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1M4A23148 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Chemistry Degree Examination, April 2023

MCH4C12 – Instrumental Methods of Analysis

(2019 Admission onwards)

Time: 3 hours Max. Weightage : 30

Section A Short Answer
Answer 8 Questions out of 12.
Each question carries a weightage of 1 (8 X 1 = 8)

1. Calculate variance for the set of data: 20.3,20.2,20.4,20.1 and 20.3 .
2. What are adsorption indicators ?
3. What are metal -ion indicators ?
4. Write *Ilkovic* equation and explain the terms.
5. What are the limitations of glass electrodes ?
6. What are the advantages of coloumetry over volumetric method?
7. `Explain the features of a double beam spectrometer over single beam spectrometer.
8. Explain the principle of ESCA analysis.
9. What are the advantages of SEM ?
10. What is the effect of particle size on a DTA curve?
11. What is thermometric titration?
12. Express mechanism for gel permeation chromatography.

Section B Short Essay
Answer 4 Questions out of 7.
Each question carries a weightage of 3 (4 X 3 = 12)

13 Write a note on organic precipitating agents.

14 Describe any two redox titrations. Explain the choice of redox indicators.

15 Explain briefly 'Anodic stripping voltammetry'.

16 Discuss organic polarography.

17 Briefly explain the instrumentation of UV-visible spectrophotometry.

18 What is TEM ? What are the types of informations would you get from TEM analysis? Discuss.

19 Explain the instrumentations in DSC. What are the advantages of DSC over DTA?

Section B Essay

Answer 2 Questions out of 4.

Each question carries a weightage of 5 (2 X 5 = 10)

20 a)Discuss classification of errors. Mention the ways to minimize the errors(4 wtg)

b)Explain Q – test. (1 wtg)

21 Write a note on

(a)ion selective electrodes (b) biological and biocatalytic electrodes

(c) Chronopotentiometry (d) Primary and secondary coulometry

22 Discuss the principle, instrumentation and applications of (a) AAS (b) AES

23 Discuss the principle involved in HPLC. Give a brief account on the different types of detectors used in HPLC. What are its important applications?

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Chemistry Degree Examination, April 2023

MCH4E06 – Natural Products & Polymer Chemistry

(2019 Admission onwards)

Time: 3 hours Max. Weightage : 30

Section A Short Answer
Answer 8 Questions out of 12.
Each question carries a weightage of 1 (8 X 1 = 8)

1. Mention any three important constituents of citronella oil. Write the structure of each.
2. Establish the position of double bond in cholesterol.
3. Write the classification of steroids. Mention an example of each class.
4. Write the steps involved in the biosynthesis of Papaverine.
5. Mention any three flavanols and write their structure.
6. Write a note on Squarene dyes.
7. What is chain transfer? Explain its effects in free radical chain polymerization.
8. What is Zimm's plot? Mention its significance.
9. What is meant by degree of crystallinity in polymers? How is it calculated from density data?
10. Why PVC has low crystallinity? Give any two applications of PVC.
11. Give the commercial importance of polycarbonates.
12. Write down the advantages of using polystyrene in solid phase synthesis.

Section B Short Essay
Answer 4 Questions out of 7.
Each question carries a weightage of 3 (4 X 3 = 12)

13. Write the steps involved in conversion of Cholesterol to Progesterone.
14. Discuss the biosynthesis of Fatty acids.
15. What are the structural differences between Phthalocyanin and Porphyrin.
16. Discuss the classification of dyes based on chemical composition.
17. Discuss the kinetics and mechanism of free radical polymerization.

18 Explain Gel Permeation Chromatography for the determination of molecular weight of polymers.

19 Write the synthesis, structure and applications of PMMA and Polyurethanes.

Section C Essay

Answer 2 Questions out of 4.

Each question carries a weightage of 5 (2 X 5 = 10)

20 Discuss in detail the classification of natural products.

21 Discuss the structure elucidation of alkaloids by degradative reactions.

22 Explain the following polymerisation techniques in detail

a) Solution polymerization

b) Suspension polymerization

c) Emulsion polymerization

d) Bulk polymerisation

23 Explain polymeric liquid crystals and their applications.

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Chemistry Degree Examination, April 2023

MCH4E08 – Organometallic Chemistry

(2019 Admission onwards)

Time: 3 hours Max. Weightage : 30

Section A: Short Answer

Answer 8 Questions out of 12.Each question carries a weightage of 1 (8 X 1 = 8)

1) Determine the value of 'n' in the following compounds using 18 electron rule.
(a) $W(\eta^6\text{-}C_6H_6)(CO)n$ (b) $Rh(\eta^5\text{-}C_5H_5)(CO)n$ (c) $MnBr(CO)n$

2) What are carbonylate anions? How are they prepared?

3) Explain migratory insertion reactions in metal carbonyls.

4) Discuss the bonding in tertiary phosphine complexes.

5) Explain why $Mo(PMe_3)_5H_2$ is a di-hydride, but $Mo(CO)_3(PR_3)_2(H_2)$ contains the dihydrogen ligand (Me = methyl, R = isopropyl).

6) What are metallocenes? Write one synthesis method and structure of uranocene.

7) Explain bonding in dihydrogen complexes.

8) Nucleophilic addition of MeO^- to free PhCl is negligiblyslow under conditions for which the reaction with $(\eta^6\text{-}C_6H_5Cl)Cr(CO)_3$ is fast. Why is the reaction accelerated by coordination and what is the product formed?

9) What is meant by agostic interaction?

10) Write the important characteristics of Ziegler- Natta catalyst.

11) What are the merits and demerits of homogeneous catalysis?

12) Discuss the applications of organometallic dendrimers.

Section B: Short Essay

Answer 4 Questions out of 7.Each question carries a weightage of 3 (4 X 3 = 12)

13) How can you identify the back donation in metal carbonyls using IR spectra?

14) Write a short note on photochemical substitution reactions in metal carbonyls.

15) Explain fluxional behaviour in organometallic compounds containing allyl and cyclopentadienyl groups

16) Describe the bonding in η^6- arene complexes.

17) Explain briefly the steps involved Wacker process.

18) Discuss oxidative coupling and reductive de coupling.

19) Illustrate hydrosilation and hydrocyanation of alkenes.

Section C: Essay

Answer 2 Questions out of 4.Each question carries a weightage of 5 (2 X 5 = 10)

20) (a) Discuss briefly about the synthesis, structure and bonding of metal- acetylene complexes.

(b) Explain the synthesis and structure of Zeise's salt.

21) Discuss the classification of nitrosyl complexes based on structure and bonding with suitable examples.

22) What are oxidative addition and reductive elimination reactions involving organometallic species? Explain with example.

23) Explain the synthesis and applications of

(i) poly(ferrocenylsilane) (ii) polygermanes and (iii) polystannanes.