Cambridge AS & A Level

CHEMISTRY

Paper 1

Topical Past Paper Questions

+ Answer Scheme

2015 - 2021

PapaCambridge

Chapter 16

Hydroxy compounds

16.1 Alcohols

933. 9701_m22_qp_12 Q: 29

A reaction occurs when a sample of 1-chloropropane is heated under reflux with sodium hydroxide dissolved in ethanol.

Which row is correct?

	type of reaction	name of product
A	elimination	propan-1-ol
B	elimination	propene
C	substitution	propan-1-ol
D	substitution	propene

---

934. 9701_m21_qp_12 Q: 21

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

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

---

935. 9701_s21_qp_11 Q: 25

When an organic compound is oxidised, any oxygen atom gained by the organic molecule is considered to be from a water molecule also producing $2H^+ + 2e^-$. Any hydrogen atom lost may be considered to be lost as $H^+ + e^-$.

These changes can be represented by the following two equations.

$$H_2O \rightarrow [O] + 2H^+ + 2e^-$$

$$[H] \rightarrow H^+ + e^-$$

Compound X is oxidised by heating under reflux with hot, acidified potassium dichromate(VI) for one hour. The half-equation for the reduction reaction is shown.

$$Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$$

Under these conditions, one mole of potassium dichromate(VI) oxidises three moles of X.

What could X be?

A propanal

B propan-1-ol

C propan-1,2-diol

D propan-1,3-diol

---

936. 9701_s21_qp_11 Q: 29

The table describes four reactions of propene.

Which row is correct?

	reagent used	name of main organic product
A	aqueous bromine	2-bromopropane
B	cold acidified aqueous potassium manganate(VII)	propane-1,3-diol
C	hydrogen chloride	2-chloropropane
D	steam	propan-1-ol

---

937. 9701_s21_qp_12 Q: 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

---

938. 9701_s21_qp_12 Q: 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

---

939. 9701_s21_qp_12 Q: 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)	Li*Al*H_4
C	NaOH(aq)	H_2 + Ni
D	NaOH(aq)	$NaBH_4$

---

940. 9701_s21_qp_13 Q: 24

A mixture of ethanol and methanol is burned in oxygen to produce 35 cm^3 of CO_2 and 55 cm^3 of H_2O.

Complete combustion occurs and the volumes of both products are measured at 101 kPa and 120 °C.

What is the molar ratio, ethanol : methanol, in the mixture?

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

---

941. 9701_s21_qp_13 Q: 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.

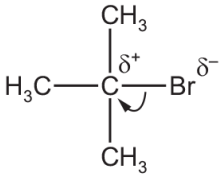
---

942. 9701_w21_qp_11 Q: 23

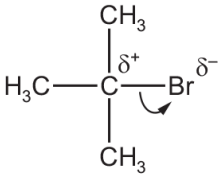
When 2-bromo-2-methylpropane reacts with aqueous sodium hydroxide, an alcohol is formed.

Which diagram describes the first step in the reaction mechanism?

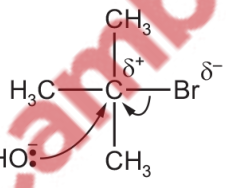
A



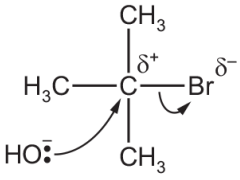
B



C



D



---

943. 9701_w21_qp_11 Q: 24

When an organic compound, Q, is treated with phosphorus pentachloride, fumes of hydrogen chloride are evolved. When Q is warmed with acidified aqueous potassium dichromate(VI), the solution turns green.

What is Q?

A CH_3CH_2CHO

B $CH_3CH_2CO_2H$

C $CH_3CH(OH)CH_3$

D $(CH_3)_3COH$

---

944. 9701_w21_qp_11 Q: 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 $CH_2(OH)CH_2CH(OH)CH_2CH_3$

---

945. 9701_w21_qp_12 Q: 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

---

946. 9701_w21_qp_12 Q: 27

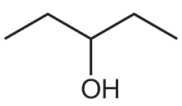
Structural and stereoisomerism should be taken into account when answering this question.

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

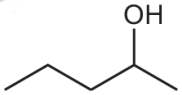
Only **two** organic products are formed.

What could be X?

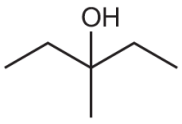
A



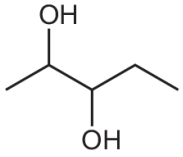
B



C



D



---

947. 9701_w21_qp_13 Q: 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 $CH_3C(OH)(CH_3)CH_2CH_2OH$

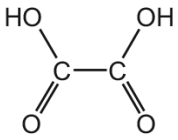
C $CH_3CH(OH)CH_2CH(OH)CH_3$

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

---

948. 9701_m20_qp_12 Q: 22

The diagram shows the structure of ethanedioic acid.



Ethanedioic acid reacts with ethanol in the presence of a few drops of concentrated sulfuric acid to form a diester. The molecular formula of the diester is $C_6H_{10}O_4$.

What is the structural formula of the diester?

A $CH_3CH_2CO_2CO_2CH_2CH_3$

B $CH_3CH_2OCOCO_2CH_2CH_3$

C $CH_3CH_2O_2CO_2CCH_2CH_3$

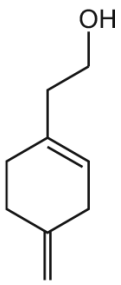
D $CH_3CO_2CH_2CH_2OCOCH_3$

---

949. 9701_m20_qp_12 Q: 26

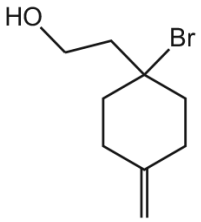
An excess of dry HBr is warmed with compound Y.

