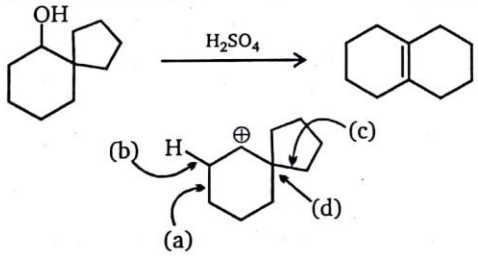
6 ALCOHOL, ETHERS AND EPOXIDES

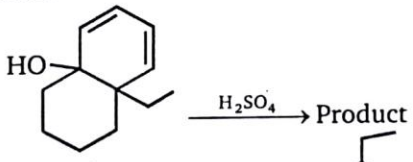
LEVEL-1

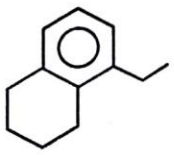
1. The following transformation involves a carbocation rearrangement. The carbocation is generated by protonation of the hydroxyl group, followed by the loss of water. Which bond has to migrate in the carbocation to yield the product indicated (after the deprotonation) ?

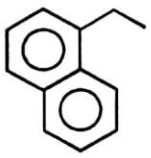


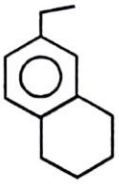
(a) a (b) b (c) c (d) d

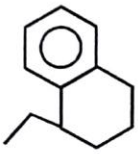
2. Identify the major product.



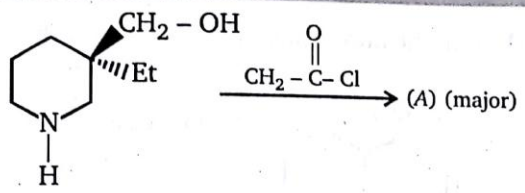
(a) 

(b) 

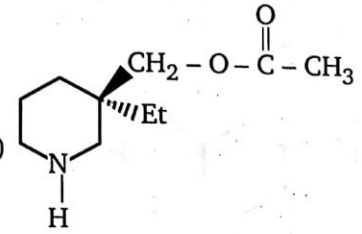
(c) 

(d) 

3.



(a)



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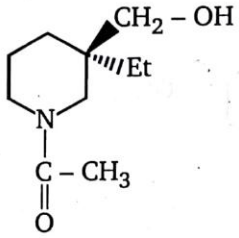

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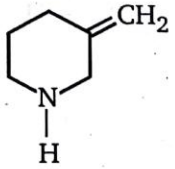
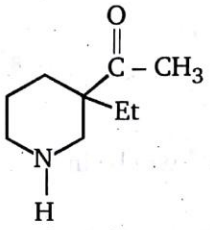
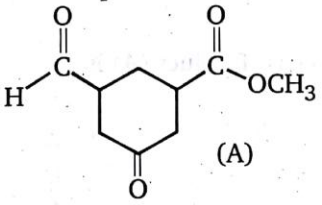


(d)

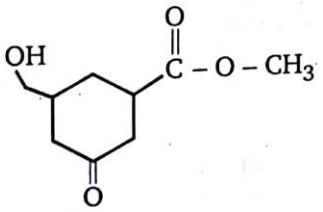


4. Predict the product when given compound reacts with $LiAlH_4$:

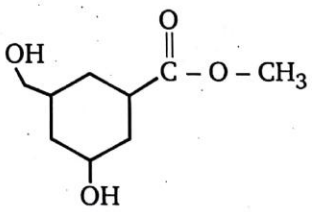


(A)

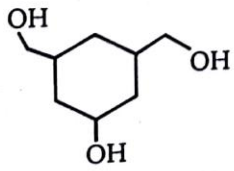
(a)



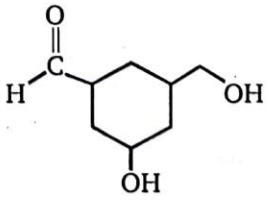
(b)



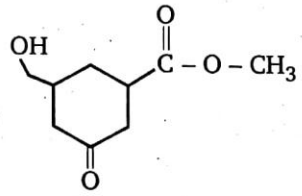
(c)

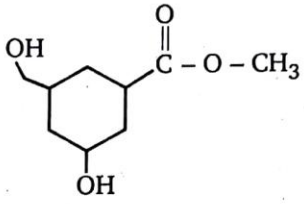


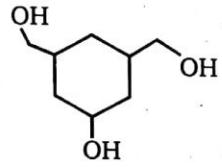
(d)

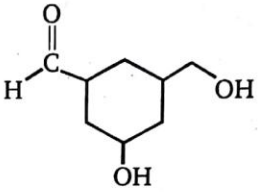


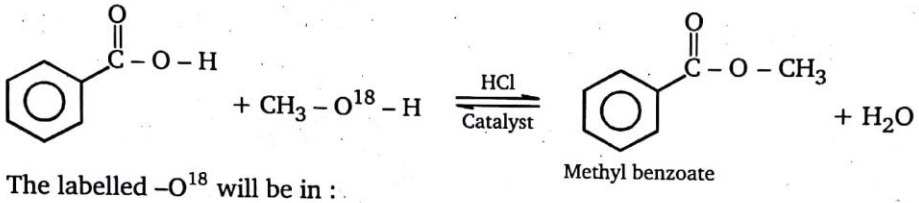
5. Predict the product when given compound (*A*, in the above question 4) reacts with $NaBH_4$.

(a) 

(b) 

(c) 

(d) 

6. 

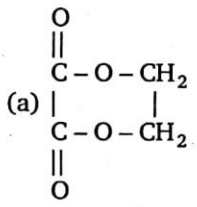
Methyl benzoate

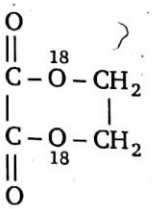
The labelled $-O^{18}$ will be in :

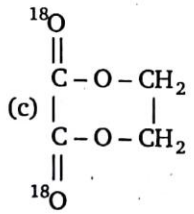
(a) H_2O (b) Methyl benzoate

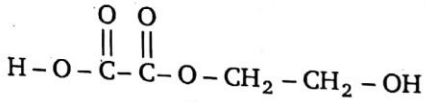
(c) Both (a) and (b) (d) Benzoic acid

7. $\begin{matrix} CO_2H \\ | \\ CO_2H \end{matrix} + \begin{matrix} CH_2-\overset{18}{O}H \\ | \\ CH_2-\overset{18}{O}H \end{matrix} \xrightarrow[\Delta]{H^+}$ (*A*); Product (*A*) is :

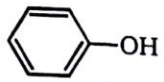
(a) 

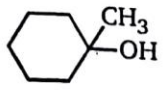
(b) 

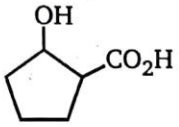
(c) 

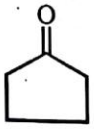
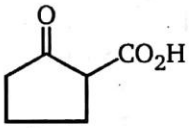
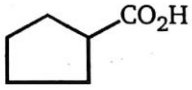
(d) 

8. Which is oxidized most easily ?

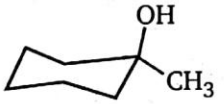
(a) $CH_3-CHOH-CH_3$ (b) 

(c) $CH_3-CH_2-O-CH_2-CH_3$ (d) 

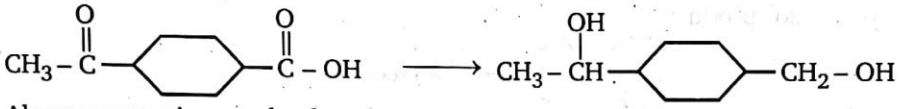
9.  $\xrightarrow[\Delta]{K_2Cr_2O_7}$ (*P*); Product (*P*) is :

(a)  (b)  (c)  (d) 

10. Which of the following react with HBr at faster rate ?

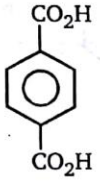
(a)  (b) 

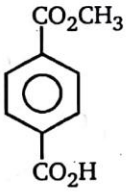
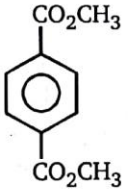
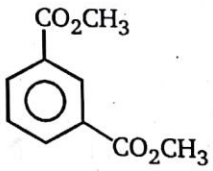
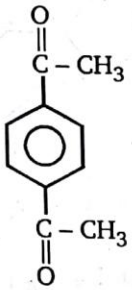
(c)  (d) 

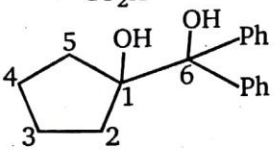
11. 

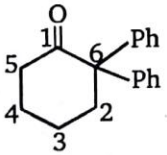
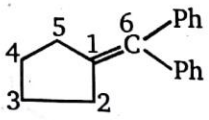
Above conversion can be done by :

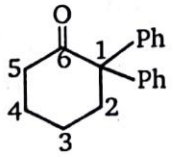
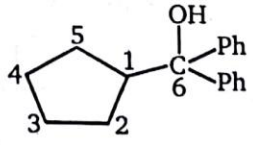
(a) $NaBH_4$ (b) $LiAlH_4$ (c) PCC (d) $KMnO_4$

12.  $\xrightarrow[H_2SO_4,\Delta]{2\ CH_3OH}$ (*A*) ; Product (*A*) is :

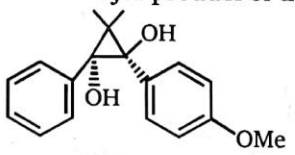
(a)  (b)  (c)  (d) 

13.  $\xrightarrow[99\%\text{yield}]{H_2SO_4}$ (*P*) ; Unknown (*P*) of the reaction is :

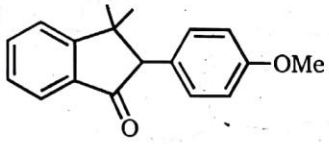
(a)  (b) 

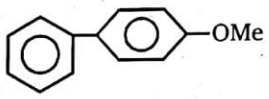
(c)  (d) 

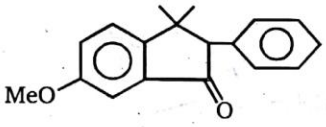
14. Predict the major product of the given reaction.

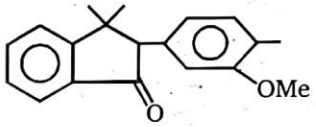


$\xrightarrow{H^+}$ (*A*); Product (*A*) is :

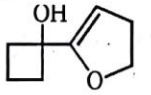
(a) 

(b) 

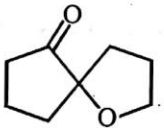
(c) 

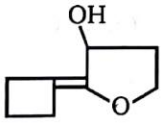
(d) 

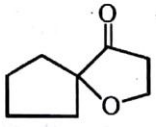
15. Identify the major product,

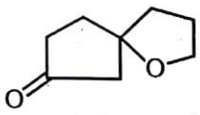


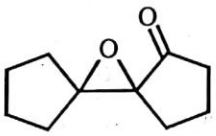
$\xrightarrow{H^+}$ Product

(a) 

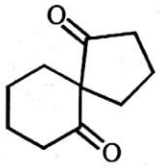
(b) 

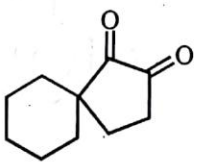
(c) 

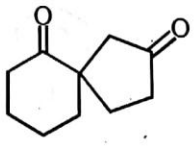
(d) 

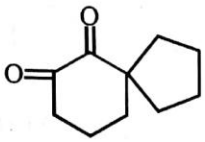
16. 

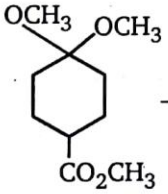
$\xrightarrow{H^+}$ (*A*); Product (*A*) is :

(a) 

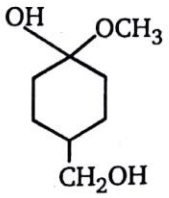
(b) 

(c) 

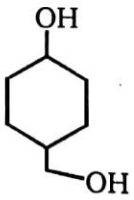
(d) 

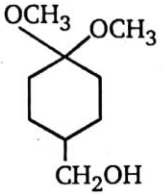
17. 

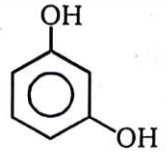
$\xrightarrow{LiAlH_4}$ (*A*) Major; product (*A*) is :

(a) 

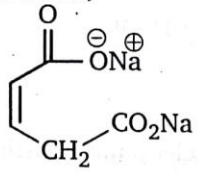
(b) 

(c) 

(d) 

18.  $\xrightarrow{I_2+NaOH}$ $\underset{\text{(Iodoform)}}{CHI_3}$ + (*A*); Compound (*A*) is :

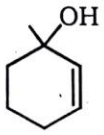
(Resorcinol)

(a) 

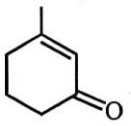
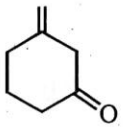
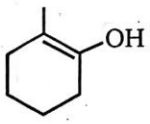
(b) $H-O-\overset{O}{\overset{\|}{C}}-(CH_2)_2-\overset{O}{\overset{\|}{C}}-OH$

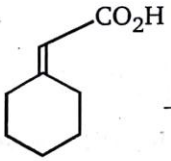
(c) $CH_3-CH_2-CH_2-CH_2-\overset{O}{\overset{\|}{C}}-OH$

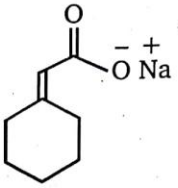
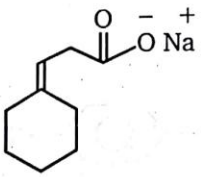
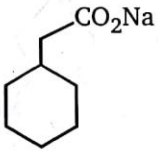
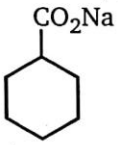
(d) $CH_3-(CH_2)_3-\overset{O}{\overset{\|}{C}}-ONa$

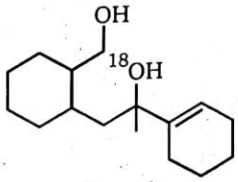
19.  $\xrightarrow{H_2CrO_4}$ (*A*). Product (*A*) is :

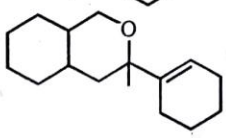
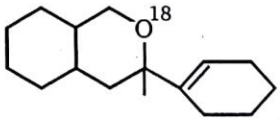
(3° alcohol)

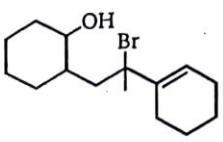
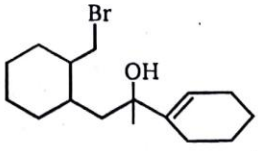
(a) No reaction (b)  (c)  (d) 

20.  $\xrightarrow[(2)\ H^{\oplus}]{(1)CH_3-Li(excess)}$ (*A*) $\xrightarrow[NaOH]{I_2}$ (*B*) + $CHI_3\downarrow$; Compound (*B*) is :

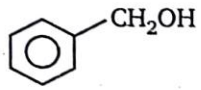
(a)  (b)  (c)  (d) 

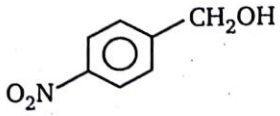
21.  $\xrightarrow[CCl_4]{H-Br}$ Major product obtained in the reaction is :

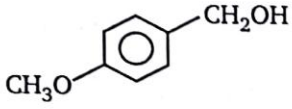
(a)  (b) 

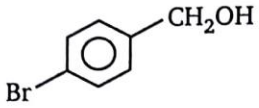
(c)  (d) 

22. Consider the following alcohols,

(I) 

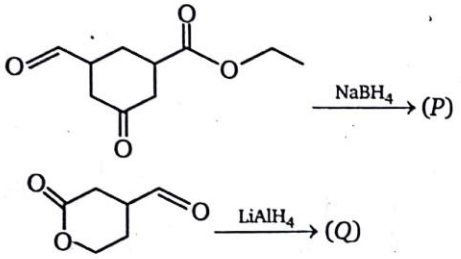
(II) 

(III) 

(IV) 

The order of decreasing reactivities of these alcohols towards nucleophilic substitution with HBr is:

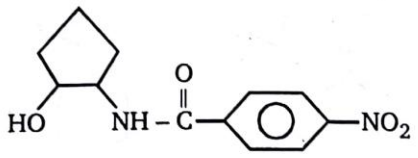
(a) III > I > IV > II (b) III > I > II > IV (c) I > III > IV > II (d) I > III > II > IV

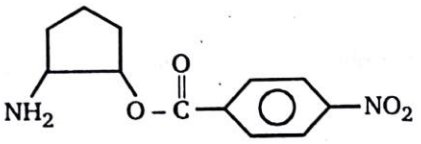
23. 

