

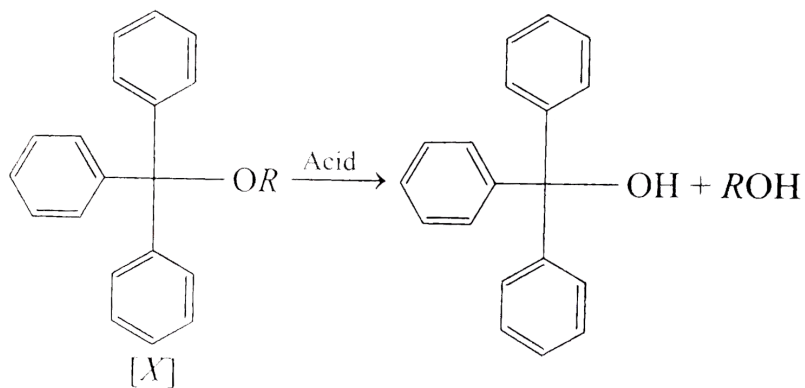
CHEMISTRY

BOOKS - IIT-JEE PREVIOUS YEAR (CHEMISTRY)

ALCOHOLS AND ETHERS

Jee Main And Advanced

1. The acidic hydrolysis of ether (X) shown below is fastest when



A. one phenyl group is replaced by a methyl group

- B. one phenyl group is replaced by a para-methoxyphenyl group
- C. two phenyl groups are replaced by two para-methoxyphenyl groups
- D. non structural change is made to X

Answer: C

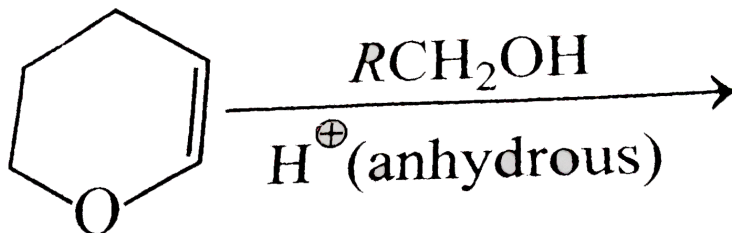
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2. An unknown alcohol is treated with "Lucas reagent" to determine wheter the alcohol is primary. Secondary or teritary. Which alcohol reacts fastest and by what mechanism?

- A. Secondary alcohol by S_N1
- B. Tertiary alcohol by S_N1
- C. Secondary alcohol by S_N2
- D. Tertiary alcohol by S_N2

Answer: B

3. The major product of the following reaction is



- A. a hemiacetal
- B. an acetal
- C. an ether
- D. an ester

Answer: B

4. (I) 1,2-Dihydroxy benzene

(II) 1,3-Dihydroxy benzene

(III) 1,4-Dihydroxy benzene

(IV) Hydroxy benzene

The increasing order of boiling points of the above-mentioned alcohols is:

A. $I < II < III < IV$

B. $I < II < IV < III$

C. $IV < I < II < III$

D. $IV < II < I < III$

Answer: C



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5. The best method to prepare cyclohexene from cyclohexanol is by using

A. conc. $HCl + ZnCl_2$

B. conc. H_3PO_4

C. HBr

D. conc. HCl

Answer: B

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6. When phenyl magnesium bromide reacts with tert butanol, which of the following is formed?

A. Tert butyl methyl ether

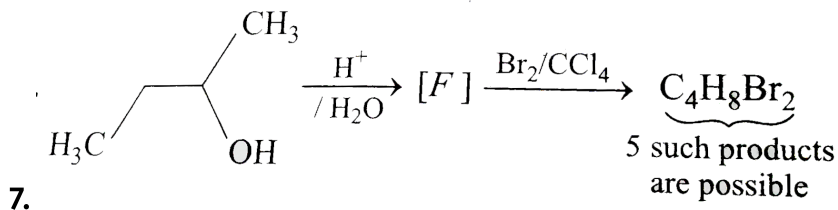
B. Benzene

C. Tert butyl benzene

D. phenol

Answer: B

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How many structures of F is possible?

