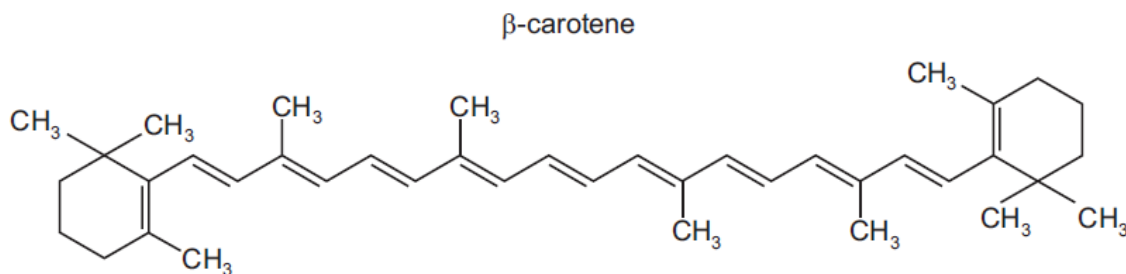


1. Nov/2023/Paper_9701/11/No.30

β -carotene is responsible for the orange colour of carrots.



β -carotene is oxidised by hot, concentrated, acidified KMnO_4 .

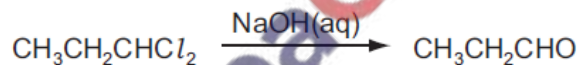
When an individual molecule of β -carotene is oxidised in this way, many product molecules are formed.

How many of these product molecules contain a ketone functional group?

- A 4 B 6 C 9 D 11

2. Nov/2023/Paper_9701/11/No.31

1,1-dichloropropane reacts with aqueous sodium hydroxide in a series of steps to give propanal.

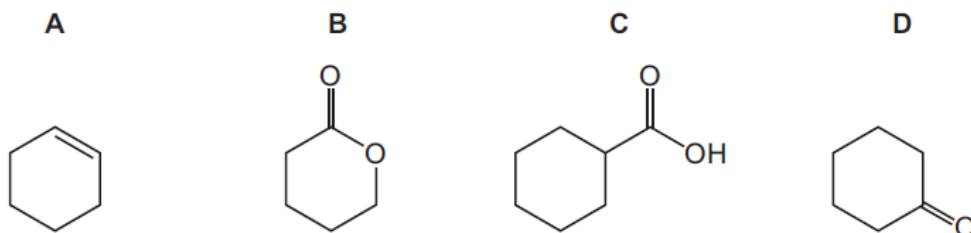


Which term describes the first step of this reaction?

- A addition
B elimination
C oxidation
D substitution

3. Nov/2023/Paper_9701/11/No.36

Which compound will produce a yellow-orange precipitate when added to 2,4-dinitrophenylhydrazine?



4. Nov/2023/Paper_9701/11/No.37

Ethanal, CH_3CHO , undergoes an addition reaction with HCN in the presence of CN^- ions.

Which row identifies the type of reaction and the name of the product formed?

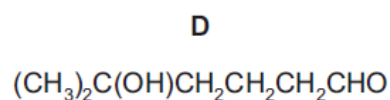
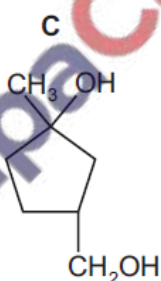
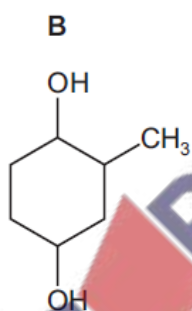
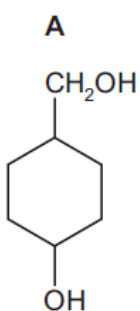
	type of reaction	name of product
A	electrophilic addition	2-hydroxypropanenitrile
B	electrophilic addition	2-hydroxyethanenitrile
C	nucleophilic addition	2-hydroxypropanenitrile
D	nucleophilic addition	2-hydroxyethanenitrile

5. Nov/2023/Paper_9701/12/No.35

Heating compound X, $\text{C}_7\text{H}_{14}\text{O}_2$, under reflux with an excess of acidified potassium dichromate(VI) produces compound Y.

Compound Y produces hydrogen gas with sodium metal and forms orange crystals with 2,4-DNPH reagent.

What could X be?



6. Nov/2023/Paper_9701/12/No.36

Which reaction takes place by a nucleophilic addition mechanism?

