

### 3) UV-Vis and IR Spectroscopy [Question Bank].

Analytical

Beats Que<sup>n</sup>?

Q 1A Which of the following molecule shows IR spectrum?  
① HCl ② CH<sub>4</sub> ③ CO<sub>2</sub> ④ H<sub>2</sub> ⑤ H<sub>2</sub>O ?

Q 2 Define Beer's Lambert's law?

Q 3 Which source is used for producing IR radiation in IR spectrometer?

Q 4 Indicate the finger print region in FTIR spectroscopy?

Q 5 Name of the source used for producing IR radiation in FTIR spectrometer?

Q 6 Define finger print region?

Q 2B Short Answer.

Q ① Write a note on sampling techniques IR-spectroscopy

Q ② Explain the effect polarity on various band in UV-spectroscopy?

Q 3 What are McLafferty rearrangement explain significance?

Q 4 What is finger print region in IR significance? State its significance?

Q 3 Long Answer

① Elaborate various type of molecule vibration in IR spectroscopy & explain the effect of electronic, resonance and hydrogen bonding on stretching frequency?

Q2 Illustrative various factors affecting IR <sup>stretching.</sup> spectroscopy 2014, 16

Q3 explain various type of ~~transition~~ electronic transition? and type of bands UV spectroscopy how does polarity of solvent affect the nature of various band.

Q4 indicates how electronics factors affect UV-spectra.?

Q5

# Analytical chemistry



truelines

DATE: / /

## II) Advanced Analytical Tools

Q.1 Answer the following questions (11-Marks)

1) Define isotopic peak - (2018, 2016)

2) How many signals would you expect in the NMR spectrum of neopentane  $(\text{CH}_3)_4\text{C}$  - (2018)

3) Define Nitrogen Rule - (2018, 2017, 2016, 2014)

4) How many molecular ions will be observed in mass spectrum of chlorobenzene and what would be their ratio? (2018)

5) What is the significance of TMS in NMR - (2018)

6) What is base peak - (2018, 2016)

7) What is spin-spin splitting - (2017)

8) Define coupling constant - (2017)

9) How many signals will be observed in  $^1\text{H}$  NMR spectrum of ethylacetoacetate? (2017)

10) Which isotopic peak is observed for chloro compounds. (2017)

11) How many molecular ions will be observed in the mass spectrum of bromobenzene (2016)

- 12) Arrange  $sp$ ,  $sp^2$  and  $sp^3$  proton in the increasing order of their chemical shift (2016)
- 13) What is FTNMR and TMS (2016)
- 14) List the types of ionizations used in mass spectroscopy (2016)
- 15) Write structure of compound (Molecular formula  $C_8H_{10}O_2$ ) that shows two singlets in PMR at 3.9 and 6.9 ppm (2016)
- 16) In salicylaldehyde, Hydroxyl proton appears at \_\_\_\_\_ ppm (2016)
- 17) Why tetramethyl silane is used as internal standard in NMR spectroscopy (2014)
- 18) Write the  $m/z$  and intensity of molecular ion peak and isotopic peak for methyl bromide (2014)
- 19) Predict the number of signals expected (disregarding splitting) in the  $^1H$  NMR spectrum of dibutyl ether (2014)
- 20) What is the name given to ion peak of greatest intensity in mass spectrum (2014)
- 21) What is vicinal coupling (2014)
- 22) Define the term spectroscopy (2012)

23) state the criterias to identify metastable ion peak in MS (2012)

24) In 300 MHz NMR spectrometer  $\delta = \dots$  Hz (2012)

25) In MS three peaks in 1:2:1 proportion at  $M$  ( $M+2$ ) and ( $M+4$ ) and indicate the presence of (2012)

26) Write the name and structure of an ion that appears at  $m/z = 91$  (2011)

27) Enlist the methods use to record NMR spectrum (or to achieve resonance) (2011)

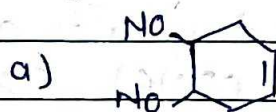
Q.2 Short answer questions

1) Give an account on various types of ions produced in mass spectroscopy (2017) [6 marks]

