22CHU621

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION DECEMBER 2025
(Sixth Semester)

Branch – **CHEMISTRY**

INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

Time: Three Hours Maximum: 50 Marks

SECTION-A (5 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1. The number of significant figures present in 6.02×10^{23} is
   (i) 23 (ii) 1
   (iii)2 (iv) 3

2. Select the number of fundamental modes of vibration present in CO_2
   (i) 2 (ii) 3
   (iii)4 (iv) 5

3. Which one of the following shift is expected in UV-Visible spectrum if a molecule is substituted with NO_2 group?
   (i) Batho chromic (ii) hypso chromic
   (iii)Hyper chromic (iv) hypo chromic

4. The ESR spectra of anthracene negative ion consists of ------- hyperfine lines.
   (i) 25 (ii) 75
   (iii)15 (iv) 85

5. The current measured in polarography is ----------
   (i) Residual current (ii) Migration current
   (iii) Diffusion current (iv) Conduction current

SECTION - B (15 Marks)

Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6. a) Define the terms precision and accuracy. Explain with respect to gravimetric analysis.

   OR

   b) Draw the thermogram of calcium oxalate monohydrate and write the decomposition steps.

7. a) Write any four differences between IR are Raman spectroscopy? Explain mutual exclusion principle using CO_2 molecules.

   OR

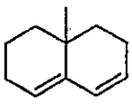
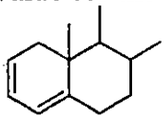
   b) How will you distinguish inter and intra molecular hydrogen bonding using IR Spectroscopy?

Cont...

8. a) How will you estimate the amount of Nickel present in the given solution by Dubosque method.

OR

b) Calculate the λ_{max} value for the following compound using Woodward-Fieser rule.

i.  ii. 

9. a) How many resonance peak should be observed for p-chlorobenzoic acid in H^1NMR spectrum and elucidate?

OR

b) Assign the structure of the compound having molecular formula C_9H_{12} which gives the following NMR signals (i) singlet (δ 6.7), 3H (ii) singlet (δ 2.27), 9H.

10. a) Draw the polarograms for three solution of $PbCl_2$ with concentrations 0.05, 0.1 and 0.2mM. Mention the advantages of Dropping Mercury Electrode.

OR

b) Give an account on organic polarography.

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11. a) Illustrate the variation of absolute error and relative error with respect to constant and proportionate errors.

OR

b) Discuss the instrumentation involved in TGA with a neat diagram.

12. a) i) Derive Hook's equation for a diatomic molecule. (3)
ii) Mention the significance of fingerprint region in IR spectroscopy. (3)

OR

b) Draw the Double beam IR spectrometer and mention the parts. Mention two Sample preparation methods for solid substance.

13. a) i. State and explain Beer Lamberts law. Derive its mathematical relation. (3)
ii. What are chromophores and auxochromes? Give examples. (3)

OR

b) What are the electronic transitions present in UV-Vis spectroscopy. Explain.

14. a) Define chemical shift. What are the factors that affect the chemical shift in NMR spectra?

OR

b) Describe the Hyperfine structure and selection rule of ESR spectroscopy. Explain Hyperfine splitting to methyl radical and naphthalene negative ion.

15. a) What are the various currents involved in polarography?. How they can be eliminated to obtain I_d?. Mention the importance of I_d.

OR

b) Write the current - potential relationship in polarography and explain.

Z-Z-Z END