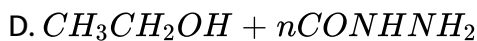
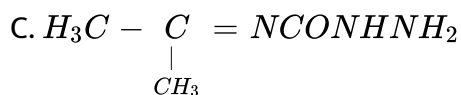
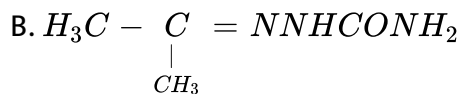
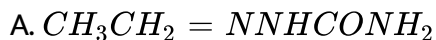
- A. 2
- B. 5
- C. 6
- D. 3

Answer: D

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8. Compound A (molecular formula $\text{C}_3\text{H}_8\text{O}$) is treated with acidified potassium dichromate to form a product B (molecular formula $\text{C}_3\text{H}_6\text{O}$). B forms shining silver mirror on warming with ammoniacal silver nitrate.

B when treated with an aqueous solution of $H_2NCONHNH_2$, HCl and sodium acetate gives a product C. Identify the structure of C.



Answer: A



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9.1 – Propanol and 2 – propanal can be best distinguished by

A. oxidation with alkaline $KMnO_4$ followed by reaction with Fehling solution.

B. oxidation with acidic dichromate followed by reaction with Fehling solution.

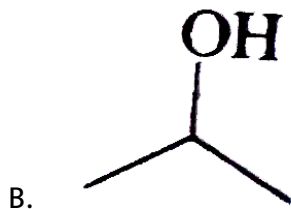
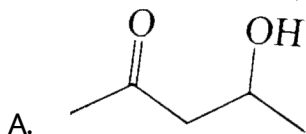
C. oxidation by heating with copper followed by reaction with Fehling solution.

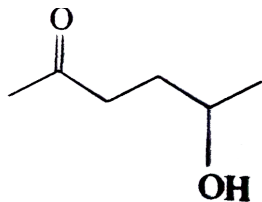
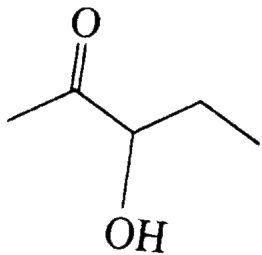
D. oxidation with concentrated H_2SO_4 followed by reaction with Fehling solution.

Answer: C

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10. Which one of the following will most readily be dehydrated in acidic condition?





Answer: A

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11. The products of combustion of an aliphatic thiol (RSH) at 298 K are

A. $CO_2(g)$, $H_2O(g)$ and $SO_2(g)$

B. $CO_2(g)$, $H_2O(l)$, and $SO_2(g)$

C. $CO_2(l)$, $H_2O(l)$ and $SO_2(g)$

D. $CO_2(g)$, $H_2O(l)$ and $SO_2(l)$

Answer: B

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12. In CH_3CH_2OH , the bond that undergoes heterolytic cleavage most readily is

A. C-C

B. C-O

C. C-H

D. O-H

Answer: D

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13. Hydrogen bonding is maximum in

- A. ethanol
- B. diethyl ether
- C. ethyl chloride
- D. triethyl amine

Answer: A

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14. HBr reacts fastest with

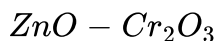
- A. 2-methy 1 propan-2-ol
- B. propan-1ol
- C. propan-2-ol
- D. 20methyl propan-1-ol

Answer: A

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15. An industrial method of preparation of methanol is

A. catalytic reduction of carbon monoxide in presence of



B. by reacting methane with steam at 900°C with nickel catalyst

C. by reducing formaldehyde with LiAlH_4

D. by reacting formaldehyde with aqueous sodium hydroxide solution

Answer: A



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16. Diethyl ether on heating with conc. HI gives two moles of

A. ethanol

B. iodoform

C. ethyl iodide

D. methyl iodide

Answer: C

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17. The compound which reacts fastest with Lucas reagent at room temperature is

A. butan-2-ol

B. butan-1-ol

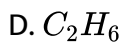
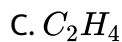
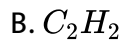
C. 2-methyl propan-1-ol

