

CHE 513

M.Sc. IIIrd SEMESTER EXAMINATION, 2022-23

CHEMISTRY
(Spectroscopy-I)

(4+0)

(CBCS MODE)



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Date (तिथि) : _____

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(To be filled in the
OMR Sheet)

8077

अनुक्रमांक (अंकों में) :

Roll No. (In Figures)

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Roll No. (In Words) : _____

Time : 1 Hour

समय : 1 घण्टा

Max. Marks : 60

अधिकतम अंक : 60

नोट : पुस्तिका में 40 प्रश्न दिये गये हैं, सभी प्रश्न करने होंगे। प्रत्येक प्रश्न 1.5 अंक का होगा।

Important Instructions :

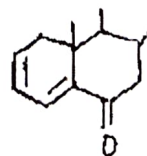
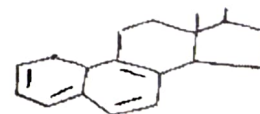
1. The candidate will write his/her Roll Number only at the places provided for, i.e. on the cover page and on the OMR answer sheet at the end and nowhere else.
2. Immediately on receipt of the question booklet, the candidate should check up the booklet and ensure that it contains all the pages and that no question is missing. If the candidate finds any discrepancy in the question booklet, he/she should report the invigilator within 10 minutes of the issue of this booklet and a fresh question booklet without any discrepancy be obtained.

महत्वपूर्ण निर्देश :

1. अभ्यर्थी अपने अनुक्रमांक केवल उन्हीं स्थानों पर लिखेंगे जो इसके लिए दिये गये हैं, अर्थात् प्रश्न पुस्तिका के मुख्य पृष्ठ तथा साथ दिये गये ओ०एम०आर० उत्तर पत्र पर, तथा अन्यत्र कहीं नहीं लिखेंगे।
2. प्रश्न पुस्तिका मिलते ही अभ्यर्थी को जाँच करके सुनिश्चित कर लेना चाहिए कि इस पुस्तिका में पूरे पृष्ठ हैं और कोई प्रश्न छूटा तो नहीं है। यदि कोई विसंगति है तो प्रश्न पुस्तिका मिलने के 10 मिनट के भीतर ही कक्ष परिप्रेक्षक को सूचित करना चाहिए और बिना त्रुटि की दूसरी प्रश्न पुस्तिका प्राप्त कर लेना चाहिए।

1. The energy required for various transitions follow the order :
- (A) $\sigma - \sigma^* > n - \sigma^* > \pi - \pi^* > n \rightarrow \pi^*$
- (B) $\sigma - \sigma^* > \pi - \pi^* > n - \sigma^* > n \rightarrow \pi^*$
- (C) $\pi - \pi^* > n - \pi^* > \sigma - \sigma^* > n - \sigma^*$
- (D) $n - \pi^* > \sigma - \sigma^* > n - \sigma^* > \pi - \pi^*$
2. In a carbonyl compound the increase in polarity of a solvent shifts the following transitions to shorter wavelength :
- (A) $n - \pi^*$
- (B) $\pi - \pi^*$
- (C) $\sigma - \pi^*$
- (D) $\sigma - \sigma^*$
3. Ultra violet spectroscopy is useful for the detection of :
- (A) Functional group
- (B) Extent of conjugation
- (C) Geometrical isomers
- (D) All of these
4. The effect of the ultraviolet radiation on organic compound is to cause :
- (A) Bond vibrations in the molecule
- (B) Rotation in the molecule
- (C) Electronic transitions
- (D) All of these
5. When a few drops of acid is added to arylamine, absorption occurs at lower wavelength, the reason is :
- (A) Increase in conjugation
- (B) Reduction in conjugation
- (C) Acid decomposes the compound
- (D) Compound remains insoluble

6. The structural increment of 5nm for estimating λ_{max} for α, β -unsaturated carbonyl compound is given for :
- Exocyclic double bond
 - Alkyl substituent
 - Ring residue
 - All of these
7. Applying Woodward fieser rules the basic value of 215nm is given to :
- Acyclic ketone
 - Homoannulus conjugated diene
 - α, β -unsaturated aldehyde
 - α, β -unsaturated esters
8. The shift of an absorption maximum towards longer wavelength is known as :
- Hypsochromic effect
 - Bathochromic effect
 - Hyperchromic effect
 - Hypochromic effect
9. The value of absorption maximum for the compound is :
- 343 nm
 - 370 nm
 - 315 nm
 - 305 nm
10. The value of λ_{max} for the given structure is :



11. The vibrational stretching frequency of diatomic molecule depends on :
- (A) Force constant
 - (B) Masses of two atoms
 - (C) Both (A) and (B)
 - (D) None
12. Total number of vibrations in allyl bromide, $CH_2 = CH - CH_2 Br$ are :
- (A) 18
 - (B) 21
 - (C) 14
 - (D) 16
13. Ring strain in lactone or a lactam :
- (A) Increases carbonyl stretching frequency
 - (B) Decreases carbonyl stretching frequency
 - (C) Increases C=C frequency
 - (D) Decreases C=C frequency
14. Ketenes absorb in IR at a very high frequency because :
- (A) The inner C is sp hybridized
 - (B) The more S character in a bond, the stronger it is
 - (C) Inner C is sp^2 hybridised
 - (D) Both (A) and (B)
15. The lowest energy of a quantum mechanical harmonic oscillator is $\frac{1}{2} h\nu$. It is referred to as :
- (A) Ground state energy
 - (B) Zero-point energy
 - (C) Vibrational energy
 - (D) All

