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Reg. No:.....

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE  
Fourth Semester M.Sc Degree Examination, March/April 2021  
**MCH4C12 – Instrumental Methods of Analysis**  
(2019 Admission onwards)

Time: 3 hours

Max. Weightage : 30

**Section A - Short Answer**  
**Answer 8 questions. Each carries weightage 1**

1. Explain the difference between accuracy and precision.
2. Mention the conditions for precipitation.
3. What are the advantages of using organic precipitants over inorganic precipitants?
4. What are the limitations of glass electrodes?
5. What are the applications of polarography?
6. What are the advantages of coulometric titrations over volumetric titrations?
7. What is hollow cathode lamp? How does it function as a radiation source in AAS.
8. Explain the principle of TEM.
9. Explain the principle of auger electron spectroscopy.
10. Which factors affect DTA curve.
11. What is isotopic dilution method? How is it different from neutron activation analysis?
12. "Thin layer chromatography is superior to other types of chromatographic methods".  
Explain this statement.

**(8x1=8 weightage)**

**Section B- Short Essay**  
**Answer 4 questions out of 7. Each carries a weightage of 3**

13. What is meant by co precipitation? Mention its causes and remedy giving suitable examples.
14. Explain EDTA titrations. What are redox indicators?
15. Write a note on organic polarography.
16. Give an account on amperometric titrations. What are the applications of amperometric titrations.

17. Briefly explain the atomization techniques in AAS and AES.
18. What is SEM? How do you collect information from SEM?
19. Explain the instrumentation in DSC. What are the advantages of DSC over DTA?

(4 x 3 = 12 weightage)

### Section C-Essay

Answer 2 questions out of 4. Each carries weightage 5

20. a) Define errors.
  - b) Explain determinate and indeterminate errors. Mention their causes.
  - c) Explain significant figures giving suitable examples.
21. Write a note on.
  - a) Redox indicators
  - b) Adsorption indicators
  - c) Indicators for non-aqueous titrations
  - d) Metal ion indicators
  - e) Buffer solutions
22. Explain the principle, instrumentation and applications of AAS and AES.
23. a) Explain the principle involved in ion exchange chromatography.
  - b) Explain ion exchange capacity.
  - c) Discuss the applications of ion exchange chromatography in
    - (i) complete demineralization of water.
    - (ii) softening of hard water.
    - (iii) separation of lanthanides.

(2 x 5 = 10 weightage)

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE  
 Fourth Semester M.Sc Degree Examination, March/April 2021  
**MCH4E06 – Natural Products and Polymers**  
 (2019 Admission onwards)

Time: 3 hours

Max. Weightage : 30

**Section A -Short Answer**  
**Answer any 8 questions. Each question carries 1 weightage**

1. What are the sources of carotenoids from nature? Mention three functions of them.
2. How is the short chain fatty acid synthesised?
3. Draw the structure of abietic acid.
4. How the presence of two  $\beta$ -ionone units in  $\beta$  carotene is confirmed?
5. What products are obtained by the alkali fusion of flavones?
6. List five reasons why there is an interest in supramolecular chemistry.
7. What is bulk polymerization? Why does heat dissipation in bulk polymerization becomes progressively difficult with high conversions?
8. What are stereo regular polymers?
9. What is Metallocene? Write one example.
10. Write down the applications of PMMA.
11. What is the significance of glass transition temperature?
12. What are liquid crystals? How can be avoided the temperature range problems in liquid crystal?

**[8 x 1 = 8 weightage]**

**Section B- Short Essay**  
**Answer any 4 questions. Each question carries 3 weightage**

13. Discuss the classification of alkaloid based on origin and structure.
14. Establish the position of keto group and angular methyl group in Oestrone.
15. Write down the general synthesis method for Anthocyanins.
16. Explain the structural difference between  $\beta$  carotene and indigo dye.
17. Write a note on gelation and cross linking.
18. Discuss any method used for the determination of molecular weight of polymers.
19. Discuss the structure of this Ziegler-Natta catalysts and the mechanism of coordination polymerisation in which they are used.

