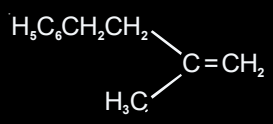
Chapter 22

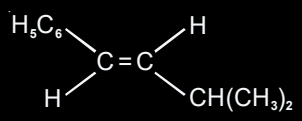
Hydrocarbons

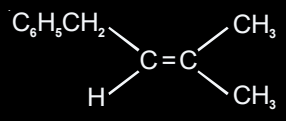
1. The main product of the following reaction is

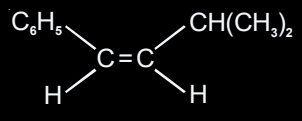
$C_6H_5CH_2CH(OH)CH(CH_3)_2 \xrightarrow{conc.H_2SO_4} ?$

[AIEEE-2010]

(1) 

(2) 

(3) 

(4) 

2. One mole of a symmetrical alkene on ozonolysis gives two moles of an aldehyde having a molecular mass of 44 u. The alkene **[AIEEE-2010]**

(1) Ethane (2) Propene

(3) 1-butene (4) 2-butene

3. 2–Hexyne gives trans–2–Hexene on treatment with **[AIEEE-2012]**

(1) Li/NH_3

(2) $Pd/BaSO_4$

(3) $Li\,AlH_4$

(4) Pt/H_2

4. Which branched chain isomer of the hydrocarbon with molecular mass 72 u gives only one isomer of mono substituted alkyl halide? **[AIEEE-2012]**

(1) Neopentane

(2) Isohexane

(3) Neohexane

(4) Tertiary butyl chloride

5. The major organic compound formed by the reaction of 1, 1, 1-trichloroethane with silver powder is **[JEE (Main)-2014]**

(1) Acetylene (2) Ethene

(3) 2-Butyne (4) 2-Butene

6. Which of the following compounds will exhibit geometrical isomerism? **[JEE (Main)-2015]**

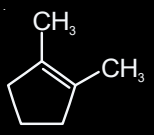
(1) 1 - Phenyl - 2 - butene

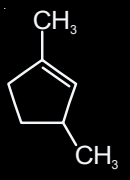
(2) 3 - Phenyl - 1 - butene

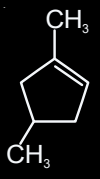
(3) 2 - Phenyl - 1 - butene

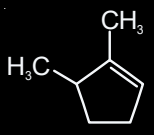
(4) 1, 1 - Diphenyl - 1 propane

7. Which compound would give 5-keto-2-methyl hexanal upon ozonolysis? **[JEE (Main)-2015]**

(1) 

(2) 

(3) 

(4) 

8. The reaction of propene with HOCl ($Cl_2 + H_2O$) proceeds through the intermediate **[JEE (Main)-2016]**

(1) $CH_3 - CH^+ - CH_2 - Cl$

(2) $CH_3 - CH(OH) - CH_2^+$

(3) $CH_3 - CHCl - CH_2^+$

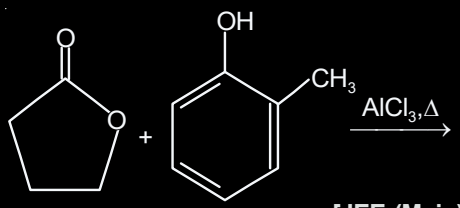
(4) $CH_3 - CH^+ - CH_2 - OH$

9. The *trans*-alkenes are formed by the reduction of alkynes with **[JEE (Main)-2018]**

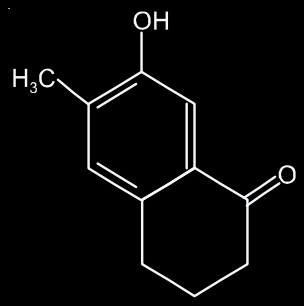
(1) H_2 - Pd/C, $BaSO_4$ (2) $NaBH_4$

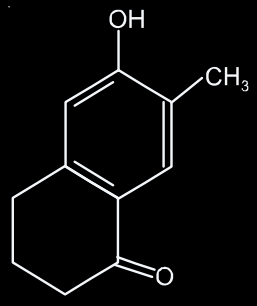
(3) Na/liq. NH_3 (4) Sn - HCl

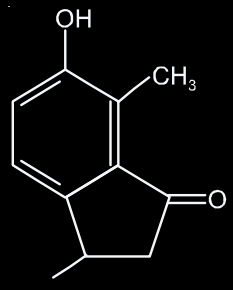
10. The major product of the following reaction is

