

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 2921

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Unique Paper Code : 2172583601

Name of the Paper : Analytical Techniques in Chemistry - DSC

Name of the Course : **B.Sc. (Prog) AGROCHEMICAL AND PEST
MANAGEMENT**

Semester : VI

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any 4 question in all.
3. Question 1 is compulsory.

Q 1 (a) Fill in the blanks

1. The difference between the true value and measured value with regard to sign is theerror
2. The antilog of 1.946 should contain.....significant figures.
3. The number of significant figures in the value 6.023×10^{23} is
4. The square of the standard deviation is known as.....
5. The Principle of solvent extraction is governed bylaw.
6. For identification purpose in chromatography the spots are characterized by theirfactors.
7. In conductometry, is the unit of measurement for electrical conductivity.
8. Radiation source used in UV-Visible spectrophotometer is
9. The unit of molar extinction co-efficient is
10. The various types of bending vibrations are.....,,and.....

P.T.O.

11. The fingerprint region in IR spectra ranges from.....
12. The value of TMS protons (in NMR) in δ scale is
13. A quartet has an intensity ratio of signal is
14. Shielding shift the signal.....while the deshielding shifts the signal.....
15. Mass spectrum is a record of the relative abundance versus.....

(15X1)

- Q 2 (a) Discuss the various absorption laws involved in UV-visible Spectroscopy. Derive Lambert-Beers law. What are the limitations of Lambert-Beers law?
- (b) What are the advantages of TMS used as internal standard in NMR Spectroscopy? Calculate the chemical shift for proton signal appearing at 120 Hz relative to TMS at given oscillator frequency of 60 MHz.
- (c) Sketch the ^1H NMR spectrum for each the following compounds with Peak intensities
- | | |
|---|----------------------------|
| (i) Ethylalcohol | (ii) 1,1,1-trifluoroethane |
| (iii) $\text{CH}_3\text{—O—CH}_2\text{—CH}_3$ | (iv) Benzaldehyde |
| (v) $\text{CH}_3\text{—CO—CH}_3$ | |

(5,5,5)

- Q 3 (a) Explain the isotopic effect in mass spectrometry. Determine possible Isotopic Combinations when two chlorine atoms combine to form Cl_2 and also calculate the relative peak intensities.
- (b) What is the effect of hybridisation of carbon on the stretching frequency of C—H bond? What are the factors which can influence the position of IR absorption bands from the normal position? Arrange the following according their vibrational frequency:
- | | |
|--|--|
| (i) $\text{C}\equiv\text{C}$, $\text{C}=\text{C}$ & $\text{C}-\text{C}$ | (ii) $\text{C}-\text{Br}$, $\text{C}-\text{C}$, $\text{C}-\text{Cl}$, $\text{C}-\text{I}$, $\text{C}-\text{H}$ & $\text{C}-\text{O}$ |
|--|--|
- (c) What are the selection rules of Infra-red spectroscopy? Calculate the wave number of stretching vibrations of a carbon-carbon double bond. Given: force constant ($k = 10 \times 10^5 \text{ dynes cm}^{-1}$).

(5,5,5)

- Q 4 (a) What is meant by term chemical shift? What are the Factors affecting chemical shift?
- (b) How would you distinguish Bathochromic shift and hypsochromic shift?
- (c) Write the various selection rules involved in UV-visible spectroscopy.
- (d) 2.5×10^{-4} M solution of a substance in a 1 cm length cell at $\lambda_{\max}$ 245 nm has absorbance 1.17. Calculate $\epsilon_{\max}$ or molar extinction coefficient for this transition.
- (e) Explain the concept of chromophore by giving suitable example.
(5,2,3,2,3)
- Q 5 (a) Draw and explain the conductometric titration curve of the following
- (i) Strong Acid vs Strong Base
 - (ii) Weak Acid vs Strong Base
 - (iii) Mixture of Strong Acid & Weak Acid vs Strong Base
- (b) Define Accuracy and Precision. What are the various ways of expressing accuracy and precision?
- (c) Define errors. Mention their causes. Differentiate between determinate and Indeterminate error.
(6,4,5)
- Q 6 (a) Describe the Principle of solvent extraction. How the efficiency of the process of extraction can be increased?
- (b) A chemist analyses a sample of iron ore furnished by the National Institute of Standard and Technology (NSIT) and obtained the following result $\bar{x} = 10.52$, $s = 0.05$, $n = 10$. The NSIT value for sample is 10.6% Fe. Are the result Significantly at 95% probability level? Given at 95% probability level Corresponding to 9 degrees of freedom, $t = 2.262$.
- (c) Describe the Principle and technique of column chromatography. What are the factors on which separation of components of the sample using column Chromatography depends?

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- (d) Substances A and B were found to have retention time of 17.30 and 19.92 minutes respectively on a 25.0 cm column. The width (at the base) for A and B were 1.10 and 1.22 minutes respectively. Calculate resolution, the average Number of plates in the column. (3,4,4,4)

(500)