D. 2-methyl propan-2-ol

Answer: D

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18. Ethyl alcohol is heated with conc. H_2SO_4 . The product formed is

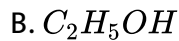


Answer: C



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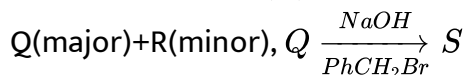
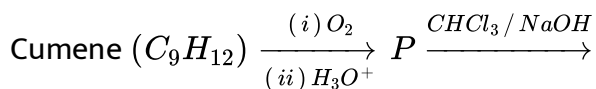
19. Which of the following is soluble in water?



Answer: B

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20. The correct statement(s) about the following reaction sequence is (are)



A. R is steam volatile

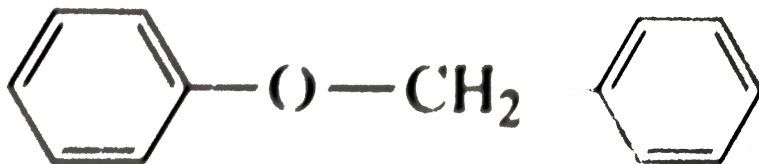
B. Q gives dark violet colouration with 1% aqueous $FeCl_3$ solution

C. S given yellow precipitate with 2,4-dinitrophenylhydrazine

D. S gives dark violet colouration with 1% aqueous $FeCl_3$ solution

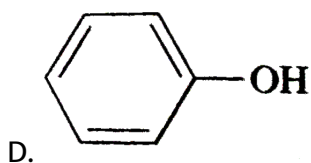
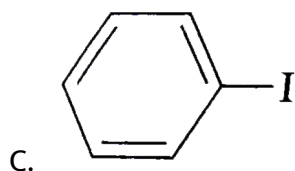
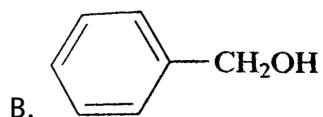
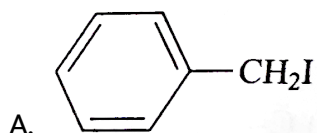
Answer: B::C

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21. The ether

when treated with HI produces:



Answer: A::D

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22. The products of reaction of alcoholic silver nitrate with ethyl bromide are

- A. ethane
- B. ethene
- C. nitroethane
- D. ethyl alcohol

Answer: C



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23. Statement I Solubility of n-alcohol in water decreases with increase in molecular weight.

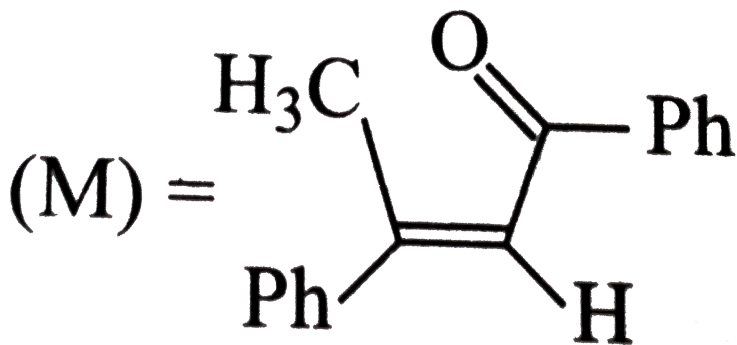
Statement II The relative proportion of the hydrocarbon part in alcohols increases with increasing molecular weight which permit enhanced hydrogen with water.

- A. Statement I is correct. Statement II is correct. Statement II is a correct explanation of Statement I.
- B. Statement I is correct, Statement II is correct, Statement II is not the correct explanation of Statement I.
- C. Statement I is correct, Statement II is incorrect
- D. Statement I is incorrect, Statement II is correct

Answer: C

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24. A tertiary alcohol (H) upon acid-catalysed dehydration gives a product (I). Ozonolysis of (I) leads to compounds (J) and (K). Compound (J) upon reaction with KOH gives benzyl alcohol and a compound (L), whereas (K) on reaction with KOH gives only (M).