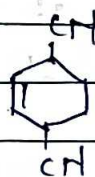
2) Explain McLafferty rearrangement (2017) [5 marks]

3) Resolution of mass spectrometer (2016) [4 marks]

4) How will you distinguish between the following pairs using MS (2011) [4 Marks]



and



b)  $\text{BE}(\text{CH}_2)_2\text{CHO}$  and  $\text{CH}_3 - (\text{CH}_2)_2 - \text{COBE}$

5) Explain the terms CI EI and FAB-MS in mass spectrometry and comment on their advantages and disadvantages - 2011 [6 Marks]

6) chlorination of ethylmethyl ether can give three different compounds. Write their structures and explain how they can be distinguished using PMR Spectroscopy - 2011 [4 Marks]

Q.3 Long answer questions.

1) 1,1,2 trichloroethane in its PMR spectrum shows doublet and triplet. Explain its genesis (2018) [7 Marks]

2) Give brief account on McLafferty rearrangement (2018) [8 Marks]

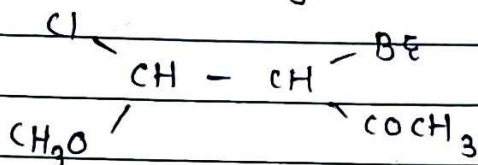
3) What is chemical shift? How it is measured? and describe with suitable examples. Explain factors affecting chemical shift (2017, 2016, 2014) [8 Marks]

4) Give an account on various peak obtained in mass spectroscopy (2016) [8 Marks]

5) Using the concept of spin-spin splitting explain the appearance of doublet and triplet in a  $^1\text{H}$  NMR spectrum (2016) [8 Marks]

6) Explain McLafferty rearrangement with suitable example (2016) [8 Marks]

- 7) Explain the appearance of two doublets in <sup>1</sup>H NMR spectrum of following compound (2014) [7 Marks]



- 8) Explain anisotropic effect (2014) [8 Marks]

- 9) What are McLafferty rearrangement Explain their significance. (2014) [8 Marks]

- 10) Explain in detail the appearance of doublet due to spin-spin coupling phenomenon (2012) [8 Marks]

- 11) Give brief account of various ions produced in recording the MS an organic compound illustrate the significance of any two of them during interpretation of MS (2012) [8 Marks]

- 12) Discuss anisotropic deshielding with reference to the protons attached to sp and sp<sup>2</sup> carbon atoms (2011) [8 Marks]

- 13) state and Explain nitrogen rule in mass spectroscopy (2011) [8 Marks]

# Analytical chemistry

## unit - IV - Atomic spectroscopy.

Q.1 Answer the following questions:

1) In atomic absorption spectroscopy (AAS), which part of the flame is considered important for the analysis. (April-2018)

2) What emission spectra are observed in atomic spectroscopy? (April-2017)

3) In which part of the flame is atomic spectroscopy performed? (Dec-2016)

4) What is the source of radiation used in AAS? (April-2016)

5) What do you mean by spectral interference in atomic spectroscopy? (Nov-2014)

6) Define nebulisation (April-2014)

7) What is the most widely used fuel in AAS? (Nov-2012)

8) What is the radiation source in AAS? (Nov-2012)



Q.5

a) Explain the instrumentation with schematic and working principle of flameless AAS. (April-2018)

b) What are the differences between Flame emission and Atomic Adsorption Spectroscopy. (April-2017)

c) Explain the advantage of ICP over Atomic Absorption Spectroscopy (April-2017)

d) Discuss in detail the instrumentation for atomic absorption spectroscopy. (Nov-2014)

e) Discuss the instrumentation for ICP. (Nov-2014)

f) Draw a schematic diagram showing path of light in ICP spectrometer. What are the basic types of instruments used in ICP? Discuss instrumentation of ICP spectroscopy. (April-2014)

g) State the difference between AAS and flame emission spectroscopy. Discuss in detail atomization units and burners in AAS with schematic diagrams. (Nov-2012)

h) What are the types of ICP spectroscopy? (Nov-2012)

i) What are the interferences in AAS? Draw a schematic diagram for AAS. (April-2011)