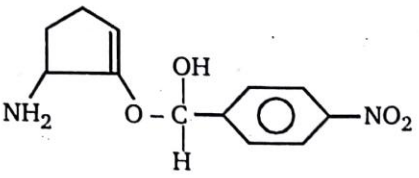
Sum of number of 1° alcoholic groups in product (*P*) and (*Q*) is:

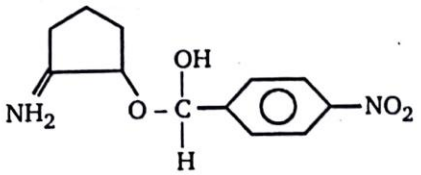
(a) 1 (b) 2 (c) 3 (d) 5

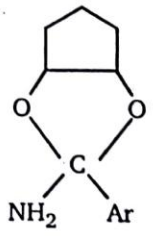
24. In presence of dil. HCl, compound *A* is converted to a constitutional isomer (*B*), compound *B* is:

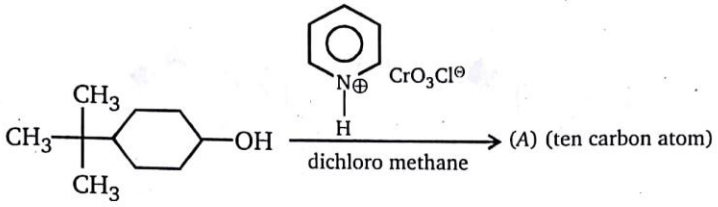


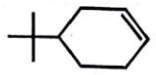
(a) 

(b) 

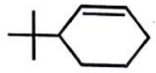
(c) 

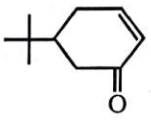
(d) 

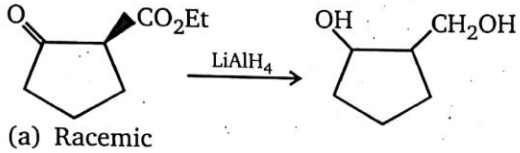
25. 

(a) 

(b) 

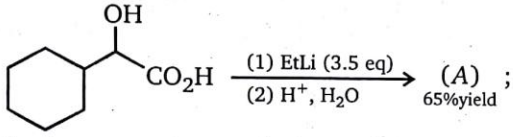
(c) 

(d) 

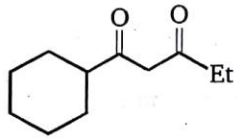
26. 

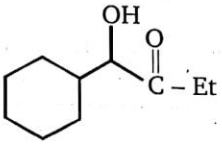
; Product of the reaction is:

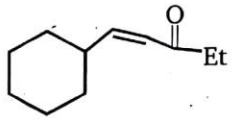
(a) Racemic
(b) Diastereomer
(c) Meso
(d) Optically pure

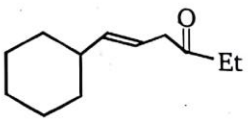
27. 

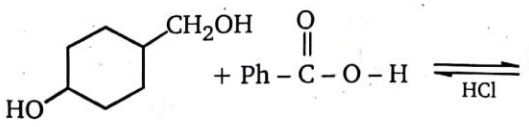
; Chemist added extra 0.5 mole of Et-Li in above reaction to obtain product (*A*), which is?

(a) 

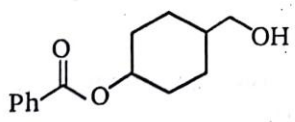
(b) 

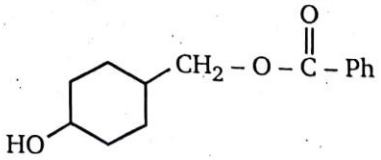
(c) 

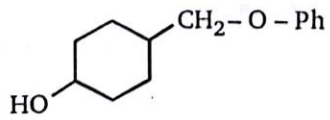
(d) 

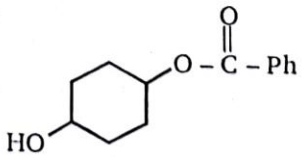
28. 

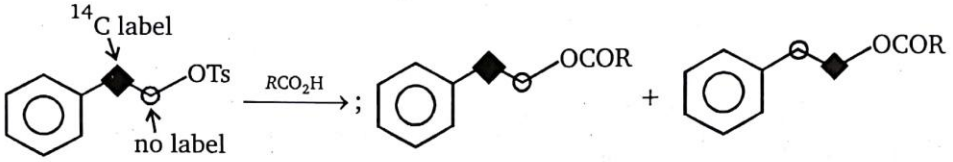
Major product of above esterification reaction is:

(a) 

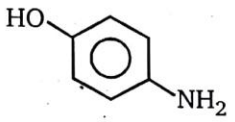
(b) 

(c) 

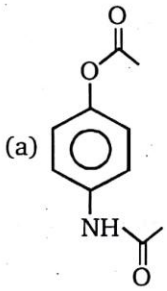
(d) 

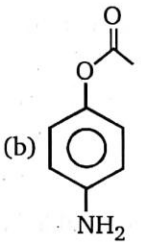
29. 

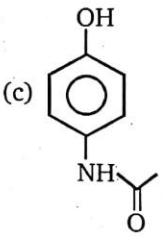
(a) S_{N^1} (b) S_{N^2} (c) SN — NGP (d) SN — Ar

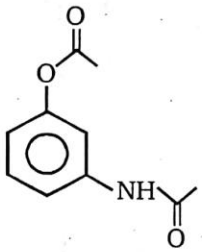
30. 

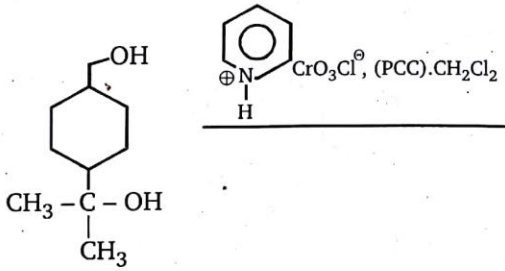
(*A*); Product (*A*) of reaction is :

(a) 

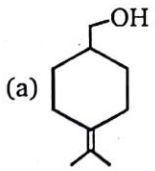
(b) 

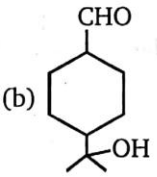
(c) 

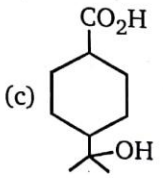
(d) 

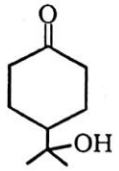
31. 

Product of the reaction is :

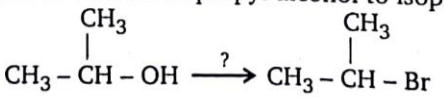
(a) 

(b) 

(c) 

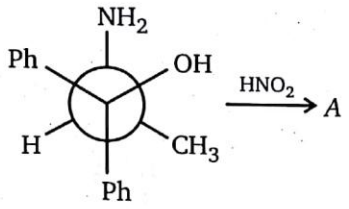
(d) 

32. Which is the best reagent to convert isopropyl alcohol to isopropyl bromide ?

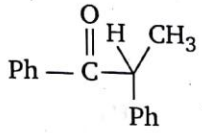


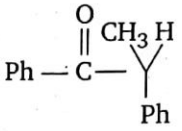
(a) HBr (b) $SOBr_2$ (c) Br_2 (d) CH_3MgBr

33.



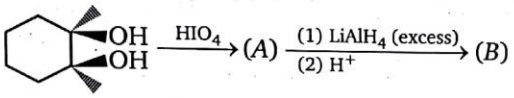
Major product obtained in the above reaction is :

(a) 

(b) 

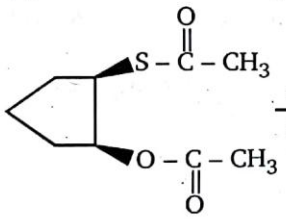
(c) Racemic

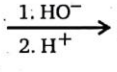
(d) Diastereomers

34. 

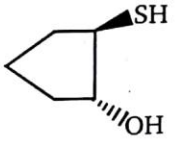
Total number of stereoisomers of product (*B*) will be:

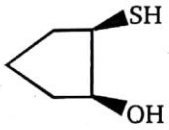
(a) 2 (b) 3 (c) 4 (d) 5

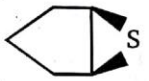
35. 

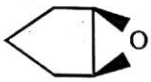


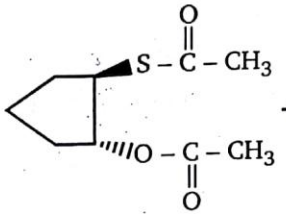
Major product of the reaction is :

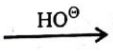
(a) 

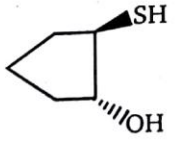
(b) 

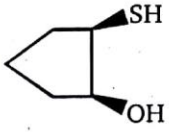
(c) 

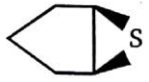
(d) 

36. 

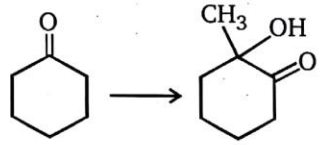


(a) 

(b) 

(c) 

(d) 

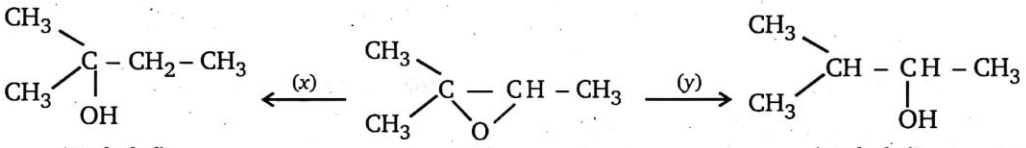
37. 

CH_3MgBr/H^+ (1) $KMnO_4$ (cold dil.) (2) CrO_3 (3) H^+/Δ (4)

For the above conversion the correct order of reagents used is :

(a) $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$ (b) $1 \rightarrow 4 \rightarrow 3 \rightarrow 2$

(c) $1 \rightarrow 4 \rightarrow 2 \rightarrow 3$ (d) $2 \rightarrow 3 \rightarrow 4 \rightarrow 1$

38. 

(3° alcohol) (2° alcohol)

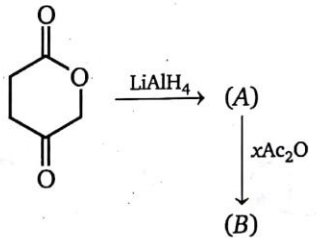
Find missing reagents.

(a) $x = LiAlH_4, y = NaBH_4$ (b) $x = LiAlH_4/AlCl_3, y = LiAlH_4$

(c) $x = LiAlH_4, y = LiAlH_4/AlCl_3$ (d) $x = H_2/Ni, y = H_2/Pt$

39. In solvolysis of 1, 2-dimethyl propyl p-toluene sulfonate in acetic acid at 75°C, (alkene + substitution products) will be formed by mechanism ?

(a) S_{N^2}, E_2 (b) S_{N^2}, E_1 (c) S_{N^1}, E_2 (d) S_{N^1}, E_1

40. 

x = moles of anhydride consumed

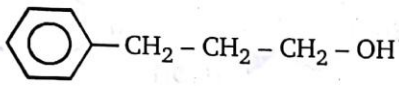
(a) 1 (b) 2 (c) 3 (d) 4

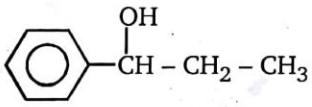
41. Identify product when (*R*) – and (*S*) – 2 – butanol reacts with (*R*,*R*) tartaric acid in acidic medium.

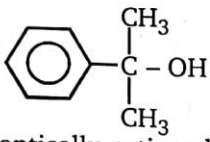
(a) Racemic (b) Diastereomer

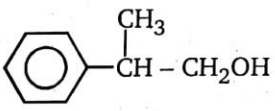
(c) Meso (d) Pure enantiomer

42. An alcohol of formula $C_9H_{12}O$ reacts with $Na_2Cr_2O_7$ to form a compound having formula $C_9H_{10}O$. The original alcohol might be :

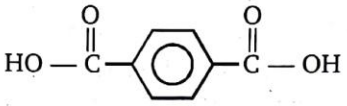
(a) 

(b) 

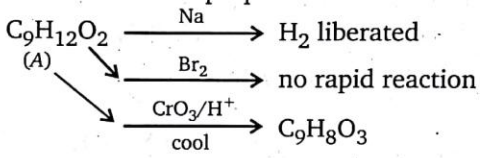
(c) 

(d) 

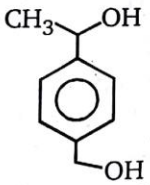
43. An optically active alcohol of formula $C_9H_{12}O_2$ produced the following compound when refluxed with $KMnO_4$.

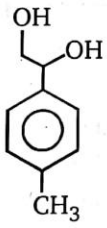


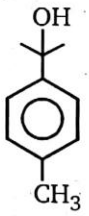
The original compound showed these properties also :



What is structure of (*A*)?

(a) 

(b) 

(c) 

(d) both (a) and (b)

44. Which are not cleaved by HIO_4?

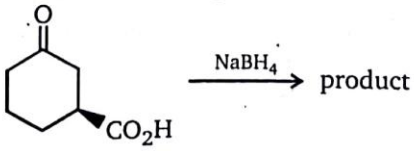
I : glycerol
II : glycol
III : 1, 3-propenediol
IV : methoxy-2-propanol

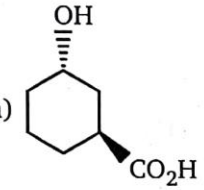
(a) I, II, III, IV
(b) I, II
(c) II, III
(d) III, IV

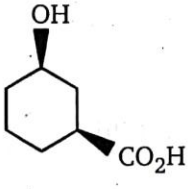
45. Which of the following reactions require an oxidising agent ?