Y

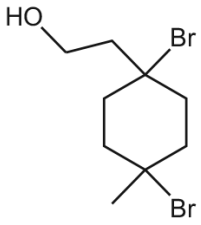


What is the major product of the reaction?

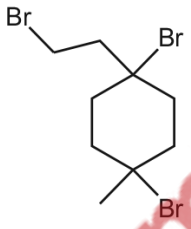
A



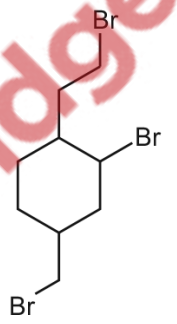
B



C



D

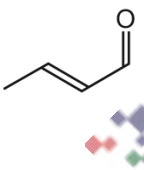


---

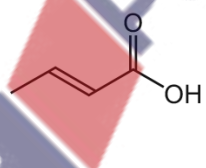
950. 9701_m20_qp_12 Q: 29

What is the skeletal formula of the compound formed when $CH_3CH{=}CHCH_2OH$ is heated, under reflux, with $K_2Cr_2O_7 / H^+$?

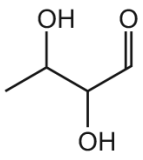
A



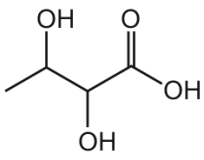
B



C



D



---

951. 9701_s20_qp_11 Q: 25

An alcohol has the molecular formula $C_5H_{12}O$. It has several isomers.

Which isomer forms a yellow precipitate with alkaline aqueous iodine?

A 2,2-dimethylpropan-1-ol

B 2-methylbutan-2-ol

C 3-methylbutan-2-ol

D pentan-3-ol

---

952. 9701_s20_qp_12 Q: 24

Which reagent could be used to distinguish between propane-1,2-diol and ethane-1,2-diol?

A alkaline aqueous iodine

B aqueous acidified dichromate(VI)

C ethanol and a few drops of concentrated sulfuric acid

D sodium metal

---

953. 9701_s20_qp_13 Q: 22

There are many non-cyclic alcohols that cannot be oxidised by warm acidified MnO_4^- ions. Alcohol X is the member of this set of alcohols with the **lowest** molecular mass.

How many moles of oxygen are required for the complete combustion of 1.0 mol of alcohol X?

A 3.5 mol **B** 4.5 mol **C** 6.0 mol **D** 6.5 mol

---

954. 9701_s20_qp_13 Q: 29

The ester ethyl methanoate is prepared in a school laboratory by reacting a carboxylic acid with an alcohol.

During the reaction, only 50.0% of the alcohol is converted into the ester.

Which mass of alcohol is needed to prepare 10.0 g of the ester?

A 3.11 g **B** 8.65 g **C** 12.4 g **D** 32.2 g

---

955. 9701_w20_qp_11 Q: 26

An alcohol with the molecular formula $C_5H_{12}O$ decolourises warm acidified potassium manganate(VII). The alcohol also gives a yellow precipitate with alkaline aqueous iodine.

What could be the identity of the alcohol?

A 2-methylbutan-2-ol

B 3-methylbutan-2-ol

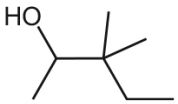
C pentan-1-ol

D pentan-3-ol

---

956. 9701_w20_qp_12 Q: 21

What is the correct name for the compound shown?



A 1,2,2-trimethylbutan-3-ol

B 2-ethyl-2-methylbutan-2-ol

C 3,3-dimethylpentan-2-ol

D 4-hydroxy-3,3-dimethylpentane

---

957. 9701_w20_qp_12 Q: 24

Ethanol can be converted into ethene in a single reaction.

Ethanol can be converted into bromoethane in a single reaction.

Under standard laboratory conditions, is a catalyst used in these reactions?

	ethanol to ethene	ethanol to bromoethane
A	yes	yes
B	yes	no
C	no	yes
D	no	no

---

958. 9701_w20_qp_12 Q: 26

Which alcohol will give a yellow precipitate when warmed with alkaline aqueous iodine?

A $(CH_3)_2CHCH_2OH$

B $(CH_3)_3COH$

C $CH_3CH_2C(OH)(CH_3)_2$

D $CH_3CH(OH)CH_2CH_3$

---

959. 9701_m19_qp_12 Q: 25

Which product is formed when 3-methylpentane-1,3,4-triol is heated under reflux with an excess of acidified potassium dichromate(VI)?

A $HO_2CCH_2C(CH_3)(OH)COCH_3$

B $HO_2CCH_2COC(OH)(CH_3)_2$

C $OHCCH_2C(CH_3)(OH)COCH_3$

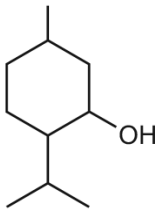
D $HO_2CCH_2CO(CH_3)COCH_3$

---

960. 9701_m19_qp_12 Q: 26

Menthol is a naturally occurring alcohol.

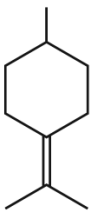
menthol



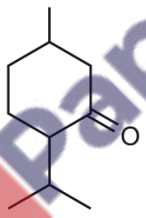
When menthol is heated with concentrated sulfuric acid it reacts. The products formed include compound T.

