

Pre. Ph.D. Course Work (2017 Course) : SUMMER - 2018
(Chemistry)

SUBJECT: PAPER – II (CHEMISTRY)

Day: Tuesday
Date: 26/06/2018

S-2018-4754

Time: 10.00 AM TO 01.00 PM
Max. Marks: 100

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat and labelled diagrams **WHEREVER** necessary.

Q.1 Attempt any **FOUR** of the following: (20)

- a) Discuss the type of ligands with suitable example.
- b) Comment on electrochemical behavior of complexes.
- c) What are organometallic compounds? Give their applications.
- d) Discuss the methodology for synthesis of coordination compounds.
- e) Name and draw structures of the following complexes:
i) $[\text{CoCl}_4]^{2-}$ ii) $[\text{Ni}(\text{CN})_4]^{2-}$ iii) $[\text{PtCl}_6]^{2-}$
- f) Write a note on: Spectroscopic characterization of organometallic compounds.

Q.2 Attempt any **FOUR** of the following: (20)

- a) Explain principle and instrumentation of Transmission Electron Microscopy (TEM).
- b) Discuss principle and uses of scanning electron Microscopy (SEM) for surface morphology of materials.
- c) Explain the role of X-ray photoelectron Spectroscopy (XPS) for material characterization.
- d) Discuss principle and applications of Electron Spectroscopy for Chemical Analysis (ESCA).
- e) Explain in brief X-ray diffraction (XRD) technique.
- f) Write a note on: Applications of Thermo Gravimetric (TG) analysis.

Q.3 Attempt any **FOUR** of the following: (20)

- a) Discuss fluorescence-lifetime microscopy.
- b) Explain instrumentation for fluorescence spectroscopy.
- c) Discuss applications of fluorescence in analytical work.
- d) How is the fluorescence technique useful for molecular interaction? Explain.
- e) Discuss phenomenon and characteristic of fluorescence.
- f) Write a note on: Fluorescence quenching.

Q.4 Attempt any **FOUR** of the following: (20)

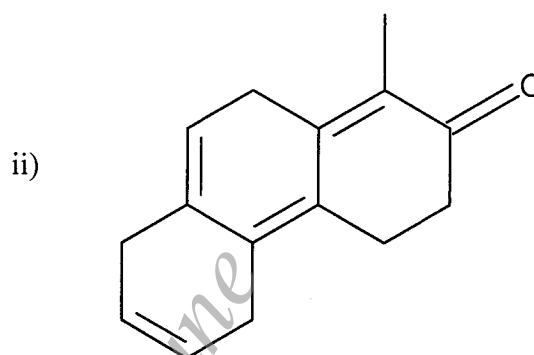
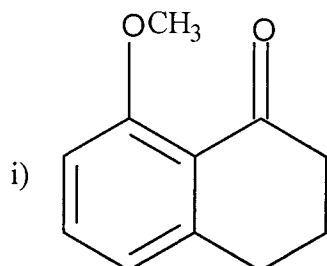
- a) Describe the principle and instrumentation of HP- TLC.
- b) Discuss instrumentation and applications of GC- MS.
- c) Explain in brief ICP- MS technique.
- d) Give an applications of LC- MS in material characterization.
- e) What are hyphenated techniques? Give their advantages.
- f) Write a note on: Applications of HP- TLC in forensic and Pharmaceutical Science.

P. T. O.

Q.5 Attempt any **FOUR** of the following:

(20)

- Explain importance of "Integration" in PMR.
- Hydrogenation of $\text{Ph} - \text{C} \equiv \text{C} - \text{COOH}$ gives two isomeric products. How will you differentiate these two by NMR and IR spectroscopy?
- An unknown hydrocarbon has a molecular ion peak at $m/e = 84$, with a relative intensity of 31.3. The $M+1$ peak has a relative intensity of 2.06 and the $M+2$ peak has relative intensity of 0.08. What is the molecule formula for this substance?
- Calculate the λ_{max} for the following compound. Clearly shows your calculations.



- Assign the structure of the compound by using following spectral data.

M.F: $\text{C}_{10}\text{H}_{12}\text{O}_2$

I.R.: 1745, 1608, 1497 cm^{-1}

^1H NMR: 2.02 δ (s, 3H)

2.93 δ (t, 2H)

4.30 δ (t, 2H)

7.29 δ (s, 5H)

- Write a note on: Applications of FTIR spectroscopy in structure determination.

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