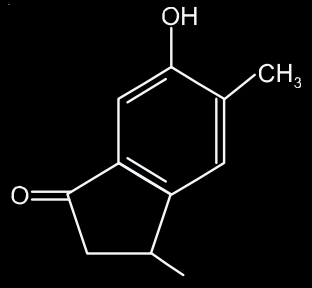


[JEE (Main)-2019]

(1) 

(2) 

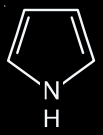
(3) 

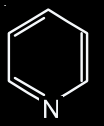
(4) 

11. Which of the following compounds is not aromatic?

[JEE (Main)-2019]

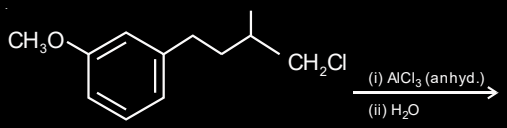
(1) 

(2) 

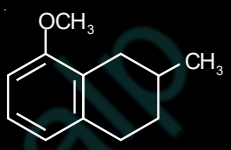
(3) 

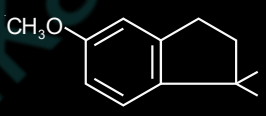
(4) 

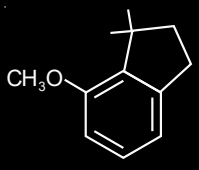
12. The major product of the following reaction is

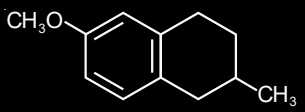


[JEE (Main)-2019]

(1) 

(2) 

(3) 

(4) 

13. Which hydrogen in compound (E) is easily replaceable during bromination reaction in presence of light?

$$\underset{\delta}{CH_3}-\underset{\gamma}{CH_2}-\underset{\beta}{CH}=\underset{\alpha}{CH}$$

(E)

[JEE (Main)-2019]

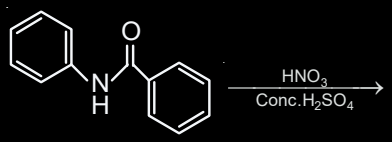
(1) γ-hydrogen

(2) α-hydrogen

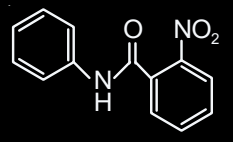
(3) δ-hydrogen

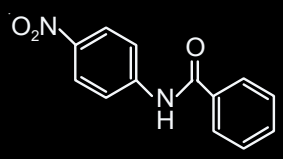
(4) β-hydrogen

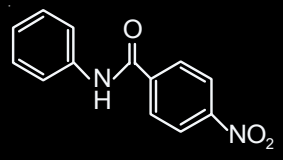
14. What will be the major product in the following mononitration reaction?

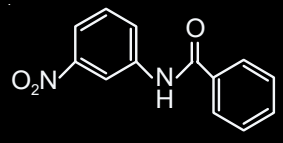


[JEE (Main)-2019]

(1) 

(2) 

(3) 

(4) 

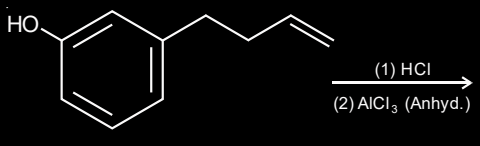
15. Which compound(s) out of following is/are not aromatic?

