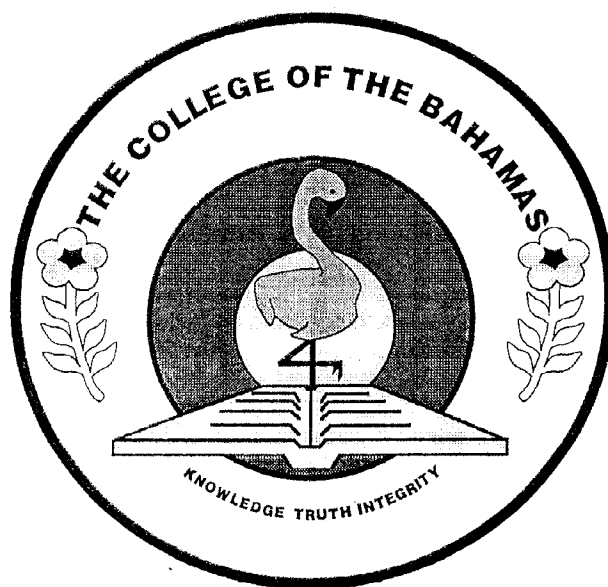


THE COLLEGE OF THE BAHAMAS



NASSAU

FREEPORT

EXAMINATION FOR THE FALL SEMESTER, 042000

SCHOOL: NATURAL SCIENCES AND ENVIRONMENTAL STUDIES

COURSE NUMBER: CHEM 230

COURSE TITLE: ORGANIC CHEMISTRY

Date and Time:
(To be entered by Examination Office)

Duration: 3 Hours

INSTRUCTION TO CANDIDATES: This paper has 6 pages and 25 questions.
Follow instructions given.

THE COLLEGE OF THE BAHAMAS
Natural Sciences Division

Organic Chemistry – C230

Final Examination semester 2000-04

December __ th 2000

Time : 3.0 hours

INSTRUCTIONS TO CANDIDATES: This paper has __ pages and __ questions. Follow the instructions provided in each section.

Section A: Multiple Choice. Select the answer that best answers the question. Mark your answer on the multiple choice answer sheet as indicated. You should use a #2 (HB) pencil. If you wish to change your answer, erase the first one neatly and clearly mark in your new choice.

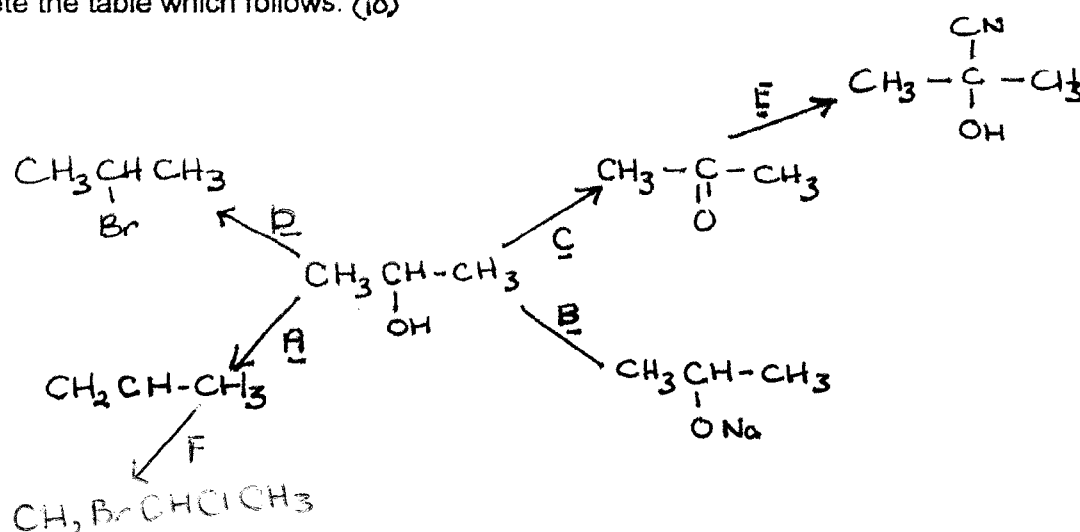
1. Select the appropriate IUPAC name for the structure shown below :
- C. 3
D. 2
E. 1
2. Which one of the following substances exhibits cis-trans isomerism ?
- A. 1-butene
B. 2,3-dichloro-2-butene
C. 2,3-dichlorobutane
D. hexachloroethane
E. phenol
3. The products of heterolytic bond cleavage are :
- A. a positive ion and a negative ion
B. two radicals
C. one radical and a neutral molecule
D. two carbocations
E. two neutral, smaller molecules
4. Select the compound most likely to undergo an S_N2 reaction with the hydroxide ion
- A. 1-chloropropane
B. 3-hexene
C. 2-methyl-2-chloropropane
D. cyclohexane
E. none of the above
5. The maximum number of structural isomers of C_4H_{10} that can be formed is
- A. 5
B. 4
6. The general formula for an amide is :
- A. $RC=NH$
B. $RCNH_2$
C. $RC \equiv NH$
D. $H_2N-R-COOH$
E. $RCNH_2$

