[Alcohols]

1. Which set correctly represents a primary, a secondary and a tertiary alcohol?

	primary	*secondary*	*tertiary*
A	CH_2OH | CH_2 | CH_3	CH_2OH | $CHOH$ CH_3	CH_2OH | $CHOH$ | CH_2OH
B	CH_2OH | CH_3-C-H | CH_3	CH_3 | CH_3-C-OH | CH_3	CH_3 | CH_3-C-H | CH_2OH
C	CH_2OH | CH_3-C-H | H	CH_2OH | CH_3-C-CH_2OH | H	CH_2OH | CH_3-C-CH_2OH | CH_2OH
D	H | CH_3-C-OH | H	CH_3 | CH_3-C-OH | H	CH_3 | CH_3-C-OH | CH_3

2. Which isomer of $C_5H_{11}OH$ would give the largest number of different alkenes on dehydration?

A $CH_3\text{-}CH_2\text{-}CH(CH_3)\text{-}CH_2OH$

B $CH_3\text{-}CH_2\text{-}CH_2\text{-}CH(OH)\text{-}CH_3$

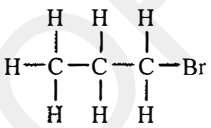
C $CH_3\text{-}CH_2\text{-}CH(OH)\text{-}CH_2\text{-}CH_3$

D $CH_3\text{-}CH(CH_3)\text{-}CH_2\text{-}CH_2OH$

3. In an experiment, propan-1-ol, $CH_3CH_2CH_2OH$, is dehydrated by passing it over hot aluminium oxide. The hydrocarbon obtained is then allowed to react with bromine to give compound **X**.

What is the structural formula of **X**?

A



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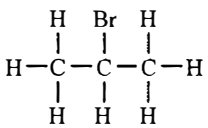

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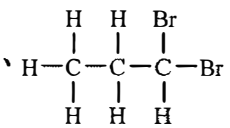

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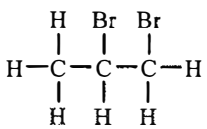
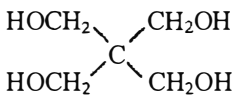


4. Which of the following are **correct** statements about pentaerythritol, an intermediate in the manufacture of paint?



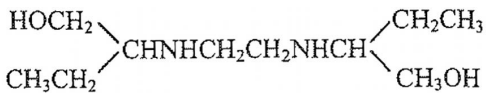
pentaerythritol

1 Its empirical formula is CH_3O.

2 It reacts with metallic sodium.

3 It decolourises acidified potassium manganate(VII) on warming.

5. The diagram gives the structure of *ethambutol*, a drug used for treating tuberculosis since 1960.



With which reagents would it react to give a halogen-containing organic compound?

1 hydrogen bromide **2** alkaline aqueous iodine **3** ethanoyl chloride

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6. To prepare ethene, a student added ethanol a drop at a time to a heated reagent **Y**. He then washed the impure ethene by bubbling it through a solution **Z** before collection.

Which of the following could be reagent **Y** and solution **Z**?

	reagent **Y**	*solution* **Z**		*reagent* **Y**	*solution* **Z**
A	acidified $K_2Cr_2O_7$	dilute NaOH	**B**	concentrated H_2SO_4	dilute H_2SO_4
C	concentrated H_2SO_4	dilute NaOH	**D**	ethanolic NaOH	concentrated H_2SO_4

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7. Which process gives at least one product that is a gas at room temperature and pressure?

A dehydration of ethanol **B** esterification of ethanoic acid by ethanol
C oxidation of ethanal by $H^+/Cr_2O_7^{2-}$ **D** substitution of ethanol by hydrogen bromide

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8. Which compounds can be obtained from propan-1-ol, $CH_3CH_2CH_2OH$, by reacting it with concentrated sulfuric acid under different conditions?

1 $CH_3CH{=}CH_2$ **2** $CH_3CH_2CH_2HSO_4$ **3** $CH_3CH_2CH_2OCH_2CH_2CH_3$

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9. Traditionally, vinegar is prepared by the oxidative fermentation of aqueous solutions of ethanol.

Which of the following are intermediates or products in this fermentation process?

1 HCO_2H **2** CH_3CHO **3** CH_3CO_2H

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10. What are the possible products formed when an aqueous solution of butan-1-ol is heated with dilute acidified potassium manganate(VII)?

1 butanal **2** butanoic acid **3** butanone

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11. An organic compound **X** is found to decolourise dilute acidified aqueous potassium manganate(VII) on warming, but it does not decolourise bromine water.

