



A LEVEL CHEMISTRY

TOPIC 16 – ALDEHYDES, KETONES AND OPTICAL ISOMERISM

TEST

Answer all questions

Max 50 marks

Name		
Mark/50%	Grade

www.megalecture.com

SECTION A

1. (a) (i) Give a suitable reagent and state the necessary conditions for the conversion of propan-2-ol into propanone. Name the type of reaction.

Reagent

Conditions

Type of reaction

- (ii) Propanone can be converted back into propan-2-ol. Give a suitable reagent and write an equation for this reaction.
(Use [H] to represent the reagent in your equation.)

Reagent

Equation

.....

(5)

- (b) Propanal is an isomer of propanone.

- (i) Draw the structure of propanal.

- (ii) A chemical test can be used to distinguish between separate samples of propanone and propanal. Give a suitable reagent for the test and describe what you would observe with propanone and with propanal.

Test reagent

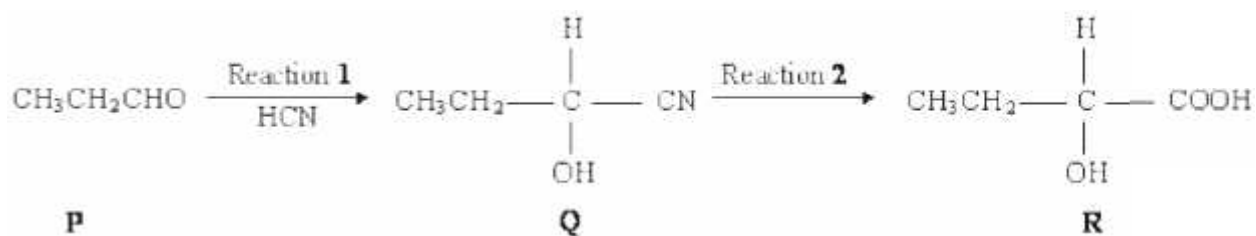
Observation with propanone

Observation with propanone

(4)

(Total 9 marks)

2. Consider the sequence of reactions below.



(a) Name and outline a mechanism for Reaction 1.

Name of mechanism

Mechanism

(5)

(b) Name compound **Q**

.....

(1)

(c) Draw the structure of the main organic product formed in each case when **R** reacts separately with the following substances:

(ii) acidified potassium dichromate(VI);

(iii) concentrated sulphuric acid in an elimination reaction.

(2)

(Total 8 marks)

3. The reducing agent in the following conversion is NaBH_4



- (i) Name and outline a mechanism for the reaction.

Name of mechanism

Mechanism

(5)

- (ii) By considering the mechanism of this reaction, explain why the product formed is optically inactive.

.....
.....
.....
.....
.....
.....
.....
.....
.....

(3)

(Total 8 marks)

4. (a) **P**, **Q** and **R** have the molecular formula C_8H_{12}

All three are branched-chain molecules and none is cyclic.

P can represent a pair of optical isomers.

Q can represent a pair of geometrical isomers.

R can represent another pair of geometrical isomers different from **Q**.

Draw one possible structure for one of the isomers of each of **P**, **Q** and **R**.

Structure of **P**

Structure of **Q**

Structure of **R**

(3)

- (b) Butanone reacts with reagent **S** to form compound **T** which exists as a racemic mixture. Dehydration of **T** forms **U**, C_5H_8 , which can represent a pair of geometrical isomers.

- (i) State the meaning of the term *racemic mixture* and suggest why such a mixture is formed in this reaction.

Racemic mixture

.....

Explanation.....

.....

.....

- (ii) Identify reagent **S**, and draw a structural formula for each of **T** and **U**.

Reagent **S**

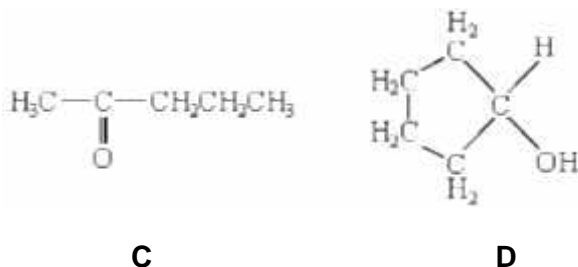
Compound **T**

Compound **U**

(6)

(Total 9 marks)

5. Compounds **C** and **D**, shown below, are isomers of $C_5H_{10}O$



- (a) Name compound **C**.

.....

(1)

- (b) Use **Table 2** on the Data Sheet to help you to answer this question.

- (i) Suggest the wavenumber of an absorption which is present in the infra-red spectrum of **C** but not in that of **D**.

.....

- (ii) Suggest the wavenumber of an absorption which is present in the infra-red spectrum of **D** but not in that of **C**.

.....

(2)

- (c) Identify a reagent that you could use to distinguish between **C** and **D**. For each of **C** and **D**, state what you would observe when the compound is treated with this reagent.

Reagent

Observation with **C**

Observation with **D**

(3)

- (d) Compound **E**, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CHO}$, is also an isomer of $C_5H_{10}O$

Identify a reagent which will react with **E** but not with **C** or **D**. State what you would observe when **E** is treated with this reagent.