[JEE (Main)-2019]

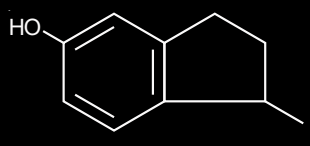
(1) (B), (C) and (D) (2) (A) and (C)

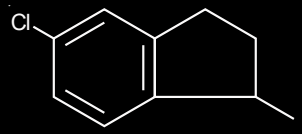
(3) (C) and (D) (4) (B)

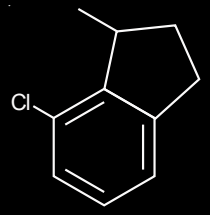
16. The major product of the following reaction is

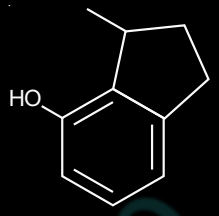


[JEE (Main)-2019]

(1) 

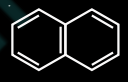
(2) 

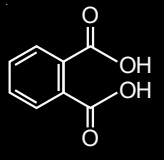
(3) 

(4) 

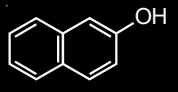
17. Among the following four aromatic compounds, which one will have the lowest melting point?

[JEE (Main)-2019]

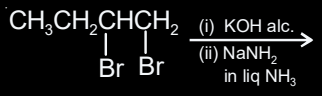
(1) 

(2) 

(3) 

(4) 

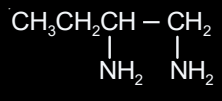
18. The major product of the following reaction is



[JEE (Main)-2019]

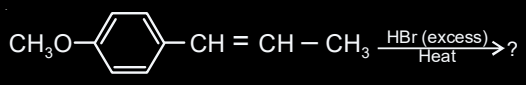
(1) $CH_3CH_2C \equiv CH$

(2) $CH_3CH = CHCH_2NH_2$

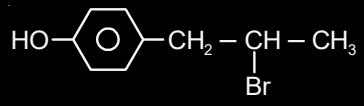
(3) 

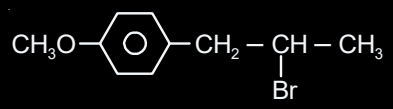
(4) $CH_3CH = C = CH_2$

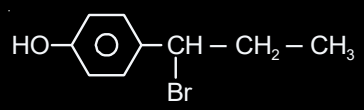
19. The major product in the following conversion is

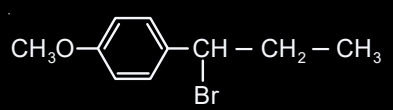


[JEE (Main)-2019]

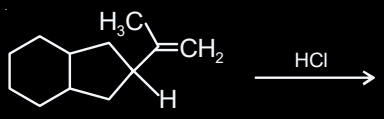
(1) 

(2) 

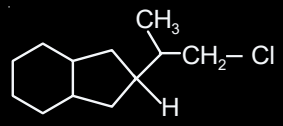
(3) 

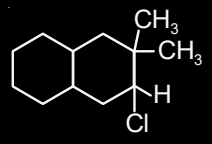
(4) 

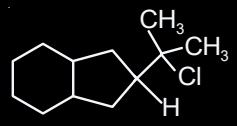
20. The major product of the following reaction is

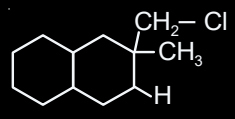


[JEE (Main)-2019]

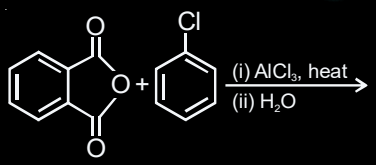
(1) 

(2) 

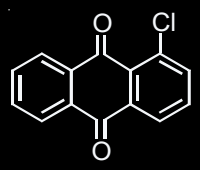
(3) 

(4) 

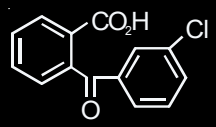
21. The major product of the following reaction is

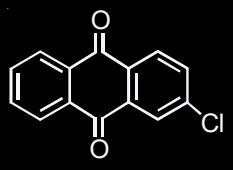


[JEE (Main)-2019]

(1) 

(2) 

(3) 

(4) 

22. Which one of the following alkenes when treated with HCl yields majorly an anti Markovnikov product?

[JEE (Main)-2019]

(1) $F_3C–CH=CH_2$ (2) $CH_3O–CH=CH_2$

(3) $H_2N–CH=CH_2$ (4) $Cl–CH=CH_2$

23. Polysubstitution is a major drawback in :

[JEE (Main)-2019]