16. The total no. of normal modes of vibration of a linear molecule consisting of N atoms is given by :
- (A) $3N - 6$
 - (B) $3N - 5$
 - (C) $3N - 7$
 - (D) $3N - 8$
17. For a linear molecule such as HCl , the number of modes of vibration are :
- (A) Zero
 - (B) One
 - (C) Two
 - (D) Three
18. For CO_2 molecule, number of modes of vibration are :
- (A) 3
 - (B) 5
 - (C) 4
 - (D) 6
19. Vibrational transition exist in :
- (A) Intra-red
 - (B) Microwave
 - (C) Radio wave
 - (D) Visible region of the spectrum
20. Which of the following molecules show rotational spectra ?
- (A) NO
 - (B) N_2O
 - (C) $CHCl_2$
 - (D) All

21. For Raman Spectra, the molecule must have :
- (A) Anisotropic polarisability
 - (B) Isotropic polarisability
 - (C) Oscillating dipole moment
 - (D) Hydrogen bonding
22. The cause of Raman spectrum of a molecule is :
- (A) Change of polarisability of the molecule
 - (B) No effect on polarisability of the molecule
 - (C) Inductive effect
 - (D) None
23. Raman spectra differs from infrared spectra as it shows :
- (A) Scattering of radiation by vibrating molecules
 - (B) Polarisability of the molecule changes
 - (C) Water can used as solvent
 - (D) All of these
24. Scattered light has the same frequency as that of incident beam. This phenomenon is known as :
- (A) Rayleigh scattering
 - (B) Elastic scattering
 - (C) Raman scattering
 - (D) Both (A) and (B)
25. Raman lines on the low frequency side of the excitation frequency are called :
- (A) Stokes lines
 - (B) Anti stokes lines
 - (C) Rayleigh line
 - (D) All

26. When the electron density of a molecule is symmetrical, polarizability is :
- (A) Anisotropic
 - (B) Isotropic
 - (C) Different in all directions
 - (D) None
27. No rotational Raman effect is observed for :
- (A) Spherical top molecules
 - (B) Symmetric top molecules
 - (C) Linear molecules
 - (D) Asymmetric top molecules
28. Raman effect is ;
- (A) Inelastic scattering of light
 - (B) Elastic scattering of light
 - (C) Absorption of light
 - (D) All
29. The stimulated Raman effect using giant pulses from a ruby laser was on :
- (A) Nitrobenzene
 - (B) Water
 - (C) CCl_4
 - (D) CS_2
30. Fourier transform Raman spectroscopy using laser operating in near IR region overcomes :
- (A) Fluorescence
 - (B) Inherently weak scattering by molecules
 - (C) Strong scattering of molecules
 - (D) Both (A) and (B)

31. X-rays are produced following photoelectric process while continuous x-rays are produced as a result of :
- (A) Bremsstrahlung process
 - (B) Diffraction
 - (C) Interference
 - (D) Duane hunt process
32. The mass absorption coefficient is contributed by absorption coefficient corresponding to :
- (A) Photoelectric process
 - (B) Elastic scattering
 - (C) Inelastic scattering
 - (D) All
33. The elastic scattering of the photons by bound atomic electrons is termed as :
- (A) Rayleigh scattering
 - (B) Coherent scattering
 - (C) Both (A) and (B)
 - (D) Incoherent scattering
34. The short curve length region of 62 KV X – Ray tube is:
- (A) 0.2 nm
 - (B) 0.02 nm
 - (C) 0.6 nm
 - (D) 0.06 nm
35. No Bragg reflection of X-rays from a crystal will be observed if d_{hkl} is smaller than :
- (A) λ
 - (B) $\lambda/2$
 - (C) $\lambda/3$
 - (D) $\lambda/4$

36. If a molecule consists of a number of atoms, the total intensity is given by :
- (A) De. Broglie equation
 - (B) Wierl equation
 - (C) Laue method
 - (D) Debye equation
37. Wierl equations shows the appearance of diffraction pattern caused by ‘
- (A) Solids
 - (B) Liquids
 - (C) Molecule in the path of electron beam
 - (D) All
38. LEED pattern illustrate :
- (A) Three dimensional structure
 - (B) Two dimensional structure
 - (C) Complicated structure
 - (D) Depth structures
39. The wavelength of neutron beam is related to the neutron mass and velocity by:
- (A) Bragg's equation
 - (B) De. Broglie relation
 - (C) Born equation
 - (D) Lane equation
40. Neutron diffraction technique was developed in 1994 by Nobel prize winner :
- (A) C.G. Shull
 - (B) B. N. Brockhouse
 - (C) Both (A) and (B)
 - (D) J. Karle