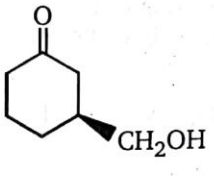
(a) $CH_3 - CH = CH_2 \longrightarrow CH_3 - CH_2 - CH_3$
(b) $CH_3 - CH_2OH \longrightarrow CH_3CHO$
(c) $CH_3 - CH_2Cl \longrightarrow CH_3 - CH_3$
(d) $CH_3 - CH_2OH \longrightarrow CH_3 - CH_2Cl$

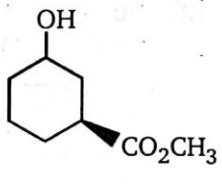
46. What is the major product of the following reaction ?



(a) 

(b) 

(c) 

(d) 

47. Which of the esters shown, after reduction with $LiAlH_4$ and aqueous workup, will yield two molecules of only a single alcohol ?

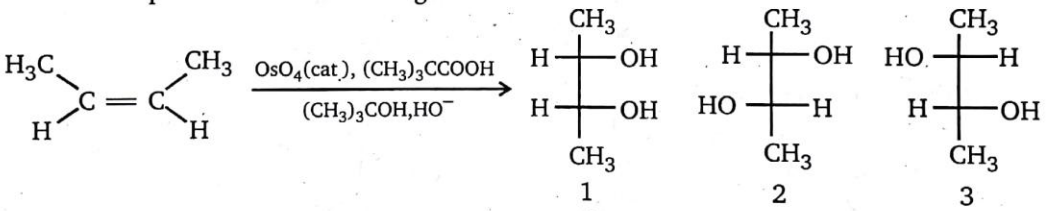
(a) $CH_3CH_2CO_2CH_2CH_3$ (b) $C_6H_5CO_2CH_2C_6H_5$
(c) $C_6H_5CO_2C_6H_5$ (d) None of these

48. For the following reaction, select the statement that best describes the change.

$$RCH_2OH + PCC\ [C_5H_5NH^+ClCrO_3^-] \longrightarrow$$

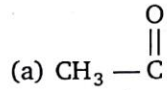
(a) The alcohol is oxidized to an acid, and the Cr(VI) is reduced
(b) The alcohol is oxidized to an aldehyde, and the Cr(VI) is reduced
(c) The alcohol is reduced to an aldehyde, and the Cr(III) is oxidized
(d) The alcohol is oxidized to a ketone, and the Cr(VI) is reduced

49. What is the product of the following reaction ?



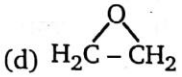
(a) Only 1 (b) 1 : 1 mixture of 2 and 3
(c) Only 2 (d) 1 : 1 : 1 mixture of 1, 2, and 3

50. An organic compound *B* is formed by the reaction of ethylmagnesium iodide (CH_3CH_2MgI) with a substance *A*, followed by treatment with dilute aqueous acid. Compound B does not react with PCC in dichloromethane. Identify *A* ?

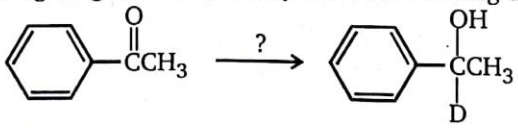
(a) 

(b)

(c) $H_2C = O$

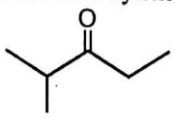
(d) 

51. Which of the following reagents would carry out the following transformation ? (D = ^2H)



(a) $NaBD_4$ in CH_3OH (b) $LiAlH_4$, then D_2O
(c) $NaBD_4$ in CH_3OD (d) $LiAlD_4$, then D_2O

52. Which sequence of steps describes the best synthesis of 2-methyl-3-pentanone ?



(a) (1) 1-Propanol + $(CH_3)_2CHMgBr$, diethyl ether
(2) H_3O^+
(3) PCC, CH_2Cl_2

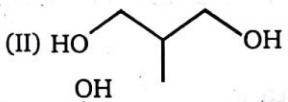
(b) (1) 1-Propanol + $Na_2Cr_2O_7$, H_2SO_4, H_2O, heat
(2) $SOCl_2$
(3) $(CH_3)_2CHCl$, $AlCl_3$

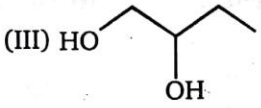
(c) (1) 1-Propanol + PCC, CH_2Cl_2
(2) $(CH_3)_2CHLi$, diethyl ether
(3) H_3O^+
(4) $Na_2Cr_2O_7$, H_2SO_4, H_2O, heat

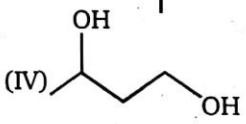
(d) (1) 2-Propanol + $Na_2Cr_2O_7$, H_2SO_4, H_2O, heat
(2) $CH_3CH_2CH_2Li$, diethyl ether
(3) H_3O^+
(4) PCC, CH_2Cl_2

53. Diols (I-IV) which react with CrO_3 in aqueous H_2SO_4 and yield products that readily under go dercarboxylation on heating, are :

(I) 

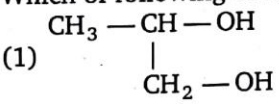
(II) 

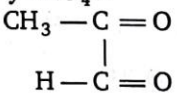
(III) 

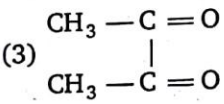
(IV) 

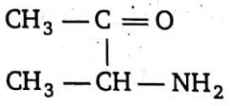
(a) I and II (b) II and III (c) II and IV (d) I and IV

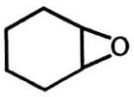
54. Which of following compounds are not oxidized by HIO_4?

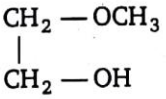
(1) 

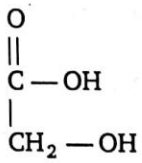
(2) 

(3) 

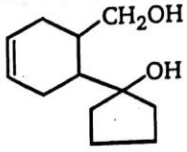
(4) 

(5) 

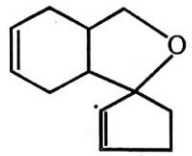
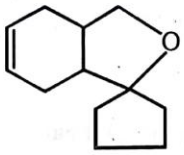
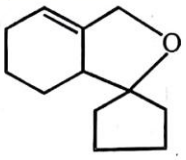
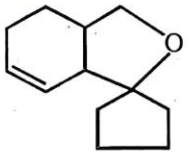
(6) 

(7) 

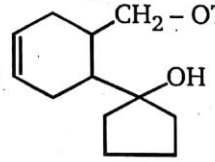
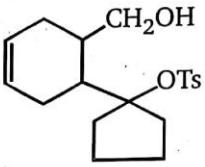
(a) 5, 6, 7 (b) 4, 5, 6, 7 (c) 6, 7 (d) 3, 4, 5, 6, 7

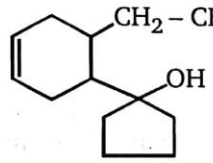
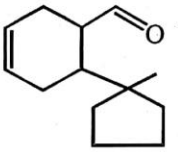
55. 

(B) 84%; Final product (B) will be :

(a)  (b)  (c)  (d) 

56. Unknown (*A*) in the reaction (given in Q. 55) is :

(a)  (b) 

(c)  (d) 

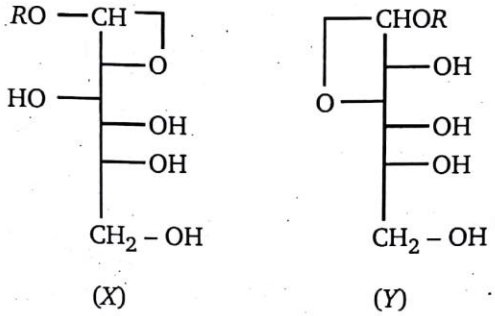
57. In the given table, identify the incorrect option. The digit in box indicate the moles of that substance.

	Reactant	HIO_4 consumed	HCO_2H formed	HCHO formed
(a)	$HO-CH_2-\underset{\displaystyle OH}{\underset{\vert}{CH}}-CH_2-OH$	2	1	2
(b)	$R-\underset{\displaystyle OH}{\underset{\vert}{CH}}-\underset{\displaystyle OH}{\underset{\vert}{CH}}-\underset{\displaystyle OH}{\underset{\vert}{CH}}-CH_2-OH$	3	2	1
(c)	$HO-CH_2-\underset{\displaystyle OCH_3}{\underset{\vert}{CH}}-CH_2OH$	0	0	0
(d)	$HO-CH_2-\underset{\displaystyle OH}{\underset{\vert}{CH}}-\underset{\displaystyle OCH_3}{\underset{\vert}{CH_2}}$	1	1	1

58. Succinic acid $\xrightarrow{\Delta}(A)\xrightarrow[\Delta]{NH_3}(B)\xrightarrow[KOH]{Br_2}(C)$; Product (*C*) will be :

(a) $\begin{matrix}CH_2-CO_2H\\ \vert\\ CH_2-CH_2-NH_2\end{matrix}$ (b) $\begin{matrix}CH_2-CO_2H\\ \vert\\ CH_2-NH_2\end{matrix}$ (c) $\begin{matrix}CH_2-CO_2^-K^+\\ \vert\\ CH_2-NH_2\end{matrix}$ (d) $\begin{matrix}CH_2-CO_2H\\ \vert\\ CH_2-CH_2-Br\end{matrix}$

59A. Given are the structures of cyclic D-glucoside. Moles of HIO_4 consumed with *X* and *Y* are ..... respectively:



(*X*) (*Y*)

(a) 2, 2 (b) 3, 3
(c) 2, 3 (d) 3, 2

B. Moles of formic acid formed in *X* and *Y* respectively are:

(a) 1, 2 (b) 2, 1
(c) 2, 3 (d) 3, 2

C. Moles of HCHO formed are:

(a) 1, 1 (b) 2, 2
(c) 1, 2 (d) 2, 1

60. In which of the following group, each member gives positive iodoform test ?

(a) methanol, ethanol, propanone (b) ethanol, isopropanal, methanal
(c) ethanol, ethanal, isopropyl alcohol (d) propanal, propanol-2, propanone

61. $H_2O^{18} + Na \longrightarrow \underset{\text{(base)}}{(A)} + (B)$

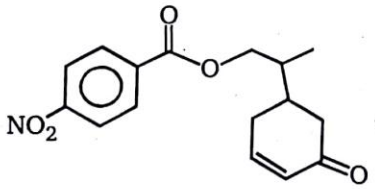
$$CH_3 - \overset{O}{\overset{\|}{C}} - O - CH_2 - CH_3 + (A) \longrightarrow (C) + (D) \text{ alcohol}$$

Product (*C*) of the reactions is:

(a) $CH_3 - \overset{O}{\overset{\|}{C}} - \underset{18}{O} - H$ (b) $CH_3 - \overset{O^{18}}{\overset{\|}{C}} - O - H$

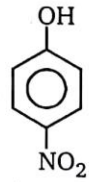
(c) $CH_3 - \overset{O}{\overset{\|}{C}} - \overset{18}{O^-}$ (d) $CH_3 - \overset{O}{\overset{\|}{C}} - O^{\ominus}Na^{\oplus}$

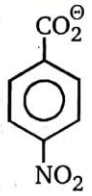
62A.

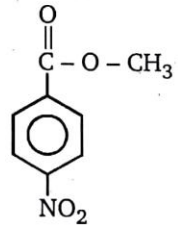


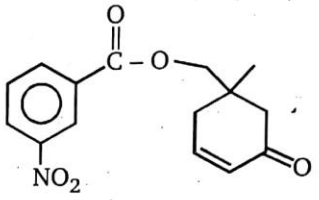
$$\xrightarrow[(Ph_3P)_3\ RhCl]{H_2} (A) \xrightarrow[H_2O\ (Methanol)]{0.1\ M\ NaOH} (B) + \underset{\text{(Contains no nitrogen)}}{(C)}$$

Product (*B*) of the reaction is :

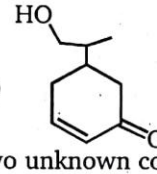
(a) 

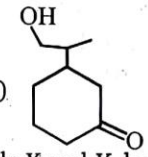
(b) 

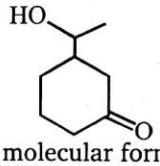
(c) 

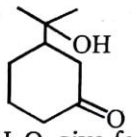
(d) 

B. Product (*C*) of above reaction is :

(a) 

(b) 

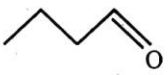
(c) 

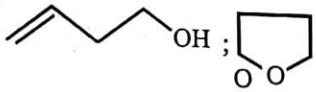
(d) 

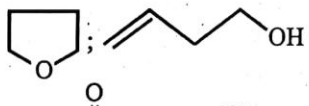
63. Two unknown compounds *X* and *Y*, both having molecular formula C_4H_8O, give following results with four chemical tests.

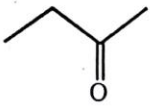
	Bromine	Na metal	Chromic acid	Lucas reagent
Compound *X*	decolourises	bubbles	Orange to Green	No reaction
Compound *Y*	No reaction	No reaction	No reaction	No reaction

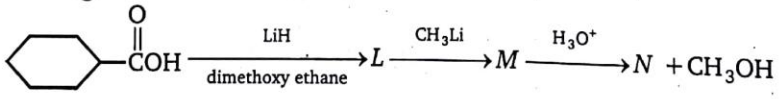
Compound *X* and *Y* respectively are :

(a) $CH_3 - CH_2 - \overset{O}{\overset{\|}{C}} - CH_3$; 

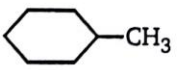
(b) 

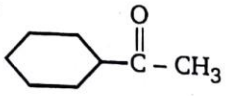
(c) 

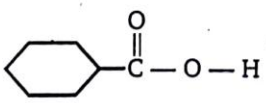
(d) $CH_3 - CH_2 - CH_2 - \overset{O}{\overset{\|}{C}} - H$; 

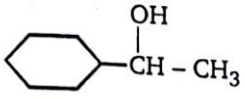
64. 

Product (*N*) is :

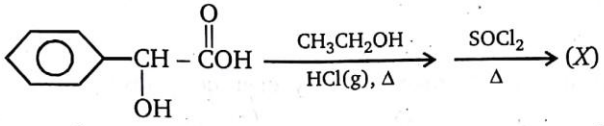
(a) 

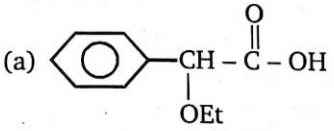
(b) 

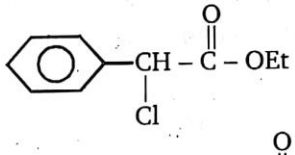
(c) 

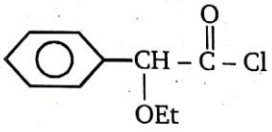
(d) 

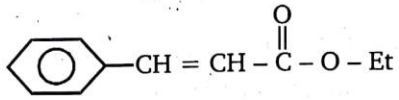
65. Assign the structure of major product (*X*) of the reaction given below.

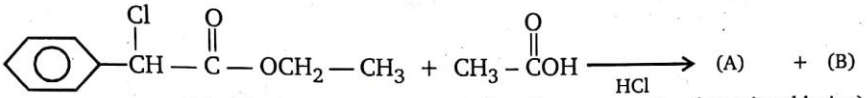


(a) 

(b) 

(c) 

(d) 

66. 

