SAVITRIBAI PHULE PUNE UNIVERSITY
Progressive Education Society's
Modern College of Arts, Science and Commerce, Ganeshkhind, Pune-411016
B.Sc. Blended Program
(A degree of Savitribai Phule Pune University equivalent to the degree of University of Melbourne)

End Semester Examination : April 2024

Program: B.Sc. Blended **Semester:IV** **SET: B**
Program (Specific): B.Sc.Blended(Chemistry) **Course Type: Core Course Theory**
Class: S.Y.B.Sc.Blended **Max.Marks: 50**
Name of the Course: Structure and Properties
Course Code: CHM403 **Time: 2½ hrs**
Paper: III

Note:
1) All questions are compulsory.
2) Figures to the right corner indicate full marks.
3) Use of scientific calculators is allowed.
4) Draw diagrams wherever necessary.
5) Use only Black or blue ink/ball/gel pens for writing.

Q1] Select the correct option (Any 10). **[10 x 1 =10 M]**

i) Which of the following is not a chiral compound?
a. 2-butanol b. t-butanol c. 2-bromobutane d. 1-bromobutane

ii) Which of the following can make a difference in geometrical isomers?

a. pressure b. temperature c. polarized light d. arrangement of atoms

iii) Glucose and fructose are which types of isomers?

a. enantiomers b. Mesomers c. Constitutional d. Configurational

iv) Which of the following is NOT true of enantiomers? They have the same:

a. boiling point. b. melting point.

c. specific rotation. d. chemical reactivity toward achiral reagents

v) Which amongst the following nuclei is NMR active?

a. spin = 1/2 b. spin =0 c. spin = -1 d. spin = 2

vi) The I.R. frequency of carbonyl group of (C=O) is –

a. 1100 cm^{-1} b. 1720 cm^{-1} c. 1790 cm^{-1} d. 2250 cm^{-1}

vii) The types of protons present in dimethyl ether are -----

a. Two b. Three c. One d. six

viii) Which among the following will show the microwave spectrum?

a. CO b. N_2 c. O_2 d. Cl_2

ix) The BF_3 molecule does not have —--- of symmetry.

a. plane b. centre c. axis d. all of these

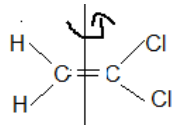
x) Carbon dioxide has —-------- degrees of freedom ..

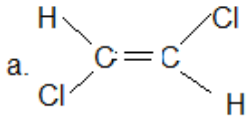
a. 1 b. 2 c. 3 d. 4

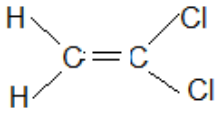
xi) . The fundamental band is due to —-- transsition

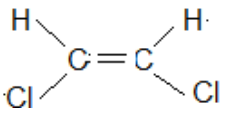
a. 0 to 1 b. c. 1 to 2 c. 0 to 2 d. 0 to 3

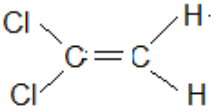
xii) What will be the orientation of the following molecules after the application of C_2 operation in a given direction.



a. 

b. 

c. 

d. 

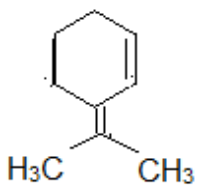
Q2] Answer the following (Any 10). [10 x 2 =20 M]

i) Justify the mechanism for the action of Grignards reagent on carbon dioxide.

ii) What is a rigid rotor? Explain its properties.

iii) Deduce the structure of a compound with molecular formula $C_6H_{10}O$ which shows I.R. frequency at 1730 cm^{-1} and gives a positive iodoform test.

iv) Calculate the λ_{max} value for the following compounds.



v) Explain the splitting of spectral lines in the presence of magnetic field.

vi) Among 1,2-dibromo benzene , 1,3-dibromo benzene and 1,4-dibromo benzene which compound will show zero dipole moment?

vii) Calculate the energy of an electromagnetic wave having wave number 120 cm^{-1}.

viii) Explain how the radical formation in the Grignard reaction is detected.

ix) Show Schematic representation of anharmonic oscillator.

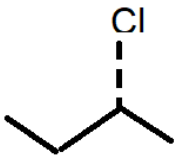
x) What are the types of protons observed in the dimethyl ether and ethanol?

xi) Explain Hooke's law.

xii) What is luminescence?

Q3] Answer the following (Any 4). **[4 x 5 =20 M]**

i) Assign R/S configuration to the following.



ii) Predict the structure of the compound from the given data

M.F. = $C_9H_{10}O$

UV: λ_{max} = 260 nm and 290 nm

I.R. = 1715, 1590, 1550, 1460, cm^{-1}

PMR = 2.09 (S, 3H); 3.65 (S, 2H), 7.25 (S, 5H)

iii) What are light emitting polymers ?

iv) Identify the point group of ammonia molecule.

v) Derive an expression for the determination of spectral lines of the microwave spectrum for the diatomic molecules. Show first three transmission schematically,

vi) Discuss the stereochemistry of butane molecule.

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