



## CT3 MODEL Questions Paper

Chemistry (SRM Institute of Science and Technology)



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INTERNAL ASSESSMENT – III [CLA1-T3]

Program: B. Tech.

Course Code & Title: 21CYB101J & Chemistry

Year & Semester: I Year & I Semester

Date: 28/11/2023

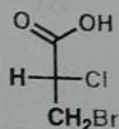
Time: 8.00-9.00 am

Max. Marks: 30 Marks

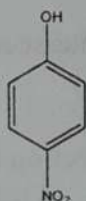
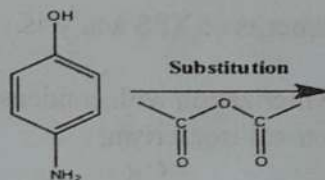
**Part- A (10 x 1 = 10 Marks)**

**Answer ALL the Questions**

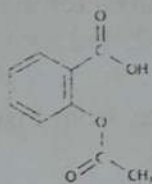
- Which of the following reacts by the E1 mechanism in ethanol most readily?  
a)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$  b)  $(\text{CH}_3)_2\text{CHCH}_2\text{Br}$  c)  $(\text{CH}_3)_3\text{CBr}$  d)  $\text{CH}_3\text{CH}_2\text{CHBrCH}_3$
- Find R/S notation for the compound given:



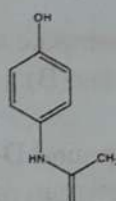
- R b) S c) both a and b d) No chiral center
- Pick out chiral molecule from the given examples.  
a) Bromochlorofluoromethane b) dichlorofluoromethane c) 2-propanol d) 3-pentanol
  - Predict the product that has medicinal value:



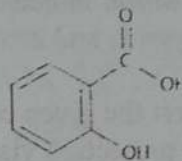
a)



b)



c)



d)

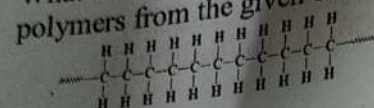
- The strength of the polymer increases with \_\_\_\_\_ in molecular weight.  
a) Increase b) Decrease c) No change d) Slightly decrease
- Which of the following statement is INCORRECT for PVC?  
a) It is odourless, colourless and non-inflammable b) It is used for making bottles for consumable liquids c) It is soluble in ethyl chloride and has superior chemical resistance d) It has poor resistance to weathering and oil resistance
- Cis-polyisoprene unit is an example of ---- polymer.  
a) Isotactic b) syndiotactic c) Atactic d) conducting
- The characteristics of condensation polymerization are given below-  
I. only  $\text{-C-C-}$  linkages present in the polymer structure  
II. use of bifunctional or polyfunctional monomers  
III. elimination of a small byproduct molecule  
Which of the following is true?  
a) I, II, III b) II and III c) I and II d) Only III

9. The kinetic energy of the photoelectron is dependent on \_\_\_\_\_ of the atom, which makes XPS useful to identify the oxide state.
10. In ----- analysis, the sample can be analysed for its crystal structure, space group, lattice parameters, preferred orientation and its size.
- a) Mass b) Charge c) Chemical environment d) Volume  
a) XPS b) UV c) NMR d) XRD

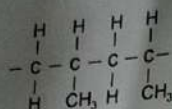
**Part- B (2 x 10 = 20 Marks)**

- 11 a. i. What is peroxide effect? Explain the mechanism that involves it, by taking an example. (6 Marks)

- ii. What are homo chain and hetero chain polymers? Pick out the homo and hetero chain polymers from the given examples. (4 Marks)

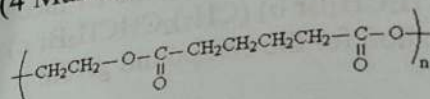


A)

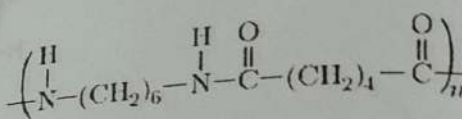


C)

B)



D)



OR

- b. i. Explain synthesis, properties and applications of:  
PVC (B) synthetic rubber

[6 Marks]

- ii. Give the merits and demerits of XPS analysis.