The structures of compounds (J), (K), and (L), respectively, are:

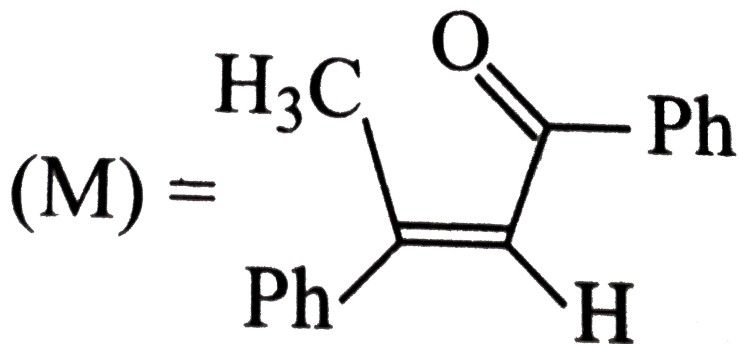
- A. $PhCOCH_3$, $PhCH_2COCH_3$ and $PhCH_2COO^- K^+$
- B. $PhCHO$, $PhCH_2CHO$ and $PhCOO^- K^+$
- C. $PhCOCH_3$, $PhCH_2CHO$ and $CH_3COO^- K^+$
- D. $PhCHO$, $PhCOCH_3$ and $PhCOO^- K^+$

Answer: D

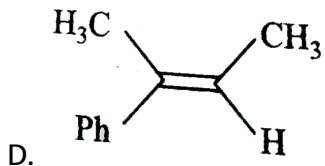
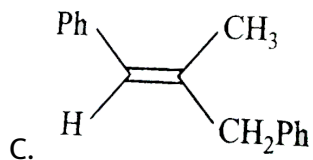
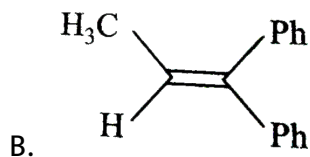
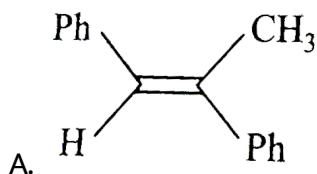
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25. A tertiary alcohol (H) upon acid-catalysed dehydration gives a product (I). Ozonolysis of (I) leads to compounds (J) and (K). Compound (J) upon reaction with KOH gives benzyl alcohol and a compound (L), whereas (K)

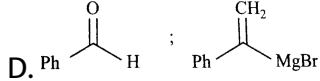
on reaction with KOH gives only (M).



The structures of compounds (J), (K), and (L), respectively, are:



Answer: A



Answer: B

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27. Glycerine contains one Hydroxyl group.

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28. Aliphatic ethers are purified by shaking with a solution of ferrous salt to remove Which are formed on prolonged standing in contact with water.

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29. A..... Diol has two hydroxyl groups on Carbon atoms.

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30. Ethanol vapour is passed over heated copper and the product is treated with aqueous NaOH. The final product is

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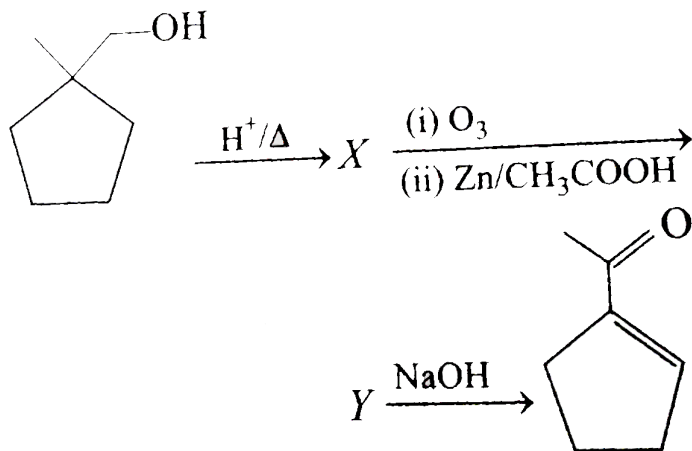
31. Sodium ethoxide is prepared by reacting ethanol with aqueous sodium hydroxide.

