B.Sc.Part III (Semester- V) CBCS Examination March/April.-2022

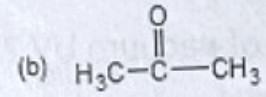
Chemistry –(Paper X) Organic Chemistry

Subject Code: 79683

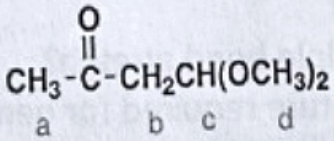
Question bank

Q.1) A. Answer in one sentence

1. How many sets of equivalent protons present in the following compounds?

(a) $CH_3.CH_2.CHO$ (b) 

2. In which type of vibration, change in bond angle take place ?
3. Which material are used to prepare rod of globar source ?
4. Which of hydrogens a-d in the following molecule gives a triplet signal in a normal ^1H NMR spectrum?



5.Why the bands seen in UV- spectum are broad in nature?

6. How many fundamental modes of vibrations are shown by NH_3 molecule?

7. Which internal standard is used in NMR spectroscopy ?

8. What information will be provided by molecular ion peak in Mass spectrum ?

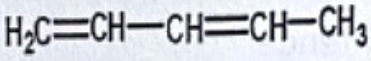
9. Which type of electronic excitation is caused by saturated compounds?

10.Which material are used to prepare rod of globar source?

11.How many fundamental modes of vibrations occur in CO_2 and H_2O molecules?

12.Which ion is formed by ejection of electron from neutral molecule by bombarded with electrons in Mass spectroscopy?

13. What will be the λmax value for the following compound ?



14. Which type of spectroscopy techniques is associated with molecular emission?

15. What is the wavelength of vacuum UV ?

16. Which spectroscopic method is used to determine the molecular weight of the compound?

17. In which region of the infrared spectrum would you expect to find a peak characteristic of a triple bond stretch?

18. What is the temperature required for nernst glower to produce IR radiation ?

19. In infrared spectroscopy which frequency range is known as the fingerprint region?

20. What is the relation between wavelength and frequency ?

b) Choose the correct alternative for each of the following and rewrite the sentence

1] The wavelength range for UV-visible region of electromagnetic spectrum

4. A) Explain the phenomenon of spin-spin coupling, with examples

   B) What is coupling constant? Write the types of coupling and their applications .

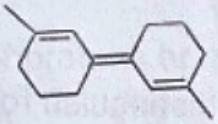
5. Explain the different types of electronic transitions. Illustrate with suitable examples.

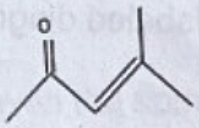
6. A)What are the different types of ions produced in mass spectrometry with suitable examples ?

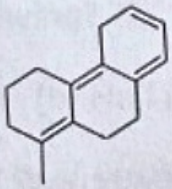
   B) Explain McLafferty rearrangement with suitable examples.

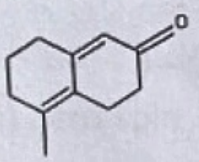
7. Explain the fundamental modes of vibrations in IR Spectroscopy.

8. Calculate λ_{max} for the following compounds by using Woodword-Fieser rule.

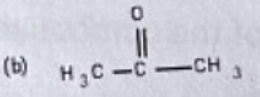
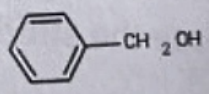
(a) 

(b) 

(c) 

(d) 

9. A) How many sets of equivalent protons present in the following compounds?

(a) $CH_3.CH_2.CH_2.CH_3$ (b)  (c) 

(d) $CH_3.CHCl_2$ (e) $CH_3.CH_2.CHO$

   B) Explain Shielding and De-shielding of Protons.

10. What are the magnetic and non magnetic nuclei ? which of the following

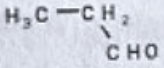
20]. Basic λmax for an unsubstituted, conjugated, homoannular diene is.....