What could be the structure of compound T?

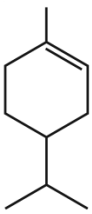
A



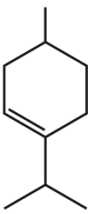
B



C



D



---

961. 9701_m19_qp_12 Q: 27

Structural isomerism only should be considered when answering this question.

All the isomeric alcohols with the molecular formula $C_5H_{12}O$ are added separately to warm alkaline aqueous iodine.

How many of the isomers give a yellow precipitate?

A 0 **B** 1 **C** 2 **D** 3

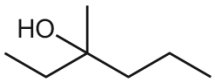
---

962. 9701_s19_qp_11 Q: 26

Structural isomerism and stereoisomerism should be considered when answering this question.

3-methylhexan-3-ol reacts with hot, concentrated sulfuric acid to form several isomeric compounds with the molecular formula C_7H_{14}.

3-methylhexan-3-ol



How many isomeric compounds could be formed in this reaction?

A 3 **B** 4 **C** 5 **D** 6

---

963. 9701_s19_qp_11 Q: 27

An organic compound T undergoes the following reactions.

- T is oxidised by hot, acidified potassium manganate(VII).
- T reacts with sodium to give hydrogen.

What could be compound T?

A $CH_3CH_2CH(OH)CH_3$

B $CH_3CH_2CH_2CHO$

C $(CH_3)_3COH$

D $CH_3CH_2COCH_3$

---

964. 9701_s19_qp_12 Q: 24

Alcohol W **cannot** be made by reducing a carboxylic acid with $LiAlH_4$. Alcohol W gives only one product when dehydrated with concentrated sulfuric acid.

What could be the identity of W?

A butan-1-ol

B butan-2-ol

C propan-1-ol

D propan-2-ol

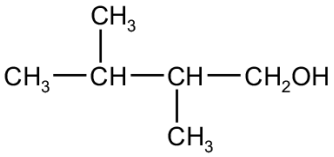
---

965. 9701_s19_qp_13 Q: 26

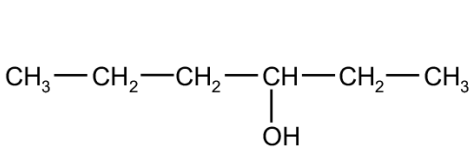
Structural isomerism and stereoisomerism should be considered when answering this question.

Which isomer of $C_6H_{13}OH$ gives the greatest number of different alkenes when it is dehydrated?

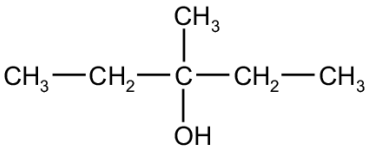
A



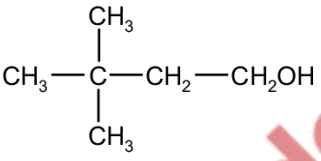
B



C



D



---

966. 9701_s19_qp_13 Q: 29

Which pair of substances could react to give the ester $CH_3CH_2CO_2CH_3$?

A ethanol and ethanoic acid

B methanol and ethanoic acid

C methanol and propanoic acid

D propan-1-ol and methanoic acid

---

967. 9701_w19_qp_11 Q: 5

Ethanal, CH_3CHO, ethanol, C_2H_5OH, and methoxymethane, CH_3OCH_3, are three organic compounds.

Which compound has the highest boiling point and what is the interaction that causes this boiling point to be the highest?

	highest boiling point	interaction
A	methoxymethane	permanent dipole-dipole forces
B	ethanal	hydrogen bonds
C	ethanol	hydrogen bonds
D	ethanal	permanent dipole-dipole forces

---

968. 9701_w19_qp_11 Q: 25

Alcohol X is oxidised to form compound Y.

The composition of Y is 54.54% carbon, 36.36% oxygen and 9.10% hydrogen. The M_r of Y is 88.0.

What could be the structure of alcohol X?

A $CH_3CH_2CH(OH)CH_3$

B $CH_3CH_2CH_2CH_2CH_2OH$

C $CH_3CH_2CH_2CH_2OH$

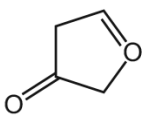
D $CH_3CH_2CH(OH)CH_2CH_3$

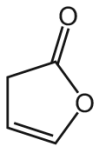
---

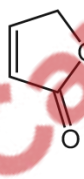
969. 9701_w19_qp_11 Q: 29

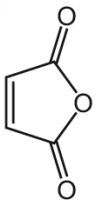
When $CH_2(OH)CH{=}CHCO_2H$ is warmed with a little concentrated sulfuric acid, a cyclic compound is formed.

What is the skeletal formula of the cyclic compound?

A 

B 

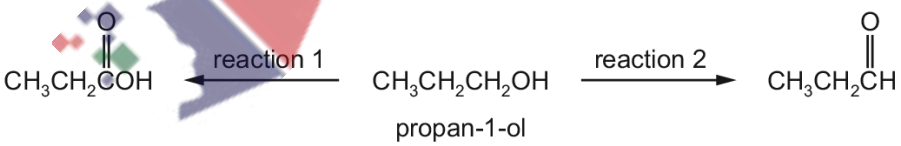
C 

D 

---

970. 9701_w19_qp_12 Q: 24

Propan-1-ol can be reacted with acidified potassium dichromate(VI) to form propanoic acid, reaction 1, or propanal, reaction 2.



