



‘समानो मन्त्रः समितिः समानी’

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 6th Semester Examination, 2022

CC14-CHEMISTRY

ORGANIC CHEMISTRY

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.
All symbols are of usual significance.*

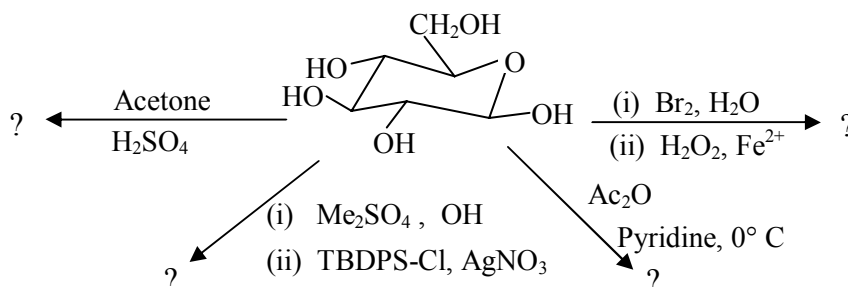
Answer any four questions from the following

10×4 = 40

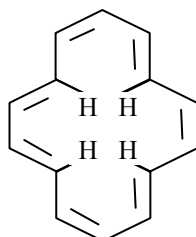
1. (a) UV-Vis spectroscopy shows a broad hump rather than sharp peak. Explain the facts. 2
- (b) UV spectra of equal concentrations of toluene and 4,4'-bitolyl are very much different in ethanol however similar solutions of mesitylene and bimesitylene are almost the same. — Explain. 3
- (c) Define glycoside. Why do you transform a monosaccharide into the corresponding glycoside prior to reaction of monosaccharide in alkaline medium? 1+2=3
- (d) What are the basic structural features of a coloured substance? 2
2. (a) CO₂ does not give any C = O symmetrical stretching frequency in its IR spectrum but value for asymmetric stretching is recordable. — Explain. 2
- (b) *meso*.Butan-2,3-diol and active butan-2,3-diol can be distinguished spectroscopically. Explain the fact. 3
- (c) Discuss the influence of electronegativity of A on the proton chemical shift of A–C–H. 2
- (d) How would you explain the unfield shift of acetylinic proton with respect to ethylenic proton though sp hybridised carbon has greater electronegativity? 3
3. (a) All sugars are carbohydrates but all carbohydrates are not sugars. Justify the statement. 1
- (b) α -D-glucopyranose is oxidised by HIO₄ more rapidly than the β -anomer at the 1,2-bond. Suggest a reason. 2
- (c) α -D(+) glucopyranose and β -D(+) glucopyranose exists as 36% and 64% at equilibrium respectively, whereas α -D(+)-mannopyranose and β -D(+)-mannopyranose appears as 69% and 31% at equilibrium respectively. — Explain. 3

(d) Complete the equations and find out the product(s).

4

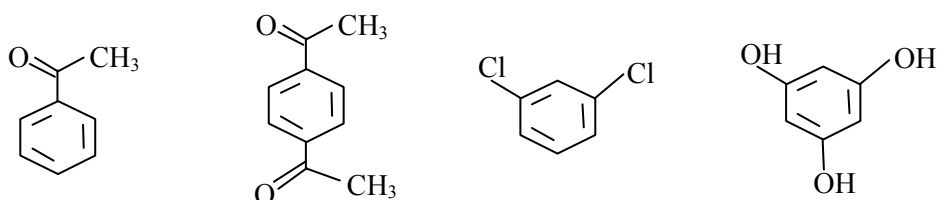


4. (a) What is meant by coupling constant in NMR spectroscopy? How do these coupling constant values help to interpret NMR spectrum having non-equivalent hydrogen atoms? 2
- (b) Does the external magnetic field affect on chemical shift value of any proton? — Explain. 2
- (c) Predict the compounds with the following NMR data: 2×2 = 4
- (i) Molecular formula C_8H_8O
 δ (in ppm): 7.28 (m, 5H) ; 2.8 (d, 2H) ; 9.78 (t, 1H)
- (ii) Molecular formula $C_4H_8O_2$
 δ (in ppm): 4.0 (q, 2H) ; 1.97 (s, 1H) ; 1.23 (t, 3H)
- (d) Calculate the chemical shift in ppm (δ) for a proton that has resonance at 126 Hz down field from TMS on a spectrophotometer that operates at 60 MHz. 2
5. (a) Define a dye. “All coloured substance cannot act as dye” — Explain. 2
- (b) Outline the synthesis of the following dyes: 2×2 = 4
- (i) Methyl orange
- (ii) Malachite green
- (c) Explain why sucrose does not undergo mutarotation but maltose does. 3
- (d) Give chemical evidences in favour of the following fact: 1
 Glucose has five –OH groups on five different carbon atoms.
6. (a) How would you distinguish following pair of compounds spectroscopically? 2×2 = 4
- (i) *Trans*-stilbene and *cis*-stilbene by UV-Vis
- (ii) 1,3-Butanedione and 1,4-Butanedione by IR spectroscopy.
- (b) Comment on the aromatic character of the following compound. Discuss about shielding and deshielding effects of protons present in the compound. 3



- (c) A compound with molecular weight: 116 3
 UV data: $\lambda_{\max} = 283 \text{ nm}$, $\epsilon = 22$
 IR data: $3000\text{-}2500 \text{ cm}^{-1}$ (b), 1715 cm^{-1} (s), 1342 cm^{-1} (w)
 NMR data: ($^1\text{H-NMR}$):
 δ in ppm: 2.12 (3H, singlet), 2.25 (2H, triplet),
 2.40 (2H, triplet), 11.1 (1H, singlet)

7. (a) How can you detect the phenomena of keto-enol tautomerism in ethylacetoacetate 3
 by IR spectroscopy?
 (b) The UV spectrum of $\text{Me}_2\text{C} = \text{CHCOCH}_3$ shows absorption bands at 230 nm and 321 nm in isooctane. Assign them in terms of electronic transitions. How do the absorption bands change with the change of the solvent from isooctane to water? Give reason on this fact. 3
 (c) Compare the $^1\text{H-NMR}$ spectra of *o*-xylene and *p*-xylene. 2
 (d) Cyclopropyl methyl ketone shows >C=O stretching frequency differently from the normal >C=O stretching frequency. 2
8. (a) The $^1\text{H-NMR}$ spectrum of ethanol in CDCl_3 shows the hydroxyl group at a chemical shift of δ 2.5 ppm as a broad singlet. The same spectrum runs in the $\text{d}_6\text{-DMSO}$ shows the –OH group hydrogen at a chemical shift of δ 4.3 ppm as a triplet. Justify these observations. 3
 (b) How many types of protons are found in the following molecules by $^1\text{H-NMR}$ spectra? 1×4 = 4



- (c) Maltose on hydrolysis gives two units of $\alpha\text{-D-glucose}$, but unlike sucrose, it is a reducing sugar and can exhibit mutarotation. What conclusion can be obtained from this fact? 3

—x—