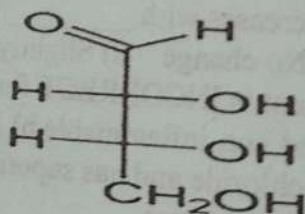
[4 marks]

- 12 a. i. Compare addition polymerization with condensation polymerization with examples.  
ii. Write a note on geometrical isomerism.

OR

- b. i. What are Miller indices? Compute Miller indices for the planes intersecting at  
A)  $x = \frac{1}{2}$ ,  $y = 1$ , and  $z = \infty$  and B)  $x = 3$ ,  $y = -2$ , and  $z = 1$  [6 marks]

- ii. Interconvert the given compound D-Erythrose, from Fischer Projection to Sawhorse projection via Newman projection. [4 marks]





INTERNAL ASSESSMENT - III [CLA1-T3]

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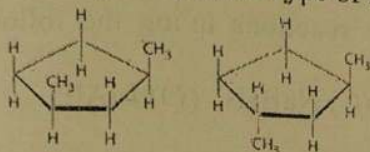
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Part- A (10 x 1 = 10 Marks)

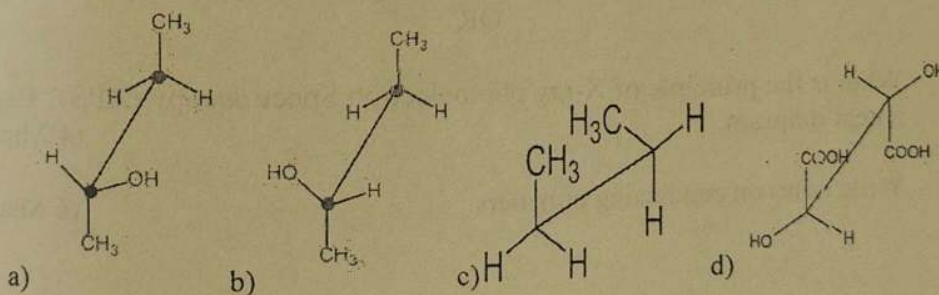
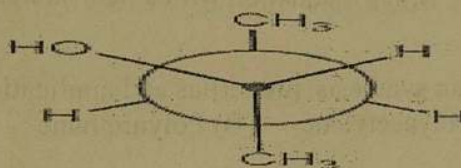
Answer ALL the Questions

1. Identify the compound with the highest ring strain  
a) Cyclomethane b) Cyclobutane c) Cyclopropane d) Cyclopentane

2. Identify from the given pair the type of isomerism it exhibits:



- a) geometrical isomerism b) Functional isomerism c) chain isomerism d) position isomerism
3. The correct sawhorse projection for the given Newman projection is -----.



4. Markovnikov's law is applied in  
a) addition of propylene with  $\text{Cl}_2$  b) addition of ethylene with  $\text{HCl}$   
c) addition of ethylene with  $\text{Br}_2$  d) addition of propylene with  $\text{HBr}$
5. Which of the following is true for the resultant polymer product formed, when molecules of phthalic acid react with molecules of glycerol?  
a) branched polymer b) cross-linked polymer c) linear polymer d) both a and b

6. The polymer in which steric placements of the substituents are arranged in such a way to give alternate d and l configurations, is known as \_\_\_\_\_ polymer(s).  
a) isotactic b) atactic c) syndio-tactic d) extrinsic
7. The compound  $[-CH_2-CH(C_6H_5)-]_n$  is a \_\_\_\_\_.  
a) homopolymer b) co-polymer c) condensation polymer d) network polymer
8. Which of the following has the weakest intermolecular forces?  
a) Buna-N rubber b) Nylon-6,6 c) Polythene d) Polystyrene
9. Which of the following wavelength falls in an X-ray region?  
a)  $10^{-4}$  Å b) 1 Å c) 1000 Å d) 10000 Å
10. The Miller indices of the plane, whose intercepts along the axes are (2a, b, 3/2c) are  
a) (3 6 4) b) (6 3 4) c) (6 3 2) d) (3 6 2)