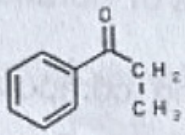
(a) 215 nm (b) 207 nm (c) 312 nm (d) 253 nm

Q.2 Solve any TWO of the following

1. i) State and explain Lambert's –Beer Law and name the terms involved in its expression

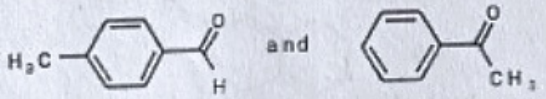
ii) Using (n+1) rule predict number of signals and splitting pattern in following compound

1) 

2) 

2. i)Draw a neat labeled diagram of Mass Spectrometer and explain its working

ii) How does IR spectroscopy helps to distinguish following pair



3. i) What is shielding and de-shielding of protons? Explain with suitable example

ii) Deduce the structure of the compound from the following spectral data

Molecular formula: C_4H_8O

IR:1715 cm^{-1}

PMR: δ 1.07 (triplet,3H); δ 1.12(singlet.3H); δ 2.5(quartet,2H)

(a) flipping (b) resonance (c) magnetic nuclei (d) chemical shift

11] How many ^{1}H NMR signals are found in vinyl chloride ?

(a) 1 (b) 2 (c) 3 (d) 4

12] The largest peak in the Mass spectrum is called as.....

(a) Weak Peak (b) Sharp Peak (c) Broad Peak (d) Base Peak

13] Which of the following is used in calibration of IR instrument ?

(a) TMS (b) Glass (c) Metal Halide (d) Polystyrene

14] In a triplet, the relative peak areas are in the ratio...

(a) 1:1:1 (b) 1:2:1 (c) 1:3:1 (d) 1:4:1

15] The stretching frequency due to -OH is observed at.....

(a) 3600-3400cm^{-1} (b) 3000-2800cm^{-1} (c) 2700-2500cm^{-1} (d) 1780-1690cm^{-1}

16] If the number of protons or neutrons is even the spin of the nucleus will be

which of the following?

(a) Integral spin (b) Half integral spin (c) Zero spin (d) Positive spin

17]. . ..... is an example of auxochrome.

(a) $-NH_2$ (b) >C = N– (c) >C = O (d) >C = C<

18] α, β-unsaturated ketone is called as ..... system.

(a) diene (b) ene (c) enone (d) one

19] The region of electromagnetic spectrum for nuclear magnetic resonance is .....

(a) Microwave (b) Radio frequency (c) Infrared (d) UV-rays

is,

a) 200- 800 Å b) 200 - 800 nm c) 200 - 800 μm d) 200 - 800 cm

2] The pmr-spectrum of which compound carries more than one peak?

a) CH_3 CO CH_3 b) $(CH_3)_2CCl_2$ c) CH_3CHO d) CH_4

3] Which among the following molecule show IR absorption?

a) HCl b) CCl_4 c) N_2 d) Cl_2

4] An ion having sufficient energy but short life span that dissociates spontaneously is called as--

a) metastable ion b) parent ion c) isotopic ion d) radial ion

5] According to Woodward fieser rule, the increment for double bond extending conjugation is.....

(a) 5 (b) 15 (c) 12 (d) 30

6] The most deshielded proton is found in the ..... compound.

(a) CH_3OH (b) CH_3COOH (c) TMS (d) C_6H_6

7] In IR Spectroscopy, Nujol means.....

(a) Polymer (b) Mineral oil (c) Crude oil (d) Volatile oil

8] Hooks law is used in determination of .....

(a) stretching frequency (b) bending frequency (c) functional group

(d) molecular weight

9] The shift of absorption band to longer wavelength is called as.....

(a) bathochromic shift (b) hypsochromic shift

(c) hyperchromic effect (d) hypochromic effect

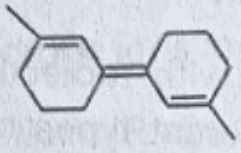
10] The transition of nuclei between α-state to β-state is called .....

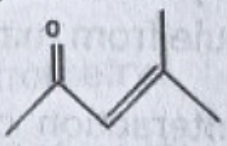
nuclei show the phenomenon of nuclear magnetic resonance?

