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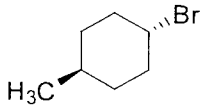
THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. Degree Programme and Stand Alone Courses in Science - 2016/2017
CMU2221/CME4221 - Organic Chemistry 1
CONTINUOUS ASSESSMENT TEST II – PART A (Multiple Choice Questions)

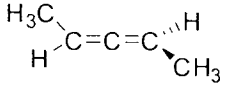
Saturday, 23rd September 2017 14.30–15.30 hrs

Instructions: Mark a cross on each correct response in the MCQ answer sheet.
Each correct answer carries **04 marks** while **01 mark** will be **deducted for each wrong answer.**

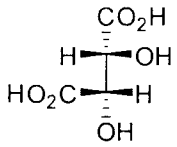
1. Which of the following molecules achiral?



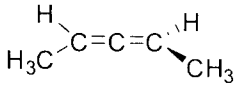
A



B



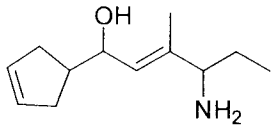
C



D

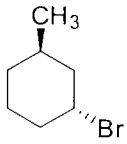
(1) **A** and **B** (2) **A** and **C** (3) **A** and **D** (4) **B** and **D** (5) **C** and **D**

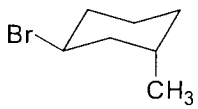
2. What is the total number of stereocentres found in the following compound?



(1) 6 (2) 5 (3) 4 (4) 3 (5) 2

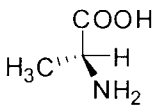
3. What is the best term to describe the following two compounds?



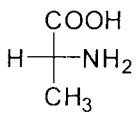
and


(1) Same compound (2) Conformational isomers (3) Constitutional isomers
(4) Diastereomers (4) Enantiomers

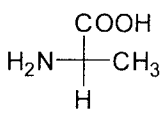
4. Which of the following compounds in equal proportions can cause net rotation of plane polarized light zero?



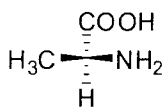
A



B



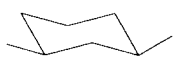
C

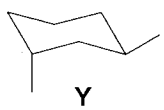


D

(1) **B** and **C** (2) **B** and **D** **(3) A** and **B** **(4) A** and **C** **(5) A** and **D**

5. Select the compound/s which can be described as *meso* compound/s.


X


Y


Z

(1) **X** and **Y** (2) **X** and **Z** (3) **Y** and **Z** (4) **Y** only (5) **Z** only

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6. Which statement/s is/are true regarding the following reaction?

$CH_3CH_2Cl + NaOH \longrightarrow CH_3CH_2OH + NaCl$

(a) Rate of the reaction depends only on the concentration of CH_3CH_2Cl.
(b) Rate of the reaction depends only on the concentration of NaOH.
(c) Rate of the reaction depends on the concentrations of both $CH_3CH_2Cl$and NaOH.
(d) Reaction occurs *via* a carbocation intermediate.

(1) (a) only (2) (b) only (3) (c) only (4) (c) and (d) (5) (a) and (d)

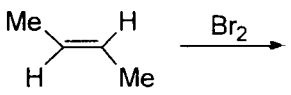
7. Consider the following statements regarding S_N2 reactions.

(a) Intermediates that are formed during S_N2 reactions does not undergo rearrangements
(b) Electronic effects of the substituents have only a very little or no effect on the rate of S_N2 reactions
(c) S_N2 reactions occur with inversion of configuration

Correct statement/s is/are,

(1) (a) only (2) (b) only (3) (c) only (4) (a) and (c) only (5) (b) and (c) only

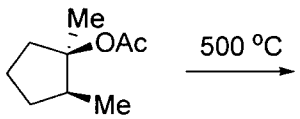
8. The product of the following reaction is,

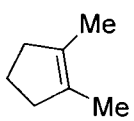


(1) A racemic mixture of 2,3-dibromobutane
(2) *Meso*-2,3-dibromobutane
(3) All three stereo isomers of 2,3-dibromobutane
(4) Any one of the optically active 2,3-dibromo butanes
(5) A diastereoisomeric mixture of 2,3-dibromobutane

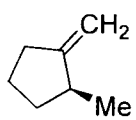
9. Which of the following statements is **true** regarding nucleophilic substitution reactions?
(1) Polar protic solvents favour the S_N1 mechanism
(2) Nonpolar solvents favour the S_N1 mechanism
(3) Weak nucleophiles favour the S_N2 mechanism
(4) S_N2 reactions occur with racemisation
(5) Rates of S_N2 reactions are not affected by steric effects

10. What are the possible products of the following reaction?

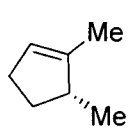




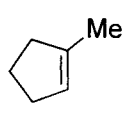
P



Q



R



S

(1) **P**, **Q** and **R** (2) **P**, **R** and **S** (3) **P** and **Q** (4) **R** and **S** (5) **Q** and **R**

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	Max.	Marks
MCQ	40	
1	30	
2	30	
Total	100	

