AF-3516

M.Sc. (Final)
Term End Examination, 2017-18

CHEMISTRY

Paper - I

Application of Spectroscopy, Photochemistry and Solid State Chemistry

Time : Three Hours] [*Maximum Marks* : 100
[*Minimum Pass Marks* : 36

Note : Answer any **five** questions. The figures in the right-hand margin indicate marks.

1. (*a*) Explain symmetry and shape of AB_3, AB_4 and AB_5 types of molecule. 6

(*b*) Describe hyperfine interaction in ESR spectroscopy. 8

(*c*) What is the significance of '*g*' tensor ? 6

2. (*a*) Discuss the various factors which influences the vibrational frequencies of carbonyl group in IR spectroscopy. 6

(*b*) What is the effect of hybridisation of carbon on the stretching frequency of C — H bond in IR spectroscopy ? 6

(*c*) How will you differentiate the following pairs of compounds with the help of IR spectroscopy ? 8

(*i*) Primary alcohol and Secondary alcohol

(*ii*) Malic acid and Fumeric acid

3. (*a*) Illustrate chemical shift. Explain the various factors which are responsible for affecting the magnitude of chemical shift. 8

(*b*) Explain Karplus curve and give its applications. 6

(*c*) Discuss spin-spin interaction between two nuclei. 6

4. (*a*) Show the various electronic transitions taking place when cinnamaldeyhde molecule absorbs UV radiations. 5

(*b*) How cis and trans stilbene can be distinguished by UV spectroscopy. 5

(*c*) Explain the term optical rotatory dispersion (ORD) and circular dichroism (CD). 5

(*d*) Discuss the effect of solvent polarity on π–π^* transition and n–π^* transitions. 5

5. (*a*) Write notes on any **two** of the following : 5×2

(*i*) McLafferty Rearrangement

(*ii*) Mass spectral fragmentation of branched chain hydrocarbon

(*iii*) Biological applications of Mossbauer spectroscopy

(*b*) Identify the following isomeric alcohol : 5

(*i*) $CH_3 - CH_2 - CH_2OH$

(*ii*) $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2OH$

(*iii*) $CH_3 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_2 - CH_3$

(*iv*) $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle CH_3}{\overset{|}{C}}}} - OH$

(*c*) Explain COSY and NOESY techniques. 5

6. (*a*) What is the fate of excited molecule ? 8

(*b*) Describe the different types of photochemical reactions. Explain photodissociation reaction with suitable examples. 8

(*c*) What is photosensitization reaction ? 4

7. Write notes on any **four** of the following : 5×4

(*a*) Photo-Fries rearrangement

(*b*) Barton reaction

(*c*) Cyclohexadienone rearrangement

(*d*) Oxetane formation

(*e*) Quantum yield

(*f*) Photoisomerization of benzene

8. (*a*) Give detailed account on photochemical cis-trans isomerization 10

(*b*) Discuss the photochemistry of saturated cyclic ketones. 10

9. (*a*) Discuss the kinetics of solid state reaction. 6

(*b*) What do you mean by point defects, line defects and plane defects ? 6

(*c*) Explain superconductivity. Give the uses of organic superconductors. 8

10. (*a*) On the basis of Band theory differentiate among conductor, semi-conductor and insulator. 10

(*b*) How Ferromagnetic properties originated in substances ? 5

(*c*) Write a note on photoelectric effect. 5

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