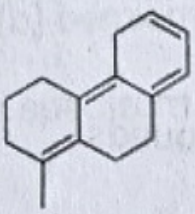
i. $_1H^1$, $_3B^{10}$, $_6C^{12}$, $_6C^{13}$, $_8O^{16}$, $_{16}S^{31}$, $_{15}P^{30}$

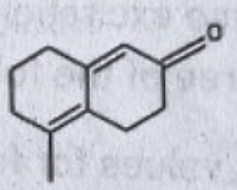
11. How will you differentiate the following pairs by U.V. spectroscopy ?
    (a) 1, 3 butadiene and 1, 4 cyclohexadiene.
    (b) Phenol and cyclohexanol.
    (c) $H_2C = CH—CH = CH_2$ and $H_2C = CH_2$.
    (d) 1, 3 pentadiene and 1, 4 pentadiene.
    (e) Cyclohexa 1 : 3 diene and cyclohexa 1 : 4 diene.

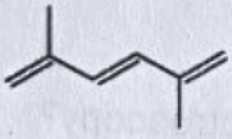
12. Calculate λ_{max} for the following compounds by using Woodword-Fieser rule.

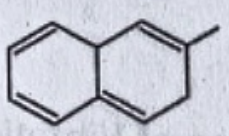
(a) 

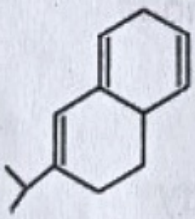
(b) 

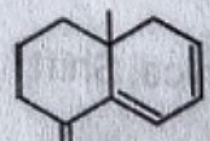
(c) 

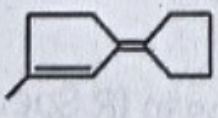
(d) 

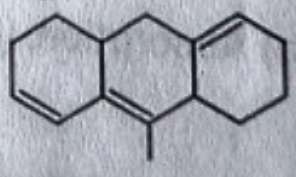
(e) 

(f) 

(g) 

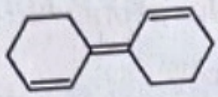
(h) 

(i) 

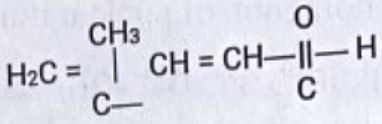
(j) 

(k)

(l)



(m)



(n)

13. Explain Fragmentation patterns of- alkanes, alkenes, aromatic hydrocarbons,

alcohols, phenols, amines ,carbonyl compounds .

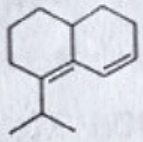
14. Explain how will you determine the presence of chlorine, bromine and iodine in the molecule from mass spectrum?

15. Discuss the interaction of radiation with molecules. What different kinds of excitations take place? How different types of radiations can be used to study these excitations?

Q.3 Solve any Three of the following

a) Calculate λ_{max} values for following compounds

1)



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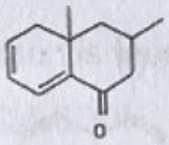

b) What are different modes of Vibrations in IR Spectroscopy?

c) Advantages and Limitations of spectroscopic methods

d) Write a note on Chemical Shift

e) Molecular ion and Isotope ion in Mass Spectrometry

f) Explain the terms: (a) Absorption, (b) Emission (c) Fluorescence, (d) Scattering

i)Different types of fundamental modes of vibrations in IR Spectroscopy.

j)What is functional group region? State its significance

k) Chromophore and Auxochrome

l) Factors affecting Frequencies in IR Spectroscopy

m) Short note on Hooks law

n) Spin-spin couplin

o)Mc-Lafferty Rearrangement

p) Applications of Mass spectroscopy

q) Chromophore and Auxochrome

r) Molecular and Isotope ions in Mass Spectrometry

s) Identify characteristic IR-absorption peaks given by,

(a)ethyl amine (b) benzamide (c) ethyl acetate

t)Colour and visible spectrum

u) Aromatic region

v) Define the term a) Bathochromic shift b) Hypsochromic shift