers are,

- (1) a b c (2) a c d (3) b c d (4) a b d (5) a b c d