Bankim Sardar College

Semester IV Examination

B.Sc Hons

Subject- Chemistry, Paper-CC8

Answers of each group should be in separate Answer-Sheet

Group-A (F.M-10)

1. Select the correct answer **10x1 = 10**

(i) What is the wavelength range for UV spectrum of light?

a) 400 nm – 700 nm

b) 700 nm to 1 mm

c) 0.01 nm to 10 nm

d) 10 nm to 400 nm

(ii) What is the correct order of λ_{max} for π –> π* transition for the following three compounds?

a) R-C≡C-R > $R_2C = CR_2$ > R-CHO

b) R-C≡C-R < $R_2C = CR_2$ < R-CHO

c) R-C≡C-R = $R_2C = CR_2$ = R-CHO

d) R-C≡C-R < $R_2C = CR_2$ >R-CHO

(iii) In which region of the electromagnetic spectrum does an absorption at 600 nm come?

a) Infra red

b) Vacuum UV

c) Near UV

d) Visible

(iv) What does the notation *n* →σ* mean?

a) Emission; transition from a non-bonding MO to σ* MO.

b) Absorption; transition from a non-bonding MO to σ* MO.

c) Absorption; transition from a quantum level *n* to σ* MO

d) Emission; transition from a quantum level *n* to σ* MO.

(v) What is a *red shift*?

a) The shifting of an absorption towards the blue end of the spectrum.

b) The shifting of an absorption to higher energy.

c) The shifting of an absorption to shorter wavelength.

d) The shifting of an absorption to lower energy

(vi) On which factors the vibrational stretching frequency of diatomic molecule depend?

a) Force constant

b) Atomic population

c) Temperature

d) Magnetic field

(vii) In the IR spectrum of a *ketone* ($R_2C=O$), in what approximate region would you expect to find an absorption assigned to the C=O stretch?

a) 1400-1500 cm^{-1}

b) 1700-1750 cm^{-1}

c) 2000-2100 cm^{-1}

d) 1900-2000 cm^{-1}

(viii) Bayer-Villiger rearrangement is an example of

a) Electron deficient Carbon Rearrangement

b) Electron deficient Oxygen Rearrangement

c) Electron deficient Nitrogen Rearrangement

d) Aromatic Rearrangement

(ix) A generalized fragment usually an ion produced by disconnection of the actual compound

a) Synthon

b) Synthetic Equivalent

c) FGI

d) FGA

(x) $R\text{-}C=C^{+}\text{-}R$ is an example of

a) Logical Electrophile

b) Logical Nucleophile

c) Illogical Electrophile

d) Illogical Nucleophile

Group B (F.M-30)

2. I. Select the correct answer **10x1 = 10**

(i) Which colour among the following would you find in the Lassaigne's test of an organic sample containing sulphur as a special element

(a) Blue (b) Green (c) Violet (d) Red

(ii) Why HNO_3 is used for detection of Chlorine as a special element.

(a) to remove cyanide ion

(b) to remove chloride ion

(c) to add nitrate ion

(d) for complexation with silver ion

(iii) When an organic compound without N atom is insoluble in all solvents (i.e, in water, in dil HCl, in dil NaOH, in dil$NaHCO_3$) it contains

(a) a Ph-OH Group (b) A -COOH Group (c) a C=C Group (d) A C=O Group

(iv) Optimum temperature required for Back Dye test is

(a) 5^o-10^oC (b) 0^o-5^oC (c) 10^o-12^oc (d) room temp

(v) The appropriate experiment required for detection of nitro gr. (-NO_2) in *m*-nitro aniline is

(a) Mulliken- Barker test

(b) Reduction followed by diazotization

(c) Any one of them

(d) None of them

(vi) The exact colour you observe when β-naphthol is treated with 1 drop of neutral $FeCl_3$ is

(a) Blue (b) Violet (c) Red (d) Green

(vii) The full form of 2,4 DNP reagent is

(a) 2, 4-dinitro phenyl hydrazine

(b) 2, 4-dinitro phenol

(c) 2,4-dinitroso phenyl hydrazine

(d) None of the them

(viii) Resorcinol is soluble in water because of presence of

(a) a –COOH group

(b) one alcoholic –OH group

(c) one phenolic –OH group

(d) two phenolic –OH groups

(ix) Name of the compound containing a phenolic –OH gr and a –CHO gr. which is used as flavouring agent is

(a) Vanillin (b) Resorcinol (c) Catechol (d) Benzil

(x) The solvent in which salicylic acid is soluble is

(a) dil. $NaHCO_3$ only (b) dil. NaOH only (c) both of the solvents (d) neither of the solvents

II. Answer the following briefly **5x2 = 10**

(i) Why is Dinitro benzene insoluble in all the solvents used in solubility classification? Zn/NH_4Cl is used in Mulliken-Barker test to reduce $–NO_2$ gr into which group?