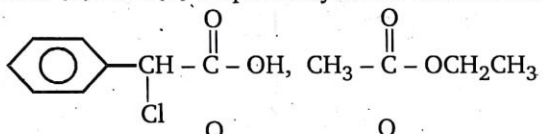
ethyl-2-chloro 2-phenyl acetate (1 mole)

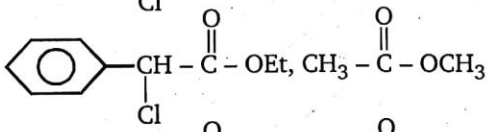
acetic acid (7 mole)

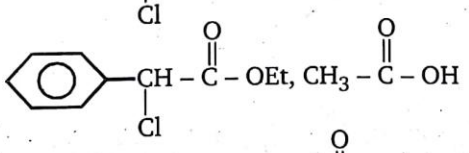
HCl, Δ, 1.5 h

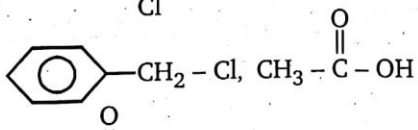
(A) + (B) (contains chlorine)

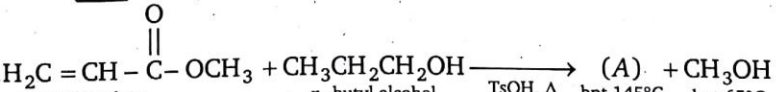
Product (*A*) and (*B*) respectively in the above reaction are :

(a) 

(b) 

(c) 

(d) 

67. 

methylacrylate bpt 81°C

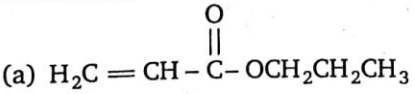
n-butyl alcohol bpt 117°C

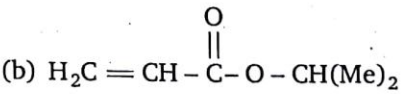
TsOH, Δ

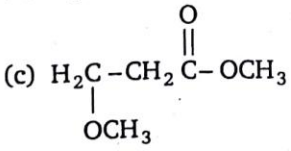
(*A*) bpt,145°C

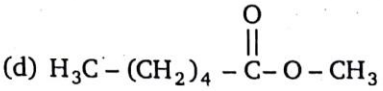
CH_3OH bpt 65°C

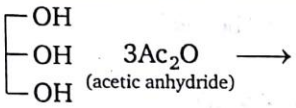
Product (*A*) of above reaction is :

(a) 

(b) 

(c) 

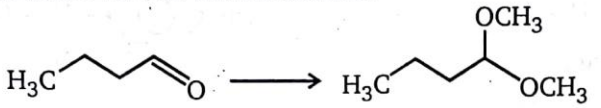
(d) 

68. 

In above reaction molecular formula of glycerol increases by :

(a) $C_4H_4O_2$ (b) $C_6H_6O_6$ (c) $C_6H_6O_2$ (d) $C_6H_6O_3$

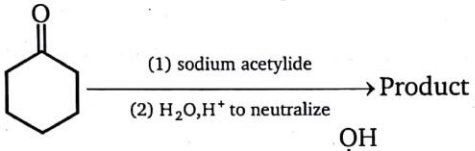
69. Give the best conditions for this transformation:

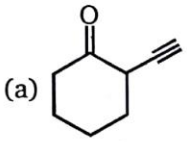


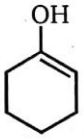
(a) CH_3OH, H^+ (cat.), heat (b) H_2O, H^+ (cat.), heat

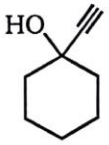
(c) Mg, ether, CH_3OH (d) $SOCl_2, CH_3OH$

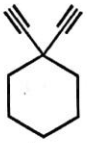
70. Give the major organic product of the following reaction.

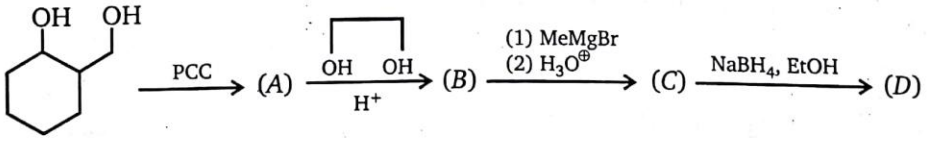


(a) 

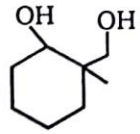
(b) 

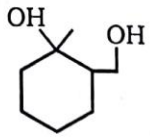
(c) 

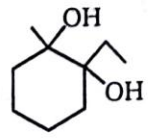
(d) 

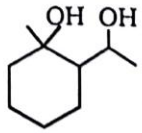
71. 

Product (*D*) in above reaction is :

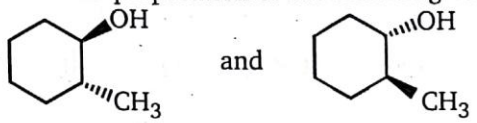
(a) 

(b) 

(c) 

(d) 

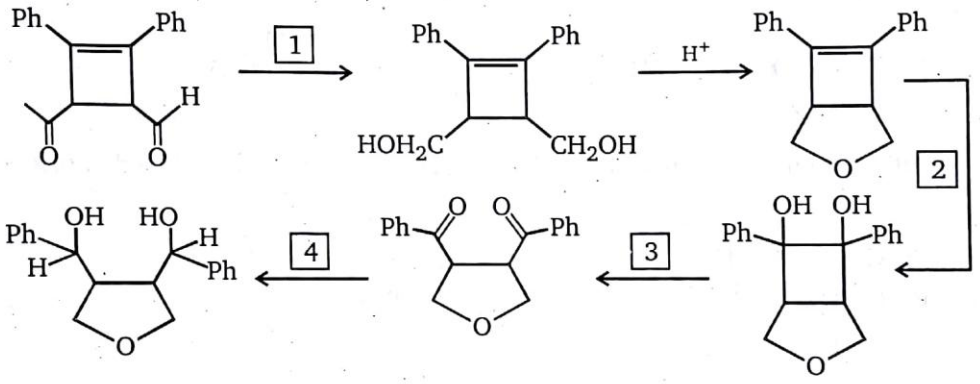
72. Select the best method for the preparation of the following compounds :



(MCPBA = Metachloro per benzoic acid)

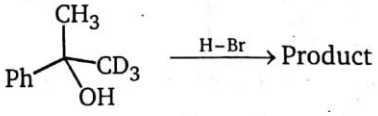
(a) reaction of cyclohexanone with CH_3Li
(b) reaction of 1-methylcyclohexene with $Hg(OAc)_2$ followed by $NaBH_4$
(c) reaction of cyclohexene with BH_3; $NaOH/H_2O_2$, following by CH_3Br
(d) reaction of cyclohexene with MCPBA, followed by CH_3MgBr

73. Identify the reagents (1-4), required for the transformations shown and arrange them in correct order.



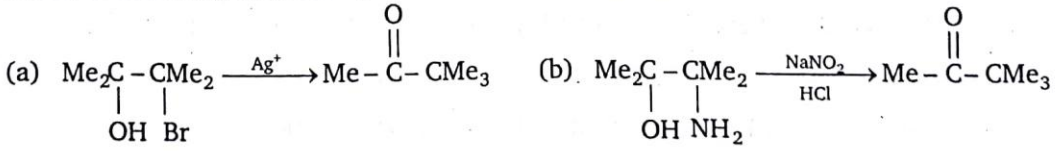
(1) LAH ($LiAlH_4$)
(2) OsO_4
(3) $NaIO_4$
(4) $NaBH_4$
(a) $1 \rightarrow 3 \rightarrow 4 \rightarrow 2$
(b) $2 \rightarrow 3 \rightarrow 1 \rightarrow 4$
(c) $2 \rightarrow 1 \rightarrow 3 \rightarrow 4$
(d) $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$

74. Which describes the best stereochemical aspects of the following reaction ?

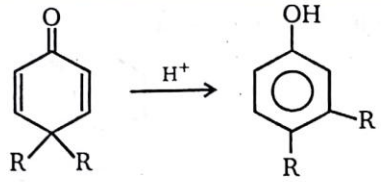


(a) Inversion of configuration occurs at the carbon undergoing substitution.
(b) Retention of configuration occurs at the carbon undergoing substitution.
(c) Racemization (loss of configuration) occurs at the carbon undergoing substitution.
(d) The carbon undergoing substitution is not stereogenic

75. Which of following is an example of Pinacol-Diazotization ?



(c) $Me_2C(OH)-C(OH)Me_2 \xrightarrow{H^{\oplus}} Me-C(=O)-CMe_3$

(d) 

76. $\underset{C_5H_{10}O}{(A)} \xrightarrow{H_3O^{\oplus}} B + C$; (B) and (C) both give +ve iodoform test. Compound (A) is :

(a) $CH_3-CH=CH-O-CH_2-CH_3$

(b) $CH_3-CH(CH_3)-O-CH_2-CH_3$

(c) $CH_3-C(=CH_2)-O-CH_2-CH_3$

(d) both (b) and (c)

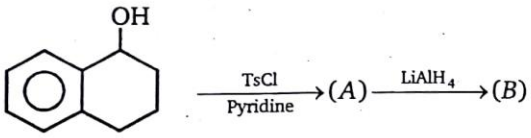
77. A solution of Ph_3CCO_2H in conc. H_2SO_4 gives (X) when poured into methanol X is :

(a) $Ph_3C-C(=O)-O-CH_3$

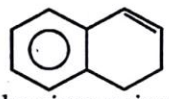
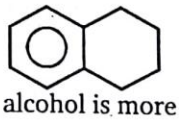
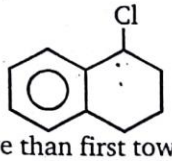
(b) $Ph_2CH-C(=O)-O-CH_3$

(c) Ph_3C-OCH_3

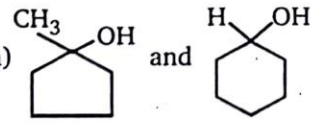
(d) Ph_3C-CH_3

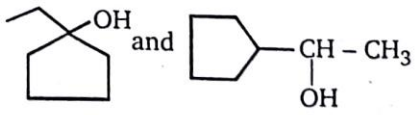
78. 

Product (B) of the above reaction is :

(a)  (b)  (c)  (d) 

79. In the given pair of alcohol, in which pair second alcohol is more reactive than first towards hydrogen bromide?

(a) 

(b) 

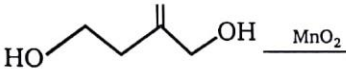
(c) $CH_3-CH(OH)-CH_2-CH_3$ and $CH_3-CH_2-CH(CH_3)-CH_2-OH$

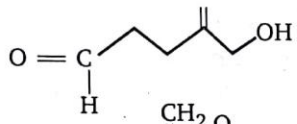
(d) $CH_3-CH(OH)-CH_2-CH_3$ and $(CH_3)_2C(OH)-CH_2-CH_3$

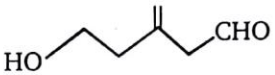
80. Rank the transition states that occur during the following reaction steps in order of increasing stability (least → most stable)

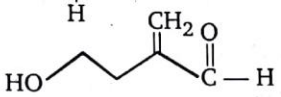
1. $H_3C-\overset{+}{O}H_2 \longrightarrow CH_3^+ + H_2O$
2. $(CH_3)_3C-\overset{+}{O}H_2 \longrightarrow (CH_3)_3C^+ + H_2O$
3. $(CH_3)_2CH-\overset{+}{O}H_2 \longrightarrow (CH_3)_2CH^+ + H_2O$

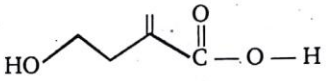
(a) 1 < 2 < 3 (b) 2 < 3 < 1 (c) 1 < 3 < 2 (d) 2 < 1 < 3

81.  (MnO_2) → (*A*), Product (*A*) is :

(a) 

(b) 

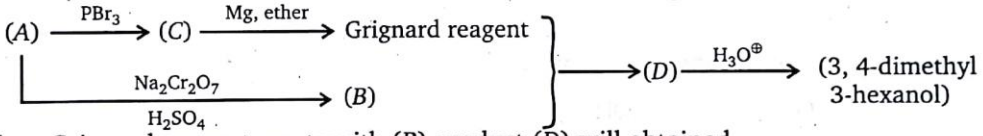
(c) 

(d) 

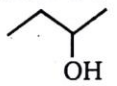
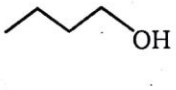
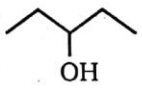
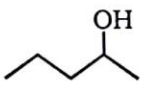
82. In which of the following reactions hydrogen gas will not be evolved ?

(a) $CH_3-CH_2-OH \xrightarrow{Na}$ (b) $CH_3-CH_2-OH \xrightarrow{K}$

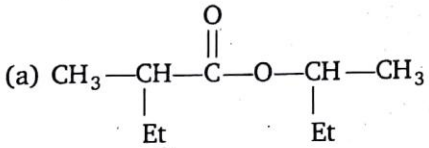
(c) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-OH \xrightarrow{Al}$ (d) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-OH \xrightarrow{CH_3MgBr}$

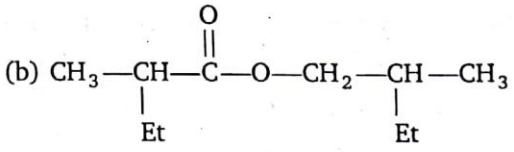
83. 

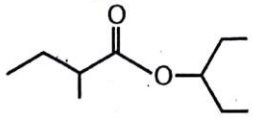
When Grignard reagent reacts with (*B*) product (*D*) will obtained.
Reactant (*A*) of the above reaction is :

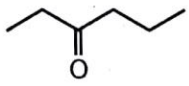
(a)  (b)  (c)  (d) 

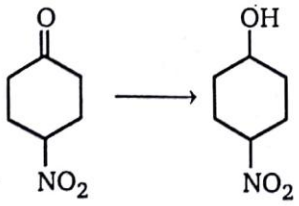
84. (*A*) $\xrightarrow[\text{(Chiral alcohol only)}]{LiAlH_4}$ 2(*B*) ; structure of (*A*) is :

(a) 

(b) 

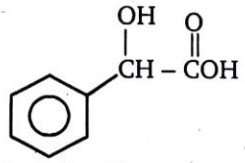
(c) 

(d) 

85. 

Above conversion can be acheived by :

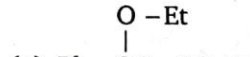
(a) $LiAlH_4$ (b) $NaBH_4$ (c) H_2/Ni (d) CrO_3

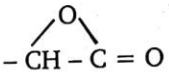
86. 

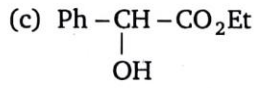
$$+ \text{EtOH} \xrightarrow[\text{HCl}]{} (86\%)$$

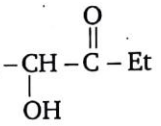
(Mandelic acid)

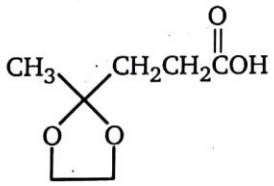
Identify product of above Fischer esterification reaction :

(a) 

(b) 

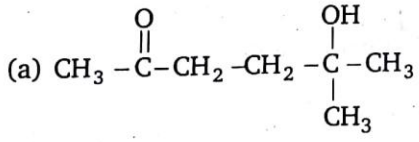
(c) 

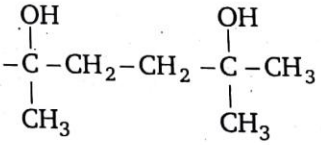
(d) 

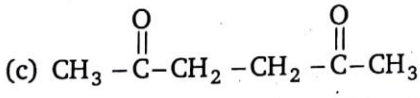
87. 