**Part- B (2 x 10 = 20 Marks)**

- 11 a. Explain oxidation and reduction reactions using the following reagents with suitable examples:  
(A)  $KMnO_4$  (B)  $K_2Cr_2O_7$  (C)  $NaBH_4$  (D)  $LiAlH_4$  (10 Marks)

OR

- b. i. How polymers are classified based on origin? Give examples. (4 Marks)
- ii. Derive Bragg's equation with a neat sketch. (6 Marks)
- 12 a. i. Explain synthesis, properties and applications of:  
(A) Polyacetylene (B) Polyurethane
- ii. Explain plane of symmetry and alternating axis of symmetry with examples. (6 Marks)

OR

- b. i. What is the principle of X-ray photoelectron Spectroscopy (XPS)? Explain with a neat diagram. (4 Marks)
- ii. Write notes on conducting polymers. (6 Marks)



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Program: B.Tech  
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Date: 28/11/2023  
Time: 12:30 – 1:30 PM  
Max. Marks: 30 marks

**Part – A (10 x 1 = 10 Marks)**

**Answer all the questions**

- 1 One of the characteristic properties of polymer material is
  - (a) High temperature stability
  - (b) High mechanical strength
  - (c) High elongation
  - (d) Low hardness
- 2 Find the incorrect macromolecule among the following
  - a) Cellulose
  - b) Glycogen
  - c) RNA
  - d) Galactose
- 3 Which of the following is a thermosetting polymer?
  - a) polystyrene
  - b) polyolefins
  - c) nylons
  - d) phenolic resins
- 4 A low concentration of nucleophile favours the
  - a)  $S_N2$  mechanism
  - b)  $E2$  mechanism
  - c) Both  $S_N1$  and  $S_N2$
  - d)  $S_N1$  mechanism
- 5 Glass transition temperature ( $T_g$ ) for Nylon-6 is  $50^\circ\text{C}$ , which is higher than polyethylene due to \_\_\_\_\_
  - a) Inter-molecular hydrogen bonding
  - b) Intra-molecular hydrogen bonding
  - c) Vander Waals forces
  - d) Covalent forces
- 6 According to the Cahn Ingold Prelog selection rules, the decreasing order of preference is
  - a)  $-\text{CH}(\text{CH}_3)_2 > -\text{C}_6\text{H}_5 > -\text{H} > -\text{NH}_2$
  - b)  $-\text{NH}_2 > -\text{C}_6\text{H}_5 > -\text{CH}(\text{CH}_3)_2 > -\text{H}$
  - c)  $-\text{NH}_2 > -\text{CH}(\text{CH}_3)_2 > -\text{C}_6\text{H}_5 > -\text{H}$
  - d)  $-\text{C}_6\text{H}_5 > -\text{CH}(\text{CH}_3)_2 > -\text{NH}_2 > -\text{H}$

- 7 The neighbouring polymeric chains in thermosets are held together by \_\_\_\_\_
- Van der Waals force
  - Hydrogen bond
  - Covalent bond
  - Electrovalent bond
- 8 Which of the following is not an application of conducting polymers?
- Rechargeable batteries
  - Analytical sensors
  - Electronics
  - Adhesives
- 9 The X-ray source for XPS is
- Mercury- arc
  - Nernst glower
  - Globar source
  - Al K $\alpha$
- 10 Obtain the Miller indices of a plane whose intercepts are 4, 4 and 2 units along the three axes.
- (122)
  - (211)
  - (121)
  - (112)

