Hydroxyl Compounds – 2021 AS

1. Nov/2021/Paper_12/No.26

Compound P is heated under reflux with an excess of acidified potassium dichromate(VI) to form compound Q.

Compound Q has a **lower** boiling point than compound P.

What could be compound P?

A 2-methylbutan-1-ol

B 2-methylbutan-2-ol

C pentan-1-ol

D pentan-2-ol

2. Nov/2021/Paper_12/No.27

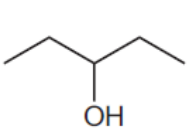
Structural and stereoisomerism should be taken into account when answering this question.

An organic compound, X, is dehydrated by heating with concentrated phosphoric(V) acid.

Only **two** organic products are formed.

What could be X?

A



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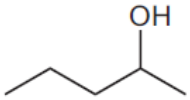

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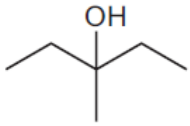

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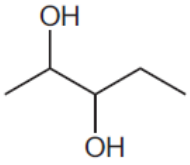


3. Nov/2021/Paper_13/No.25

Alcohol Y gives a yellow precipitate with alkaline aqueous iodine. It can be oxidised to give a mixture of products including substance Z. Substance Z gives a red-brown precipitate with Fehling's solution.

Which alcohol could be Y?

A $CH_3CH(OH)CH(CH_3)CH_2OH$

B $CH_3C(OH)(CH_3)CH_2CH_2OH$

C $CH_3CH(OH)CH_2CH(OH)CH_3$

D $CH_2(OH)CH_2CH(OH)CH_2CH_3$

4. Nov/2021/Paper_13/No.26

$CH_3CH_2COCH_2CH_3$ reacts with hydrogen cyanide to form an organic product called a cyanohydrin.

Which statement is correct?

A The cyanohydrin product has one chiral centre.

B The cyanohydrin product is formed by electrophilic addition.

C The cyanohydrin product is formed via an intermediate which contains a C–OH group.

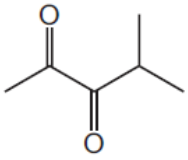
D The formation of the cyanohydrin product requires the use of cyanide ions as a catalyst.

5. Nov/2021/Paper_13/No.27

Reduction of compound R with $LiAlH_4$ gives the compound 4-methylpentane-2,3-diol.

What could be the identity of compound R?

A



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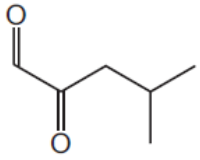

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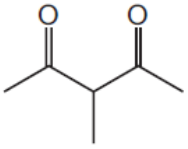

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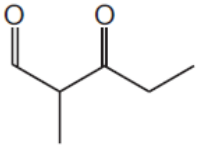


6. Nov/2021/Paper_13/No.40

Which reactions of propan-1-ol have water as one of the products?

1 passing propan-1-ol vapour over hot Al_2O_3

2 mixing propan-1-ol with warm ethanoic acid and a few drops of concentrated sulfuric acid

3 warming propan-1-ol with HBr

7. March/2021/Paper_12/No.21

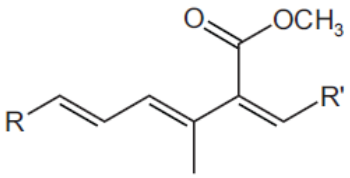
How many tertiary alcohols have the molecular formula $C_6H_{14}O$?

A 1 **B** 2 **C** 3 **D** 4

8. March/2021/Paper_12/No.23

Part of the structure of strobilurin is shown. R and R' are inert groups.

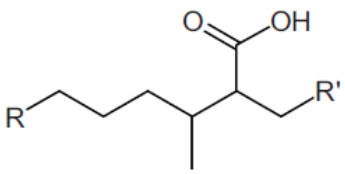
strobilurin



Strobilurin is warmed with aqueous sulfuric acid producing compound X. Compound X is then treated with hydrogen in the presence of a nickel catalyst producing compound Y.

What could be the structure of compound Y?

A



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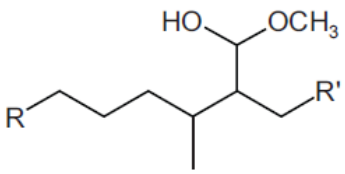

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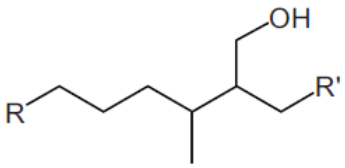

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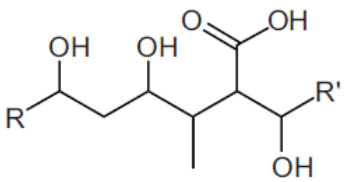


9. March/2021/Paper_12/No.28

Ethanedioic acid has the formula HO_2CCO_2H.