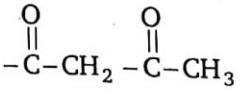
$$\xrightarrow{CH_3Li} (A) \xrightarrow{CH_3Li} (B) \xrightarrow{H_3O^{\oplus}} (C)$$

Product (*C*) of the above reaction is :

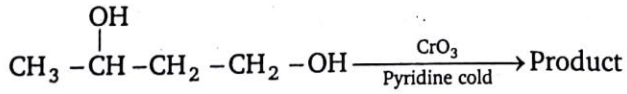
(a) 

(b) 

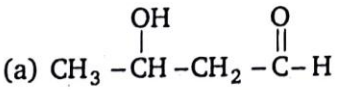
(c) 

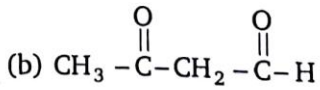
(d) 

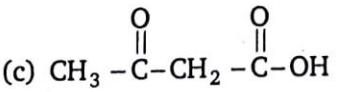
88. What is the major product of the following reaction ?

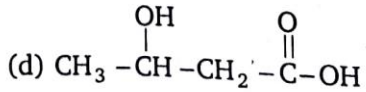


$$\xrightarrow[\text{Pyridine cold}]{CrO_3} \text{Product}$$

(a) 

(b) 

(c) 

(d) 

89. The major reason that phenol is a better Bronsted acid than cyclohexanol is that :

(a) it is a better proton donor.

(b) the cyclohexyl group is an electron donating group by induction, which destabilizes the anion formed in the reaction by resonance.

(c) phenol is able to stabilize the anion formed in the reaction.

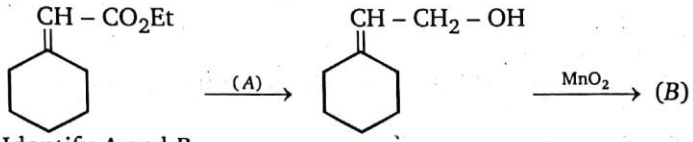
(d) the phenyl group is an electron withdrawing group by induction, which stabilizes the anion formed in the reaction.

90. Which of these reagents would accomplish the following reduction ?

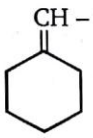
$$N\equiv C-CH_2-\overset{\overset{O}{\|}}{C}-CH_2-CH=CH_2 \longrightarrow N\equiv C-CH_2-\overset{\overset{OH}{|}}{\underset{H}{C}}-CH_2-CH=CH_2$$

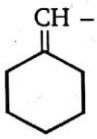
(a) $NaBH_4$ (b) $LiAlH_4$

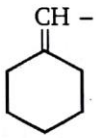
(c) 1 mole H_2, poisoned catalyst, low pressure (d) H_3O^+

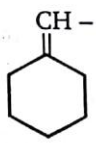
91. 

Identify *A* and *B* :

(a) $A = NaBH_4$, $B =$ 

(b) $A = NaBH_4$, $B =$ 

(c) $A = LiAlH_4$, $B =$ 

(d) $A = LiAlH_4$, $B =$ 

92. $Ph-CH_2-\underset{\underset{OH}{|}}{CH}-CH_3 \xrightarrow{K} \xrightarrow{C_2H_5Br} (A)$

Product (*A*) in above reaction is:

(a) $Ph-CH_2-\underset{\underset{OEt}{|}}{CH}-CH_3$, (inversion) (b) $Ph-CH_2-\underset{\underset{OEt}{|}}{CH}-CH_3$, (retention)

(c) $Ph-CH_2-\underset{\underset{OEt}{|}}{CH}-CH_3$, (racemic) (d) $Ph-CH=CH-CH_3$

93. $Ph-\overset{\overset{O}{\|}}{C}-O-H+CH_3-O^{18}-H \overset{H^+}{\rightleftharpoons} (X)+H_2O$; Identify *X*:

(a) $X = Ph-\overset{\overset{O}{\|}}{C}-O^{18}-CH_3$ (Trans esterification)

(b) $X = Ph-\overset{\overset{O}{\|}}{C}-O^{18}-CH_3$ (Esterification reaction)

(c) $X = Ph-\overset{\overset{O}{\|}}{C}-O^{18}-CH_3$ (Saponification)

(d) $X = Ph-\overset{\overset{O}{\|}}{C}-O-CH_3$ (Hydrolysis)

94. $R-OH + H-O-\overset{\overset{O}{\|}}{C}-C_6H_4-NO_2 \xrightarrow{H^+} R-O-\overset{\overset{O}{\|}}{C}-C_6H_4-NO_2$

Fastest rate of reaction will be when R is :

(a) CH_3- (b) CH_3-CH_2 (c) $CH_3-\underset{\underset{CH_3}{|}}{CH}-$ (d) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-$

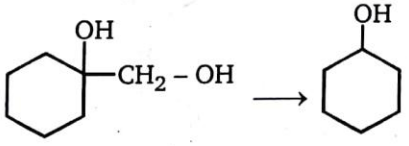
95. Select the correct statement.

(a) Solvolysis of $(CH_3)_2C=CH-CH_2-Cl$ in ethanol is over 6000 times greater than alkyl chloride (25°C)

(b) $CH_3-CH=CH-CH_2-OH$ when reacts with HBr give a mixture of 1-bromo-2-butene and 3-bromo 1-butene

(c) When solution of 3-buten-2-ol in aqueous sulphuric acid is allowed to stand for one week, it was found to contain both 3-buten-2-ol and 2-buten-1-ol

(d) All of these

96.  ; Above transformation can be carried out by :

(a) H^+/Δ, Zn(Hg), HCl (b) $HIO_4, LiAlH_4$

(c) $HIO_4, H^+/\Delta$ (d) H^+/Δ, HIO_4

97. $H_2C=CH-CH_2-CH_2-\underset{\underset{OH}{|}}{CH}-CH_3 \xrightarrow[\text{Pyridine}]{SOCl_2} (A) \xrightarrow[(H_2O)]{O_3/Zn} \underset{C_5H_9ClO}{(B)} \xrightarrow{NaBH_4} (C)$

Compound (C) is :

(a) $CH_3-\underset{\underset{OH}{|}}{CH}-CH_2-\underset{\underset{Cl}{|}}{CH}-CH_3$

(b) $HOCH_2-CH_2-CH_2-CH_2-CH_2-CH_2-Cl$

(c) $HO-CH_2-CH_2-CH_2-\underset{\underset{Cl}{|}}{CH}-CH_3$

(d) $HO-CH_2-CH_2-\underset{\underset{Cl}{|}}{CH}-CH_2-CH_3$

98. Iodoform can be obtained on warming NaOH and iodine with :

(a) $CH_3CH_2CH(OH)CH_3$

(b) $(CH_3)_2CHC(=O)C_2H_5$

(c) $CH_3-C(=O)-OCH_3$

(d) $(CH_3)_2CHCH_2OH$

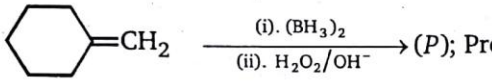
99. Which of these is a reducing agent ?

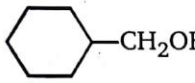
(a) CrO_3/H^+

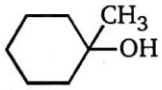
(b) $KMnO_4$

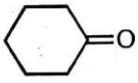
(c) $LiAlH_4$

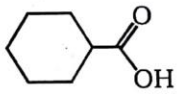
(d) O_3

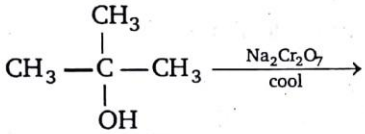
100.  ; Product (*P*) in the reaction is:

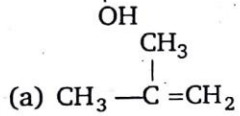
(a) 

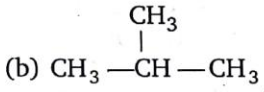
(b) 

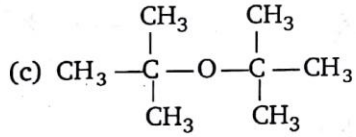
(c) 

(d) 

101.  ; Product (*P*) in the reaction is:

(a) 

(b) 

(c) 

(d) No reaction

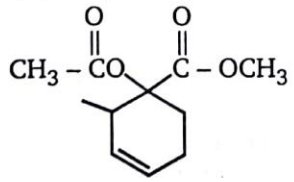
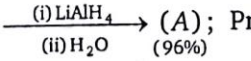
102. 1, 2, 3 – butanetriol undergoes oxidative cleavage of HIO_4. During this process

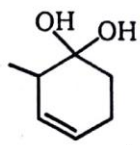
(a) 1 equivalent of HIO_4 consumed & HCO_2H & $H_3C-C(=O)-CO_2H$ are formed

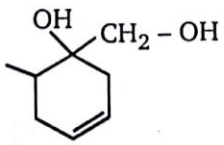
(b) 2 equivalents of HIO_4 consumed & HCO_2H, $HCH=O$ & $CH_3-CH=O$ are formed

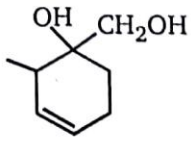
(c) 3 equivalents of HIO_4 consumed & HCO_2H (2 eq.) & 1 eq. of CH_3CO_2H are formed

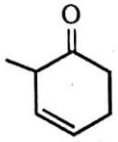
(d) 2 equivalents of HIO_4 consumed & 2 eq. of HCO_2H & 1 eq. of $CH_3CH=O$ is formed

103.   ; Product (*A*) of the reaction is :

(a) 

(b) 

(c) 

(d) 

104. $R-\overset{O}{\overset{\|}{C}}-O-R'+R''OH \overset{H^{\oplus}}{\rightleftharpoons} R-\overset{O}{\overset{\|}{C}}-O-R''+R'OH$

Above reaction is/an example of :

(a) esterification (b) saponification

(c) *trans*-esterification (d) hydrolysis

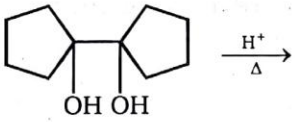
105. What is the major organic product of the following sequence of reactions ?

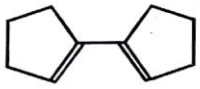
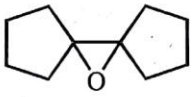
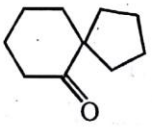
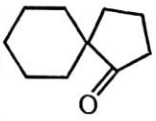
$(CH_3)_2CHCH_2OH \xrightarrow{PBr_3} \xrightarrow{Mg} \xrightarrow{H_2C-CH_2\ (O)} \xrightarrow{H_3O^+} ?$

(a) $(CH_3)_2\underset{OH}{C}HCH_2CH_3$ (b) $(CH_3)_2CHCH_2CH_2OH$

(c) $(CH_3)_2CHCH_2\underset{OH}{C}HCH_3$ (d) $(CH_3)_2CHCH_2CH_2CH_2OH$

106. The structure of the product formed in the reaction given below is :



(a)  (b)  (c)  (d) 

107. $\underset{\underset{CH_2-OH}{|}}{\overset{CHO}{|}}{CH-OH} \xrightarrow{2HIO_4}$ Products obtained in the above reaction are :

(a) $HCHO, HCO_2H$ (b) $HCHO, 2HCO_2H$

(c) $CO_2, 2HCO_2H$ (d) $CO_2, HCHO, HCO_2H$

108. $\underset{\underset{CH_2-OH}{|}}{\overset{CHO}{|}}{(CH-OH)_3} + 4HIO_4 \longrightarrow$ Products obtained are :

Aldo pentose

(a) $4HCO_2H, HCHO$ (b) $4CH_2O, HCO_2H$

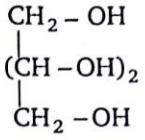
(c) $CO_2, 4HCHO$ (d) $CO_2, 3HCO_2H, HCHO$

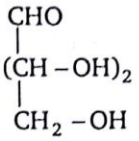
109. (i) $\underset{\underset{CH_2-OH}{|}}{\overset{CHO}{|}}{(CH-OH)_3} \xrightarrow{4HIO_4}$ Product (ii) $\underset{\underset{CH_2-OH}{|}}{\overset{CH_2OH}{|}}{(CH-OH)_4} \xrightarrow{5HIO_4}$ Product

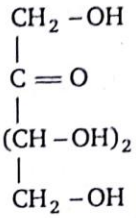
Ratio of moles of formic acid obtained in reaction (i) and reaction (ii) is :

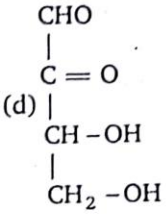
(a) 3/4 (b) 4/5 (c) 1 (d) 5/4

110. Which of the following compound gives $2HCHO, CO_2, HCO_2H$ when oxidised by periodic acid?

(a) 

(b) 

(c) 

(d) 

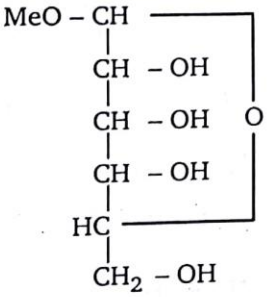
111. Hydration of 3-phenylbut-1-ene in dil. H_2SO_4 will give mainly :

(a) 3-Phenylbutan-1-ol (b) 3-Phenylbutan-2-ol

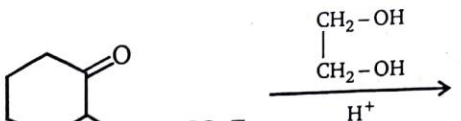
(c) 2-Phenylbutan-2-ol (d) 2-Phenylbutan-1-ol

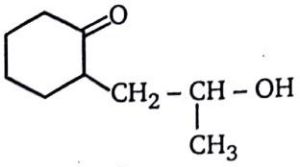
112. Decarboxylation of sodium salicylate with soda lime forms :

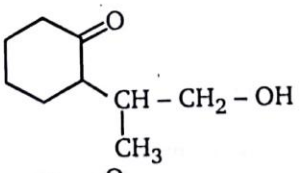
(a) Salicylic acid (b) Phenol (c) Benzene (d) None of these

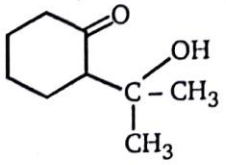
113.  What is the maximum value of (x) ?

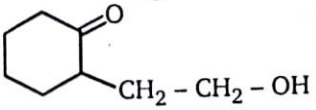
(a) 1 (b) 2 (c) 3 (d) 4

114.  Product C is :

(a) 

(b) 

(c) 

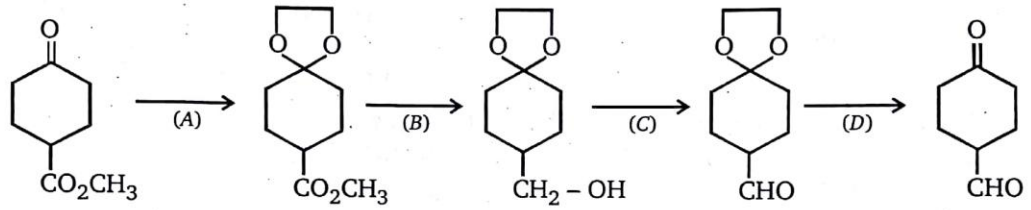
(d) 

115. $(A) + \underset{\underset{CH_2-OH}{|}}{CH_2-OH} \xrightarrow{\text{Pyridine}} \underset{\underset{CH_2-O}{|}}{CH_2-O}\!\!>\!C=O$;

Reactant A of the above reaction is :

(a) $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$ (b) $COCl_2$ (c) $CH_3-\overset{\overset{O}{\|}}{C}-Cl$ (d) $CH_3-\overset{\overset{O}{\|}}{C}-OEt$

116.