**Part – B (2 x 10 = 20 Marks)**

11. a. Discuss the condensation polymerization process in the synthesis of Nylon and PET along with the properties and applications. (10 Marks)
- (OR)
- b. i. What are the differences between thermoplastic and thermosets? (5 Marks)
- ii. Explain S<sub>N</sub><sup>1</sup> and S<sub>N</sub><sup>2</sup> mechanism of nucleophilic substitution reactions with examples. (5 Marks)
12. a. i. What is the reaction of the following with cyclopropane?  
I. Chlorine, II. Hydrogen Iodide, III. Sulphuric acid, IV. Hydrogen (6 Marks)
- ii. What is a medicinal drug? Give the uses of aspirin and paracetamol. (4 Marks)
- (OR)
- b. Discuss the principle and instrumentation of X-ray photo electro spectroscopy. (10 Marks)



**INTERNAL ASSESSMENT – III [CLA1-T3]**

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Year & Sem: 1 Year & 1 Sem

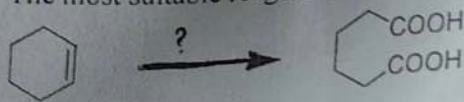
Date: 28/11/2023  
Time: 12:30 – 1:30 PM  
Max. Marks: 30 marks

**Part – A (10 x 1 = 10 Marks)**

**Answer all the questions**

- 1 In most of the world, acetaminophen is best known as which of the following?
  - a) Paracetamol
  - b) Methamphetamine
  - c) Aspirin
  - d) Naproxen
- 2 Identify the polymer formed by addition polymerization
  - a) Nylon
  - b) Polyester
  - c) Teflon
  - d) Bakelite
- 3 The synthesis of which of the following polymers involves the repeated loss of small molecules?
  - a) Polythene
  - b) Buna-S
  - c) Buna-N
  - d) Nylon-6,6
- 4 \_\_\_\_\_ undergoes permanent deformation on heating.
  - a) Polythene
  - b) PVC
  - c) Teflon
  - d) Bakelite
- 5 Arrange the following in the decreasing order of leaving group in nucleophilic substitution reaction.
  - a)  $\text{H}^- > \text{Cl}^- > \text{HO}^- > \text{Br}^- > \text{CH}_3\text{COO}^-$
  - b)  $\text{Cl}^- > \text{Br}^- > \text{HO}^- > \text{H}^- > \text{CH}_3\text{COO}^-$
  - c)  $\text{Cl}^- > \text{Br}^- > \text{CH}_3\text{COO}^- > \text{HO}^- > \text{H}^-$
  - d)  $\text{HO}^- > \text{CH}_3\text{COO}^- > \text{H}^- > \text{Br}^- > \text{Cl}^-$
- 6 Minimum interplanar spacing required for Bragg's diffraction is
  - a)  $\lambda/4$  b)  $\lambda/2$
  - c)  $4\lambda$  d)  $2\lambda$
- 7 Select the incorrect statement from the following option.
  - a) Thermosets have 3-dimensional, cross-linked network structure



- b) Thermosets cannot be remoulded, reused or reclaimed  
 c) Thermosets are hard, strong and brittle  
 d) Thermosets are soluble in suitable solvents
- 8 Which of the following is used for making rechargeable batteries?  
 a) Nylon  
 b) Polyester  
 c) Polyaniline  
 d) Polyacrylonitrile
- 9 The dehydration of alcohols is an example of \_\_\_\_\_  
 a) E2 reaction  
 b) S<sub>N</sub>2 reaction  
 c) S<sub>N</sub>1 reaction  
 d) E1 reaction
- 10 The most suitable reagent for the following transformation is
- 
- a) KMnO<sub>4</sub>  
 b) NaBH<sub>4</sub>  
 c) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>  
 d) LiAlH<sub>4</sub>