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32. The yield of ketone when a secondary alcohol is oxidised is more than the yield of aldehyde when a primary alcohol is oxidised.

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33. Complete the following reaction



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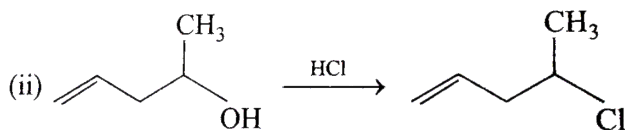
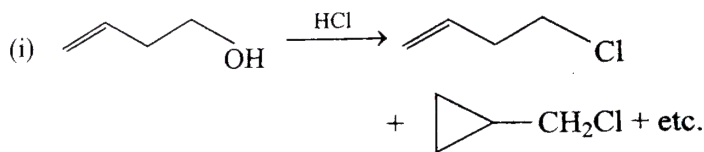
34. An organic compound P having the molecular formula $C_5H_{10}O$ when treated with dil H_2SO_4 gives two compounds, Q and R both gives positive iodoform test. The reaction of $C_5H_{10}O$ with dil, H_2SO_4 gives reaction 10^{15} times faster than ethylene. identify organic compound of Q and R. Give the reason for the extra stability of P.

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35. Cyclobutyl bromide on treatment with magnesium in dry ether forms an organometallic compound (*A*). The organometallic compound (*A*) reacts with ethanal to give an alcohol (*B*) after mild acidification. Prolonged treatment of alcohol (*B*) with an equivalent amount of HBr gives 1-bromo-1-methylcyclopentane (*C*). Write the structures of (*A*) and (*B*), and explain how (*C*) is obtained from (*B*).

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36. Explain briefly the formation of products giving the structures of the intermediates.



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37. Write the structures of the products. $(CH_3)_2CH - OCH_3 \xrightarrow[\text{heat}]{HI(\text{excess})}$

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38. Give reasons for the following in one or two sentences. 'Acid-catalysed dehydration of t-butanol is faster than that of n-butanol'.

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39. 2,2-Dimethyloxirane can be cleaved by acid (H^{\oplus}). Write the mechanism.

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40. A compound $D(C_8H_{10}O)$ upon treatment with alkaline solution of iodine gives a yellow precipitate. The fibtrate on acidification gives a

white solid $E(C_7H_6O_2)$. Write the structures of D,E and explain the formation of E.

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41. 3,3-dimethylbutan-2-ol loses a molecule of water in the presence of concentrated sulphuric acid to give tetramethylethylene as a major product. Suggest a suitable mechanism.

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42. When t-butanol and n-butanol are separately treatment with a few drops of dilute $KMnOD_4$ in one case only, the purple colour disappears and a brown precipitate is formed. Which of the two alcohols gives the above reaction and what is the brown precipitate?

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43. Compound X (molecular formula C_5H_8O) does not react appreciably with Lucas reagent at room temperature but gives a precipitate with ammoniacal silver nitrate with excess of $MeMgBr$, 0.42gm of X gives 224ml of CH_4 at $S. T. P$ Treatment of X with H_2 in the presence of Pt catalyst followed by boiling with excess of HI , gives n-pentane. Suggest the structure for X and write the equations involved.

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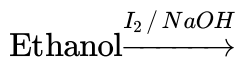
44. How will you bring about the following conversion? "Ethanal to 2-hydroxy-3-butenic acid"

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45. Arrange the following in increasing order of boiling point: n-butane, n-butanol, n-butylchloride, iso-butane.

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46. Write down the main product of the following reaction:



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47. Give a chemical test to distinguish between methanol and ethanol.

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48. Suggest a reason for the larger difference between boiling points of butanol and butanal, although they have almost the same solubility in water.

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49. An alcohol A, when heated with conc. H_2SO_4 gives an alkene B. When B is bubbled through bromine water and the product obtained is

dehydrohalogenated with excess of sodamide, a new compound C is obtained. The compound C gives D when treated with warm dilute H_2SO_4 in the presence of $HgSO_4$. D can also be obtained either by oxidising A with $KMnO_4$ or form acetic acid through its calcium salt. Identify A, B, C, and D.