- A** propene reacting with hydrogen bromide
- B** 2-bromopropane reacting with sodium hydroxide in ethanol
- C** propanone reacting with hydrogen cyanide
- D** methane reacting with chlorine

7. June/2023/Paper_9701/11/No.33

Which reagent:

- can confirm the presence of a carbonyl group in an organic compound
- does **not** distinguish between aldehydes and ketones?

- A acidified $K_2Cr_2O_7$
B 2,4-DNPH reagent
C Fehling's reagent
D $LiAlH_4$

8. June/2023/Paper_9701/11/No.34

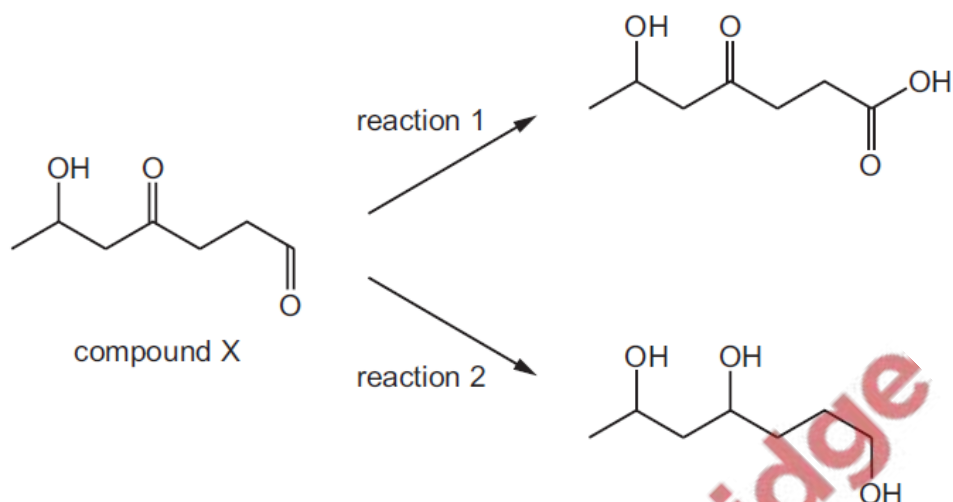
Which compound gives a positive test with alkaline aqueous iodine and does **not** show optical isomerism?

- A $CH_3COCH_2CH_2OH$
B $CH_3CH_2CH(OH)CHO$
C $CH_3COCH(OH)CH_3$
D $(CH_3)_2C(OH)CHO$

9. June/2023/Paper_9701/11/No.35

Two samples of compound X were treated separately with different reagents which were added in excess.

The products of these two reactions are shown.



Which reagents could be used for reaction 1 and reaction 2?

	reaction 1	reaction 2
A	hot acidified sodium dichromate(VI)	Na
B	hot acidified sodium dichromate(VI)	NaBH ₄
C	Tollens' reagent followed by HCl(aq)	Na
D	Tollens' reagent followed by HCl(aq)	NaBH ₄

10. June/2023/Paper_9701/12/No.34

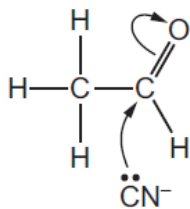
Compound G gives a pale yellow precipitate with alkaline I₂(aq).

What could be compound G?

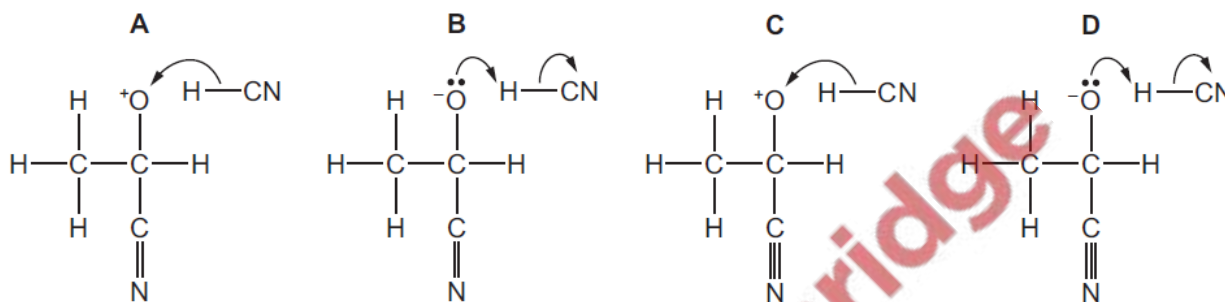
- A pentan-1-ol
- B pentan-2-ol
- C pentan-3-ol
- D 2-methylpentan-2-ol

11. June/2023/Paper_9701/12/No.35

The mechanism for the reaction between ethanal and hydrogen cyanide starts with the step shown.