What is the formula of aluminium ethanedioate?

A AlC_2O_4 **B** $Al(C_2O_4)_3$ **C** $Al_2C_2O_4$ **D** $Al_2(C_2O_4)_3$

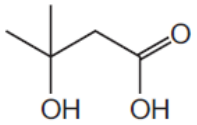
10. March/2021/Paper_12/No.38

An excess of P reacts with Q, in the presence of concentrated sulfuric acid, to form R.

Effervescence is seen when a piece of sodium is added to pure R.

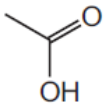
The structure of P is shown.

P



Which organic compounds could be compound Q?

1



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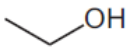
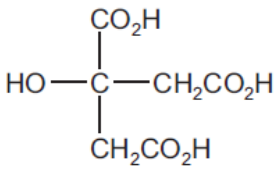


3

11. June/2021/Paper_11/No.27

How many moles of hydrogen, H_2, are evolved when an excess of sodium metal is added to one mole of citric acid?

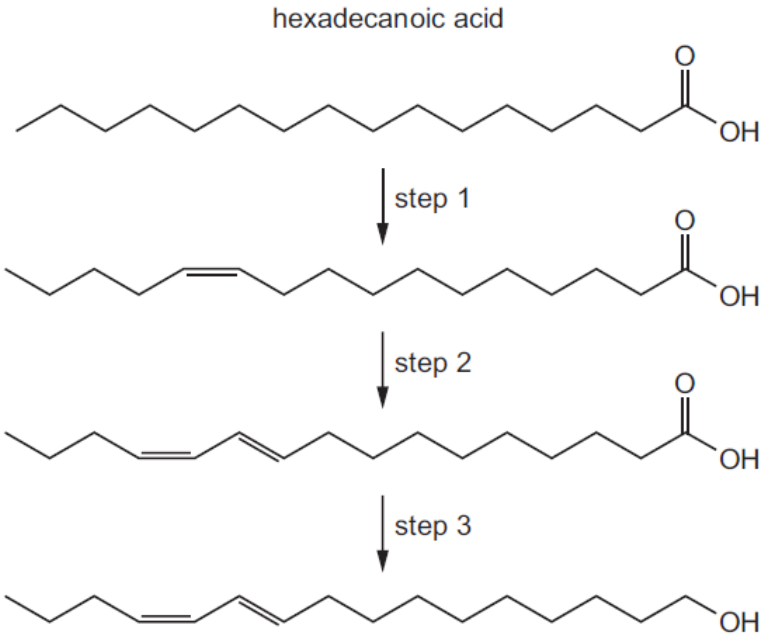
citric acid



A 0.5 **B** 1.5 **C** 2 **D** 4

12. June/2021/Paper_12/No.21

Hexadeca-10,12-dien-1-ol is produced by silk moths from hexadecanoic acid in a three-step enzymic process.



Which row contains correct descriptions of the three steps?

	step 1	step 2	step 3
A	elimination	elimination	dehydration
B	elimination	reduction	reduction
C	oxidation	elimination	oxidation
D	oxidation	oxidation	reduction

13. June/2021/Paper_12/No.26

Alcohol X reacts with concentrated sulfuric acid to produce a mixture of products.

Two of the products are structural isomers of each other.

What could be X?

A hexan-2-ol

B pentan-1-ol

C pentan-3-ol

D propan-2-ol

14. June/2021/Paper_12/No.27

Which reaction will form a strong organic base?

A ethanol and acidified sodium dichromate

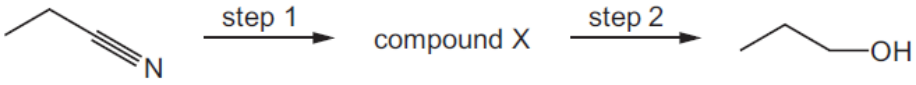
B ethanol and hot aluminium oxide

C ethanol and sodium

D ethanol and hydrogen chloride

15. June/2021/Paper_12/No.29

The synthesis shown may be used for the production of propan-1-ol.



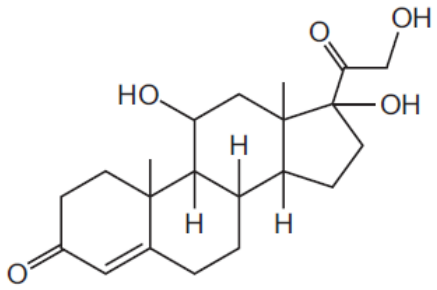
Which row gives the correct reagents for steps 1 and 2?

	step 1	step 2
A	HC*l*(aq)	H_2 + Ni
B	HC*l*(aq)	$LiAlH_4$
C	NaOH(aq)	H_2 + Ni
D	NaOH(aq)	$NaBH_4$

16. June/2021/Paper_12/No.37

Cortisone is a synthetic hormone.

cortisone



Which classes of alcohol does this molecule contain?

