

PC-372-CV-19
(533) M.Sc. Chemistry (Third Semester)
Examination, Dec-2020
Compulsory/Optional
Paper-I

Name/Title of Paper- Applications of spectroscopy

[Maximum Marks : 80

Time : Three Hours]

[Minimum Pass Marks : 29

नोट : दोनों खण्डों से निर्देशानुसार उत्तर दीजिए। प्रश्नों के अंक उनके दाहिनी ओर अंकित हैं।

Note : Answer from both the Sections as directed. The figures in the right-hand margin indicate marks.

Section-A

1- Answer the following question:

1X10

- (a) How many different types of hydrogen found in $C_6H_5-CH_3$?
- (b) Write an example of AB_2 and AB_3 molecules in vibration & spectroscopy?
- (c) Which type of electronic transition occurs when a methane molecule will absorb ultraviolet light?
- (d) Why is translational motion not involved in molecular spectra?
- (e) C^{13} was first studied in 1957 by
 - (i) P.C. Lauterbur
 - (ii) Hansen
 - (iii) Packard
 - (iv) Purcell.
- (f) Write one example in which only one signal is present in the case of PMR spectroscopy?
- (g) Write the full form of "INADEQUATE" with special reference to C-13 NMR spectroscopy?
- (h) Which amine gives a strong peak at $m/e=44$?
- (i) Why is ethanol a good solvent in ultraviolet & spectroscopy?
- (j) How is spectroscopy used in industry?

2- Answer the following questions:

2X5

- (a) Nitrite ion, is an ambidentate ligand? Discuss the mode of bonding of Nitrite ion to the metal?
- (b) Amines absorb at a higher wavelength than alcohols. Why?
- (c) Calculate the multiplicity of methyl and methylene protons in ethyl chloride (CH_3CH_2Cl)?
- (d) Write any two biological applications of electron spin resonance spectroscopy?
- (e) Explain fragmentation modes in toluene?

Section-B

Answer all the questions:

12X5=60

Unit-I

3- Discuss the symmetry and shapes of AB_5 , AB_6 and AB_3 types of molecules?

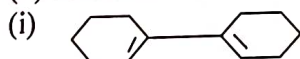
OR

Explain hyperfine interaction in Electron spin Resonance spectra of organic molecules?

Unit-II

4- (a) Discuss Woodward-Fieser rule for carbonyl compounds with one suitable example?

(b) Calculate λ_{max} of the following compounds:-



(ii) 2,4-hexadiene

OR

Discuss the factors affecting vibrational frequency with reference to IR spectroscopy?

Unit-III

5- (a) Explain why the aromatic protons are more deshielded than the ethylenic protons although both the types of protons are attached to sp^2 hybridised carbon?

(b) What are the factors which influence chemical shift in NMR spectroscopy?

OR

Write short notes on the following:-

- (a) Principle of NMR spectroscopy.
- (b) Shielding and deshielding effect.

- 6- Explain the factors affecting the C^{13} Unit-IV chemical shift?
OR

Write short notes on the following:-

- (i) Optical Rotatory dispersion (ORD) and Circular Dichroism (CD)
- (ii) Octane Rule for ketone.

Unit-V

- 7- Write short notes on the following:-

- (i) MC laffartey rearrangement
- (ii) Nitrogen Rule.

OR

- (i) Factors affecting fragmentation
- (ii) Fragmentation mode of sulphur compound and Alcohol.