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CONTINUOUS ASSESSMENT TEST II – PART B

Saturday, 23rd September 2017 14.30–15.30 hrs

MCQ Answer sheet

1. 1 2 3 4 5 **2.** 1 2 3 4 5 **3.** 1 2 3 4 5 **4.** 1 2 3 4 5 **5.** 1 2 3 4 5

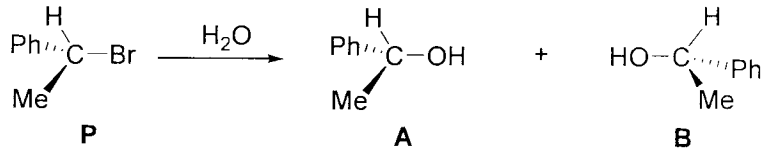
6. 1 2 3 4 5 **7.** 1 2 3 4 5 **8.** 1 2 3 4 5 **9.** 1 2 3 4 5 **10.** 1 2 3 4 5

Correct	
Wrong	
Unanswered	
Total	

Structured Essay Questions

Write answers in the spaces provided.

1. Consider the following hydrolysis reaction which results in two products **A** and **B**.



(a) Determine the configuration of the stereo centre of **P** and the two products **indicating the priorities of the groups** clearly according to Cahn-Ingold- Prelog rules.

Compound	**P**	**A**	**B**
Configuration			

(06 marks)

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(b) i. Identify the reaction pathway.

ii. Write the mechanism of this reaction.

(10 marks)

(c) i. It is found experimentally, that the above reaction occurs with 98% racemization and 2% inversion. What is the composition of the products in the reaction mixture?

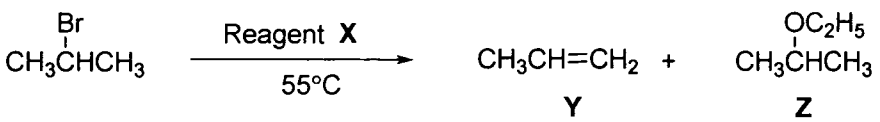
Product	**A**	**B**
%		

(04 marks)

ii. Explain why 100% racemization does not take place here.

(10 marks)

2. Consider the following reaction of 2-bromopropane leading to an elimination product and substitution product.



Y **Z**

Reagent **X**, can either be C_2H_5OH = **X1** or

C_2H_5ONa/C_2H_5OH = **X2**.

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(a) What is the nucleophile when **X1** is used?

(b) What is the nucleophile when **X2** is used?

(c) Which nucleophile acts as a strong base?

(d) What is the major product of the reaction when **X1** is used as the reagent?

(e) What is the major product of the reaction when **X2** is used as the reagent?

(f) Write the mechanism for the formation of the major product in **(e)** above.

(30 marks)

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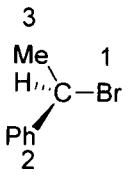
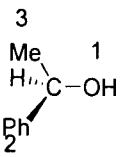
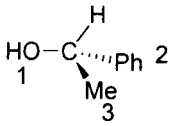
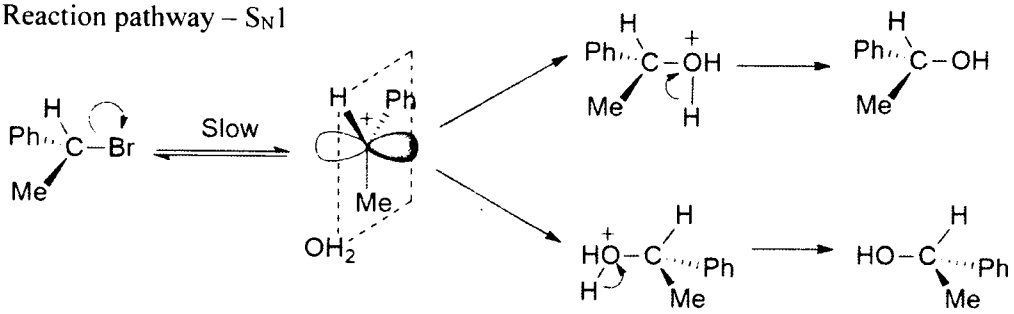
MCQ Answers **1).** 2 **2).** 4 **3).** 5 **4).** 4 **5).** 2 **6).** 3 **7).** 5 **8).** 2 **9).** 1 **10).** 5

Structured Essay Answers

1. i).

Compound	**Alkyl halide** 	**A** 	**B** 
Configuration	R	R	S

ii). Reaction pathway – S_N1



iii). A - 49% B - 51%

iv).

- When the carbocation is formed initially the Br^- is not completely removed. This is an asymmetrically solvated ion pair.
- This can give only the inverted product.
- The asymmetrically solvated ion pair is converted to symmetrically solvated ion with the solvent molecules with time
- When this is reacted with the nucleophile (solvent), it gives a racemic mixture.
- Ratio (or the abundance) of these two ions will lead to a product with racemization containing more of inverted product.

2. a). C_2H_5OH b). $C_2H_5O^-$ c). $C_2H_5O^-$ (X2) d). Z e). Y

f).