Which of the following could be **X**?

A butane **B** ethanol **C** ethene **D** ethanoic acid

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12. An organic compound **X** gives fumes of hydrogen chloride when treated with PCl_5. **X** also turns acidified $K_2Cr_2O_7$(aq) solution green when warmed with it.

Which of the following could be **X**?

A CH_3CH_2CHO **B** $CH_3CH_2CO_2H$ **C** $CH_3CH(OH)CH_3$ **D** CH_3COCH_3

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13. Some alcohol is added to a petrol consisting mainly of a mixture of alkanes and alkenes.
Which reagent could be used to detect the presence of alcohol in the petrol?

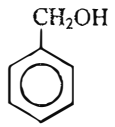
A Na **B** Br_2 (in CCl_4) **C** $KMnO_4$(aq) **D** 2,4-dinitrophenylhydrazine

14. When a molecule of phenylmethanol, $C_6H_5CH_2OH$, is dissolved in an excess of D_2O, how many of its hydrogen atoms may be replaced by deuterium?

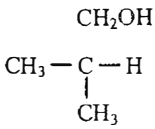
A **B** 3 **C** 5 **D** 8

15. Which alcohol resists oxidation when warmed with acidified $K_2Cr_2O_7$(aq) ?

A



B



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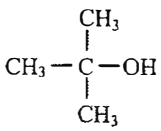

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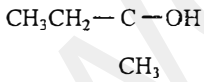


16. An alcohol **X** is treated with hot acidified aqueous potassium manganate(VII). The final oxidation product obtained is found to give the tri-iodomethane (iodoform) reaction.
Which of the following could be **X** ?

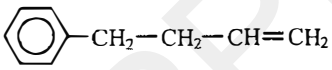
A $C_6H_5CH_2OH$ **B** C_2H_5OH **C** $CH_3CH(OH)C_2H_5$ **D** $C_6H_5CH(OH)C_2H_5$

17. Which alcohols when oxidised by acidified aqueous potassium dichromate(VI) give an organic product which causes an effervescence with sodium carbonate?

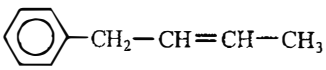
1 butan-1-ol **2** 2-methylpropan-1-ol **3** 2-methylpropan-2-ol

18. Compound **X**, molecular formula $C_{10}H_{14}O$, is unreactive towards mild oxidising agents.
Which compound is formed by dehydration of **X** ?

A



B



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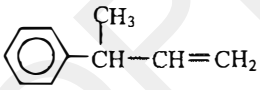

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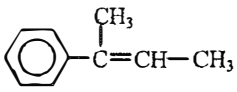
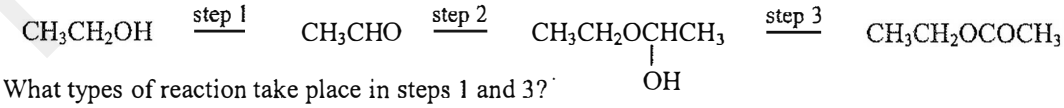


19. Currently, researches are being carried out to produce ethyl ethanoate (an important solvent in industry) from cheap, low grade ethanol using the following process.



What types of reaction take place in steps 1 and 3?

	step 1	ste 3
A	elimination	esterification
B	elimination	isomerisation
C	oxidation	esterification
D	oxidation	oxidation

20. Compound **X** releases hydrogen when reacted with sodium, and yields a ketone with oxidising agents. Which of the following could be **X**?

1 $CH_3CH(OH)CH_3$ **2** $CH_3CH_2CH_2OH$ **3** $CH_3CH{=}CHCH_2OH$

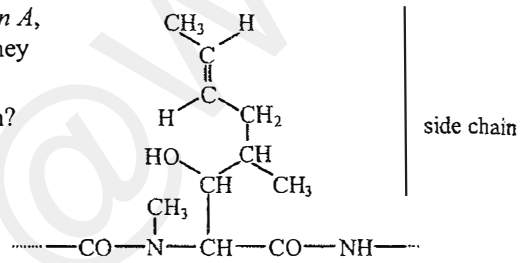
21. How many moles of ethanoyl chloride would react with one mole of glucose, $CH_2OH(CHOH)_4CHO$?