How can the reaction be carried out to ensure that reaction 2 occurs rather than reaction 1?

A An excess of acidified potassium dichromate(VI) is used.

B An excess of concentrated sulfuric acid is added.

C The reaction mixture is distilled immediately after mixing.

D The reaction mixture is heated under reflux.

---

971. 9701_w19_qp_12 Q: 25

What is the smallest amount of oxygen molecules needed for the complete combustion of 40.0 g of methanol?

A 1.88 moles **B** 2.50 moles **C** 3.75 moles **D** 5.00 moles

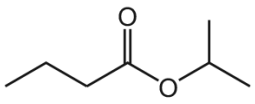
---

972. 9701_w19_qp_12 Q: 28

Esters can be prepared by the reaction of a carboxylic acid with an alcohol in the presence of concentrated sulfuric acid.

Which row gives the correct names of the reagents that would be suitable to prepare ester Z?

Z



	alcohol	carboxylic acid
A	butan-1-ol	methyl propanoic acid
B	propan-1-ol	butanoic acid
C	propan-2-ol	butanoic acid
D	propan-2-ol	propanoic acid

---

973. 9701_s18_qp_11 Q: 21

Which pair of alcohols are isomers of each other?

A butan-1-ol and 2,2-dimethylpropan-1-ol

B butan-2-ol and 2-methylpropan-2-ol

C pentan-1-ol and 2-methylpropan-2-ol

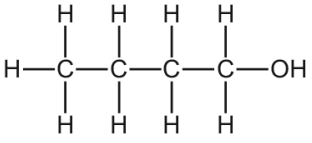
D propan-2-ol and 2-methylpropan-2-ol

---

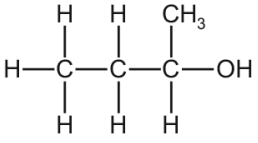
974. 9701_s18_qp_11 Q: 23

Which alcohol can be dehydrated to give two products which are structural isomers of each other?

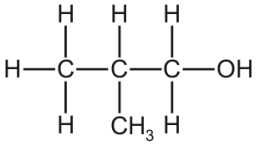
A



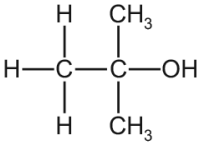
B



C



D



---

975. 9701_s18_qp_11 Q: 24

Which reagent could detect the presence of alcohol in a mixture consisting mainly of alkanes and alkenes?

A Na

B Br_2 (in CCl_4)

C $KMnO_4$(aq)

D 2,4-dinitrophenylhydrazine

---

976. 9701_s18_qp_12 Q: 22

Maleic acid is used in the food industry and for stabilising drugs. It is the cis-isomer of butenedioic acid and has the structural formula $HO_2CCH{=}CHCO_2H$.

What is the product formed from the reaction of maleic acid with cold, dilute, acidified manganate(VII) ions?

A $HO_2CCH(OH)CH(OH)CO_2H$

B HO_2CCO_2H

C $HO_2CCH_2CH(OH)CO_2H$

D $HO_2CCOCOCO_2H$

---

977. 9701_s18_qp_12 Q: 26

Which alcohol will react with an acidified solution of potassium dichromate(VI) to produce a ketone containing six carbon atoms?

A 2,2-dimethylbutan-1-ol

B 2-methylpentan-3-ol

C 3,3-dimethylpentan-2-ol

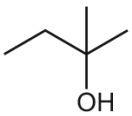
D 3-methylpentan-3-ol

---

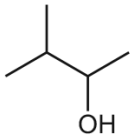
978. 9701_s18_qp_13 Q: 25

Which compound is a secondary alcohol that can be dehydrated to form an alkene with M_r = 70?

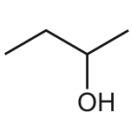
A



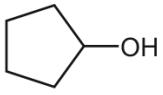
B



C



D



---

979. 9701_s18_qp_13 Q: 26

When 0.0075 mol of alcohol X are completely burnt in excess oxygen and the gases produced are passed through an excess of limewater (calcium hydroxide solution), 3.0 g of calcium carbonate are produced.

When X is warmed with acidified potassium dichromate(VI) there is a colour change from orange to green.

What could be the identity of X?

A $CH_3CH(OH)CH_2CH_3$

B $(CH_3)_3COH$

C $CH_3CH_2CH_2OH$

D $CH_3CH(OH)CH_3$

---

980. 9701_s18_qp_13 Q: 29

An ester X has the structural formula $CH_3CO_2CH(CH_3)CH_2CH_3$. X can be prepared by heating an alcohol **Y**, under reflux, with ethanoic acid and an acid catalyst.

What is the correct name for **Y**?

A butan-1-ol

B butan-2-ol

C butan-3-ol

D methylpropan-2-ol

---

981. 9701_w18_qp_11 Q: 23

The conversion of propene to propan-2-ol can be carried out in two stages represented by the equations shown.

reaction 1 $CH_3CH{=}CH_2(g) + HI(g) \rightarrow CH_3CHICH_3(l)$

reaction 2 $CH_3CHICH_3(l) + KOH(aq) \rightarrow CH_3CH(OH)CH_3(aq) + K^+(aq) + I^-(aq)$

How can these two reactions be described?

	reaction 1	reaction 2
A	addition	elimination
B	addition	substitution
C	elimination	substitution
D	substitution	elimination

---

982. 9701_w18_qp_11 Q: 24

An organic molecule W contains 3 carbon atoms. It requires 4.5 molecules of oxygen for complete combustion.

