

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

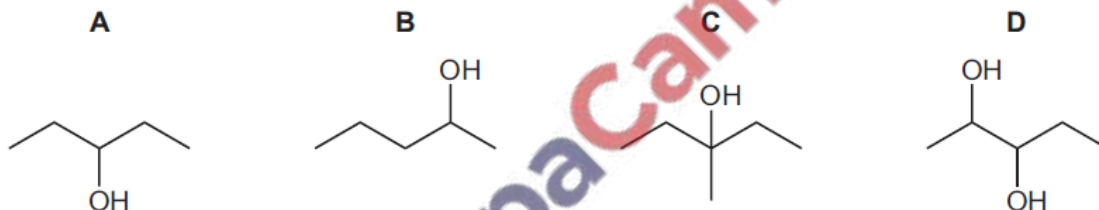
2. Nov/2021/Paper_12/No.27

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?



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 $\text{CH}_3\text{CH}(\text{OH})\text{CH}(\text{CH}_3)\text{CH}_2\text{OH}$
- B $\text{CH}_3\text{C}(\text{OH})(\text{CH}_3)\text{CH}_2\text{CH}_2\text{OH}$
- C $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$
- D $\text{CH}_2(\text{OH})\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{CH}_3$

4. Nov/2021/Paper_13/No.26

$\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$ 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?



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

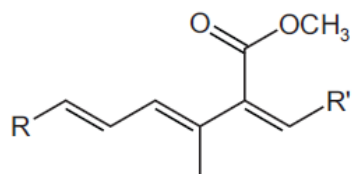
C 3

D 4

8. **March/2021/Paper_12/No.23**

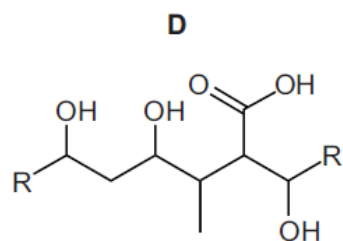
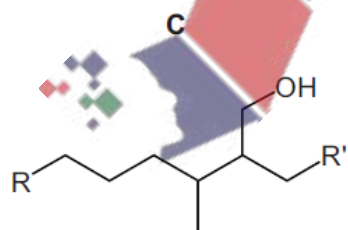
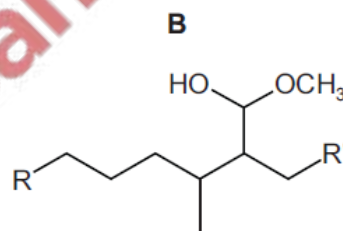
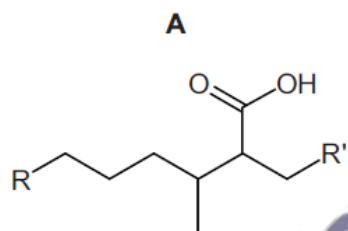
Part of the structure of strobilurin is shown. R and R' are inert groups.

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?



9. March/2021/Paper_12/No.28

Ethanedioic acid has the formula $\text{HO}_2\text{CCO}_2\text{H}$.

What is the formula of aluminium ethanedioate?

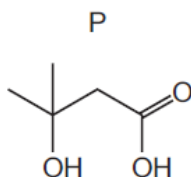
- A AlC_2O_4 B $\text{Al}(\text{C}_2\text{O}_4)_3$ C $\text{Al}_2\text{C}_2\text{O}_4$ D $\text{Al}_2(\text{C}_2\text{O}_4)_3$

10. March/2021/Paper_12/No.38

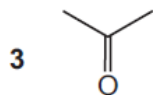
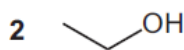
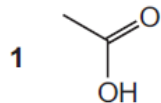
An excess of P reacts with Q, in the presence of concentrated sulfuric acid, to form R.

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

The structure of P is shown.

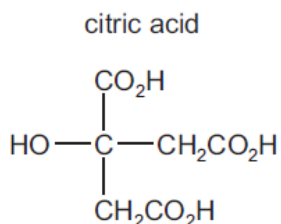


Which organic compounds could be compound Q?



11. June/2021/Paper_11/No.27

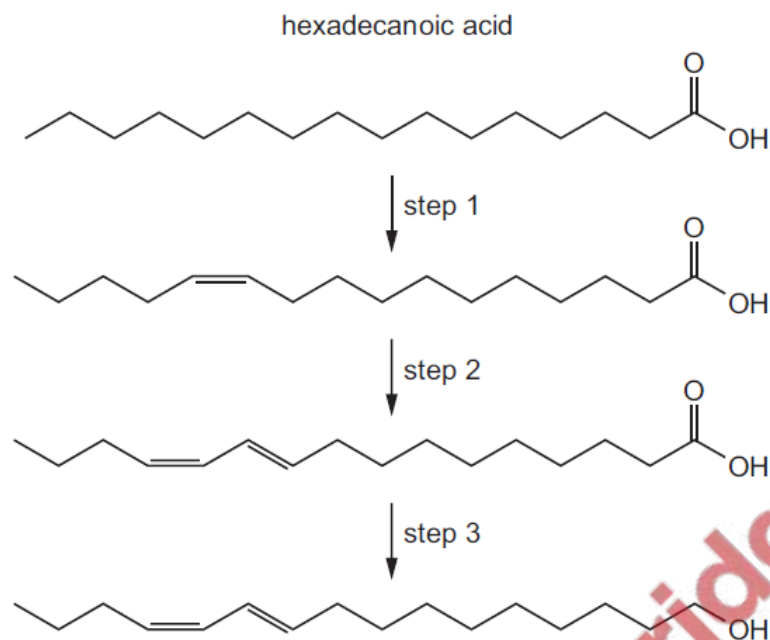
How many moles of hydrogen, H_2 , are evolved when an excess of sodium metal is added to one mole of citric acid?