**[4 x 3 = 12 weightage]**

**Section C- Essay**

**Answer any 2 questions. Each question carries 5 weightage**

20. Give a short note on the following essential oils
- a) Citronella oil
  - b) Cinnamon oil
  - c) Palmarosa oil
21. Discuss the biosynthesis of quinine and papaverine.
22. Discuss the following polymerization techniques.
- a) Solution Polymerization
  - b) Suspension Polymerization
  - c) Emulsion polymerization
23. a) Discuss solid phase peptide synthesis.
- b) Write the applications of conducting polymers.

**[2 x 5 = 10 weightage]**

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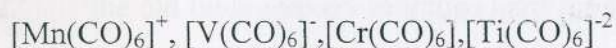
FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE  
Fourth Semester M.Sc Degree Examination, March/April 2021  
MCH4E08 – Organometallic Chemistry  
(2019 Admission onwards)

Time: 3 hours

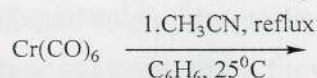
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**Section A: Short Answer**  
**Answer 8 Questions out of 12**  
**Each question carries one weightage**

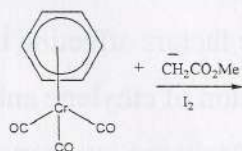
- Write the different hapticities of Cp ligand. Draw the structure of  $[W(CO)_2Cp_2]$  with the help of 18 electron rule.
- Write the correct decreasing CO stretching frequencies of the following complexes. Give reasons.



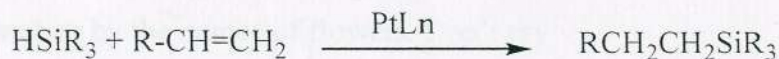
- Write the product of the following reaction. Give explanation.



- Explain why  $[Mo(PMe_3)_5CH_2]$  is a dihydride, but  $[Mo(CO)_3(PR_3)_2CH_2]$  contains the dihydrogen ligand. (Me-methyl-R-isopropyl)
- What are the characteristics of Schrock carbene complexes?
- Cobaltocene and nickelocene are readily oxidised as compared to ferrocene. Explain with the help of M.O diagram.
- What is oxidative addition? Which factors are important in determining the tendency for a complex to undergo oxidative addition reactions?
- Which mechanism is operating during the oxidative addition of  $H_2$  to Vaska's complex? Give the important steps and specify the stereochemistry.
- Write the product of the following reaction and give its significance.



- What is hydrosilation reaction? Give its characteristics
- Name the reaction and give the three important Pt based catalyst for the following reaction.

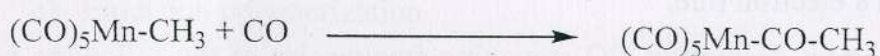


- Give one method for the preparation of poly vinyl ferrocene.

(8 x1 = 8 weightage)

**Section B: Short Essay**  
**Answer 4 Questions out of 7.**  
**Each question carries three weightage**

13. Give a brief note on different types of bonding modes of CO ligand in carbonyl complexes.
14. What is  $\text{Na}_2\text{Fe}(\text{CO})_4$ ? Give its applications in organic synthesis.
15. Write a note on f-block organometallic complexes.
16. Write a note on nitrosyl and dihydrogen complexes.
17. The following reaction is a methyl migration rather than CO insertion of CO ligand into M-C bond. Justify with  $^{13}\text{C}$  labelled studies.



18. Write a note on Monsanto acetic acid synthesis. Draw the catalytic cycle and give the significances of each step involved.
19. Write a short note on hydrocyanation of alkenes. Mention the important application of this reaction and draw the catalytic cycle for the hydrocyanation of butadiene.

**(4x3 = 12 weightage)**

**Section C: Essay**  
**Answer 2 Questions out of 4.**  
**Each question carries five weightage**

20. (a) Discuss the bonding and back-bonding interactions for a metal-allyl complex.  
(b) Explain the structure and bonding in Zeise's salt.  
(c) Explain the bonding in metal-butadiene complexes and metal-carbene complexes.
21. Give a brief account on nitrosyl and phosphine complexes. (ii) What is N-heterocyclic carbenes? Give its uses and advantages.
22. Discuss the following:
  - (a) Schwartz's reagent and hydrozirconation.
  - (b) Hydroformylation and the factors affecting n/iso ratio.
  - (c) Zeigler-Natta polymerisation of ethylene and propylene.
23. (a) How ferrocenyl silanes, germanes and stannanes are prepared?  
(b) Discuss different types of the preparation of poly ferrocenyl silanes with mechanism.

**(2 x 5 = 10 weightage)**