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50. State the conditions under which the following preparations are carried out. Give necessary equations which need not be balanced.

- (i) Ethanol from acetylene
- (ii) Lead tetraethyl from sodium-lead alloy
- (iii) Methyl chloride from aluminium carbide

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51. A compound 'X' containing C, H and O is unreactive towards sodium. It does not add with bromine. It also does not react with Schiff's reagent. On refluxing with an excess of HI, 'X' yields only one organic product 'Y'. 'Y'

on hydrolysis yield a new compound 'Z' which can be converted into 'Y' by reaction with red phosphorus and iodine. the compound 'Z' on oxidation with potassium permanganate gives a carboxylic acid. The equivalent weight of acid is 60. What are the compounds 'X','Y' and 'Z'? Write chemical equations leading to the conversion of 'X' to 'Y'.

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52. An organic liquid 'A' containing C,H and O with boiling point $78^{\circ}C$, possessing a rather pleasant odour. On heating with concentrated sulphuric acid gives a gaseous product 'B' with the empirical formula CH_2 'B' decolourises bromine water as well as alkaline permanganate solution and takes up one mole of H_2 (per mole of B) in presence of finely divided nickel at high temperature. Identify the substances A and B.

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53. The number of hydroxyl group in pyrophosphoric acid is

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54. $C_6H_{14}O$ chiral alcohol is converted to a bromide by treatment with PBr_3 . Reaction of this bromide, first with Mg in ether, followed by quenching in 0.1N HCl produces an achiral C_6H_{14} hydrocarbon. Which of the following is the original alcohol?

- A. 2-ethyl-1-butanol
- B. 4-methyl-1-pentanol
- C. 3-methyl-3-pentanol
- D. 3-methyl-1-pentanol

Answer: d

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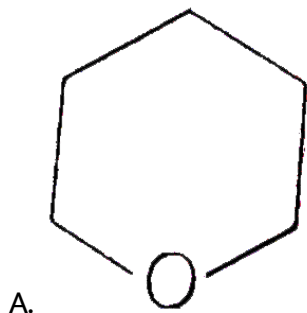
55. What is the product from the acid catalyzed addition of methanol to 2,2-diethyloxirane?

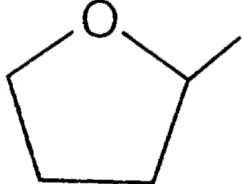
- A. 3,3-dimethoxyphenatane
- B. 2-ethyl-1-methoxy-1-butanol
- C. 2-ethyl-1-methoxy-2-butanol
- D. 2-ethyl-2-methoxy-1-butanol

Answer: d

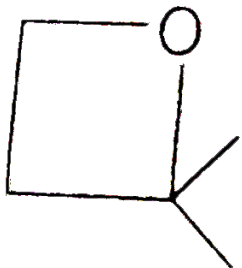
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56. A chiral $C_5H_{10}O$ ether reacts with hot HI to give a $C_5H_{10}I_2$ product. Treatment of this with hot KOH in ethanol produces 1,3-pentadiene. What is the structure of the original ether?

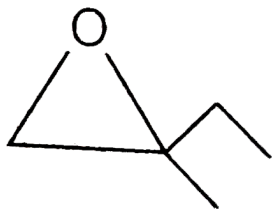




B.



C.

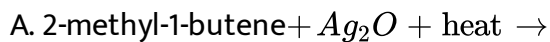


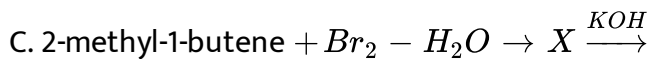
D.