Q.6

a) Describe the theory and instrumentation involved in Atomic - Absorption Spectroscopy with a neat labeled block diagram. (April-2017)

b) Elaborate instrumentation of AAS and role of each component. (Dec-2016)

c) Write note on flameless AAS? (Dec-2016)

d) Write note on instrumentation and application of atomic absorption Spectroscopy. (April-2016)

e) Compare between ICP & AAS. (April-2016)

f) Explain the construction of hollow cathode lamp. (April-2016)

g) How magnesium in tap water is determined by AAS? (Nov-2014)

h) What are the interferences in AAS? Draw a schematic diagram for AAS. (April-2014)

i) What are the types of ICP Spectroscopy? Give an account of instrumentation for ICP (Nov-2012)

## SHORT NOTES

Each 9M

How Mg in tap water is determined by AAS

Nov. 2019

Discuss the instrumentation for ICP

Nov. 2019

What is Mossbauer spectroscopy? Describe some of its imp. appl<sup>s</sup>

April 2017 April 2016

Determination of high molecular wt. polymers by turbidometry

Methods of determination of lead in petrol by AAS.

Applications/limitations of neutron activation analysis (NAA)

April 2017 Nov. 2014 April 2016

Applications of Plasma spectroscopy.

April 2017 Dec. 2016 April 2016

Compare bet<sup>n</sup> ICP & AAS

April 2018 April 2017 April 2016

Explain the const<sup>n</sup> of HCL

April 2016

Significance of hydride generator in AAS

April 2018

Design &amp; functioning of ICP torch

April 2018 April 2017 April 2016

Resolution of Mass spectroscopy.

April 2016

Explain polarity effect on various bands in uv spectroscopy

Dec. 2016

Difference bet<sup>n</sup> AAS and FES

April 2017

Discuss the significance of various types of currents in polarographic analysis. 6M

2008

Give the wavelength, frequency and energy changes pertaining to normal IR region ( $400-600\text{ cm}^{-1}$ ) 6M

2011

Using Woodward Fieser rules calculate  $\lambda_{\text{max}}$  values for following compounds. 6M/8M

APril  
2018 2011



and



Explain working of photomultiplier detector used in UV spectrophotometer. 4M

2011

Electronic absorption bands are usually broad compared to those in IR, explain 4M

2011

Describe with suitable example the use of UV spectrophotometry in quantitative analysis. 6M

2011

Discuss anisotropic deshielding with reference to the protons attached to  $sp$  and  $sp^2$  carbon atoms. 6M

2011

state and explain nitrogen rule in mass spectroscopy. 4M

2011

Draw schematic diagram showing the path of light in ICP spectrometer. What are basic types of instruments used in ICP?

Discuss the instrumentation of ICP spectroscopy 10M/4M (20/4/2011)

APril  
2014

How metals in biological system are determined in AAS 5M

2011

Instrumentation of AAS with diagram, theory.

8M

APril  
2017

Explain turbidimetric titrations 5M

Dec. 2016  
April 2016  
2011

Give comparison of TCP-AES with AAS 5M

April 2016  
2011

What are interferences in AAS? Draw a schematic diagram for AAS 10M

Nov. 2014  
April 2014

Comment on background excitation in AAS 5M

April 2016  
2011

Indicate how various electronic factors affect the uv spectra 8M

April 2016

Take an account of nephelometry w.r.t. theory, instrumentation and appl<sup>n</sup> 8M

April 2017  
Nov. 2014

Explain theory & working principle of nephelometry with schematic 8M

April 2016

Write note on instrumentation & appl<sup>ns</sup> of AAS 8M

April 2016

Explain stretching freq. various factors that effect stretching frequencies in IR spectroscopy. 8M

Dec. 2016

Explain anisotropic effect. 8M

Nov. 2014  
April 2014