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

22. Which of the following are observations shown by the compound $CH_3CH(OH)CH_3$?

1 fumes of HCl gas with PCl_5
2 a yellow precipitate with alkaline aqueous iodine
3 an orange precipitate with a solution of 2,4-dinitrophenylhydrazine

23. The diagram shows part of the structure of *Cyclosporin A*, a peptide used as an immunosuppressor in human kidney transplant operations.
Which reagents would react with the side-chain shown?

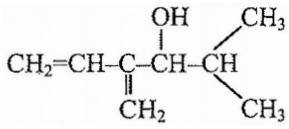


1 ethanoyl chloride
2 aqueous bromine
3 dilute potassium manganate(VII)

24. Still (i.e. non-fizzy) wine becomes 'vinegary' once the bottle is opened even when the cork is replaced. Such wines may be kept by pumping in a mixture of $CO_2(g)$ and $N_2(g)$ before resealing the bottle.
How does this mixture prevent the wine from developing a 'vinegary' taste?

1 Oxidation of ethanol to ethanoic acid is prevented.
2 The acidity of the wine is decreased.
3 The amount of carbon dioxide dissolved in the wine is increased.

25. The diagram shows the structure of a compound contained in the sex attractant of the *Ips confusus* bark beetle.
Which observations are expected from this compound?



1 It gives a positive result with Fehling's solution (alkaline copper(II) complex).
2 It reacts with ethanoyl chloride releasing hydrogen chloride.
3 It decolourises a dilute solution of bromine in tetrachloromethane.

26. Chloroethane can be prepared from bromoethane as follows:

$$C_2H_5Br \xrightarrow{\text{step X}} C_2H_5OH \xrightarrow{\text{step Y}} C_2H_5Cl$$

What deductions can be made about the above reaction sequence?

1 Step **X** involves a nucleophilic substitution.
2 Hot aqueous sodium hydroxide is the reagent in step **X**.
3 Hot aqueous sodium chloride is the reagent in step **Y**.

27. Which of the following are **correct** statements about the two isomers, **X** and **Y**, shown?

$HOCH_2CH(OH)CHO$
X

$HOCH_2COCH_2OH$
Y

1 **X** can be directly oxidised to **Y**.
2 **X** and **Y** can both be reduced to $HOCH_2CH(OH)CH_2OH$.
3 Both **X** and **Y** react with ethanoyl chloride to form esters.

28. *Mevalonic acid*, an intermediate in the biosynthesis of cholesterol, has the structure shown.

OH
$HO_2CCH_2C(CH_3)CH_2CH_2OH$
Mevalonic acid

Which of the following are properties of *mevalonic acid*?

1 It has only one chiral carbon atom.
2 It can be esterified both by ethanoic acid and by ethanol, in the presence of H^+ ions.
3 It contains both primary and secondary alcohol groups.

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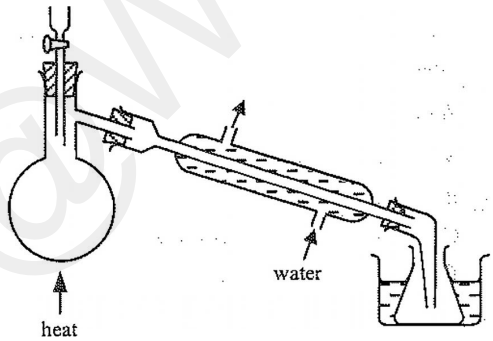
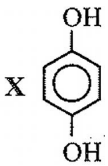
29. Which of the following preparations could be carried out in the laboratory using the apparatus set-up shown?



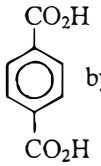
1 bromoethane, from ethanol, sodium bromide and concentrated sulfuric acid
2 ethanal, from ethanol, sodium dichromate(VI) and sulfuric acid
3 1,2-dibromoethane, from bromine and ethene

[Phenols]

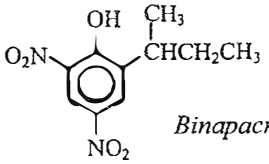
30. Compound **X** (structure shown) can be used as a photographic developer.



Which one of the following is a reaction of **X**?

A It forms a dye when mixed with phenylamine.
B It forms a salt with aqueous sodium hydroxide.
C It gives an orange precipitate with 2,4-dinitrophenylhydrazine.
D It is oxidised to  by aqueous alkaline potassium manganate(VII).

31. *Binapacryl*, a fungicide, has the structure shown.



Binapacryl

Which of the following can be deduced from its structure?

1 Its aqueous solution will be acidic.
2 It can exist in optically active forms.
3 It reacts with ethanol in the presence of concentrated sulfuric acid to give an ester.