$$\begin{array}{c} \parallel \\ O \end{array}$$
7. Which product is most likely to be formed when hydrogenbromide reacts with 1-pentene ?
- A. 2-bromopentane
B. 1-bromopentane
C. trans -2,3-dibromopentane
D. cis -1,2-dibromopentane
E. pentane
8. A compound X was treated with a solution of silver ions in aqueous ammonia. A silver mirror was formed on the inner walls of the reaction vessel. Compound X is likely to belong to which group ?
- A. tertiary alcohols/alcohol
B. carboxylic acids
C. ketones
D. aldehydes
E. ethers
9. A secondary carbon is bonded directly to :
- A. 2 hydrogens
B. 2 carbons
C. 3 hydrogens
D. 4 carbons
E. any three atoms

10. 2-methyl-2-pentene was subjected to ozonolysis. The products of the reaction would be :
- propanone and propanal
 - ethanal and 2-pentanone
 - 2-propanol and propanone
 - propanoic acid and propanal
 - 2-methyl-2,3-pentanediol
11. When butanoic acid is heated with concentrated sulphuric acid and propanol a sweet smelling compound is formed. Suggest the identity of this product.
- butylpropanoate
 - propylbutanoate
 - butoxypropylether
 - propylbutylether
 - propylester
12. The complete combustion of one mole of cyclobutane C_4H_8 produces how many moles of H_2O ?
- 8
 - 4
 - 2
 - 1
 - 0
13. When ethane is treated with Cl_2 in the presence of ultraviolet light the organic products are
- only chloroethane
 - 1,1-dichloroethane and 1,2-dichloroethane
 - hexachloroethane
 - a mixture of compounds containing 1 to 6 chlorine atoms per molecule
 - only hydrogen chloride
14. In a carbon to carbon triple bond there are
- one π and two σ
 - three π bonds
 - one σ and two π bonds
 - three σ bonds
 - three sp^2 hybridized orbitals
15. Amides are :
- all acidic
 - all basic
 - all neutral
 - some are acidic, some are neutral
 - some are basic some are neutral
16. Which of the following has the HIGHEST boiling point ?
- $CH_3CH_2CH_3$
 - $CH_3CH_2CH_2CH_3$
 - CH_3CH_2OH
 - CH_3O-CH_3
 - CH_4
17. Which statement is TRUE ? Chiral molecules..
- do not rotate the plane of polarized light
 - cannot be superimposed on their mirror images
 - have cis and trans isomers
 - contain only chiral carbon atoms
 - are less reactive than non-chiral molecules
- Questions 18 – 20 refer to the following types of reaction**
- Select the type of reaction which applies to each of the following-
- radical substitution
 - elimination
 - nucleophilic addition
 - nucleophilic substitution
 - electrophilic addition
18. The bromination of propane
19. The hydrolysis of 2-chloro-2-methylpropane to 2-methyl-2-propanol
20. The production of 2-methylpropene from 2-bromo-2-methylpropane

Section B : Structured Questions. Answer the questions in the spaces provided.