Answer: b

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57. The reaction producing 2-ethyl-2-methyl oxirane is/are



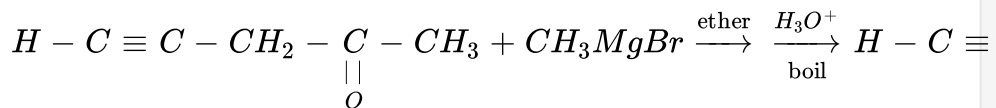


Answer: a,b,c

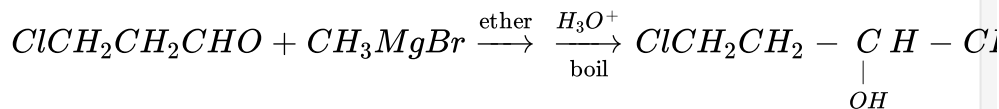
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58. Which of the following Grignard synthesis would fail to produce the desired alcohols?

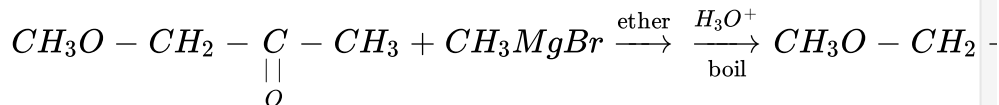
A.

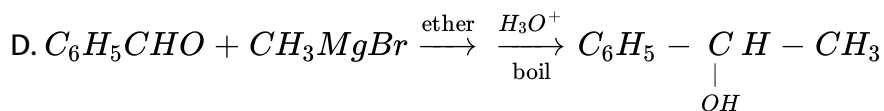


B.



C.





Answer: a,b,c

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59. Assertion Diphenyl ether (Ph-O-Ph) is very less reactive in acid catalyzed hydrolysis to phenol.

Reason Oxygen is in resonance on bot side with phenyl ring.

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60. Assertion 3-methyl-2-butanol is more reactive than-2- butanol in acid catalyzed dehydration to alkene.

Reason 3-methyl-2-butanol is more stable carbocation than 2-butanol during dehydration reaction.

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61. Consider the four constitutional isomers of a compound with formula $C_5H_{10}O$ and their reactions with Grignard's reagent and $LiAlH_4$ as described below:

	$LiAlH_4 / H_2O$	Grignard's reagent \rightarrow	Products	Stereo
A.	Achiral	CH_3MgBr then H_2O	Alcohol	Racemic mixture
B.	Achiral	C_2H_5MgBr then H_2O	Alcohol	Achiral
C.	No reaction	CH_3MgBr then H_2O	Alcohol	Chiral
D.	Racemic mixture	CH_3MgBr and H_2O	Alcohol	Achiral

Select the appropriate match of the compounds.

- A. A B C D
 2-pentanone 3-Pentanone Pentanal 1-pentaen-3-ol
- B. A B C D
 Pentanal 2-pentanone 3-pentanone 1-penten-3-ol
- C. A B C D
 2-pentanone 3-pentanone Pentanal 1-Pentaen-3-ol
- D. A B C D
 Pentanal 3-pentanone 1-penten-3-ol 2-pentanone

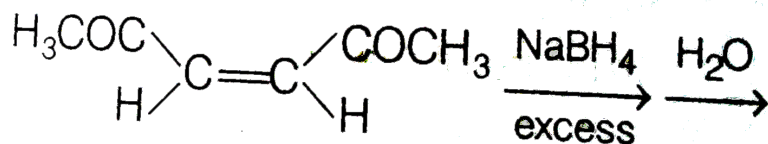
Answer: D



62. If 4-methyl-3-heptanol is boiled with concentrated sulphuric acid, it undergoes dehydration to form alkenes. Theoretically, how many different alkenes would be formed?

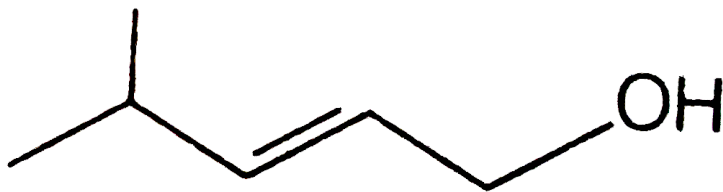
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63. In the following reaction, how many different diols would be formed?



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1. Consider the molecule



Which reagent will not give a positive test with this compound?