(1) Reimer Tiemann reaction

(2) Acetylation of aniline

(3) Friedel Craft's acylation

(4) Friedel Craft's alkylation

24. The major product of the following reaction is

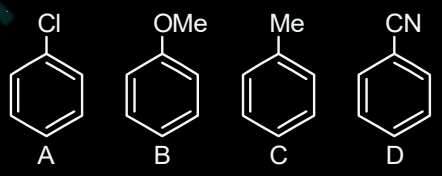
$$CH_3C \equiv CH \xrightarrow[(ii)\ DI]{(i)\ DCl\ (1\ equiv.)}$$

[JEE (Main)-2019]

(1) $CH_3C(I)(Cl)CHD_2$ (2) $CH_3CD(I)CHD(Cl)$

(3) $CH_3CD(Cl)CHD(I)$ (4) $CH_3CD_2CH(Cl)(I)$

25. The increasing order of reactivity of the following compounds towards aromatic electrophilic substitution reaction is



[JEE (Main)-2019]

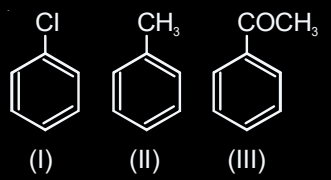
(1) D < B < A < C

(2) D < A < C < B

(3) B < C < A < D

(4) A < B < C < D

26. The increasing order of the reactivity of the following compounds towards electrophilic aromatic substitution reactions is :



[JEE (Main)-2019]

(1) I < III < II

(2) III < II < I

(3) II < I < III

(4) III < I < II

27. Which of these factors does not govern the stability of a conformation in acyclic compounds?

[JEE (Main)-2019]

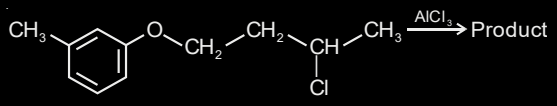
(1) Angle strain

(2) Steric interactions

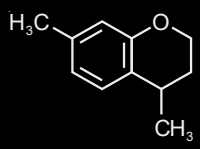
(3) Electrostatic forces of interaction

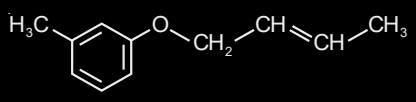
(4) Torsional strain

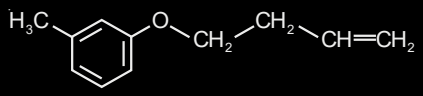
28. The major product obtained in the given reaction is:

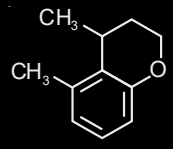


[JEE (Main)-2019]

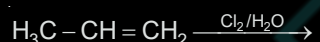
(1) 

(2) 

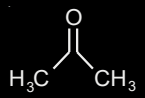
(3) 

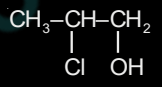
(4) 

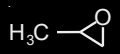
29. The major product of the following addition reaction is

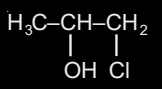


[JEE (Main)-2019]

(1) 

(2) 

(3) 

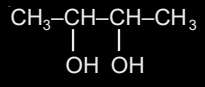
(4) 

30. But-2-ene on reaction with alkaline $KMnO_4$ at elevated temperature followed by acidification will give :

[JEE (Main)-2019]

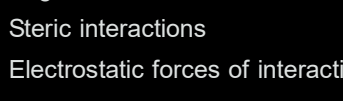
(1) 2 molecules of CH_3CHO

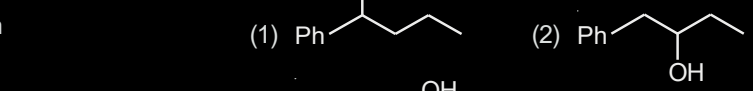
(2) 2 molecules of CH_3COOH

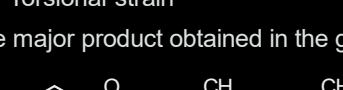
(3) 