1. The following diagram is a summary of selected reactions. Examine the diagram then complete the table which follows. (10)



a. REACTION	REAGENTS & REACTANTS	NAME OF THE MAIN PRODUCT
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A

B

C

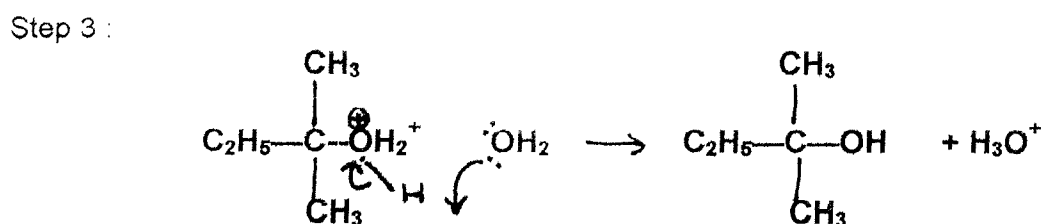
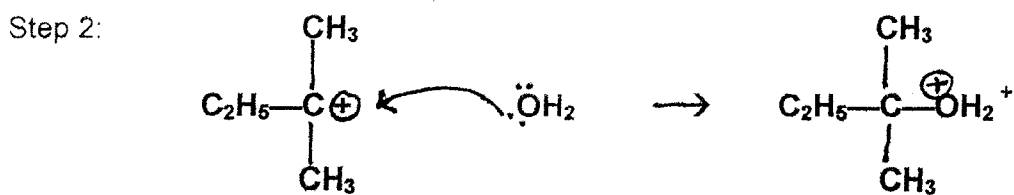
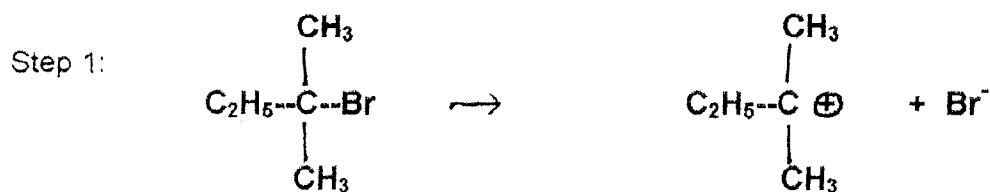
D

E

- b Briefly describe the conditions necessary for reaction F. (2)

- c Show, using appropriate diagrams, the mechanism involved in reaction D. (4)

2. The Hydrolysis of 2-bromo-2-methylbutane proceeds by the following mechanism :



a. From the mechanism, deduce the order of the reaction. (1)

b. Is this an $\text{S}_{\text{N}}1$ or an $\text{S}_{\text{N}}2$ mechanism ? (1)

c. Justify your answer to part b. (1)

d. Which substance acts as the nucleophile in this reaction ? (1)

e. State the reaction mechanism most likely to be used by 2-bromoethane; justify your choice. (3)

f. Identify the leaving group (1)

3. The carbon atoms associated with a C=C bond are especially vulnerable to electrophilic attack whereas the carbon of the carbonyl C=O functional group is more vulnerable to nucleophilic attack. How do you account for these observations? (3)
4. a. Benzene is an unsaturated compound. However it undergoes substitution reactions rather than addition reactions. Suggest a reason for this unusual behaviour. (2)
- b. Illustrate aromatic substitution, showing all the steps in the formation of EITHER propylbenzene OR nitrobenzene. Specify any special conditions/reactants/reagents needed for the reaction to occur. (5)
- c. Explain why methylbenzene (toluene) should be expected to react significantly faster than benzene in the reactions described in part b. (1)
- d. In nitration, 60% of the product was ortho-nitrotoluene., 37 % was para nitrotoluene and 3 % meta nitrotoluene. . How do you account for this distribution? (3)

