2024/05

SET A

B.Sc. CHEMISTRY
SIXTH SEMESTER
ORGANIC CHEMISTRY-V
BSC - 602

[USE OMR FOR OBJECTIVE PART]

Duration: 3 hrs. **Full Marks: 70**

Objective

Time: 30 min. **Marks: 20**

Choose the correct answer from the following: ***1×20=20***

1. Malachite green is a
   a. azo-dye
   b. phthalein dye
   c. triphenyl methane dye
   d. nitroso dye

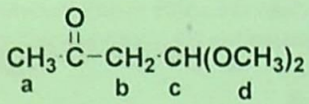
2. Chromophor in phelolphthalein is
   a. p-quinonoid group
   b. o-quinonoid group
   c. azo-group
   d. extended conjugation

3. Which of the following is not a chromophore?
   a. —N=N—
   b. —NO
   c. $—NO_2$
   d. $—NH_2$

4. The number of vibrational modes in ethanoic acid (CH_3COOH) molecule will be:
   a. 24
   b. 18
   c. 16
   d. 15

5. Correct order of stretching frequency of the following:
   a. C—C < C=C < C≡C
   b. C—C > C=C > C≡C
   c. C—C < C=C > C≡C
   d. C—C > C=C < C≡C

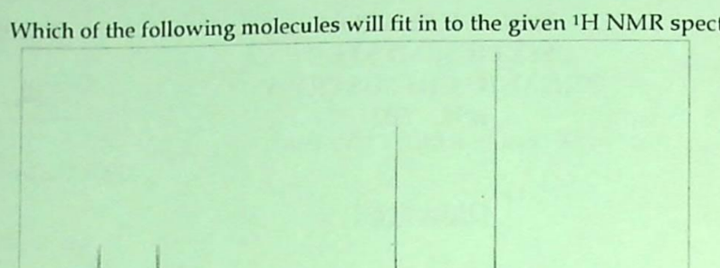
6. Which of the protons a – d in the following molecule will give a doublet signal in its ^1H NMR spectrum.

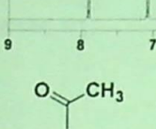


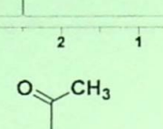
   a. protons - a
   b. protons-b
   c. Protons-a&c
   d. Protons- a&d

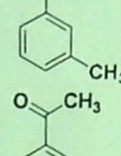
7. What do you expect to observe in the ^1H NMR spectrum of CH_3-CH_2-Cl?
   a. a triplet and a quartet
   b. two doublets
   c. a doublet and a quartet
   d. a doublet and a triplet

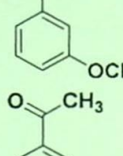
8. Which of the following molecules will fit in to the given ^1H NMR spectrum?



a. 

b. 

c. 

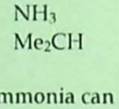
d. 

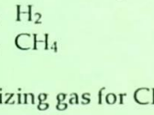
9. Which of the molecule will give M+29 peak in CI-MS analysis?

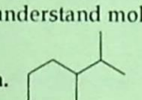
a. NH_3 b. H_2

c. Me_2CH d. CH_4

10. Ammonia can be used as the most suitable ionizing gas for CI-MS analysis to understand molecular weight of

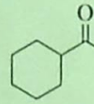
a. 

b. 

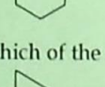
c. 

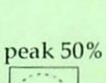
d.

11. Which of the following will have molecular ion peak 50% of its molecular weight?

a. 

b. 

c. 

d. 

12. Most suitable helping gas for CI-MS analysis to understand molecular weight of an unsaturated hydrocarbon compound is
    a. Methane
    b. Isobutane
    c. NH_3
    d. all of them

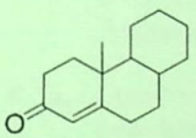
13. For CO molecule M+2 peak in the mass spectrum will be due to the presence of
    a. $^{12}C^{16}O$
    b. $^{13}C^{16}O$
    c. $^{12}C^{18}O$
    d. $^{12}C^{17}O$

14. Retro Diels-Alder fragmentation happens for the molecule containing
    a. Butadiene
    b. Cyclohexane
    c. Cyclohexene
    d. Cyclopentene

15. The absorption band that originates due to $\pi \rightarrow \pi^*$ transition in aromatic or hetero-aromatic molecules is known as
    a. K-Band
    b. R-Band
    c. B-Band
    d. E-Band

16. The energy required for various transitions in electronic spectroscopy is known to follow which of the following order?
    a. $\sigma \rightarrow \sigma^* > n \rightarrow \sigma^* > \pi \rightarrow \pi^* > n \rightarrow \pi^*$
    b. $\sigma \rightarrow \sigma^* > \pi \rightarrow \pi^* > n \rightarrow \sigma^* > n \rightarrow \pi^*$
    c. $\pi \rightarrow \pi^* > n \rightarrow \pi^* > \sigma \rightarrow \sigma^* > n \rightarrow \sigma^*$
    d. $n \rightarrow \pi^* > \sigma \rightarrow \sigma^* > n \rightarrow \sigma^* > \pi \rightarrow \pi^*$