- 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

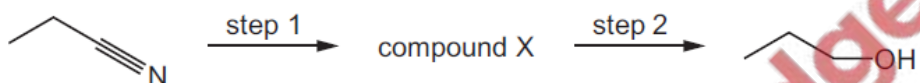
14. June/2021/Paper_12/No.27

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.

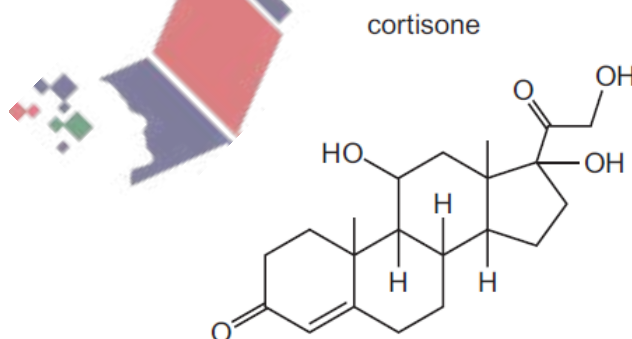


Which row gives the correct reagents for steps 1 and 2?

	step 1	step 2
A	HCl(aq)	H ₂ + Ni
B	HCl(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.



Which classes of alcohol does this molecule contain?

- 1 primary alcohol
- 2 secondary alcohol
- 3 tertiary alcohol

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.

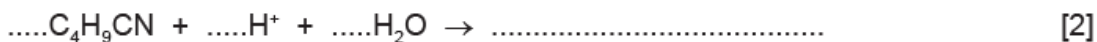
..... [1]

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

.....
..... [2]

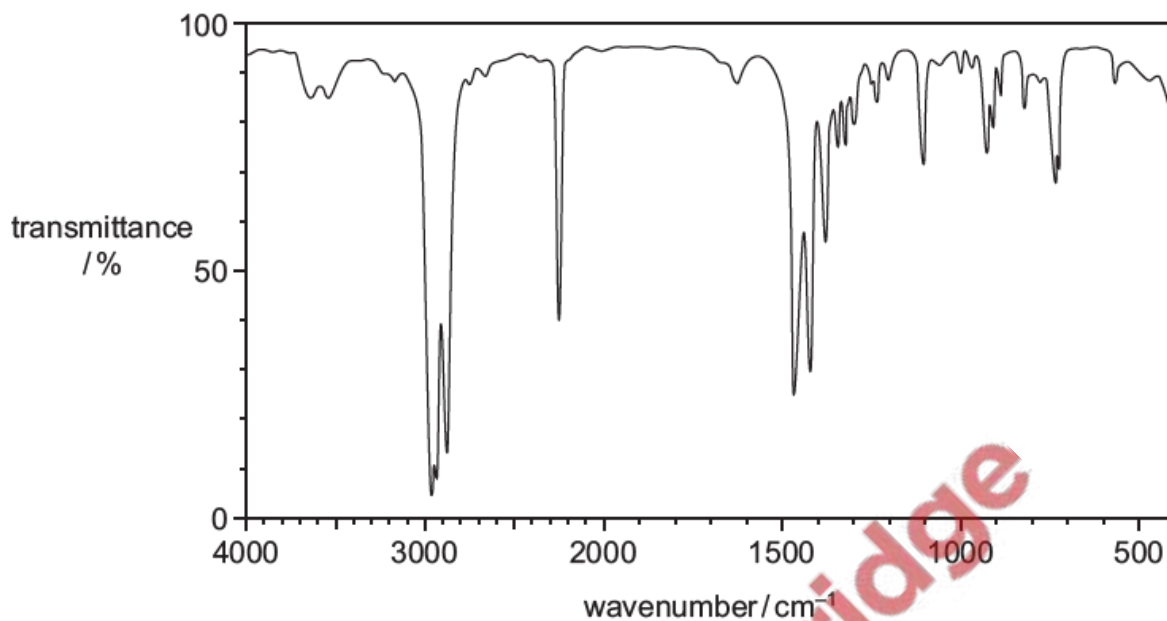
(iv) Step 3 involves heating C_4H_9CN with dilute acid to form V.

Complete the equation for this reaction.



(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**.