**Part – B (2 x 10 = 20 Marks)**

11. a. Discuss the addition polymerization process in the synthesis of PVC, Teflon along with the properties and applications. (10 Marks)  
 (OR)  
 b. i. Explain polymer tacticity and its types? (6 Marks)  
 ii. Write a short note on Dieckmann condensation. (4 Marks)
12. a. i. Explain Bragg's law with a neat diagram. (6 Marks)  
 ii. For the intercepts x, y, and, z with values of 3, 1, and 2 respectively, find the Miller indices. (4 Marks)  
 (OR)  
 b. i. Explain in detail the conformational analysis of n-butane with potential energy diagram. (5 Marks)  
 ii. Explain briefly the E1 and E2 reactions with an example for each. (5 Marks)

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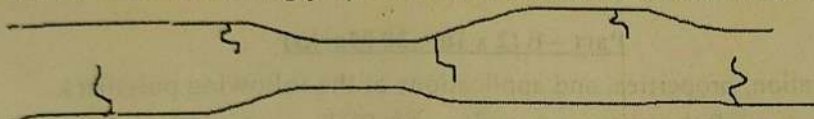
Date: 30/11/2023

Time: 08.00 – 09.00 AM

Max. Marks: 30

Part – A (10 x 1 = 10 Marks)Answer ALL The Questions

1. Which of the following polymers has a structure as shown below?



- a) Low-density polythene    b) High-density polythene    c) Polyvinyl chloride    d) Bakelite
2. In Newmann projection for ethane in the eclipsed conformation, the dihedral angle for the C—H bonds is .... degree.  
a) 0    b) 60    c) 120    d) 90
3. Which statement does not correctly describe  $S_N2$  reactions of alkyl halides?  
a) Reaction rate is first-order in both [alkyl halide] and [nucleophile]    b) The nucleophile approaches from the backside of the carbon-halogen bond  
c) Tertiary halides react faster than secondary halides    d) The mechanism is best described as a concerted, one-step mechanism
4. The reaction mixture of addition polymerization contains at any instant of time:  
I. Full grown polymer molecules  
II. Unreacted monomer molecules  
III. Free radical chains and initiators  
Which of the above statements are correct?  
a) I and II    b) I, II and III    c) I and III    d) III only
5. Which of the following groups has the lowest priority according to the Cahn-Ingold-Prelog sequence rules?  
a)  $-\text{CH}(\text{OH})\text{CH}_3$     b)  $-\text{CH}_2\text{CH}_3$     c)  $-\text{CH}=\text{CH}_2$     d)  $-\text{C}\equiv\text{CH}$
6. Hemodialysis tubes are made with .....  
a) Polypropylene    b) Thermoplastic polyurethane    c) Nylon    d) Polyurethane intermediate
7. Which of the following statement is incorrect?  
a)  $E2$  is a concerted reaction in which bonds break and new bonds form at the same time in a single step  
b) Order of reactivity of alkyl halides towards  $E2$  dehydrohalogenation is found to be  $3^\circ > 2^\circ > 1^\circ$   
c)  $E2$  reaction is favoured at low temperature



- d) E2 reaction is favoured by strong base
8. The rate equation for a nucleophilic substitution reaction of a tertiary alkyl bromide with iodide ion would be,....  
 a) Rate =  $k[I^-]$  b) Rate =  $k[RBr]$  c) Rate =  $k[I^-][Br]$  d) Rate =  $k[RBr][I^-]^2$
9. If X-ray of wavelength 100 Å is incident on an atom at an angle of  $90^\circ$ , then what should be the value of  $d$  for first-order spectrum?  
 a. 30 Å b. 40 Å c. 50 Å d. 60 Å
10. Which of the following kind of polymers are known for their high crystallinity?  
 a) random b) isotactic c) atactic d) syndiotactic

**Part - B (2 x 10 = 20 Marks)**

11. a. Write the preparation, properties, and applications of the following polymers:  
 i. Polypropylene ii. Polystyrene and iii. PET (10 marks)

