FACULTY OF SCIENCE

	DEPARTMENT OF CHEMICAL SCIENCES
MODULE:	**CEM1B01 - INTRODUCTION TO PHYSICAL AND ORGANIC CHEMISTRY**
SECTION:	**B ORGANIC CHEMISTRY**
CAMPUS:	**APK**
SUPPLEMETARY EXAM DATE:	**07 JANUARY 2020**
ASSESSOR:	DR P MOSHAPO
MODERATOR:	PROF CM MAUMELA
MARKS:	50

INSTRUCTIONS:

(1) The exam consists of 8 pages including cover page and periodic table.

(2) You can use a pen of any color except RED to write the exam.

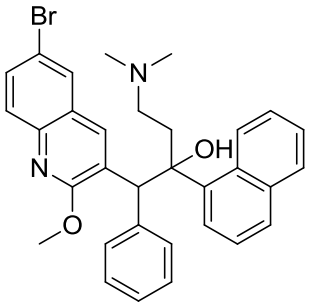
(3) You are NOT ALLOWED TO USE PENCIL. IF YOU DO, YOU CANNOT QUERY YOUR MARKS AFTER THE EXAM HAS BEEN MARKED.

NAME: _____ **SURNAME:** _____

STUDENT NUMBER: _____

QUESTION 1 **[9.5]**

Bedaquiline is a drug used to treat active tuberculosis (TB), more specifically drug-resistant TB. Study the chemical structure of this drug and answer the questions that follow.



Bedaquiline

1.1 List all the 5 functional groups present in the chemical structure of bedaquiline (5)

1.2 How many stereogenic centers does the molecule have? (1)

1.3 How many isomers do you expect the molecule to have? (1)

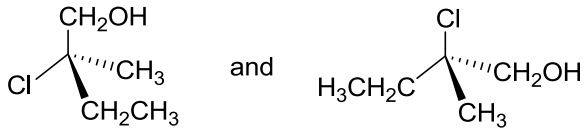
1.4 Insert the correct number of lone pair electrons around central atoms that have lone pairs. (Do it on the structure above) (2.5)

QUESTION 2 **[4]**

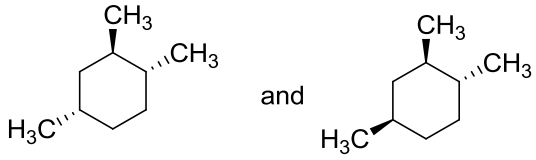
Study the pair of compounds below and state if they are constitutional isomers, conformational isomers, enantiomers, diastereoisomers or same compounds.

2.1 

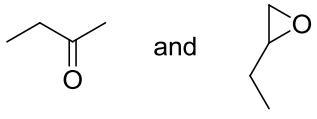
(1)

2.2 

(1)

2.3 

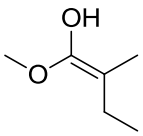
(1)

2.4 

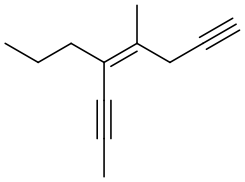
(1)

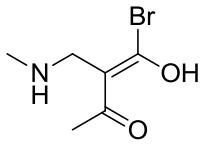
QUESTION 3 **(3)**

Assign E/Z stereochemistry to the following compounds: (show your analysis)

3.1 

(1)

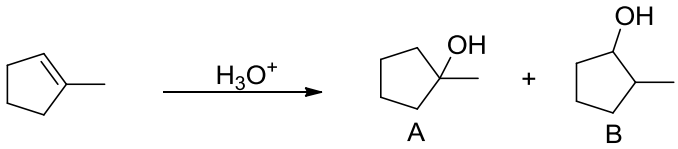
3.2 
(1)

3.3 

(1)

QUESTION 4 **[4.5]**

Study the reaction below and identify the major product of the reaction. Propose a detailed reaction mechanism showing how the major product is formed.



