UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program : Third Semester – Spring 2023

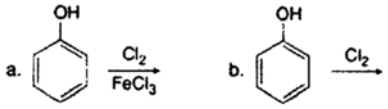
Roll No. .....

Paper: Chemistry-III (Organic Chemistry) **Course Code: CHEM-201** **Time: 3 Hrs. Marks: 60**

THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

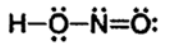
Q.1. Answer the following short questions: (15x2=30)

i. Draw the products of each reaction.



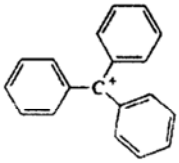
ii. How you might use SN_2 reactions to convert 1-chlorobutane into the following compounds. (a)Butan-1-ol (b) 1-iodobutane

iii. Draw a second resonance structure for nitrous acid. Label each resonance structure as a major, minor, or equal contributor to the hybrid. Then draw the resonance hybrid.



nitrous acid

iv. The triphenylmethyl cation is so stable that some of its salts can be stored for months. Explain why this cation is so stable.



triphenylmethyl cation

v. Predict the major products of acid-catalyzed dehydration of the following alcohols.
(a) pentan-2-ol (b) 2,2-dimethylpropan-1-ol

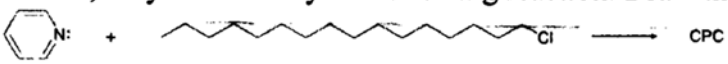
vi. Briefly explain hyper conjugation with example.

vii. Propose a mechanism for the entire reaction of pent-1-yne with 2 moles of HBr. Show why Markovnikov's rule should be observed in both the first and second additions of HBr.

viii. Iodoacetic acid is ten times less acidic than chloroacetic acid.Should it be possible to convert $CH_3CH_2CH_2OH$ to $CH_3CH_2CH_2Cl$ by a nucleophilic substitution reaction with NaCl? Explain why or why not.

ix. Why tertiary carbocations are more stable as compared to secondary carbocation?

x. CPC (cetylpyridinium chloride), an antiseptic found in throat lozenges and mouthwash, is synthesized by the following reaction. Draw the structure of CPC.



xi. N, N-dimethylaniline is less basic then 2,6,N,N-tetramethylaniline.

xii. Predict the products of the sulfuric acid-catalyzed dehydration of the following alcohols. When more than one product is expected, label the major and minor products.
(a) 2-methylbutan-2-ol (b) pentan-1-ol (c) pentan-2-ol (d) 1-isopropylcyclohexanol

xiii. How you will prepare ether by alokxy mercuration and demercuration of alkenes.

xiv. Write down all possible canonical forms of p-nitroaniline and indicate the most stable one.

xv. Define tautomerism with examples.

Answer the following questions.

Q.2 (i) What happens to the rate of an SN1 reaction under each of the following conditions? (6)
a. [RX] is tripled, and [:Nu] stays the same. b. [RX] is halved, and [:Nu] stays same.
c. Both [RX] and [:Nu–] are tripled. d. [RX] is halved, and [:Nu–] is doubled.

(ii) The ether, $CH_3OCH_2CH_3$, can be prepared by two different nucleophilic substitution reactions, one using CH_3O^- as nucleophile and the other using $CH_3CH_2O^-$ as nucleophile. Draw both routes. (4)

Q.3 (i) What is Birch Reduction. Give any two examples with mechanism? (5)

(ii) Write down two synthetic schemes for synthesis of phenol from benzene? (5)

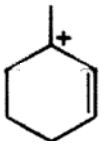
Q.4 (i) Rank the following carbocation's in decreasing order of stability.
Classify each as primary, secondary, or tertiary (4)

(a) The isopentyl cation, $(CH_3)_2CHCH_2-\overset{+}{C}H_2$

(b) The 3-methyl-2-butyl cation, $CH_3-\overset{\pm}{C}H-CH(CH_3)_2$

(c) The 2-methyl-2-butyl cation, $CH_3-\overset{+}{C}(CH_3)CH_2CH_3$

(d)



(ii) Draw a stepwise mechanism for the following reaction. (6)