1 primary alcohol

2 secondary alcohol

3 tertiary alcohol

17. June/2021/Paper_13/No.25

Two reactions are shown. Only one product is identified in each reaction.

ethanol + acidified $Cr_2O_7^{2-}$ → ethanal

ethanol + sodium → sodium ethoxide

Which statement about these reactions is correct?

A The formations of both ethanal and sodium ethoxide are redox reactions.

B The formations of both ethanal and sodium ethoxide result in colour changes.

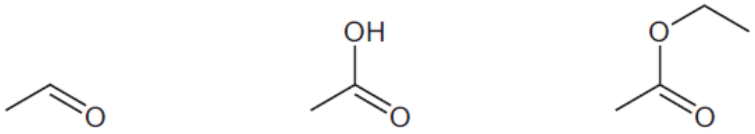
C The formation of ethanal is catalysed by potassium dichromate.

D The formation of sodium ethoxide is a dehydration reaction.

18. June/2021/Paper_13/No.26

The skeletal formulae of three compounds are shown.

R S T



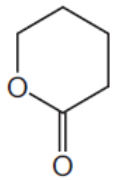
Which compounds will give a positive test with 2,4-dinitrophenylhydrazine reagent?

A R only **B** R and S only **C** S and T only **D** R, S and T

19. June/2021/Paper_13/No.40

5-hydroxypentanoic acid is readily converted into the cyclic compound L.

L



Which statements about this reaction are correct?

1 Acidified sodium dichromate(VI) is used as a reagent.

2 A water molecule is produced in the reaction.

3 The reaction can be catalysed by concentrated H_2SO_4.

20. June/2021/Paper_22/No.4(c)

(c) A sample of propan-1-ol reacts with concentrated sulfuric acid to form propene.

Identify the role of concentrated sulfuric acid in this reaction.

..... [1]

21. June/2021/Paper_22/No.5

S is a secondary alcohol with molecular formula $C_4H_{10}O$.

(a) Draw the displayed formula of **S**.

[1]

(b) **S** is converted to **V** in a three-step reaction sequence.

In step 1, the secondary alcohol **S** reacts with PBr_3 to produce **T**, which has molecular formula C_4H_9Br.

(i) Give the systematic name of **T**.

..... [1]

(ii) Name the type of reaction that occurs in step 1.

..... [1]

(iii) State the reagent(s) and conditions for step 2.

.....

..... [2]

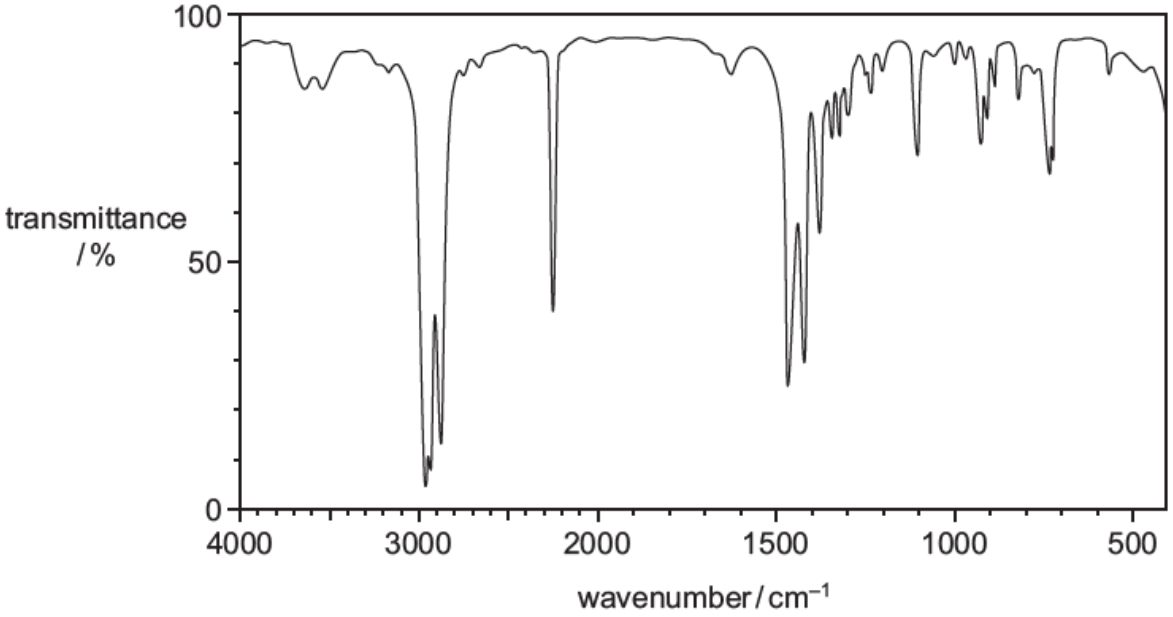
(iv) Step 3 involves heating C_4H_9CN with dilute acid to form **V**.