What could W be?

A propane

B propanoic acid

C propanone

D propan-1-ol

---

983. 9701_w18_qp_12 Q: 26

The reactions of four organic compounds are given in the table.

Which compound could be propan-2-ol?

	reagent / observations	
	when oxidised with $Cr_2O_7^{2-}/H^+$, gives an organic product with a boiling point greater than the original compound	when added to ethanoic acid, and a few drops of conc. H_2SO_4, gives a sweet-smelling compound
A	no	no
B	no	yes
C	yes	no
D	yes	yes

---

984. 9701_m17_qp_12 Q: 26

Propan-2-ol undergoes many reactions.

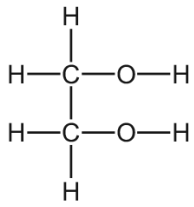
Which row is correct?

	reagent added to propan-2-ol	product
A	acidified $KMnO_4$	CH_3CH_2CHO
B	Cl_2	$CH_3CHClCH_3$
C	conc. H_2SO_4	CH_3CHCH_2
D	methanoic acid	$HCO_2CH_2CH_2CH_3$

---

985. 9701_m17_qp_12 Q: 27

Ethane-1,2-diol has the following structure.



Without breaking the C–C bond, there are five possible oxidation products.

What is the **total** number of aldehyde groups and carboxylic acid groups in these five products?

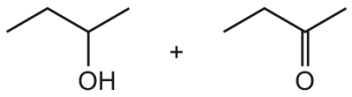
	–CHO	–COOH
A	3	3
B	3	4
C	4	3
D	4	4

---

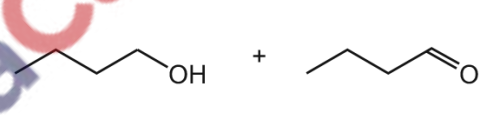
986. 9701_m17_qp_12 Q: 30

Which two compounds can react together to produce an ester?

A

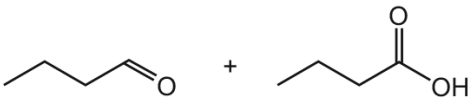


B



C

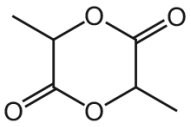
D



---

987. 9701_s17_qp_11 Q: 24

Lactide is an intermediate in the manufacture of a synthetic fibre.



lactide

Which compound, on heating with an acid catalyst, can produce lactide?

A hydroxyethanoic acid

B 2-hydroxybutanoic acid

C 2-hydroxypropanoic acid

D 3-hydroxypropanoic acid

---

988. 9701_s17_qp_11 Q: 28

A sample of 2.30 g of ethanol was mixed with an excess of aqueous acidified potassium dichromate(VI). The reaction mixture was then boiled under reflux for one hour. The required organic product was then collected by distillation. The yield of product was 60.0%.

Which mass of product was collected?

A 1.32 g **B** 1.38 g **C** 1.80 g **D** 3.00 g

---

989. 9701_s17_qp_12 Q: 6

Which reaction involves a decrease in the bond angle at a carbon atom?

A bromoethane refluxed with ethanolic sodium hydroxide

B complete combustion of methane in air

C ethanol heated with conc. H_2SO_4

D polymerisation of ethene

---

990. 9701_s17_qp_12 Q: 24

A sample of 2.76 g of ethanol was mixed with an excess of aqueous acidified potassium dichromate(VI). The reaction mixture was then boiled under reflux for one hour. The required organic product was then collected by distillation.

The yield of product was 75.0%.

Which mass of product was collected?

A 1.26 g **B** 1.98 g **C** 2.07 g **D** 2.70 g

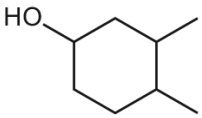
---

991. 9701_s17_qp_12 Q: 25

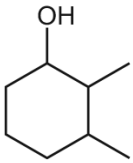
Compound X is a single, pure, optical isomer. X is heated with an excess of concentrated H_2SO_4. Only one organic product is formed.

What could X be?

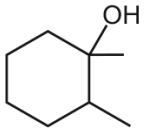
A



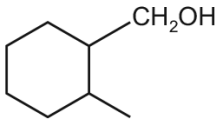
B



C



D



---

992. 9701_s17_qp_12 Q: 28

A carboxylic acid, P, has no possible chain isomers. It reacts with an alcohol, Q, that has only one positional isomer.

What could be the ester formed from a reaction between P and Q?

A butyl propanoate

B ethyl butanoate

C pentyl ethanoate

D propyl pentanoate

---

993. 9701_s17_qp_13 Q: 26

Which statement about butan-1-ol, butan-2-ol, and 2-methylbutan-2-ol is **not** correct?

A They all react with methanoic acid to form an ester.

B They all react with sodium.

C They can all be dehydrated to form an alkene.

D They can all be oxidised to a carbonyl compound.

---

994. 9701_s17_qp_13 Q: 27

Which compound will react with acidified potassium dichromate(VI) **and** with alkaline aqueous iodine?

A $CH_3COCH_2CH_3$

B $CH_3CH(OH)CH_2CH_3$

C $CH_3CH_2CH_2CHO$

D $CH_3CH_2CH_2CH_2OH$

---

995. 9701_s17_qp_13 Q: 30

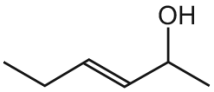
How many esters with the molecular formula $C_5H_{10}O_2$ can be made by reacting a **primary** alcohol with a carboxylic acid?

