1.Which of the following molecules will show rotational spectrum: H2, HCl, CH4, CH3Cl,CH2Cl2,H2Oand SF6?

2.What is meant by theterm polarizabilityin Raman spectra?

3.Whatis Stokes andanti-stokes linesin Raman spectrum?

4 .‘IRspectraareoftencharacterizedasfingerprintregion’.Commentonit.

5. What is the selection rule for the molecule to show rotational spectrum? .

6. Explain,whichone willexhibithighervalue**of λmax**inUV/Visiblespectraof**CH3COCH3**and

**CH2=CHCOCH3**.). .

7. DiscussthequantumtheoryofRamanspectroscopyandhowtheStokesandanti-Stokes lines appear in theRaman Spectroscopy?Howdoesit differfromIRspectroscopy?

8.WhattypeofelectronictransitionsisinvolvedinUV-visiblespectroscopy?Explainthe Absorption andIntensityshiftintheUVspectroscopy andsupportwithexamples. Illustrate,theeffectofpolarandnonpolarsolventonπ -π\*transitioninacetone?

9. AmongH2,HCl,CO2,H2OmoleculesidentifywhichwillbeIRactiveandwhy?

10.ExplaindifferentmodeofvibrationsobservedinCO2molecule. Outofthefollowing pairswhichoneisexpectedtoabsorbathigherfrequencyforstretchingvibrations?

Alsostate reason.

i) HCHO,CH3CHO;

ii) C≡C,C=C:

iii) O-H,C-C.

11.What is finger print region and functional group region in IR spectroscopy? Two

isomers A and B of the molecular formula C3H6O gives IR absorption at 1650 cm-1 and

1710 cm-1 respectively. Assign structural formula to A and B isomers?

12.StatetheselectionruleforRamanspectroscopy.Whattechnologicaladvanceshave enabledtheroutineuseofRamanspectroscopy?Whichofthefollowingspectroscopy (IRorRaman)wouldyouusetomeasurethevibrationalfrequencyofthefollowing bonds:

i)The stretching frequency of14N-15N

ii)The in Ethyne, CH≡CH

iii)The C=O Str in acetone, CH3COCH3

iv)The Re-Re str in compound, (CO)5Re-Re(CO)5

13.What is Beer-Lambert law in UV-Visible absorption spectroscopy? A compound havingconcentration10-3g/l resultedabsorbancevalue0.20atλmax510nm using1.0 cm cell.Calculateitsabsorptivityandmolarabsorptivityvalues.Molecularweightof compound is400.Canultra-violet spectraldatabeuseful todistinguishthefollowing compounds?Give reasons.

(i) Ethyl benzene and styrene.

(ii) CH2=CH-CH2-CH=CH2and CH2=CH-CH=CH-CH3.

(iii)Thepercentagetransmittance of anaqueoussolutionof unknowncompoundis20%at25ºCand300 nmfora2x10-5Msolutionina4cmcell.Calculatetheabsorbanceand themolarextinctioncoefficient.

14. Writeshortnoteson(**any TWO**)

(i)Shift(ii)Applications ofIRspectroscopy(iii)Molecularvibration

15. Give the basic principle of UV- spectroscopy.Explain varioustypes of electronic transition. Predict electronic transition inCI~CHO.