Identify correct combination :

(a) $(A) = \underset{\underset{CH_2-SH}{|}}{CH_2-OH}$ (b) $(B) = NaBH_4$ (c) $(C) = KMnO_4$ (d) $(D) = H_3O^{\oplus}$

117. In the Libermann's nitroso reaction, sequential changes in the colour of phenol occurs as :

(a) Brown or red ⟶ green ⟶ deep blue (b) Red ⟶ deep blue ⟶ green

(c) Red ⟶ green ⟶ white (d) White ⟶ red ⟶ green

118. Ethanol when reacts with PCl_5 gives A, $POCl_3$ and HCl. A reacts with dry Ag_2O to form B(major product) and AgCl. A and B respectively are :

(a) C_2H_5Cl and $C_2H_5OC_2H_5$ (b) C_2H_4 and $C_2H_5OC_2H_5$

(c) C_2H_6 and $C_2H_5OC_2H_5$ (d) C_2H_6 and $C_2H_5NO_2$

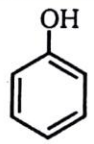
119. $CH_3-(CH_2)_3-OH \xrightarrow[ET_3N]{CH_3-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-Cl} (A) \xrightarrow{KC^{14}N} (B) \xrightarrow{H_3O^{\oplus}} (C)$

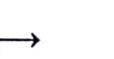
Product (C) is :

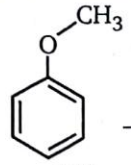
(a) $CH_3-(CH_2)_3-CO_2H$ (b) $CH_3-(CH_2)_3-{}^{14}CO_2H$

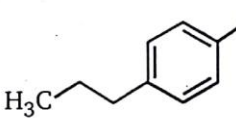
(c) CH_3-CO_2H (d) $CH_3-\overset{\overset{O}{\|}}{\underset{14}{C}}-O-H$

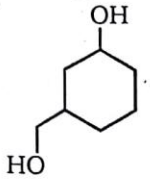
120. Choose the best synthesis of phenyl n-propyl ether.

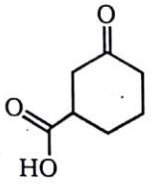
(a)  $\xrightarrow[\text{2. } CH_3CH_2CH_2Br/\text{ polar,aprotic solvent}]{\text{1. Na metal}}$

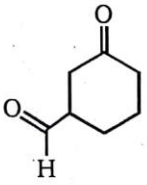
(b)  $\xrightarrow[\text{2. Ph–Br}]{\text{1. Na metal}}$

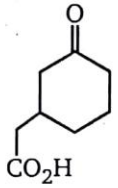
(c)  $\xrightarrow[2.\ CH_3CH_2-Br]{1.\ Na\ metal}$

(d)  $\xrightarrow[2.\ HBr]{1.\ Na\ metal}$

121.  $\xrightarrow{Na_2Cr_2O_7/H_2SO_4}$ The product obtained is :

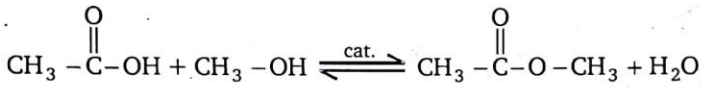
(a) 

(b) 

(c) 

(d) None of these

122. What is true for the equilibrium reaction ?



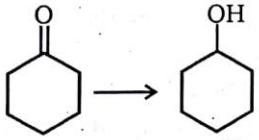
(a) The use of equimolar quantities of CH_3OH and CH_3COOH will give the greatest yield of the ester at equilibrium

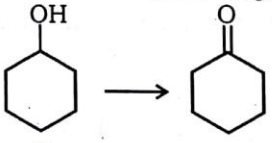
(b) Removal of water will increase the amount of ester at equilibrium

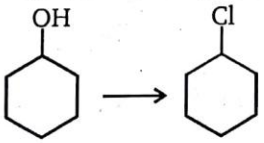
(c) Addition of CH_3COOCH_3 will cause the formation of equal an equal number of moles of water

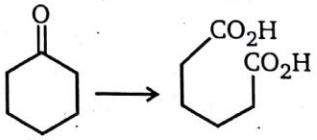
(d) Application of pressure increases the amount of ester at equilibrium

123. PCC (Pyridinium chloro chromate) is a good reagent for which of the following transformations ?

(a) 

(b) 

(c) 

(d) 

124. How many primary alcohols (including stereoisomers) are possible with formula $C_5H_{12}O$?

(a) Two (b) Three

(c) Four (d) Five

125. 1-Phenylethanol can be prepared by the reaction of benzaldehyde with the product obtained in the reaction between:

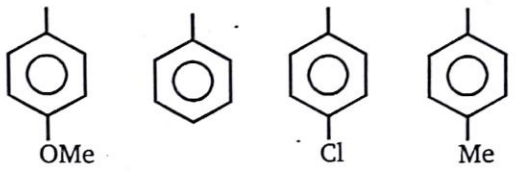
(a) CH_3I and Mg (b) C_2H_5I and Mg

(c) CH_3Br and $AlCl_3$ (d) CH_3OH and $ZnCl_2$

126. 0.092 g of a compound with the molecular formula $C_3H_8O_3$ on reaction with an excess of CH_3MgI gives 67.00 mL of methane at STP. The number of active hydrogen atoms present in a molecule of the compound is :

(a) one (b) two
(c) three (d) four

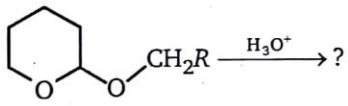
127. Migratory aptitude of the following in decreasing order is :

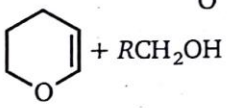


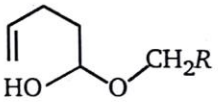
(a) (b) (c) (d)

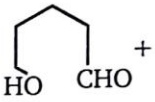
(a) a > c > b > d (b) a > d > b > c
(c) a > d > c > b (d) b > c > a > b

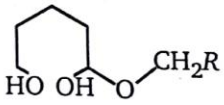
128. The major product formed in the reaction is :



(a)  + RCH_2OH

(b) 

(c)  + RCH_2OH

(d) 

129. Reaction of *R*-2-butanol with *p*-toluenesulphonyl chloride in pyridine then LiBr gives :

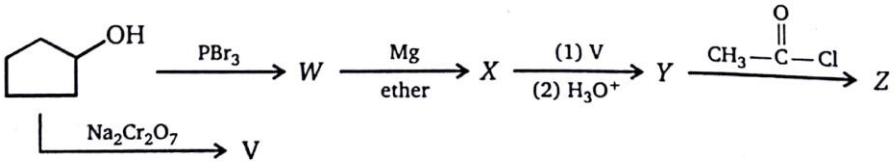
(a) *R*-2-butyl bromide (b) *S*-2-butyl tosylate
(c) *R*-2-butyl tosylate (d) *S*-2-butyl bromide

130. Optically active 2-octanol rapidly loses its optical activity when exposed to :

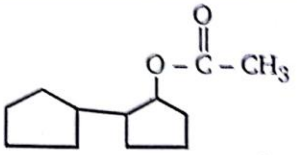
(a) dilute acid (b) dilute base (c) light (d) humidity

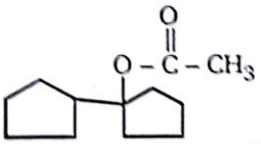
131. If (±) 2-methyl butanoic acid were esterified by reaction with (±) 2-butanol, how many optically active compounds would be present in the final equilibrium reaction mixture ?

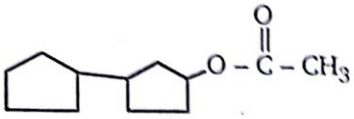
(a) 2 (b) 3 (c) 4 (d) 6

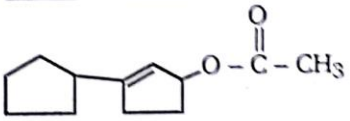
132. 

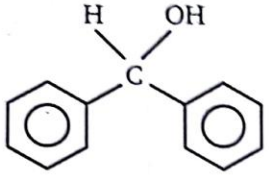
Product *Z* of above reaction is :

(a) 

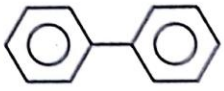
(b) 

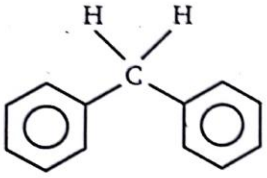
(c) 

(d) 

133.  $\xrightarrow[AlCl_3]{LiAlH_4}$ *(A)* ; Identify the product :

(a) No reaction

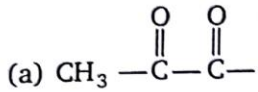
(b) 

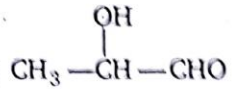
(c) 

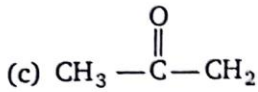
(d) 

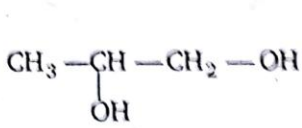
134. $(EtO)_2CHCHO + CH_3MgI \xrightarrow{H_3O^{\oplus}} (A)$

Product obtained in the above reaction is :

(a) 

(b) 

(c) 

(d) 

135. **Reaction - (1):** $CH_3 - CH = CH - CH_3 \xrightarrow[Cold]{KMnO_4} (A) \xrightarrow{NaIO_4} (B)$ 2 mole

Reaction - (2): $CH_3 - CH = CH - CH_3 \xrightarrow{KMnO_4/NaIO_4} (C)$ 2 mole

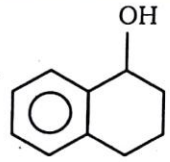
Product (*B*) and (*C*) respectively are :

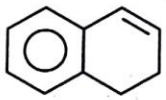
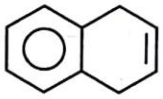
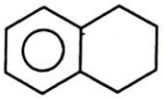
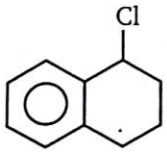
(a) CH_3CHO, CH_3CO_2H

(b) CH_3CO_2H, CH_3CHO

(c) CH_3CHO in both reaction

(d) CH_3CO_2H in both reaction

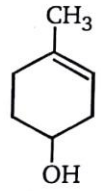
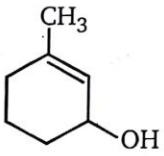
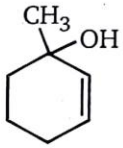
136.  $\xrightarrow[\text{Pyridine, 25°C}]{\text{TsCl}}$ A $\xrightarrow[\text{Pyridine, 25°C}]{LiAlH_4}$ B ; Product (B) is :

(a)  (b)  (c)  (d) 

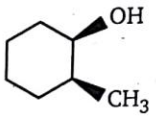
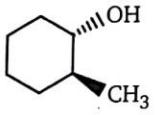
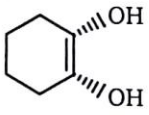
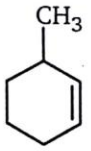
137.  $\longrightarrow$ $HO-(CH_2)_6-OH$, this conversion can be achieved by

(a) O_3, Zn, then $LiAlH_4$ (b) O_3/H_2O_2, then $LiAlH_4$
(c) cold dil. $KMnO_4$, HIO_4, then $LiAlH_4$ (d) All of these

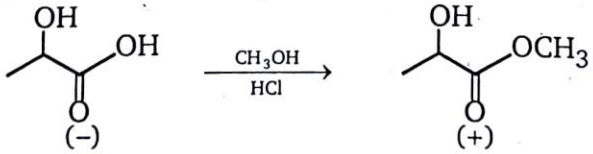
138. Which of the following alcohol on treatment with HCl give 3-chloro-3-methyl cyclohexene as a product ?

(a)  (b)  (c)  (d) All of these

139.  $\xrightarrow[\text{(b) } CH_3MgBr \text{ (c) } H^+, H_2O]{\text{(a) } RCO_3H}$ (A); Product of the reaction is :

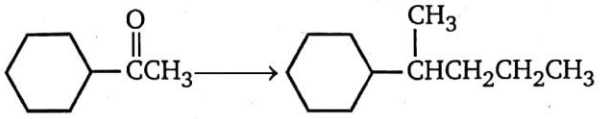
(a)  (b)  (c)  (d) 

140. Esterification (shown below) is a reaction converting a carboxylic acid to its ester. It involves only the carbonyl carbon. Esterification of (–) -lactic acid with methanol yields (+)-methyl lactate. Assuming that there are no side reactions, what is true about this reaction ?



(a) An S_{N^2} process has occurred, inverting the absolute configuration of the chiral center
(b) An S_{N^1} reaction at the chiral center has inverted the optical rotation
(c) A diastereomer has been produced; diastereomers have different physical properties including optical rotation
(d) Optical rotation is not directly related to absolute configuration, so the change in sign of rotation is merely a coincidence

141. Which of the following sets of reagents, used in the order shown, would successfully accomplish the conversion shown ?

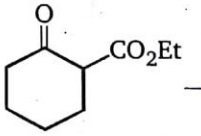


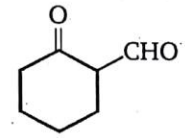
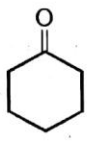
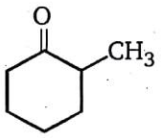
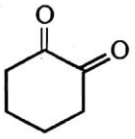
(a) $CH_3CH_2CH_2MgBr$; H_3O^+; PCC, CH_2Cl_2

(b) $CH_3CH_2CH_2MgBr$; H_3O^+; H_2SO_4, heat PCC, CH_2Cl_2

(c) $(C_6H_5)_3\overset{+}{P}-\overset{-}{\ddot{C}}HCH_2CH_3, B_2H_6$; CH_3CO_2H

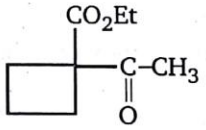
(d) $(C_6H_5)_3\overset{+}{P}-\overset{-}{\ddot{C}}HCH_2CH_3$; H_2O

142.  $\xrightarrow[(2)\,\Delta]{(1)\ H_3O^+}$ Product ; Product of the reaction is :

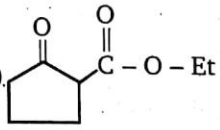
(a)  (b)  (c)  (d) 

143. Which of the following compound on hydrolysis followed by heating gives a product, which gives positive iodoform test?