A 4 **B** 5 **C** 6 **D** 8

---

996. 9701_w17_qp_11 Q: 21

What is the name of compound **X**?



compound **X**

A *trans*-2-hydroxyhex-3-ene

B *trans*-2-hydroxyhexene

C *trans*-5-hydroxyhex-3-ene

D *trans*-5-hydroxyhexene

---

997. 9701_w17_qp_12 Q: 26

Many, but not all, organic reactions need to be heated before a reaction occurs.

Which reaction occurs quickly at room temperature (20 °C)?

A $CH_3OH + PCl_5 \rightarrow CH_3Cl + POCl_3 + HCl$

B $CH_3CH_2Br + KCN \rightarrow CH_3CH_2CN + KBr$

C $CH_3CH_2OH \rightarrow C_2H_4 + H_2O$

D $CH_3CH_2CN + 2H_2O \rightarrow CH_3CH_2CO_2H + NH_3$

---

998. 9701_w17_qp_12 Q: 27

When compound X is warmed with dilute, acidified potassium dichromate(VI) there is no colour change. X does not give an orange precipitate with 2,4-dinitrophenylhydrazine reagent.

What could X be?

A butan-2-ol

B ethanal

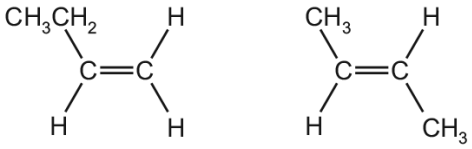
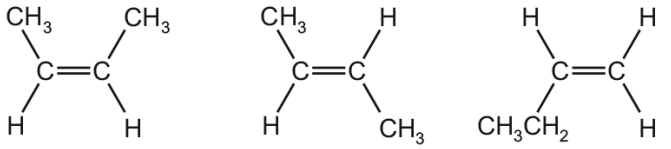
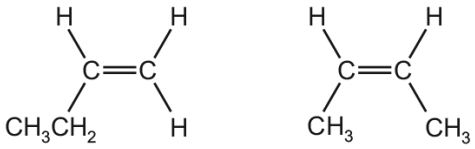
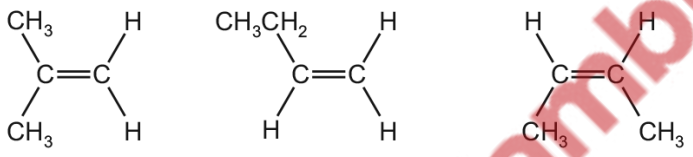
C methylpropan-2-ol

D propanone

---

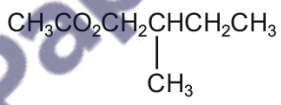
999. 9701_w17_qp_12 Q: 28

What are the **only** structures formed when butan-2-ol is heated with concentrated H_2SO_4?

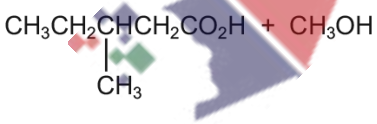
A	
B	
C	
D	

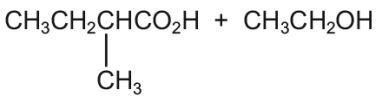
1000. 9701_w17_qp_12 Q: 30

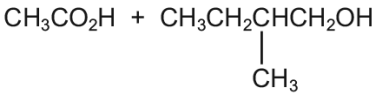
An ester with an odour of banana has the following formula.

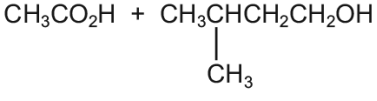


Which pair of reactants, under suitable conditions, will produce this ester?

A 

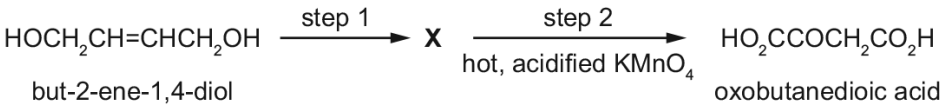
B 

C 

D 

1001. 9701_m16_qp_12 Q: 23

But-2-ene-1,4-diol is converted in two steps through an intermediate **X** into oxobutanedioic acid.

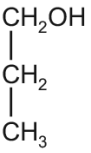
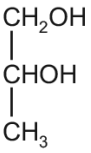
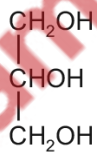
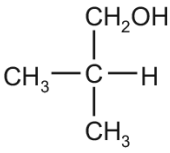
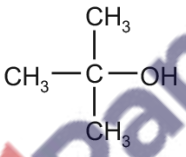
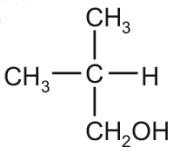
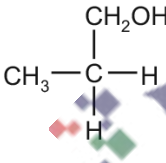
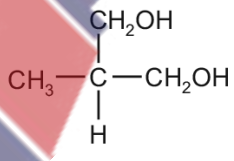
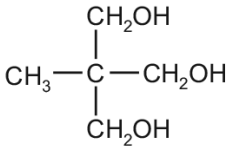
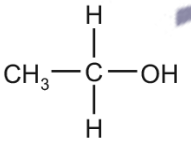
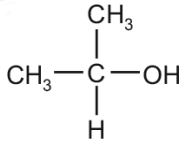
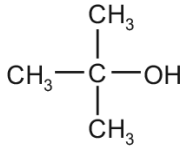