A. Cold conc. H_2SO_4

B. Br_2 / CCl_4

C. NaOH(aq)

D. Dilute $KMnO_4 / H_2O$

Answer: c

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2. Lucas test is used for distinguishing primary, secondary and tertiary alcohols as:



The correct statement regarding the above test is/are

- A. ROH behaves as a base
- B. Greater the value of pK_a of alcohol, greater the reactivity with HCl and thus, sooner the formation of white turbidity.
- C. Alcohols that reacts faster with Na metal, will give turbidity at fastest rate.
- D. Alcohols that do not change the orange colour of acidic dichromate solution produces immediate turbidity in this test.

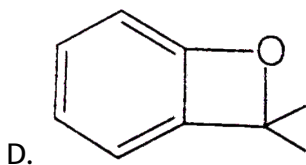
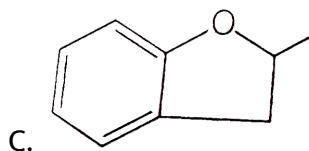
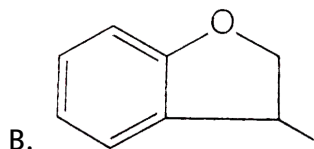
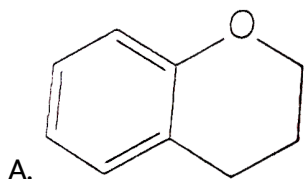
Answer: a,b,d

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3. An organic compound A ($C_9H_{10}O$) does not evolve any gas on reatement with Na-metal but on hydrolysis with dil. H_2SO_4 gives $B(C_9H_{12}O_2)$ which on further treatement with alkaline solution of

iodine gives an yellow precipitate. Also A on treatment with excess of conc. HBr gives $C(C_9(H_{11}OBr))$ as the major product. C on further treatment with C_2H_5ONa/C_2H_5OH followed by acidification of product gives D (an isomer of A). D on ozonolysis followed by work-up with dimethyl sulphide gives ortho hydroxyl benzaldehyde as one of the product. Answer the following three questions based on the above information.

The most likely structure of starting compound A is



Answer: c



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4. An organic compound A ($C_9H_{10}O$) does not evolve any gas on treatment with Na-metal but on hydrolysis with dil. H_2SO_4 gives B ($C_9H_{12}O_2$) which on further treatment with alkaline solution of iodine gives a yellow precipitate. Also A on treatment with excess of conc. HBr gives C ($C_9(H_{11}OBr)$) as the major product. C on further treatment with C_2H_5ONa/C_2H_5OH followed by acidification of product gives D (an isomer of A). D on ozonolysis followed by work-up with dimethyl sulphide gives ortho hydroxyl benzaldehyde as one of the products. Answer the following three questions based on the above information.

Which of the following statements regarding B is correct?

A. B is an optically inactive substance

- B. B is an optically active substance with same configuration as that of A
- C. B is an optically active substance with opposite configuration to that of A.
- D. A pure enantiomer of "A" will produce, on hydrolysis reaction, a racemic mixture of B

Answer: c



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5. An organic compound A ($C_9H_{10}O$) does not evolve any gas on treatment with Na-metal but on hydrolysis with dil. H_2SO_4 gives B ($C_9H_{12}O_2$) which on further treatment with alkaline solution of iodine gives a yellow precipitate. Also A on treatment with excess of conc. HBr gives C ($C_9(H_{11}OBr)$) as the major product. C on further treatment with C_2H_5ONa/C_2H_5OH followed by acidification of product gives D (an isomer of A). D on ozonolysis followed by work-up

with dimethyl sulphide gives ortho hydroxyl benzaldehyde as one of the product. Answer the following three questions based on the above information.

The statement that is true regarding A to D is

- A. if oxygen of A is labelled by ^{18}O , D will retain ^{18}O
- B. If A is hydrolyzed with H_2O^{18} / H^+ , B will have ^{18}O on phenyl ring
- C. A can show both enantiomerism and diastereomerism
- D. B can show both enantiomerism as well as diastereomerism.

Answer: a



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