(a) $CH_3-\underset{\underset{CO_2Et}{|}}{CH}-\overset{\overset{O}{\|}}{C}-CH_2-CH_3$

(b) 

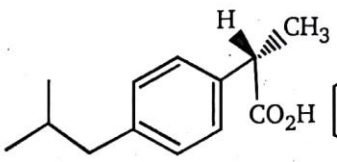
(c) $CH_3-\underset{\underset{CO_2Et}{|}}{CH}-CO_2Et$

(d) 

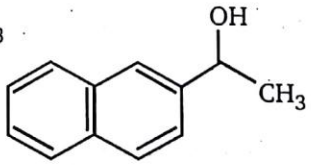
144. Treatment of a 2° OH with CrO_3/H_2SO_4 yields an/a :

(a) aldehyde (b) carboxylic acid (c) ester (d) ketone

145. Esterification of the acid **P** with the alcohols **Q** will give :



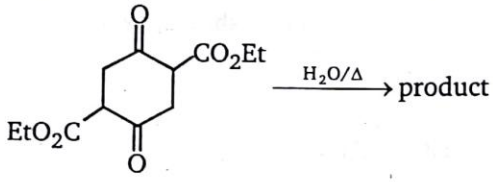
(S)-P



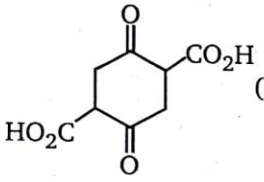
(±)-Q

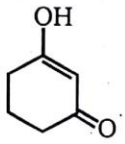
(a) only one enantiomer (b) a mixture of diastereomers

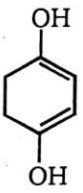
(c) a mixture of enantiomers (d) only one diastereomer

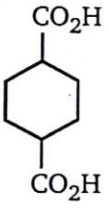
146. 

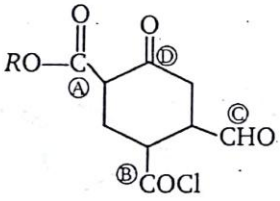
Identify major product of the reaction, when the given compound is hydrolysed and heated strongly:

(a) 

(b) 

(c) 

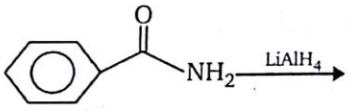
(d) 

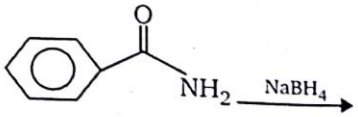
147. 

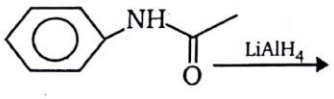
find out the reactivity order with $LiAlH_4$:

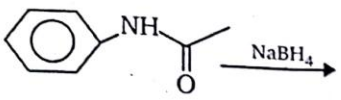
(a) $A > B > C > D$ (b) $B > C > D > A$
(c) $D > C > B > A$ (d) $B > D > C > A$

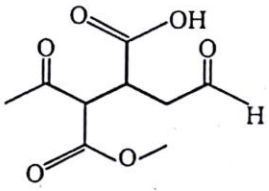
148. Find out the reaction in which obtained product give positive isocyanide test:

(a) 

(b) 

(c) 

(d) 

149. 

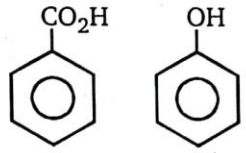
In the above given compound how many functional group reduced by LAH (Lithium aluminium hydride) and SBH (sodium borohydride) respectively ?

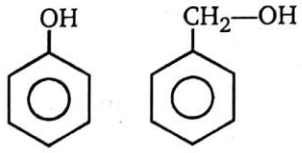
(a) 4, 4 (b) 4, 3 (c) 3, 4 (d) 4, 2

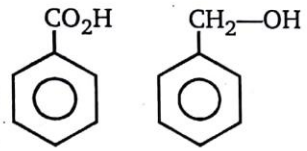
150. An unknown compound (A) (molarmass = 180) on acylation gives a product (molar mass = 390) than find the number of hydroxyl group present in compound (A).

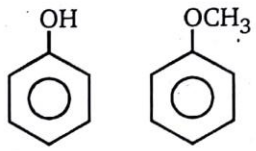
(a) 5 (b) 6 (c) 10 (d) 1

151. Which of the following compound is differentiated by $NaHCO_3$ as well as by NaOH ?

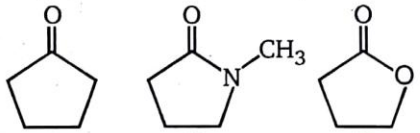
(a) 

(b) 

(c) 

(d) 

152. Arrange the following compounds in order of their reactivity toward $LiAlH_4$.

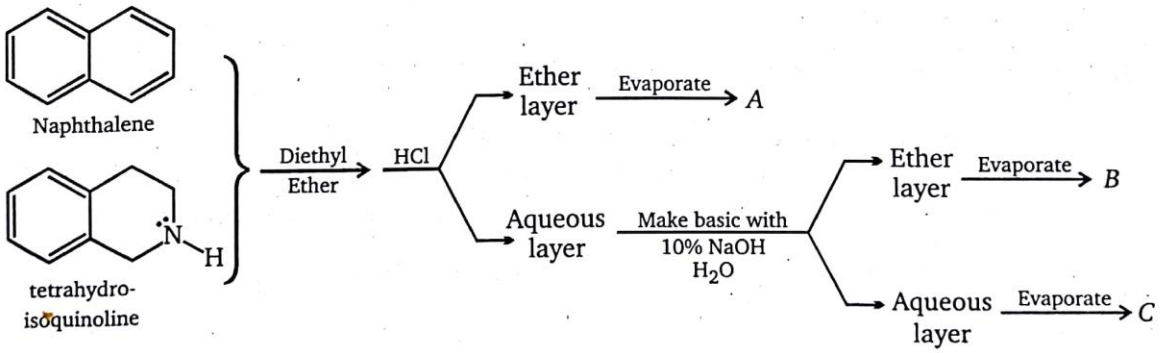


i ii iii

(a) i < ii < iii (b) i < iii < ii

(c) ii < i < iii (d) ii < iii < i

153. Choose the statement that is true about *A*, *B* and *C* in the following separation scheme.

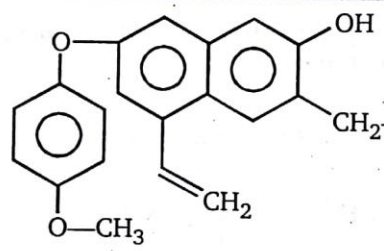


(a) *A* = tetrahydroisoquinoline, *B* = naphthalene and *C* = inorganic ions such as Na^+ and Cl^-

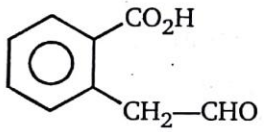
(b) *A* = naphthalene, *B* = tetrahydroisoquinoline and *C* = inorganic ions such as Na^+ and Cl^-

(c) *A* = inorganic ions such as Na^+ and Cl^-, *B* = naphthalene and *C* = tetrahydroisoquinoline

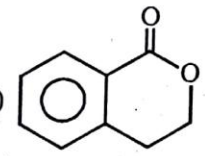
(d) *A* = inorganic ions such as Na^+ and Cl^-, *B* = naphthalene and *C* = tetrahydroisoquinoline

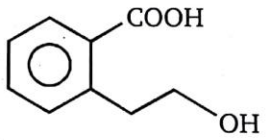
154.  $\xrightarrow{x\text{HI}}$ value of x is :

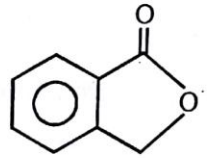
(a) 2 (b) 3 (c) 4 (d) 5

155.  $\xrightarrow{NaBH_4}$ (A) $\xrightarrow[\Delta]{H^{\oplus}}$ (B) Cyclic

Compound (B) is :

(a) 

(b) 

(c) 

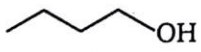
(d) (a) and (c) both

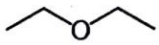
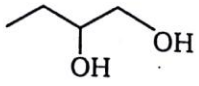
156. 1-Phenoxypropane is treated with excess of conc. HI at 0°C and the mixture of products is treated with thionyl chloride. The products formed are

(a) n-propanol + Chlorobenzene (b) Phenol + n-propyl iodide

(c) n-propyl chloride + Chlorobenzene (d) n-propyl chloride + Phenol

157. Amongst the following compounds, the compound having the lowest boiling point is

(a)  (b) 

(c)  (d) 

ANSWERS — LEVEL 1

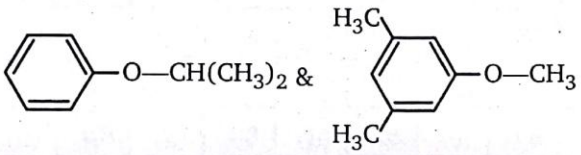
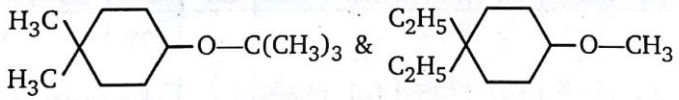
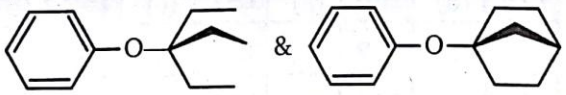
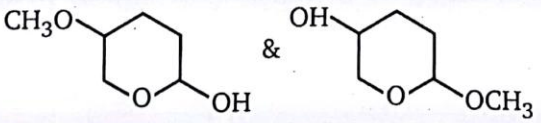
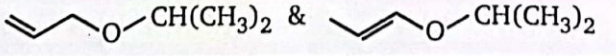
1.	(c)	**2.**	(a)	**3.**	(b)	**4.**	(c)	**5.**	(b)	**6.**	(b)	**7.**	(b)	**8.**	(a)
9.	(b)	**10.**	(b)	**11.**	(b)	**12.**	(b)	**13.**	(a)	**14.**	(a)	**15.**	(a)	**16.**	(a)
17.	(d)	**18.**	(a)	**19.**	(b)	**20.**	(a)	**21.**	(a)	**22.**	(a)	**23.**	(d)	**24.**	(a)
25.	(b)	**26.**	(b)	**27.**	(b)	**28.**	(b)	**29.**	(c)	**30.**	(c)	**31.**	(b)	**32.**	(b)
33.	(a)	**34.**	(b)	**35.**	(b)	**36.**	(c)	**37.**	(c)	**38.**	(c)	**39.**	(d)	**40.**	(c)
41.	(b)	**42.**	(b)	**43.**	(d)	**44.**	(d)	**45.**	(b)	**46.**	(a)	**47.**	(b)	**48.**	(b)
49.	(a)	**50.**	(b)	**51.**	(a)	**52.**	(c)	**53.**	(c)	**54.**	(c)	**55.**	(b)	**56.**	(a)
57.	(d)	**58.**	(c)	**59.**	A-d	**59.**	B-b	**59.**	C-a	**60.**	(c)	**61.**	(c)	**62.**	A-b
62.	B-b	**63.**	(b)	**64.**	(c)	**65.**	(b)	**66.**	(a)	**67.**	(a)	**68.**	(d)	**69.**	(a)
70.	(c)	**71.**	(b)	**72.**	(d)	**73.**	(d)	**74.**	(c)	**75.**	(b)	**76.**	(d)	**77.**	(c)
78.	(c)	**79.**	(d)	**80.**	(c)	**81.**	(c)	**82.**	(d)	**83.**	(a)	**84.**	(b)	**85.**	(b)
86.	(c)	**87.**	(c)	**88.**	(b)	**89.**	(d)	**90.**	(a)	**91.**	(c)	**92.**	(b)	**93.**	(b)
94.	(a)	**95.**	(d)	**96.**	(b)	**97.**	(c)	**98.**	(a)	**99.**	(c)	**100.**	(a)	**101.**	(d)
102.	(b)	**103.**	(c)	**104.**	(c)	**105.**	(d)	**106.**	(c)	**107.**	(b)	**108.**	(a)	**109.**	(c)
110.	(d)	**111.**	(c)	**112.**	(b)	**113.**	(b)	**114.**	(b)	**115.**	(b)	**116.**	(d)	**117.**	(b)
118.	(a)	**119.**	(b)	**120.**	(a)	**121.**	(a)	**122.**	(b)	**123.**	(b)	**124.**	(d)	**125.**	(a)
126.	(c)	**127.**	(b)	**128.**	(c)	**129.**	(d)	**130.**	(a)	**131.**	(c)	**132.**	(b)	**133.**	(c)
134.	(b)	**135.**	(a)	**136.**	(c)	**137.**	(d)	**138.**	(d)	**139.**	(b)	**140.**	(d)	**141.**	(c)
142.	(b)	**143.**	(b)	**144.**	(d)	**145.**	(b)	**146.**	(c)	**147.**	(b)	**148.**	(a)	**149.**	(d)
150.	(a)	**151.**	(c)	**152.**	(d)	**153.**	(b)	**154.**	(b)	**155.**	(a)	**156.**	(b)	**157.**	(c)

LEVEL-2

1. Consider the pairs of ethers, numbered I through V, shown below. To the right of each pair is a description of reaction conditions to be applied to each. One compound of the pair will react more rapidly than the other.

Which ether of the two will be more rapidly cleaved?

Write your answer in box.

	(A) Ether Pairs (B)	Cleavage Conditions
I.		Treated with HBr in CH_3CN, 40°C
II.		Treated with H_2SO_4 in CH_3CN, 40°C
III.		Treated with H_2SO_4 in CH_3CN, 40°C
IV.		Treated with 5% aqueous H_2SO_4, 25°C
V.		Treated with 5% aqueous H_2SO_4, 25°C

2. Comprehension

(a) $CH_3-CH_2-CH_2-CH_2-CH_2-OH$

(b) $CH_3-CH_2-CH_2-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_3$

(c) $CH_3-CH_2-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_2-CH_3$

(d) $CH_3-CH_2-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-OH$

(e) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-CH_2-OH$

(f) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_3$

(g) $HO-CH_2-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-CH_3$

(h) $CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-CH_2-OH$

Above compounds (a) to (h) are isomers of $C_5H_{12}O$.

Based on the above isomer answer the following (A to F).

A. Which isomer is most reactive towards dehydration by conc. H_2SO_4?

B. Which isomer will undergo rearrangement when treated with conc. H_2SO_4?

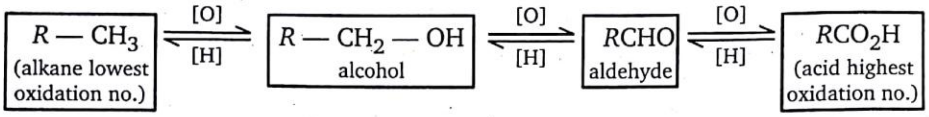
C. Which isomers on dehydration with conc. H_2SO_4 give alkene which is capable to show geometrical isomerism ?

D. Which isomer is least acidic ?

E. Which isomers on dehydration give most stable alkene ?

F. Which isomer on dehydration with conc. H_3PO_4 undergo maximum rearrangement ?

3. Comprehension



[O] = Oxidation [H] = Reduction

Consider the above sequence and answer *A* to *F*.