What could be the reagent for step 1 and what is the intermediate **X**?

	reagent for step 1	**X**
A	cold, acidified $KMnO_4$	$HOCH_2CH_2CH(OH)CH_2OH$
B	hot, acidified $K_2Cr_2O_7$	$HO_2CCH{=}CHCO_2H$
C	steam and concentrated H_2SO_4	$HOCH_2CH(OH)CH_2CH_2OH$
D	warm, acidified $K_2Cr_2O_7$	$OHCCH(OH)CH_2CHO$

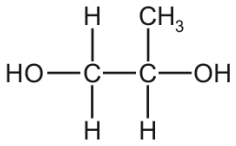
1002. 9701_m16_qp_12 Q: 26

Which row correctly shows a primary, a secondary and a tertiary alcohol?

	primary	secondary	tertiary
A			
B			
C			
D			

1003. 9701_m16_qp_12 Q: 27

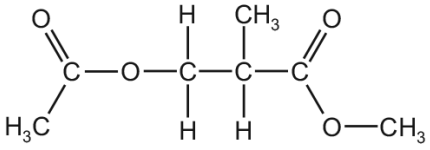
The fragrance compounds of perfumes are often dissolved in solvent **Y**, which has a molecular formula $C_7H_{12}O_4$. It is made by reacting propane-1,2-diol with ethanoic acid in the presence of an acid catalyst.



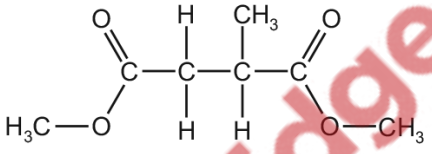
propane-1,2-diol

What is the structure of solvent **Y**?

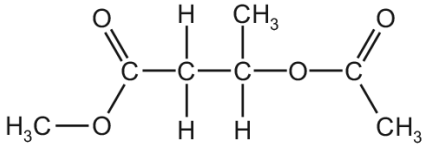
A



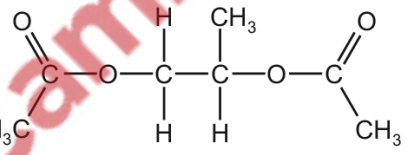
B



C



D



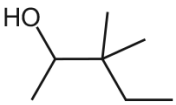
1004. 9701_s16_qp_12 Q: 29

How many isomeric esters, including structural isomers and stereoisomers, can be made with the molecular formula $C_5H_{10}O_2$, if methanoic acid is one of the two reactants used?

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

1005. 9701_s16_qp_13 Q: 20

What is the correct name of the molecule with the skeletal formula shown?



A 1,2,2-trimethylbutan-3-ol

B 2-ethyl-2-methylbutan-2-ol

C 3,3-dimethylpentan-2-ol

D 4-hydroxy-3,3-dimethylpentane

1006. 9701_s16_qp_13 Q: 26

Which volume of oxygen, at room temperature and pressure, is needed for complete combustion of 1.0 mol of methylpropan-1-ol?

A 108 dm^3 **B** 144 dm^3 **C** 156 dm^3 **D** 288 dm^3

1007. 9701_s16_qp_13 Q: 27

An unknown organic compound reacts with sodium to give a combustible gas as one product but does **not** give a yellow precipitate with alkaline aqueous iodine.

What is a possible identity of the unknown organic compound?

A propanal

B propan-1-ol

C propan-2-ol

D propanone

1008. 9701_s16_qp_13 Q: 28

Which reaction will give 2-chloropropane in the best yield?

A propane gas with chlorine gas in the presence of ultraviolet light

B propan-2-ol with dilute NaCl(aq)

C propan-2-ol with SOCl_2(l)

D propene with dilute HCl(aq)

1009. 9701_w16_qp_11 Q: 25

X, Y and Z are three isomeric alcohols.

X $CH_3CH_2CH_2CH_2CH_2OH$

Y $CH_3CH_2CH(OH)CH_2CH_3$

Z $(CH_3)_2C(OH)CH_2CH_3$

Two or more of these alcohols react with mild oxidising agents.

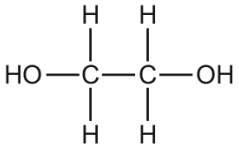
One of these alcohols, when dehydrated, will give a pair of cis-trans isomers with molecular formula C_5H_{10}.

Which row is correct?

	reacts with mild oxidising reagents	gives cis-trans isomers
A	X, Y and Z	Y only
B	X, Y and Z	Z only
C	X and Y only	Y only
D	X and Y only	Z only

1010. 9701_w16_qp_11 Q: 30

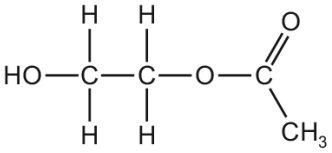
A solvent, **X**, used in printing inks has a molecular formula $C_6H_{10}O_4$. It may be made by reacting ethane-1,2-diol with ethanoic acid in the presence of an acid catalyst.



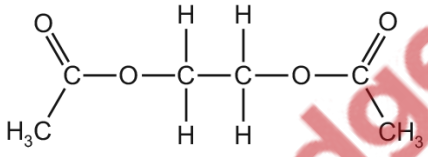
ethane-1,2-diol

What is the structure of solvent **X**?

