Carbonyl compounds – 2022 June AS Chemistry 9701

1. June/2022/Paper_11/No.27

Which compound will react with $LiAlH_4$ to form two optical isomers?

A $CH_3CH_2COCH_3$

B $CH_3CH_2CH_2CHO$

C $CH_3CH_2COCH_2CH_3$

D $CH_3CH(CH_3)CH_2CO_2H$

2. June/2022/Paper_11/No.35

The skeletal formulae of two organic compounds are shown.

Which reagents can be used to distinguish these two compounds?

1 alkaline $I_2(aq)$

2 acidified $K_2Cr_2O_7$

3 2,4-dinitrophenylhydrazine (2,4-DNPH reagent)

A 1, 2 and 3 **B** 1 and 3 only **C** 2 and 3 only **D** 2 only

3. June/2022/Paper_11/No.36

A carbonyl compound, X, reacts with HCN in the presence of NaCN to make a compound with M_r 85. Compound X does **not** react with Fehling's reagent.

What is compound X?

A butanal

B butanone

C propanal

D propanone

4. June/2022/Paper_12/No.34

Which reaction has a product that gives a yellow precipitate when treated with alkaline $I_2(aq)$?

A 2-chloropropane is warmed with a dilute aqueous solution of sodium hydroxide.

B Ethanal is heated under reflux with acidified potassium dichromate(VI).

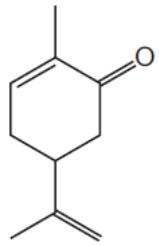
C Methyl ethanoate is heated under reflux with dilute sulfuric acid.

D Propanal is reacted with $NaBH_4$, followed by dilute sulfuric acid.

5. June/2022/Paper_12/No.36

Which compound forms a precipitate when mixed with 2,4-DNPH reagent and also forms a precipitate when mixed with Fehling's reagent?

A



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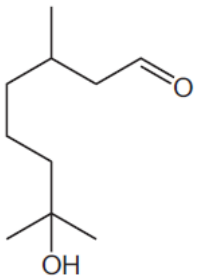

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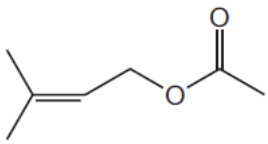

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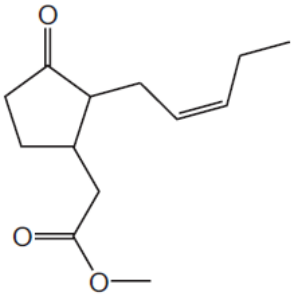


6. June/2022/Paper_12/No.37

Which reaction is a redox reaction?

A ethanenitrile heated under reflux with dilute hydrochloric acid

B ethanoic acid reacted with aqueous sodium hydroxide

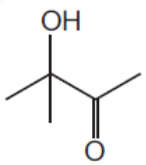
C ethanoic acid reacted with sodium

D ethyl ethanoate heated under reflux with dilute hydrochloric acid

7. June/2022/Paper_13/No.26

Compound X contains an alcohol group and a carbonyl group.

compound X



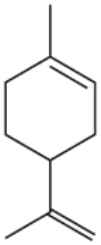
Which row is correct?

	type of alcohol group	type of carbonyl group
A	primary	aldehyde
B	primary	ketone
C	tertiary	aldehyde
D	tertiary	ketone

8. June/2022/Paper_13/No.30

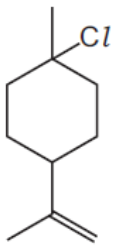
Limonene is found in lemon and orange oils.

limonene

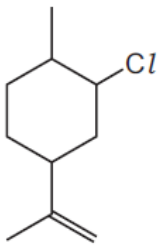


What is the major product when limonene reacts with an excess of dry hydrogen chloride?

A



B



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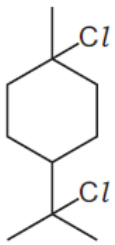
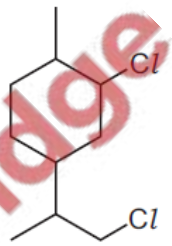


D



9. June/2022/Paper_13/No.33

Structural isomerism only should be considered when answering this question.

Several compounds with molecular formula $C_4H_8O_2$ have **one** carbonyl group and **one** OH group.

How many of these compounds produce yellow crystals with alkaline I_2(aq) at room temperature?

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

10. June/2022/Paper_13/No.36

A carbonyl compound has the structural formula CH_3COCHO.

Which row is correct for the observations made when this compound is treated with the given reagents?

	2,4-DNPH reagent	Fehling's reagent
A	silver mirror	red precipitate
B	silver mirror	orange precipitate
C	orange precipitate	silver mirror
D	orange precipitate	red precipitate

11. June/2022/Paper_21/No.3(c, d)

(c) Fig. 3.2 shows two reactions of **T**.