(ii) Why does an alcoholic solution of Sulphanilic acid give effervescence with solid $NaHCO_3$? Write the chemical reaction

(iii) Write down the chemical reaction of Diazo test for anaromatic $-NH_2$ of *m*-nitro aniline.

(iv) You get a bright blue or green precipitate in the Lassaigne's Test of an organic compound containing nitrogen as special element. What is the name of the complex formed? Write its structure also.

(v) Write the chemical reaction of a phenolic –OH when it is treated with neutral $FeCl_3$.

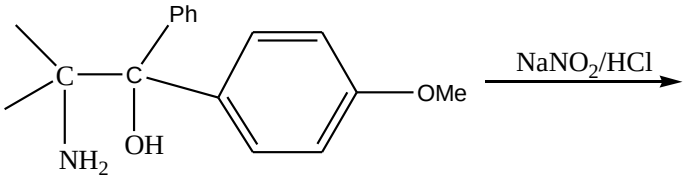
III. Write the Qualitative Analysis of *Salicylic acid* in a proper format following the given instructions. 10

(i) Detection of Special element (N, Cl and S by Lassaigne's Method)
(ii) Solubility test and solubility classification
(iii) Tests for non-nitrogeneous functional groups (-COOH, Ph-OH, -C=O)
(iv) Tests for nitrogeneous functional groups (aromatic- NH_2, $-NO_2$ and $-CONH_2$))

Group C (F.M-50)

3. Answer the following questions briefly 10x2 = 20

(i) Predict the products of the following reaction and give mechanism.



(ii) Predict the products of the following reaction & give plausible mechanism.

$$\text{Phthalimide} \xrightarrow{Br_2/KOH} $$

(iii) Predict the products of the following reaction & give plausible mechanism.

$$\text{Cyclohexanone} \xrightarrow{NH_2OH} A \xrightarrow{H^+} B$$

(iv) Define Chemical Shift

(v) How can you distinguish between the following pair of compounds by I.R. spectroscopy?
Cyclopropanone and acetone

(vi) How can you explain the following observation
The C=C stretching vibration of 2-methyl propene appears at 1640 cm^{-1}in the infra red, whereas no absorption peak appears in that region for 2,3 dimethyl 1-2 butene.

(vii) Illustrate the use of diazomethane in the homologation of acid and ring expansion

(viii) Predict the chemical shift (δ) values of two sets of protons in 4-notro anisole considering the δ value for the proton of benzene itself as 7.27 ppm

(ix) Explain how does H-bonding of any organic compound affect the shielding of ^{1}H atom with a suitable example?

(x) Give definitions of retrosynthesis and synthons.

Answer any six among the following Questions **5x6=30**

4. i) What is the structure and full name of TMS?
ii) Why is TMS chosen as the reference compound?
iii) When NMR of any compound in water is to be taken, which reference compound will be chosen and why? Write its full name and structure.

5. How can you distinguish between the following pairs of compounds by I.R. spectroscopy.

i) E-CH_3-CH_2-CH_2-CH=CH-CO_2Me and E-CH_3-CH_2-CH_2=CH_2-CH_2-CO_2Me

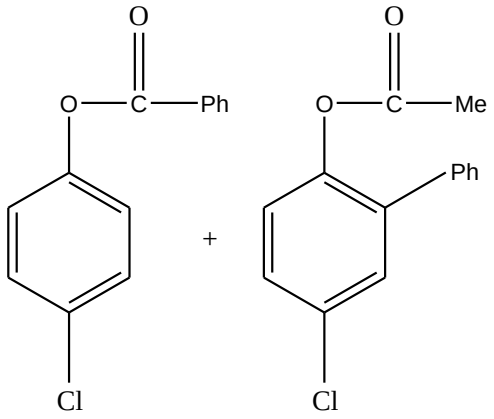
ii) Toluene and trideuteriomethylbenzene.

6. How can you explain the following observations

i) Ethylene absorbs at 164 nm in the UV, whereas 1,3-butadiene absorbs at 217 nm.

ii) In the UV, *trans*-stilbene exhibits λ_{max} at 295 nm, ε=27,000, while *cis*-stilbene exhibits λ_{max} at 280 nm ,ε=13,500.

7. Write down the possible product(s) when the following two esters are heated together in presence of anhy. $AlCl_3$ with mechanism.



8. "Benzidine rearrangement is intramolecular"- Account for this observation with mechanistic explanation. Write down the name and structures of the side products in this rearrangement.

9. What is the decreasing order of the basicity of 1^o,2^o and 3^o amines in protic solvent? Briefly discuss the reason of your answer. What will be the order of the basicity of the above mentioned amine if the solvent chosen is aprotic in nature?

10. When salicyaldehyde is treated with H_2O_2 in presence of NaOH Catechol is forme. What is the Name of this reaction? Show how it is formed with mechanism.

11. Show the transformation of Methyl ethyl ketone to $RCOCH_2COCH_2CH_3$ and CH_3-CO-CH(CH_3)-COR by separate selective routes. Also write the synthetic equivalent of CH_3-CO-CH_2^-