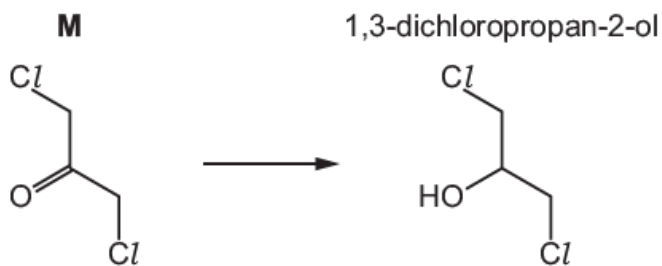
In your answer identify **one** relevant absorption in the infrared spectrum and the bond that corresponds to this absorption in the region above 1500 cm⁻¹.

.....
..... [1]

[Total: 8]



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



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

..... [1]

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

..... [1]

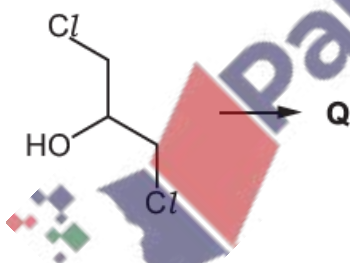
(iii) State a suitable reagent for this reaction.

..... [1]

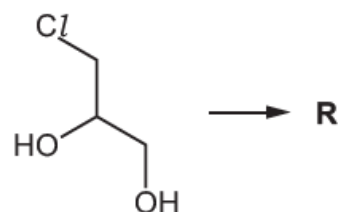
(b) Separate samples of 1,3-dichloropropan-2-ol and 3-chloropropane-1,2-diol are heated with excess acidified $\text{Cr}_2\text{O}_7^{2-}$ until there is no further reaction.

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

1,3-dichloropropan-2-ol



3-chloropropane-1,2-diol



Q and **R** are tested separately with 2,4-dinitrophenylhydrazine solution, 2,4-DNPH, and sodium carbonate solution, $\text{Na}_2\text{CO}_3(\text{aq})$.

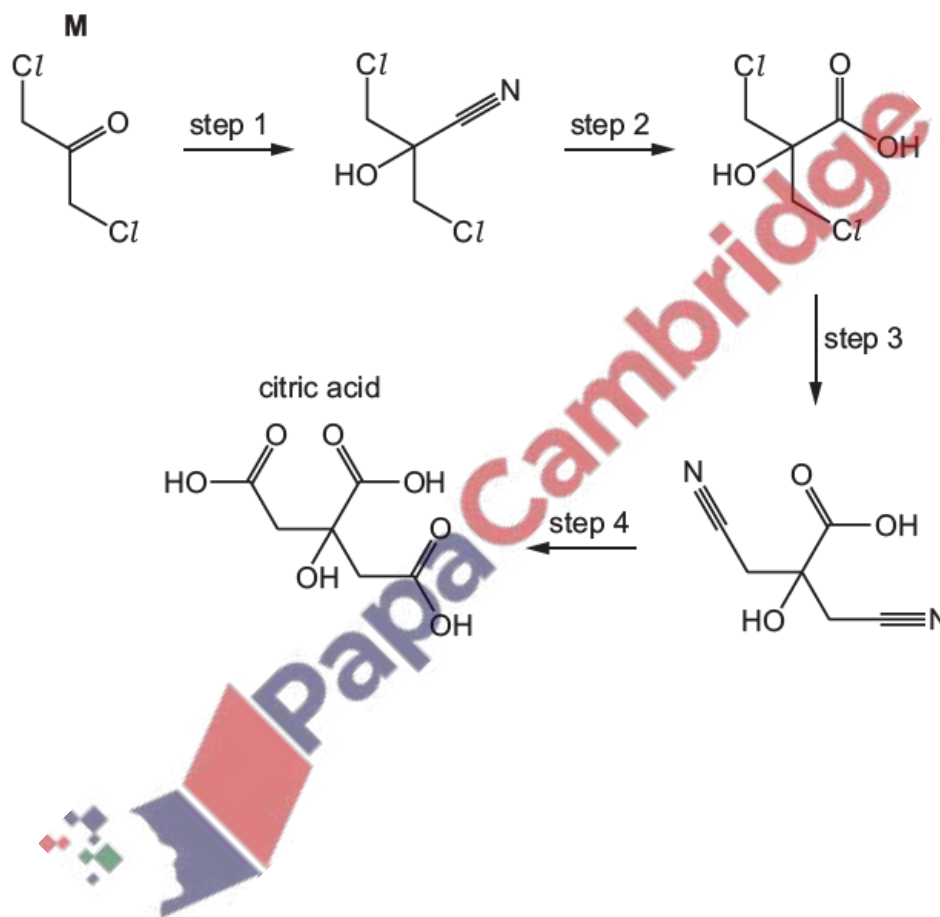
Complete the table to give any relevant observations.

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

reagent	observation with Q	observation with R
2,4-DNPH		
$\text{Na}_2\text{CO}_3(\text{aq})$		

[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]