Complete the equation for this reaction.

$$.....C_4H_9CN + ...H^+ + ...H_2O \rightarrow .....$$ [2]

(v) An unlabelled sample contains either **S**, **T** or **U**.

The sample produces the infrared spectrum shown.



Explain how this spectrum confirms that the unknown sample contains **U**.

In your answer identify **one** relevant absorption in the infrared spectrum and the bond that corresponds to this absorption in the region above 1500 cm^{-1}.

.....

..... [1]

[Total: 8]

22. June/2021/Paper_23/No.4

(a) 1,3-dichloropropan-2-ol can be made by reacting **M**.

M → 1,3-dichloropropan-2-ol

(i) Give the systematic name of **M**.

..... [1]

(ii) Name the functional group present in **M** that changes during this reaction.

..... [1]

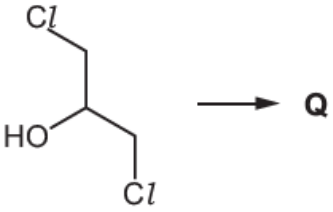
(iii) State a suitable reagent for this reaction.

..... [1]

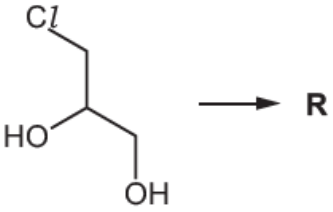
(b) Separate samples of 1,3-dichloropropan-2-ol and 3-chloropropane-1,2-diol are heated with excess acidified $Cr_2O_7^{2-}$ until there is no further reaction.

In each reaction, a different organic product, **Q** or **R**, is made.

1,3-dichloropropan-2-ol → **Q**



3-chloropropane-1,2-diol → **R**



Q and **R** are tested separately with 2,4-dinitrophenylhydrazine solution, 2,4-DNPH, and sodium carbonate solution, $Na_2CO_3(aq)$.

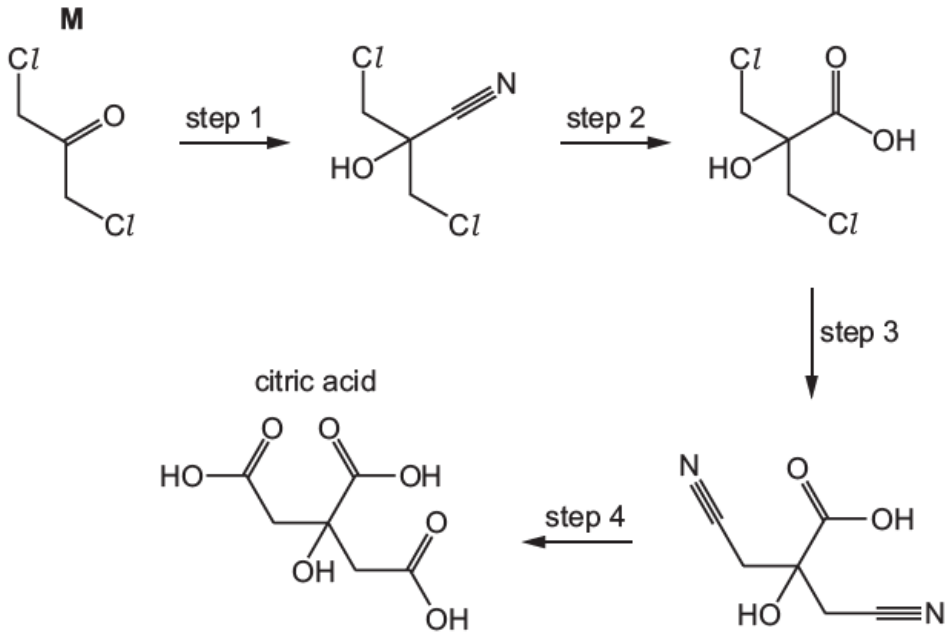
Complete the table to give any relevant observations.

If no reaction occurs, write 'no visible change'.

reagent	observation with **Q**	observation with **R**
2,4-DNPH		
$Na_2CO_3(aq)$		

[4]

(c) Citric acid can be made from **M** in a four-step reaction.



Complete the table for each step of the reaction sequence to identify:

- the reagents and conditions required
- the type of reaction.

step	reagent and conditions	type of reaction
1		
2	dilute sulfuric acid	
3		
4	dilute sulfuric acid	

[5]

[Total: 12]