What is the correct structure of the intermediate ion formed, and what is the next step in this mechanism?



12. June/2023/Paper_9701/12/No.36

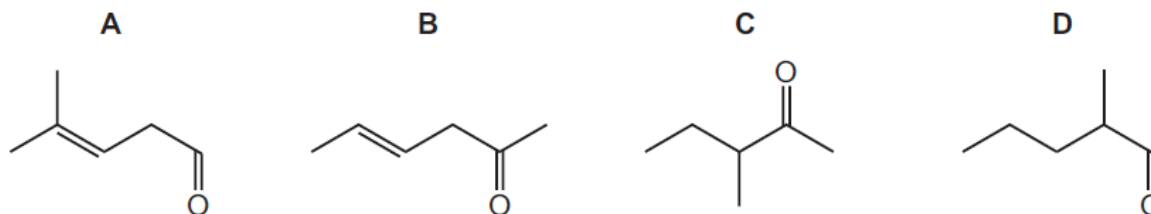
Which compound reacts with 2,4-dinitrophenylhydrazine reagent but does **not** react with Tollens' reagent?

- A $\text{CH}_3\text{COCO}_2\text{H}$
- B $\text{CH}_3\text{CH}(\text{OH})\text{CHO}$
- C CH_3COCHO
- D $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$

13. June/2023/Paper_9701/12/No.37

Compound X has stereoisomers and forms a precipitate when warmed with Fehling's reagent.

What could be the structure of compound X?



14. June/2023/Paper_9701/13/No.33

T is an organic compound which contains 66.7% by mass of carbon. T also contains one atom of oxygen per molecule.

T reacts with alkaline $I_2(aq)$ to produce a yellow precipitate.

What is T?

- A methylpropan-2-ol
- B butan-2-ol
- C butanal
- D butanone

15. June/2023/Paper_9701/13/No.34

Which statement about butanone is correct?

- A Butanone can be dehydrated by concentrated sulfuric acid to give $CH_2=CHCH=CH_2$.
- B Butanone gives a positive result with Tollens' reagent.
- C Butanone reacts with HCN by an electrophilic addition mechanism.
- D Butanone reacts with $NaBH_4$ to give a chiral product.



(b) **A** and **B** are structural isomers with molecular formula $C_5H_{10}O$.

They are both straight-chained molecules with only one functional group.

Table 5.1 describes observations when separate samples of **A** and **B** are added to different reagents.

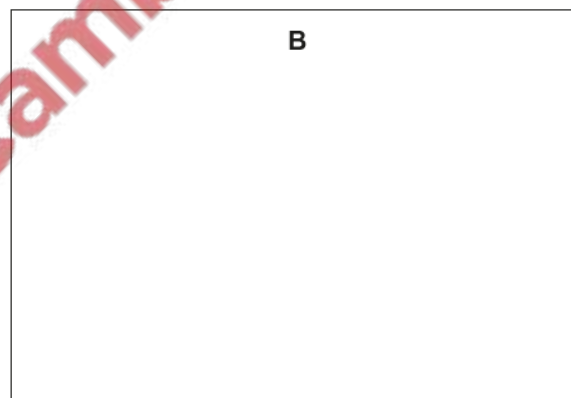
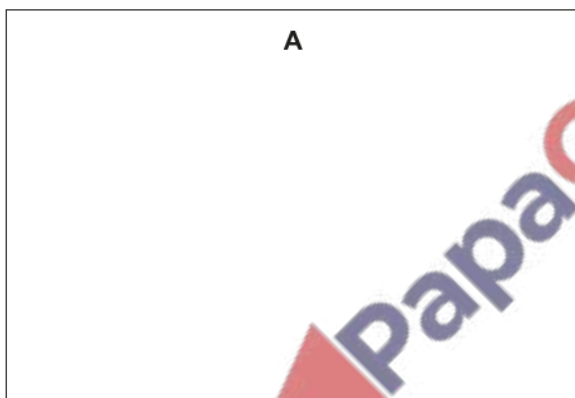
Table 5.1

reagent	A	B
2,4-dinitrophenylhydrazine (2,4-DNPH reagent)	orange precipitate appears	orange precipitate appears
Tollens' reagent	silver mirror appears	no reaction
alkaline $I_2(aq)$	no reaction	no reaction

(i) Name the functional group present in both **A** and **B**.

..... [1]

(ii) Draw the structures of **A** and **B** in the boxes.



[2]

(c) **C** is a structural isomer of **A** and **B**.

C is straight chained and has two functional groups.