(OR)

- b. i. Explain Dieckmann condensation reaction with an example (4 marks)  
 ii. Elucidate with an example the mechanism of Nucleophilic Substitution reaction,  $S_N2$  reaction. (6 marks)

12. a. i. Explain the principle and Instrumentation of XPS. (7 marks)  
 ii. Compute the Miller indices for a plane intersecting at  $x = \frac{1}{4}$ ,  $y = 1$  and  $z = \frac{1}{2}$ . (3 Marks)

(OR)

- b. i. Discuss the n and p-doping mechanism in conducting polymers.  
 ii. Explain the reaction of cyclopropane with  $H_2$  and  $Cl_2$ ?



DEPARTMENT OF CHEMISTRY  
College of Engineering and Technology  
SRM Institute of Science and Technology  
Kattankulathur – 603203

SET – I

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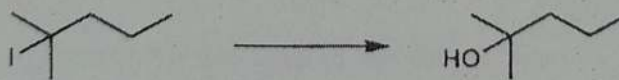
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Part – A (10 x 1 = 10 Marks)

Answer ALL The Questions

- The hybridization and geometry of the carbocation intermediate in  $S_N1$  reaction is  
a)  $sp$ , linear b)  $sp^3$ , tetrahedral c)  $sp^2$ , trigonal planar d)  $sp^2$ , tetrahedral
- Among the following, but-2-ene reacts slowest with ----.  
a) HF b) HI c) HBr d) HCl
- In Newmann projection for ethane in the staggered conformation, the dihedral angle for the C—H bonds is ....  
a)  $60^\circ$  b)  $0^\circ$  c)  $120^\circ$  d)  $90^\circ$
- Consider the following statements for condensation polymerization:  
I. Bifunctional or polyfunctional monomers  
II. Loss of each kind of functional group in each step for bifunctional species  
III. Always accompanied by the release of a byproduct molecule  
IV. Monofunctional or polyfunctional monomers  
Which of the following are true?  
a) I and IV b) I, II and III c) I and II d) III and IV
- Which of the following monomers cannot undergo chain growth polymerization?  
a)  $CH_2=CH_2$  b)  $CH_2=CHCN$  c)  $COOH-CH_2-COOH$  d)  $CH_2=CHCOOR$
- Which one of the below can be used as an insulator and also as a lubricant?  
a) Polypropylene b) PTFE c) Nylon d) Polyurethane
- By analyzing the starting material and the product, the following reaction given below can be classified as  
  
a)  $S_N2$  b) E1 c)  $S_N1$  d) E2
- Glass transition temperature ( $T_g$ ) for Nylon-66 is  $50^\circ C$ , which is higher than polyethylene due to \_\_\_\_\_



- a) Vander Waals forces b) Covalent bonding c) Inter-molecular hydrogen bonding d) Intra-molecular hydrogen bonding
9. Minimum interplanar spacing required for Bragg's diffraction is .....
- a)  $\lambda/4$  b)  $\lambda/2$  c)  $2\lambda$  d)  $\lambda$
10. Which among the following polymers have lowest solubility?
- a) polyethylene b) polystyrene c) epoxy resin d) nylon-66

**Part - B (2 x 10 = 20 Marks)**

11. a. Describe in detail the conformational analysis of n-butane by sketching its conformers and energy level diagram. (10 marks)

(OR)

- b.i. Compare and contrast syndiotactic and isotactic polymers. Provide suitable examples. (6 marks)
- ii. Elucidate with an example the mechanism of E2 reaction. (4 marks)

12. a. With a neat sketch, discuss the principle, instrumentation and applications of X-ray photoelectron spectroscopy (XPS). (10 marks)

(OR)

- b. i. Explain Cahn-Ingold-Prelog rules for the determination of absolute configuration. (4 marks)
- ii. Give the preparation, properties and uses of  
a) Polyurethane and b) Polyacetylene (6 marks)