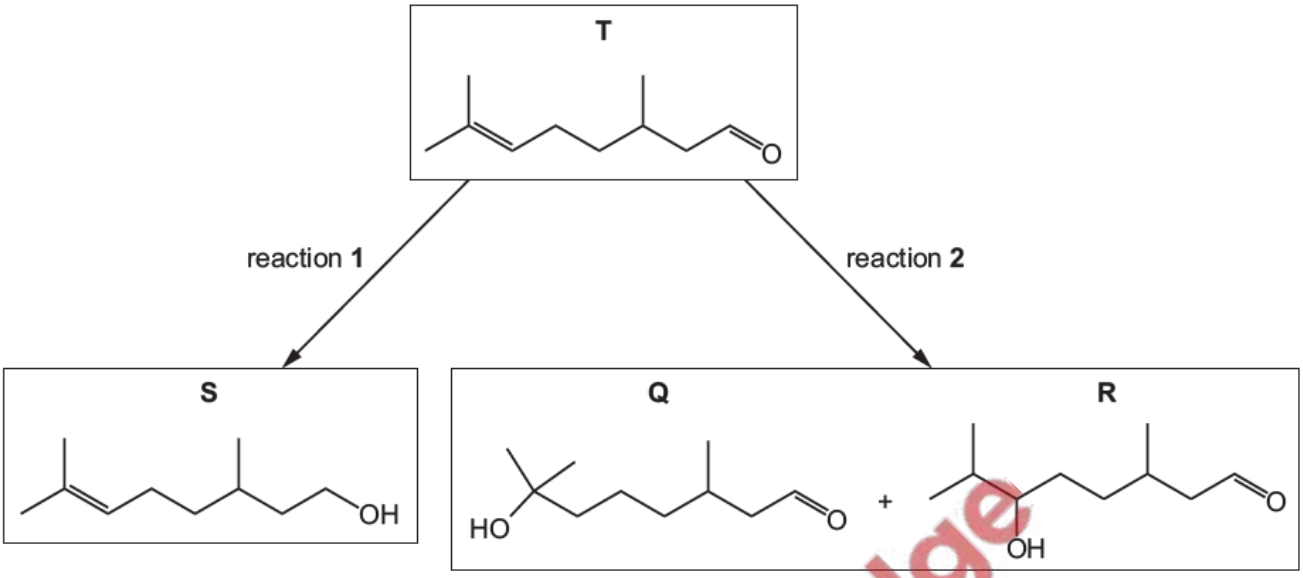


Fig. 3.2

(i) Identify a suitable reagent for reaction **1**.

..... [1]

(ii) Identify the reagent and conditions needed for reaction **2**.

.....

..... [2]

(iii) Suggest which product formed in reaction **2** has a higher yield. Explain your answer.

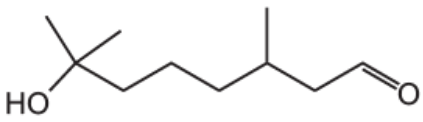
.....

.....

..... [3]

(d) Separate samples of **Q** and **R** are added to separate test-tubes containing acidified $K_2Cr_2O_7$(aq) and heated.

Q



R

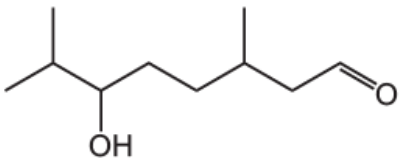


Fig. 3.3

(i) Predict the observations for each test-tube. Explain your answer in terms of the functional groups present in **Q** and **R**.

.....

.....

.....

..... [3]

(ii) When PCl_5(s) is added to separate samples of **Q** and **R** at room temperature, both react vigorously.

Complete the equation shown in Fig. 3.4 to describe the reaction that occurs when **R** reacts with PCl_5(s).

R

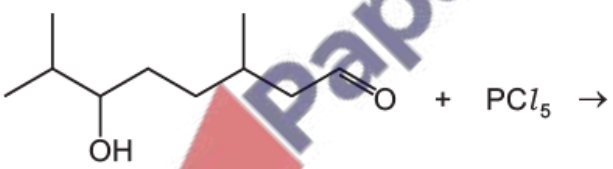


Fig. 3.4

[2]

(iii) Suggest why samples of **Q** and **R** must be dried before PCl_5 is added. Include a relevant equation to support your answer.

.....

.....

..... [2]

(c) **W**, **X** and **Y** have the same molecular formula, $C_5H_{10}O$.

W, **X** and **Y** are added separately to different reagents. Observations for these reactions are described in Table 4.1.

Table 4.1

	+ 2,4-dinitrophenylhydrazine	+ alkaline I_2(aq)	+ Fehling's reagent and warm
W	orange precipitate seen	no change	orange-red precipitate seen
X	orange precipitate seen	yellow precipitate seen	no change
Y	orange precipitate seen		

(i) **W**, **X** and **Y** each contain a common functional group.

Name the functional group that is present in all three compounds.

..... [1]

(ii) State the formula of the yellow precipitate produced when **X** is added to alkaline I_2(aq).

..... [1]

(iii) **W** could be one of four structural isomers.

- Draw the skeletal formulae for two possible structural isomers of **W**.
- Describe the type of structural isomerism shown.

isomer 1

isomer 2

type of structural isomerism

.....

[3]

13. June/2022/Paper_23/No.3(b, c)

(c) **K** has molecular formula C_3H_6O.
When **K** is added to 2,4-dinitrophenylhydrazine, an orange precipitate forms.
When **K** is warmed with Tollens' reagent, a silver mirror forms.

Draw the displayed formula of **K**.

K

[2]