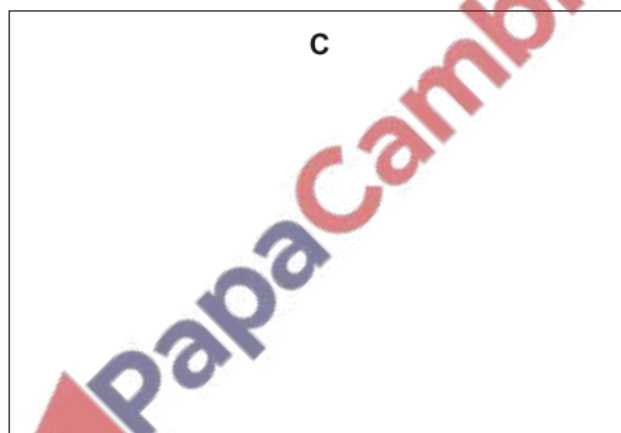
C shows only one type of stereoisomerism.

Table 5.2 describes observations when separate samples of **C** are added to different reagents.

Table 5.2

reagent	C
2,4-dinitrophenylhydrazine (2,4-DNPH reagent)	no reaction
$\text{Br}_2(\text{aq})$	orange to colourless
alkaline $\text{I}_2(\text{aq})$	yellow precipitate appears

(i) Draw the structure of **C** in the box.



[2]

(ii) Name the type of stereoisomerism shown by molecules of **C**.

..... [1]

- (b) CH_3CHO is used in a two-step synthetic route to form **W**, as shown in Fig. 6.1. In step 1, CH_3CHO is heated with HCN in the presence of KCN .

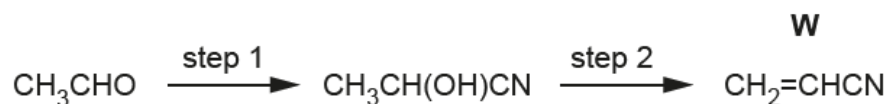


Fig. 6.1

- (i) Name the mechanism for the reaction in step 1 in Fig. 6.1.

..... [1]

- (ii) Complete Fig. 6.2 to show the mechanism for the reaction in step 1. Include all products, charges, dipoles, lone pairs of electrons and curly arrows, as appropriate.



Fig. 6.2

[3]

- (iii) Suggest a suitable reagent and conditions for step 2 in Fig. 6.1.

..... [1]

18. March/2023/Paper_9701/12/No.26

Which reagents and conditions would result in the formation of butanenitrile, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CN}$?

- A 1-bromobutane heated under pressure with ammonia in ethanol
- B 1-bromopropane heated with potassium cyanide in ethanol
- C propanal heated with hydrogen cyanide in the presence of potassium cyanide
- D propanone heated with hydrogen cyanide in the presence of potassium cyanide

19. March/2023/Paper_9701/12/No.34

Structural and stereoisomerism should be considered when answering this question.

P has molecular formula $\text{C}_5\text{H}_{10}\text{O}$.

P produces an orange precipitate with 2,4-dinitrophenylhydrazine (2,4-DNPH reagent).

How many isomeric structures does P have?

A 5

B 6

C 7

D 8

(b) **A** and **B** show reactions typical of aliphatic aldehydes.

- (i) **A** undergoes a nucleophilic addition reaction with a mixture of HCN and KCN, forming compound **C**.

Complete the diagram to show the mechanism for this reaction.

Include charges, dipoles, lone pairs of electrons and curly arrows, as appropriate.

Draw the structure of the organic intermediate.



[4]

- (ii) Table 3.1 shows information about three experiments involving **B**.

Complete Table 3.1.

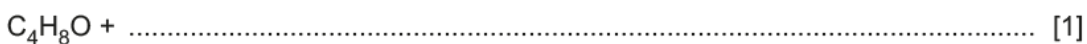
Table 3.1

experiment	reagents	observation with B
1		solution turns from orange to green
2		a silver mirror forms on the sides of the reaction vessel
3	$\text{Br}_2(\text{aq})$	

[3]

- (iii) **B**, $\text{C}_4\text{H}_8\text{O}$, is oxidised by acidified potassium manganate(VII).

Complete the equation for this reaction. Use [O] to represent one atom of oxygen from the oxidising agent.



(iv) **C** is a chiral molecule.

Circle any chiral centres in the structure of **C** shown in Fig. 3.2.

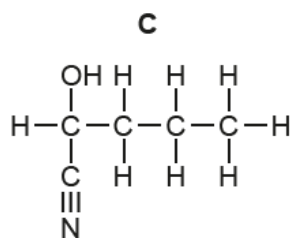


Fig. 3.2

[1]