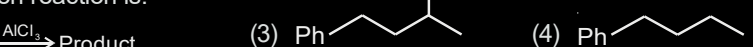
(4) One molecule of CH_3CHO and one molecule of CH_3COOH

31. Heating of 2-chloro-1-phenylbutane with EtOK/EtOH gives X as the major product. Reaction of X with $Hg(OAc)_2/H_2O$ followed by $NaBH_4$ gives Y as the major product. Y is: **[JEE (Main)-2019]**

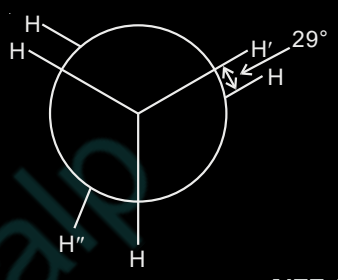
(1) 

(2) 

(3) 

(4) 

32. In the following skew conformation of ethane, H′ – C – C – H″ dihedral angle is

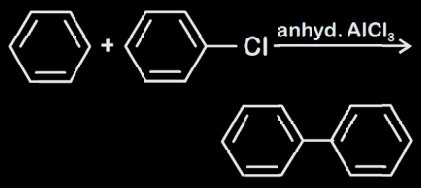


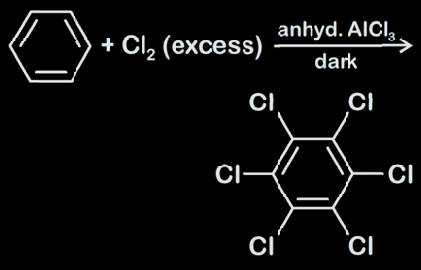
[JEE (Main)-2019]

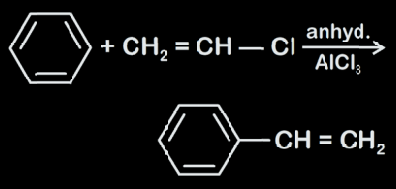
(1) 120° (2) 58°

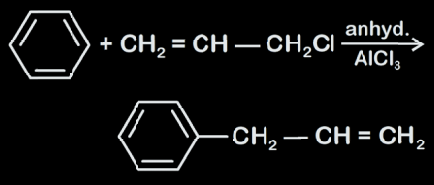
(3) 151° (4) 149°

33. Consider the following reactions

(a) 

(b) 

(c) 

(d) 

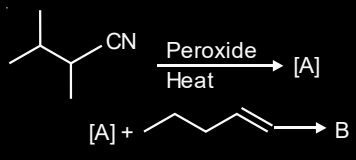
Which of these reactions are possible?

[JEE (Main)-2020]

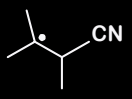
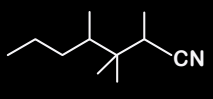
(1) (b) and (d) (2) (a) and (d)

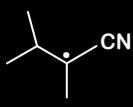
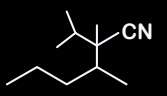
(3) (a) and (b) (4) (b), (c) and (d)

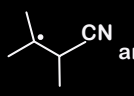
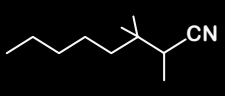
34. The major products A and B in the following reactions are

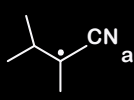
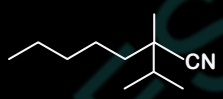


[JEE (Main)-2020]

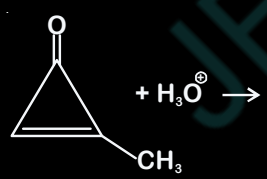
(1) A =  and B = 

(2) A =  and B = 

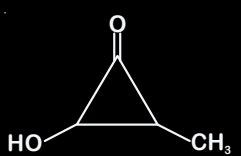
(3) A =  and B = 

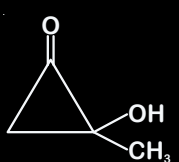
(4) A =  and B = 

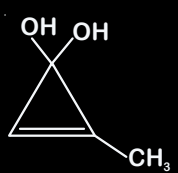
35. The major product in the following reaction is