Reagent

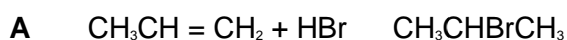
Observation with **E**

(2)

(Total 8 marks)

SECTION B

6. Which one of the following reactions involves nucleophilic addition?



- B** $\text{CH}_3\text{CH}_2\text{CH}_3 + \text{Cl}_2 \rightarrow \text{CH}_3\text{CHClCH}_3 + \text{HCl}$
- C** $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br} + \text{NaOH} \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{OH} + \text{NaBr}$
- D** $\text{CH}_3\text{CH}_2\text{CHO} + \text{HCN} \rightarrow \text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CN}$

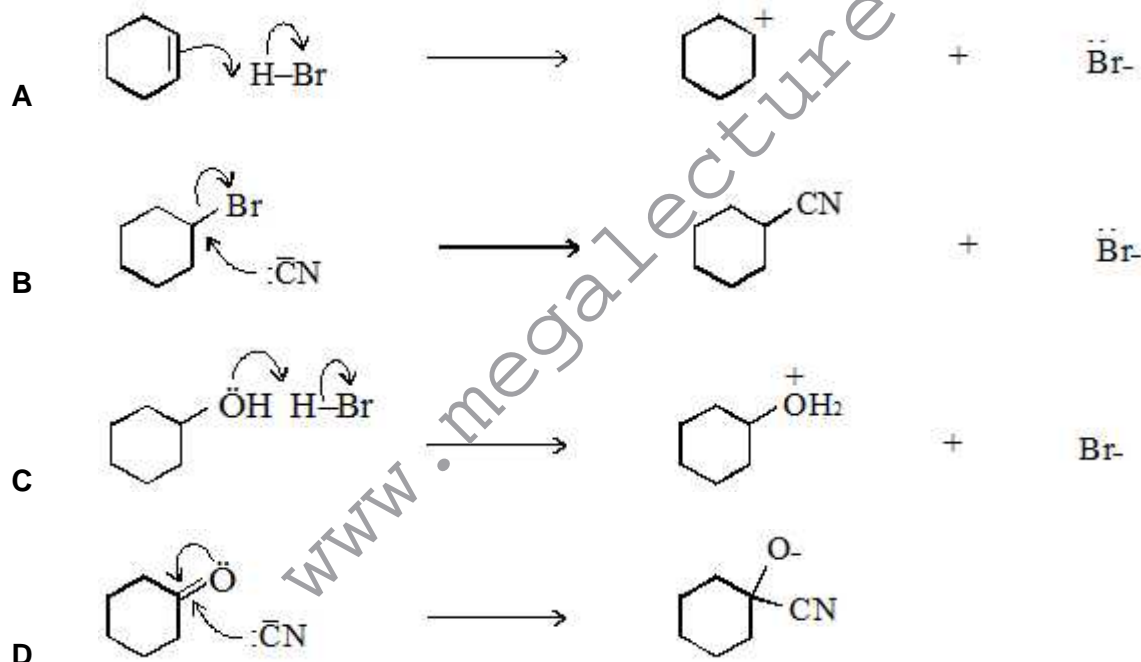
(Total 1 mark)

7. Which one of the following isomers is not oxidised under mild reaction conditions?

- A** $(\text{CH}_3)_2\text{CHCH}(\text{OH})\text{COCH}_3$
- B** $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}_2\text{COCH}_3$
- C** $(\text{CH}_3)_2\text{CHCH}(\text{OH})\text{CH}_2\text{CHO}$
- D** $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}_2\text{CH}_2\text{CHO}$

(Total 1 mark)

8. In which one of the following are the curly arrows **not** used correctly?



(Total 1 mark)

9. Which one of the following is **not** a suitable method for the preparation of ethanol?

- A oxidation of ethane
- B hydration of ethene
- C reduction of ethanal
- D hydrolysis of bromoethane

(Total 1 mark)

10. Which one of the following will undergo nucleophilic addition?

- A hex-3-ene
- B hexan-3-one
- C 3-bromohexane
- D hexan-3-ol

(Total 1 mark)

11. How many structural isomers, which are aldehydes, have the molecular formula $C_5H_{10}O$?

- A 2
- B 3
- C 4
- D 5

(Total 1 mark)

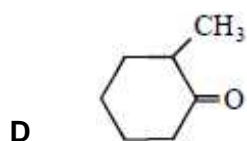
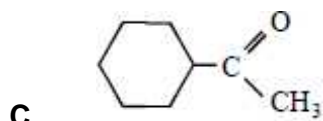
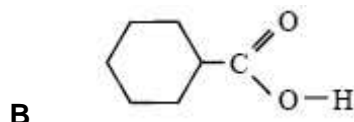
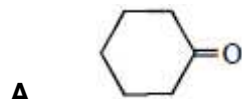
12. On reduction, a racemate can be formed by

- A $CH_3CH_2CH_2CH_2CHO$
- B $CH_3CH_2CH_2COCH_3$
- C $CH_3CH_2COCH_2CH_3$
- D $CH_3CH=CHCH_2CHO$

(Total 1 mark)

13. The compound lithium tetrahydridoaluminate(III), LiAlH_4 , is a useful reducing agent. It behaves in a similar fashion to NaBH_4 . Carbonyl compounds and carboxylic acids are reduced to alcohols. However, LiAlH_4 also reduces water in a violent reaction so that it must be used in an organic solvent.

Which one of the following can be reduced by LiAlH_4 to a primary alcohol?



(Total 1 mark)

www.megalecture.com