17. Using Woodward Fieser rules, what will be the absorption maximum for the following compound?



    a. 315 nm
    b. 300 nm
    c. 275 nm
    d. 244 nm

18. According to Woodward Fieser rules, for each alkyl substituent or ring residue at β-position, the structural increment for estimating λ_{max} for a given α, β-unsaturated carbonyl compound is
    a. 12 nm
    b. 18 nm
    c. 30 nm
    d. 39 nm

19. Buna-S is a copolymer of
    a. butene and 1,3-butadiene
    b. benzene and 1,3-butadiene
    c. styrene and 1,3-butadiene
    d. none of all

20. An example of biodegradable polymer is
    a. PHBV
    b. PVBH
    c. PABA
    d. PBHV

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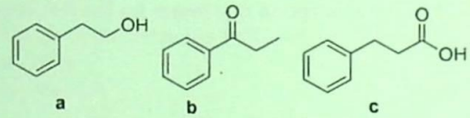
Descriptive

Time : 2 hrs. 30 min. **Marks : 50**

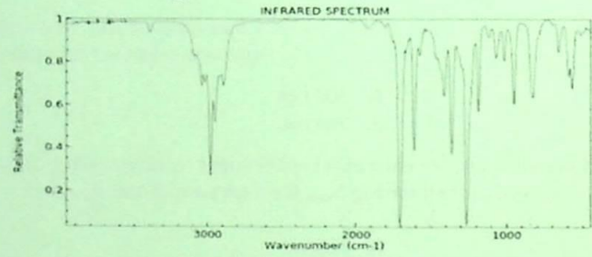
[Answer question no.1 & any four (4) from the rest]

1. **a.** Explain the term spin-spin coupling. Why does peak of a particular set of protons split into multiplet? Explain with example. **4+3+3 =10**
   b. Given, Chemical Formula: $C_7H_{13}X$. Exact Mass: 176.0201 Molecular Weight: 177.0850 m/z: 176.0201 (100.0%), 178.0180 (97.3%). Find what is X?
   c. State and explain Beer's law of UV-Visible spectroscopy.

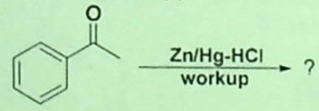
2. **a.** Define infrared spectroscopy. What are the major requirements for infra-red absorption. **3+4+3 =10**
   b. A compound gave the following IR spectrum.Which of the following is likely to be the structure of the molecule? Justify your answer.



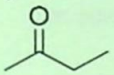
a b c



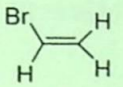
   c. How you will monitor the following reaction using IR spectroscopy?

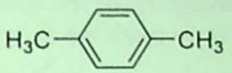


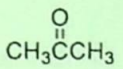
3. **a.** Draw the pattern of NMR spectrum for the following molecule with justification. **3+2+2+3 =10**

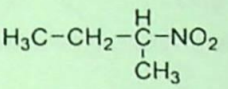


b. How many proton signals would you expect in the ^1H NMR spectra of the following compounds?

(a) 

(b) 

(c) 

(d) 

c. Why tetramethyl silane (TMS) taken as a standard for recording chemical shifts?

d. An organic compound with molar mass 120, gave following spectroscopic data on analysis.
IR spectra showed an absorption peak at about 1700 cm^{-1},
NMR spectrum gave the peaks at δ 2.6 (s, 3H), δ 7.4 (m, 3H) and δ 7.9 (d, 2H).
Assign a structure for the molecule with justification.

4. **a.** Compound $C_5H_{10}O$ shows an IR- band at 1715 cm^{-1}, and gives two signals- a triplet and a quartetin its NMR spectrum. Evaluate the structure of the compound. **3+2+3+2 =10**

b. Discuss the effect of H-bonding on IR absorption peak.

c. What is meant by McLafferty fragmentation in mass spectrometric analysis? Explain with Example.

d. Identify the ion which will show the base peak in EI-MS spectrum of 4-methoxyethylbenzene.

5. **a.** Write a short account of Witt's theory of colour and constitution. **3+2+5 =10**

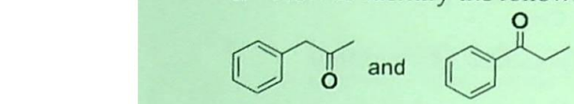
b. Justify the statement, "All dyes are coloured but all coloured compounds are not dyes".

c. Write down the structure of the following. Explain why these molecules give different colour in acidic and basic medium? Give synthesis of ***any one*** of these.
(I) Phenolphthelein (II) Methyl Orange

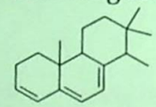
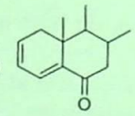
6. a. Discuss the radical mediated fragmentation routes of EI-MS. **3+4+3 =10**

b. Show the fragmentations of the following molecules in EI-MS and mention the base peak for them.

c. How to identify the following two molecules by EI-MS study?



7. a. Define the term 'auxochrome' with examples. **2+3+5 =10**
b. What are hyperchromic and hypochromic shifts? Explain.
c. Using Woodward-Fieser rules calculate the λ_{max} for the following compounds

(i)  and (ii) 

8. a. What is Zeigler-Natta catalyst? Explain its use in the polymerization of alkene. **3+3+4 =10**
b. What is vulcanization of rubber? Mention its advantages.
c. What are liquid crystals? How are they classified? Give its uses.

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