

UNIVERSITY OF SWAZILAND

MAIN EXAMINATION

2018, MAY

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TITLE OF PAPER : Functional Group Chemistry and Stereochemistry

COURSE NUMBER : CHE232

TIME : Three Hours

INSTRUCTIONS : Answer any **FOUR** questions. Each question carries **25** marks

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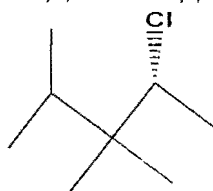
This Examination Paper Contains **SIX** Printed Pages Including This Page  
*You are not supposed to open the paper until permission to do so have been granted  
by the Chief Invigilator.*

### Question 1

- a. Dehydration of 4-methyl-3-hexanol with hydrobromic acid gives four alkene elimination products. Draw their structures and rank them according to their relative stabilities. Also give the names of the alkenes (15)
- b. Predict the major product of the reaction between 1-butanol and each of the following. Write the IUPAC names of the products (10)
- $\text{PBr}_3$
  - $\text{HCl/ZnCl}_2$
  - $\text{PCC, CH}_2\text{Cl}_2$
  - $\text{NaH}$
  - Conc.  $\text{H}_2\text{SO}_4$ , heat

### Question 2

- b. Consider a molecule of (R)-2-chloro-3,3,4-trimethylpentane:

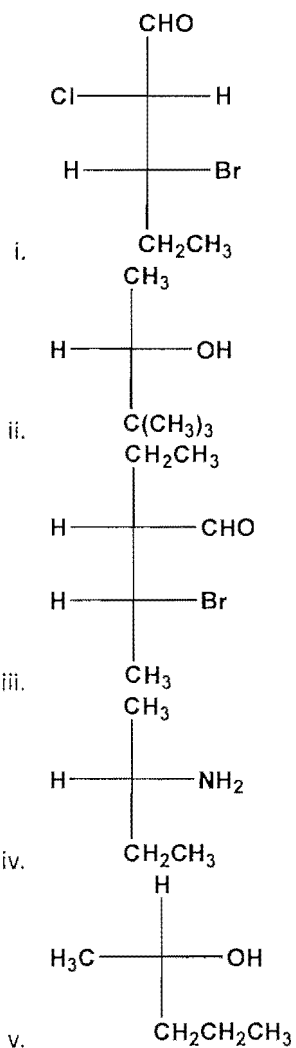


How would the substitution products of the reaction of this alkyl halide with WATER be different from the products of the reaction of this alkyl halide with HYDROXIDE ION? Consider stereochemistry. (10)

- c. How many alkenes will be produced when each of the following substrates is treated with a strong base? (10)
- 1-chloropentane
  - 2-chloropentane
  - 3-chloropentane
  - 2-chloro-2-methylpentane
  - 3-chloro-3-methylpentane

### Question 3

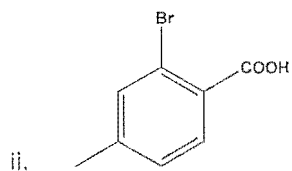
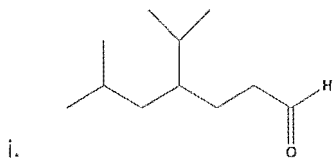
- a. Draw the structures of the following compounds: (10)
- (R)-2,2-dimethyl-3-hexanol
  - (S)-2-methyl-1-butanol
  - (R)-3-hydroxypentanal
  - (3R,4R)-3,4-dihydroxy-2-pentanone
  - (2R,3R)-2,3-dihydroxyhexanoic acid
- b. Give the names of the following compounds, including their stereochemical configuration. (10)

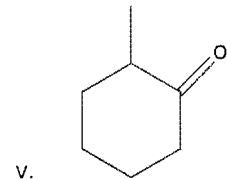
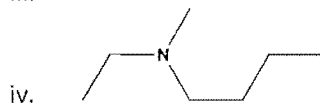
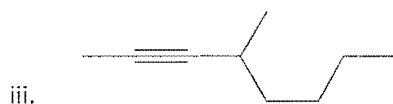


d. Give a brief discussion of plane polarised light and how it affects optically active compounds. (5)

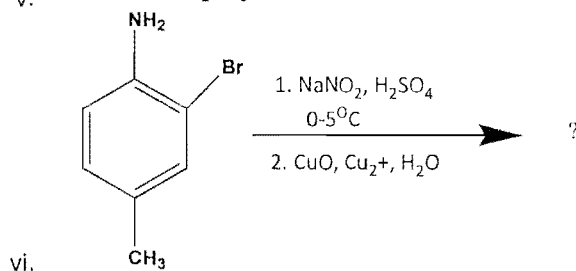
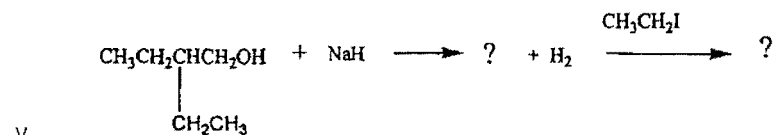
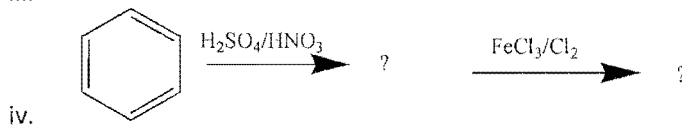
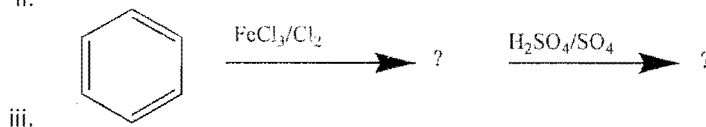
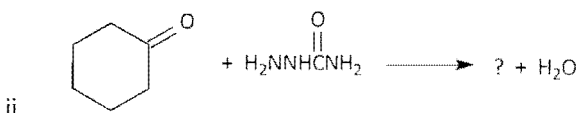
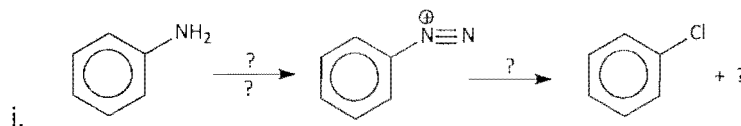
**Question 4**

a. Write the IUPAC names of the following compounds: (10)



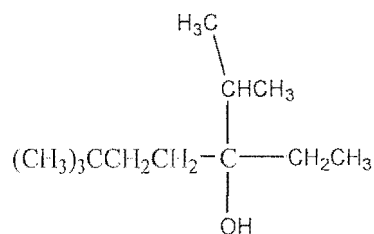


- b. Complete the following reactions by writing down only the missing reagents, reactants or products. (15)



### Question 5

- a. Outline 3 routes of Grignard synthesis of the following compound. (only write the structural formula of the carbonyl compound and Grignard reagent for each synthesis). (12)



- b. Outline the reaction mechanism for one of the reaction pairs in (a). (10)
- c. To obtain a primary alcohol from a reaction with a Grignard reagent, what other reactant can we use? (3)

### Question 6

- a. The hydrolysis of 2-iodo-3-methylpentane yields a tertiary alcohol as the major product. Provide an equation, with mechanism, for this reaction and explain why the tertiary alcohol is the major product. Also, give the name and structure of both the major and minor products. (15)
- b. Draw the structures of the following compounds: (10)
- 2-ethoxy-2methyl-2-pentene
  - 3-methoxycyclohexene
  - Phenol
  - 1,2-dimethylbenzene
  - 3-bromoBenzoic acid