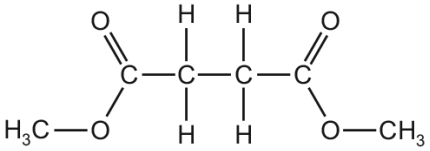
A



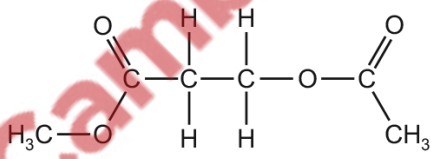
B



C



D



1011. 9701_w16_qp_12 Q: 27

Compound **X** is heated with a mild oxidising agent. One of the products of the reaction will react with hydrogen cyanide, forming 2-hydroxybutanenitrile.

What is compound **X**?

A butan-1-ol

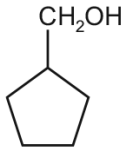
B butan-2-ol

C propan-1-ol

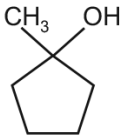
D propan-2-ol

1012. 9701_s15_qp_11 Q: 27

Which reagent will give a different observation with compounds W and X?



W



X

A hot $SOCl_2$

B hot acidified $K_2Cr_2O_7$

C NaOH(aq)

D warm Fehling's reagent

1013. 9701_s15_qp_12 Q: 20

Which alcohol will react with an acidified solution of potassium dichromate(VI) to produce a ketone containing six carbon atoms?

A 2,2-dimethylbutan-1-ol

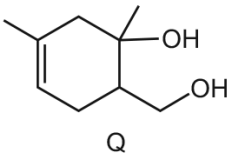
B 2-methylpentan-3-ol

C 3,3-dimethylpentan-2-ol

D 3-methylpentan-3-ol

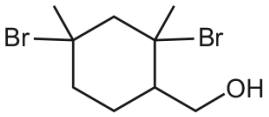
1014. 9701_s15_qp_12 Q: 21

What is the major product formed when compound Q is warmed with excess HBr?

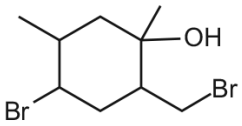


Q

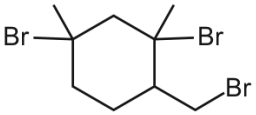
A



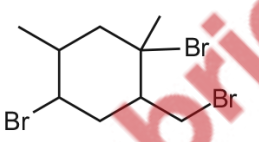
B



C



D



1015. 9701_s15_qp_12 Q: 24

Which reaction would **not** give propene?

A adding excess hot concentrated sulfuric acid to propan-1-ol

B adding warm aqueous sodium hydroxide to 2-bromopropane

C adding warm ethanolic sodium hydroxide to 1-bromopropane

D passing propan-2-ol vapour over heated aluminium oxide

1016. 9701_s15_qp_12 Q: 26

Use of the Data Booklet is relevant to this question.

2.40 g of propan-2-ol were mixed with excess acidified potassium dichromate(VI). The reaction mixture was then boiled under reflux for twenty minutes. The organic product was then collected by distillation. The yield of product was 75.0%.

What mass of product was collected?

A 1.74 g **B** 1.80 g **C** 2.22 g **D** 2.32 g

1017. 9701_s15_qp_13 Q: 20

An organic compound **Z**

- is oxidised by hot acidified potassium manganate(VII),
- reacts with sodium to give hydrogen.

What could be compound **Z**?

A $(CH_3)_3COH$

B $CH_3CH_2CH_2CHO$

C $CH_3CH_2CH(OH)CH_3$

D $CH_3CH_2COCH_3$

1018. 9701_w15_qp_12 Q: 20

Which ester is formed when the alcohol CH_3CH_2OH is reacted with $CH_3CH_2CH_2CO_2H$?

A butyl ethanoate

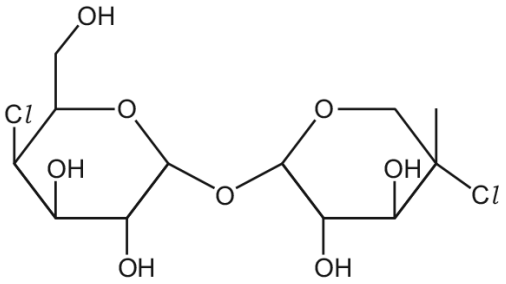
B ethyl butanoate

C ethyl propanoate

D propyl ethanoate

1019. 9701_w15_qp_12 Q: 25

Compound X has been investigated for use as an artificial sweetener.



X

The two C–C*l* bonds can be hydrolysed by hot NaOH(aq). The C-O-C bonds **cannot** be hydrolysed by hot NaOH(aq).

What are the numbers of specified types of –OH groups before and after hydrolysing the two C–C*l* bonds?

	before hydrolysis	after hydrolysis		
	secondary	primary	secondary	tertiary
A	0	1	2	4
B	0	2	1	4
C	4	1	5	1
D	4	2	4	1

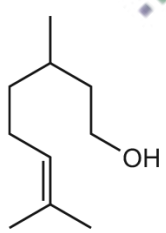
1020. 9701_w15_qp_12 Q: 26

The compounds below are all produced by plants.

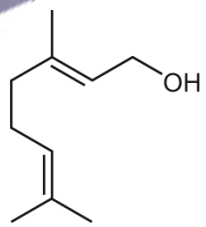
Each compound is warmed with acidified potassium dichromate(VI).

Which compound will give a different observation to the other three?

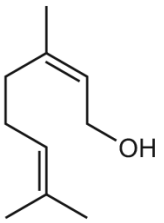
A



B



C



D