



0125291

K19P 1082

Reg. No. :

Name :

III Semester M.Sc. Degree (CBSS- Reg./Suppl./Imp.)

Examination, October-2019

(2014 Admission Onwards)

CHEMISTRY

CHE 3E 03 : POLYMERS AND MATERIAL CHEMISTRY

Time : 3 Hours

Max. Marks : 60

SECTION - A

Answer **all** questions. Each question carries **one** mark.

1. Name the product formed from the reaction of a phenol with formaldehyde.
2. Draw representative structures for (a) alternation copolymer, (b) random copolymer, (c) block copolymer and (d) graft copolymer of any two monomers, say 'A' and 'B'.
3. How many amino groups are present in each molecule of nylon-66 made from an excess of hexamethylenediamine?
4. Under what conditions are the weight-and number- average molecular weight the same.
5. Name any two cross linking agents used in polymer industry.
6. Give a specific application of chloromethyl functionalized polystyrenes.
7. Name one naturally occurring ore of tungsten.
8. Give the composition of a zinc base casting alloy.

SECTION - B

Answer any **Eight** questions. Answer may be in **two or three** sentences. Each question carries **two** marks.

9. What is living polymerization? Give an example.
10. Illustrate various conformation observed in polymeric chain with a specific example.

P.T.O.



25. Explain the principle behind CIMS technique.
26. Pyrrole is converted to 3-chloro-pyridine in presence of KOH/ CHCl_3 . Illustrate the mechanism.

SECTION-D

Essay type questions. Answer **four** questions. Each question carries **Six** marks. **(4×6=24)**

27. a) i) Explain why butadiene shows red shift compared to ethylene
ii) How does solvent polarity affect the UV absorptions of 2-butene and benzophenone?

(OR)

- b) i) Arrange the following in the order of increasing IR stretching frequencies of carbonyl group: 2-furanone, cyclopent-2-enone and tropone.
ii) How are cis-alkenes differentiated from trans-alkenes using IR spectroscopy?

(OR)

28. a) A compound shows the following ^1H NMR values: δ 9.2 (1H, s), 7.3-7.8 (5H, m), 6.8 (1H, d), 6.6 (1H, d). Identify the compound. Explain the changes in the ^1H NMR if the compound is reduced.

(OR)

- b) Explain the ^1H - ^1H COSY of butyl bromide.
29. a) The mass spectrum of 1,2-dichloroethane shows a cluster. What is the intensity ratio of the peaks in the cluster?

(OR)

- b) What are the various analyzers used in mass spectroscopy?
30. a) Illustrate the i) Fischer indole synthesis and ii) Paal Knorr furan synthesis.

(OR)

- b) Illustrate the formation of the heterocyclic compound formed from heating of biphenyl azide.
-

K19P1080

(2)



12. Calculate the absorbance of a solution of concentration 2×10^{-4} M in a 1 cm cell, given the extinction co-efficient is $10,000 \text{ mol}^{-1} \text{ Lcm}^{-1}$.
13. A compound shows 5 aromatic protons in its ^1H NMR. In addition a two proton signal is observed at δ 4.2 ppm and an exchangeable proton is seen at δ 2.3 ppm. Identify the structure of the compound.
14. What is meant by noise decoupling?
15. At what chemical shift values will the signals of methyl benzoate appear in its ^{13}C NMR spectrum approximately?
16. What are meta-stable ions? What is its significance?
17. What are the major peaks observed in the EIMS of 2-heptanone?
18. Illustrate a method to synthesize 1,2,3-triazole.
19. What products are formed when the following are treated with methyl chloride and AlCl_3 : i) pyridine ii) quinoline and iii) thiophene?
20. Give the structures of i) azepine and ii) pyrazine.

SECTION-C

Short paragraph questions. Answer any **Four** questions. Each question carries **Three** marks. (4×3=12)

21. Calculate the € value of a solution containing 1 mmol/dm^3 of a solute whose absorbance in a 1cm cell is 1.5. What is the value of the absorbance of a solution of double the concentration?
22. What difference would you expect in the IR spectra of i) methyl benzoate and phenyl acetate and ii) salicylaldehyde and 4-hydroxy benzaldehyde?
23. What is the reason for shielding of acetylenic protons and deshielding of vinylic protons in proton NMR spectra?
24. A compound $\text{C}_8\text{H}_7\text{N}$ shows a peak at 2210 cm^{-1} . In addition to the aromatic protons there is a two proton signal at δ 4.2 ppm in its ^1H NMR. Identify the structure of the compound.



11. Explain the effect of temperature and pressure on chain polymerization.
12. Explain why the viscosity of polymer solution decreases as the temperature increases.
13. Which will yield the higher apparent molecular weight values in the light—scattering method:
(a) a dust free system or (b) one in which dust particles are present? Why?
14. What are the colligative methods for measuring molecular weight and what kind of molecular weight do you get?
15. Exemplify gas phase polymerization reaction.
16. Briefly explain the process of vulcanization.
17. Give any two examples of polymer blends along with their specific properties.
18. What are ferrites? What is their importance?
19. Explain the technical importance of porous metallic bearing.
20. Exemplify hybrid composites with their applications.

SECTION - C

Answer any **Four** questions **each** in a paragraph. **Each** question carries **3** marks.

21. How gelation happens with polymers. Explain the concept of gel point and how it can be estimated.
22. Discuss about various mechanical properties associated with crystalline polymers.
23. What are the driving forces for polymer solubility?
24. Write a short note on end group analysis for the measurement of molecular weight of polymers.
25. Differentiate between polymerization in homogeneous and heterogeneous systems.
26. Explain the post reactions of polymers for the preparation of graft and block polymers.



(3)

K19P 1082

27. Write a short note on the various casting alloys used in the tool and die industry.
28. Give the properties and application of refractory materials with specific examples.

SECTION - D

Answer either **A** or **B** of each question. Each question carries **6** marks.

29. A) Comment about the glass transition temperature (T_g) of polymers? How it can be measured and what are the factors affecting T_g ?

(OR)

- B) Inorganic compounds play a crucial role in the preparation of stereo regular polymers. Justify the statement.

30. A) Give the principle and illustrate the GPC method used for the fractionation of polymers.

(OR)

- B) Discuss Flory Huggins theory of polymer solutions.

31. A) Explain the solid phase polymerization, giving emphasis to protein synthesis.

(OR)

- B) Discuss various methods of degradation of polymers.

32. A) Discuss briefly the synthesis, properties and applications of ceramic materials.

(OR)

- B) Explain the various magnetic properties of materials used in the engineering industry.
-