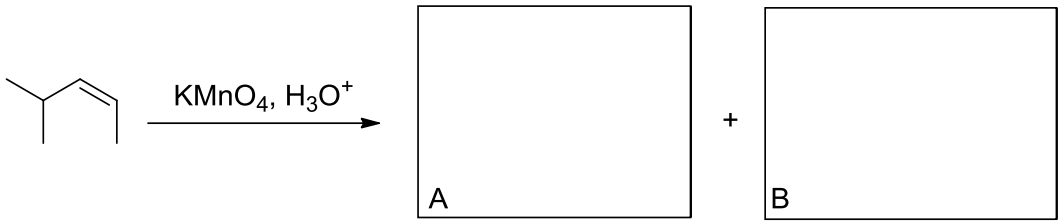
QUESTION 5 **[3]**

Draw the most stable chair conformation of *cis*-3-bromocyclohexanol and its ring-flipped isomer.

QUESTION 6 **[8]**

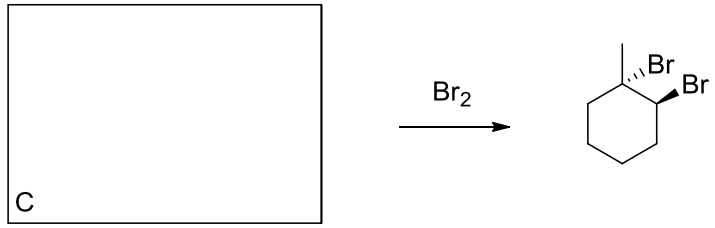
Complete each of the following reaction equations by **providing the missing information** (A, B, C, D, E and F). In each case **state the type of reaction**.

6.1



(3)

6.2



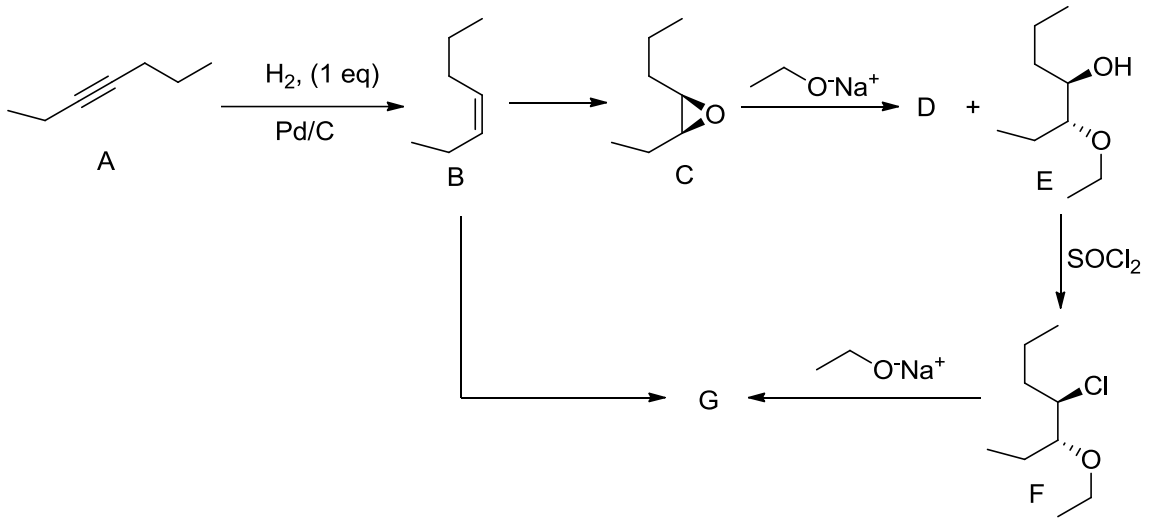
(2)

6.3

(3)

QUESTION 7 **[18]**

The reaction below describes the synthesis of compound G. Study it and answer the questions below.



7.1 Draw the product that you would form if more than 2 equivalences of H_2 was used in the first step. (1)

7.2 What is the role of Pd/C in the reaction? (2)

7.3 Name the reagent used to form C. (1)

7.4 Give the IUPAC names of A and B (4)

7.4 Draw the structure of product D (1)

7.5 Assign R/S configuration on the carbon attached to the OH functional group in structure E. Show your working. (3)

7.6 Draw structure of product G, with the correct stereochemistry. (2)

7.7. Propose a two-step method that you can use to synthesize G from B. (4)

TOTAL: 50

The Periodic Table