A. Conversion ($CH_3-CH_3 \longrightarrow CH_3-CH_2-OH$) alkane $\longrightarrow$ alcohol is achieved by:

(a) $Br_2/h\nu$, alc. KOH (b) $Br_2/h\nu$, aq. KOH
(c) Br_2/CCl_4, $LiAlH_4$ (d) Br_2/CCl_4, $NaBH_4$

B. Conversion $R-CH_2-OH \longrightarrow R-CHO$ can be done by:

(a) PCC/CH_2Cl_2 (b) Cu, 300°C
(c) CrO_3 (d) All of these

C. Conversion $R-CHO \longrightarrow R-CO_2H$ can be done by:

(a) $KMnO_4$ (b) H_2CrO_4
(c) $K_2Cr_2O_7$ (d) All of these

D. Conversion $R-CO_2H \longrightarrow R-CHO$ can be done by:

(a) $LiAlH_4$ (b) $NaBH_4$
(c) DIBAL – H (d) All of these

E. Conversion $R-CHO \longrightarrow R-CH_2-OH$ can be done by:

(a) $LiAlH_4$ (b) $NaBH_4$
(c) H_2/Ni (d) All of these

F. Reduction $R-CH_2-OH \longrightarrow R-CH_3$ can be done by:

(a) $LiAlH_4$ (b) $NaBH_4-AlCl_3$
(c) H_2-Ni (d) Red P + HI

4. Which of the following is true for 3-methylbutanal ?

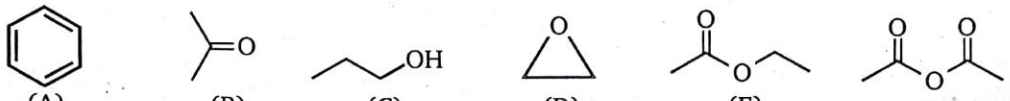
a.	This compound may be classified as an aldehyde.	
b.	This compound may be classified as a ketone	
c.	An aldol reaction takes place on treatment with NaOH solution.	
d.	There is no reaction with $LiAlH_4$ in ether solution.	
e.	An excess of CH_3MgBr in ether reacts to give 4-methyl-2-pentanol.	
f.	Wolff-Kishner reduction gives butane.	
g.	This compound is an isomer of 3-pentanone.	

5. This problem is an introduction to the planning of multistep syntheses.

For use, you have six reactant compounds (**A** through **F**) ; and eight reagents (**1** through **8**), shown below.

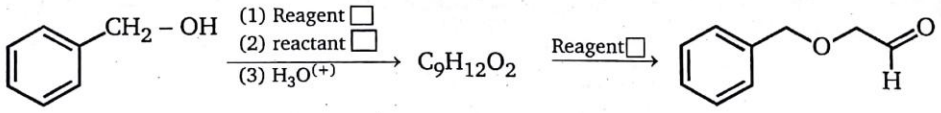
Following these lists, five multistep syntheses are outlined. For each of these, certain reactants or reagents must be identified by writing an appropriate letter or number in designated answer boxes. Write a single letter or number, indicating your choice of the best reactant or reagent, in each answer box.

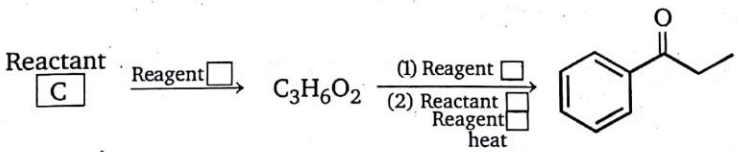
Reactant Compounds :

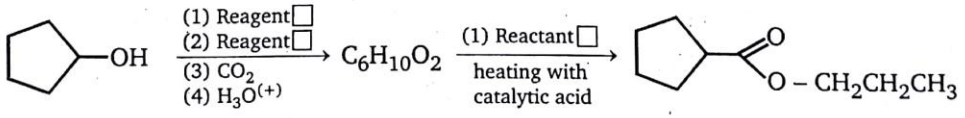


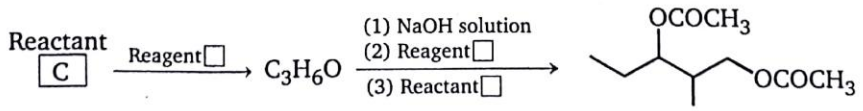
Reagents :

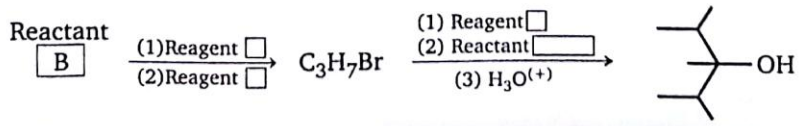
(1) Jones' reagent [$Na_2Cr_2O_7$ in H_3O^+]
(2) PCC [CrO_3 in pyridine + HCl]
(3) Sodium hydride NaH
(4) Sodium borohydride $NaBH_4$
(5) Thionyl chloride $SOCl_2$
(6) Phosphorus tribromide PBr_3
(7) Aluminium trichloride $AlCl_3$
(8) Magnesium turnings in ether

1. 

2. 

3. 

4. 

5. 

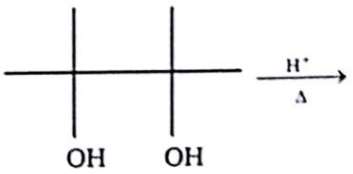
6. Which of the following is true for 3-methyl-2-butanone?

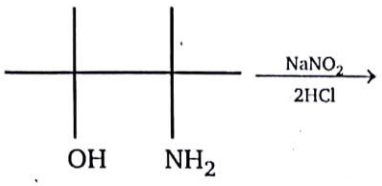
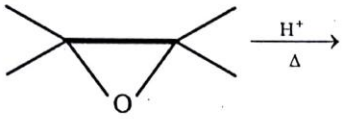
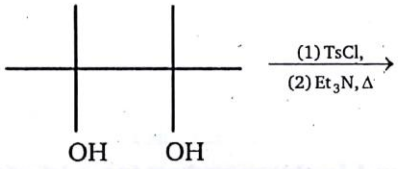
a.	It may be prepared by CrO_3 oxidation of 2-methyl-2-butanol.	
b.	Its reaction with $NaBH_4$ gives a secondary alcohol.	
c.	It may be prepared by acidic Hg^{2+} catalyzed hydration of 3-methyl-1-butyne.	
d.	It forms a silver mirror on treatment with $[Ag(NH_3)_2]^+$.	
e.	This compound is an isomer of 4-penten-1-ol.	

7. Which of these methods would serve to prepare 1-phenyl-2-propanol?

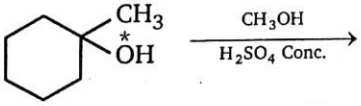
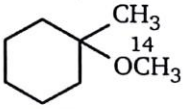
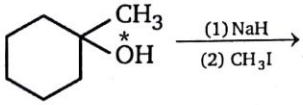
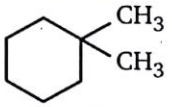
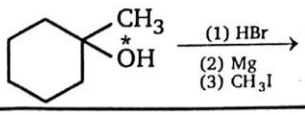
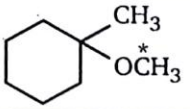
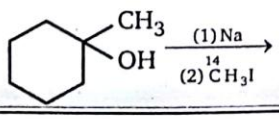
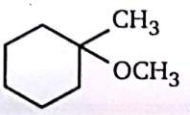
a.	Addition of benzyl Grignard reagent to acetaldehyde (ethanal).	
b.	Addition of phenyl lithium to propylene oxide (methyloxirane).	
c.	Addition of phenyl Grignard reagent to acetone (2-propanone).	
d.	Acid-catalyzed hydration (addition of water to) of 2-phenyl-1-propene.	
e.	Addition of methyl Grignard reagent to acetophenone (methyl phenyl ketone).	
f.	Addition of methyl Grignard reagent to phenylacetaldehyde.	

8. Match the Column (I) and (II).

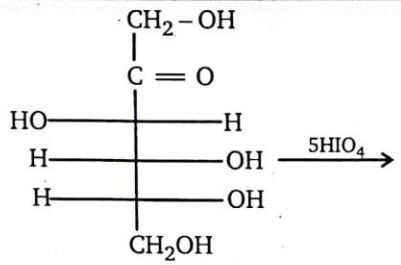
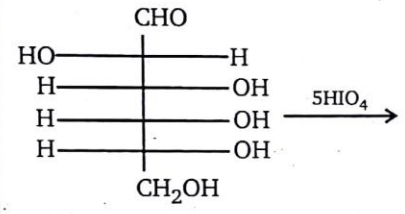
Column (I)		**Column (II)**	
Reaction		**Name of Reaction**	
(a)		**(p)**	Pinacol-Pinacolone rearrangement

(b)		(q)	Semi-Pinacol reaction
(c)		(r)	Pinacolic-Diazotization
(d)		(s)	Pinacol fashion reaction

9. Match the Column (I) and (II).

Column (I)		Column (II)	
Reactant		Products	
(a)		(p)	
(b)		(q)	
(c)		(r)	
(d)		(s)	

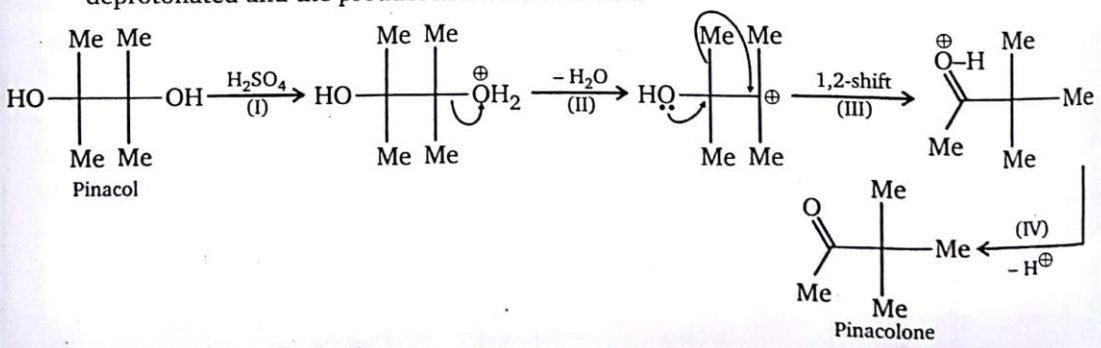
10.

Reaction 1.	
Reaction 2.	

Ratio of moles of formaldehyde obtained in the reaction (1) and reaction (2) ?

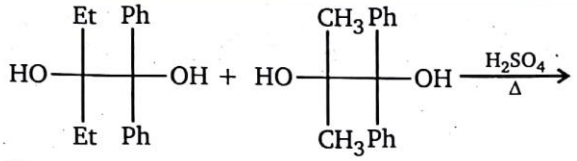
11. Comprehension

Di-tert-glycols rearrange in the presence of acid to give α-tertiary ketones. The trivial name of the simplest glycol of this type is pinacol, and this type of reaction therefore is named pinacol rearrangement (in this specific case, the reaction is called a pinacol-pinacolone rearrangement). The rearrangement involves 4 steps. one of the hydroxyl groups is protonated in the first step. A molecule of water is eliminated in the second step and a tertiary carbocation is formed. The carbocation rearranges in the third step into a more stable carboxonium ion *via* a [1, 2] rearrangement. In the last step, the carboxonium ion is deprotonated and the product ketone is obtained.



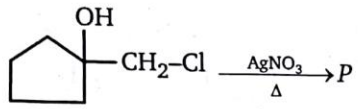
A. What is R.D.S. of pinacol-pinacolone rearrangement ?

(a) I step
(b) II step
(c) III step
(d) IV step

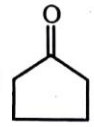
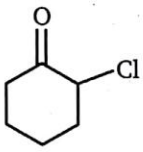
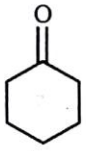
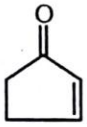
B. 

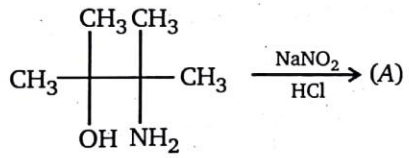
How many products obtained in above reaction ?

(a) 1 (b) 2 (c) 3 (d) 4

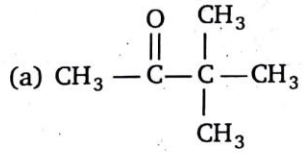
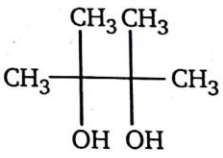
C. 

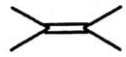
Product '*P*' is :

(a)  (b)  (c)  (d) 

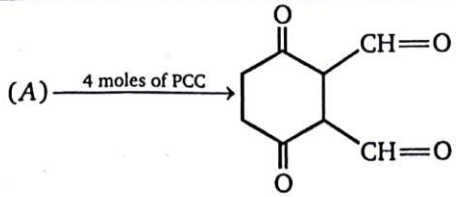
D. 

Product (*A*) is :

(a)  (b) 

(c)  (d) None of these

SUBJECTIVE PROBLEMS

1. 

Maximum number of moles of Ac_2O consumed by reactant (*A*) is :

ANSWERS — LEVEL 2

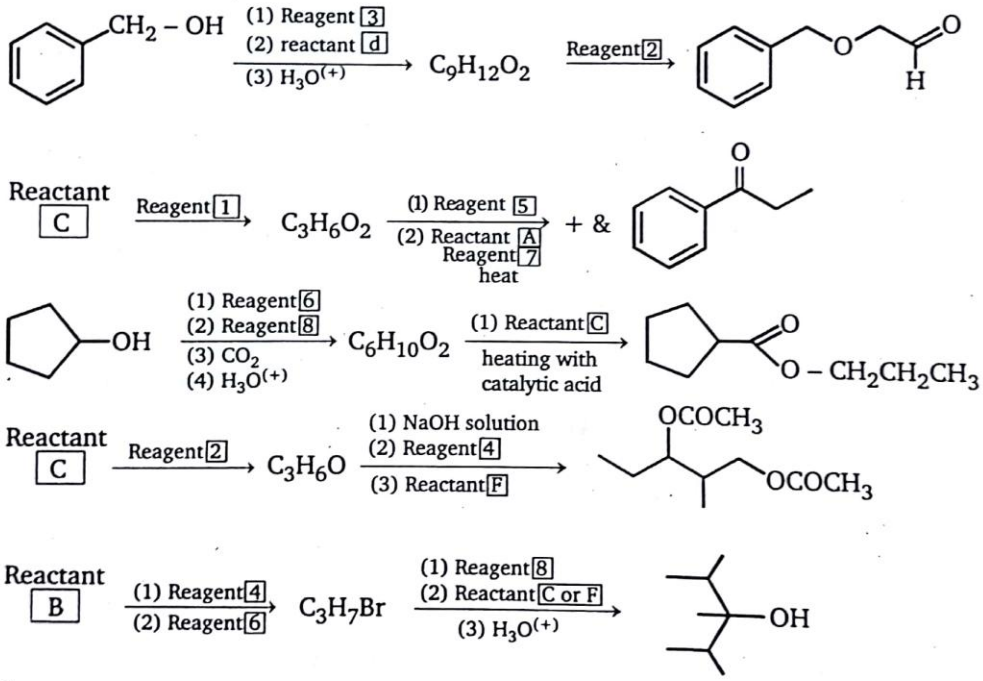
1. I – B; II – A; III – A; IV – B; V – B

2. A – d; B – a, c, e, f, g, h; C – a, b, c; D – d; E – d, e, f, g, h; F – e

3. A – b; B – d, C – d, D – c, E – d; F – d

4. a, c, e, g

5.



6. b, c, e

7. a, b, f

8. a – p, b – r, c – s, d – q

9. a – s, b – r, c – q, d – p

10. Ratio of reaction I and II = 2

11. A – b; B – b; C – c; D – a

Subjective Problems

1. 4