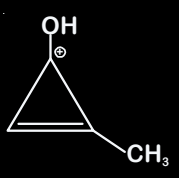


[JEE (Main)-2020]

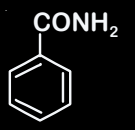
(1) 

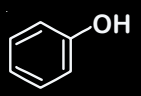
(2) 

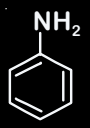
(3) 

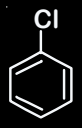
(4) 

36. Which of these will produce the highest yield in Friedel Crafts reaction? **[JEE (Main)-2020]**

(1) 

(2) 

(3) 

(4) 

37. The correct order of heat of combustion for following alkadienes is

(a) 

(b) 

(c) 

[JEE (Main)-2020]

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

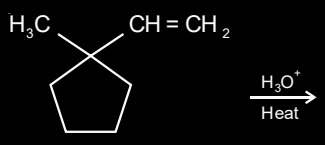
(3) (b) < (c) < (a) (4) (a) < (b) < (c)

38. The number of sp^2 hybrid orbitals in a molecule of benzene is **[JEE (Main)-2020]**

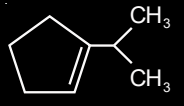
(1) 24 (2) 18

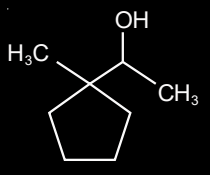
(3) 12 (4) 6

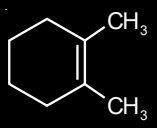
39. The major product in the following reaction is

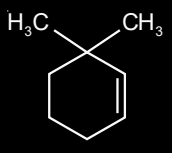


[JEE (Main)-2020]

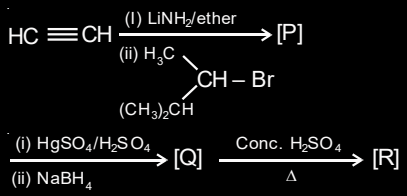
(1) 

(2) 

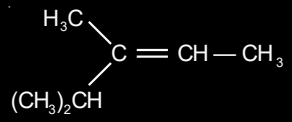
(3) 

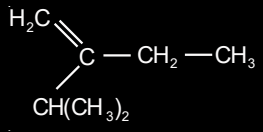
(4) 

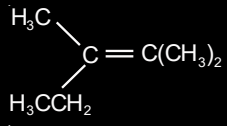
40. The major product [R] in the following sequence of reactions as:

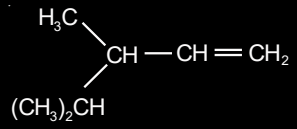


[JEE (Main)-2020]

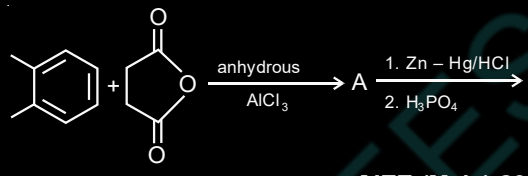
(1) 

(2) 

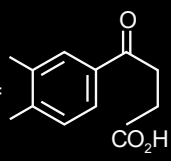
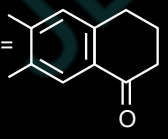
(3) 

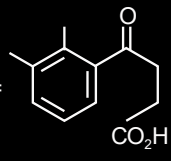
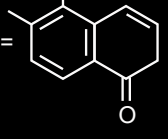
(4) 

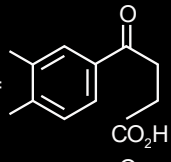
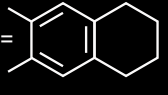
41. In the following reaction sequence the major products A and B are:

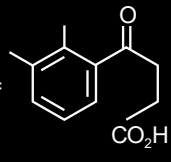
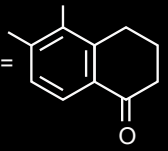


[JEE (Main)-2020]

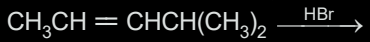
(1) A =  ; B = 

(2) A =  ; B = 

(3) A =  ; B = 

(4) A =  ; B = 

42. The major product formed in the following reaction is



[JEE (Main)-2020]

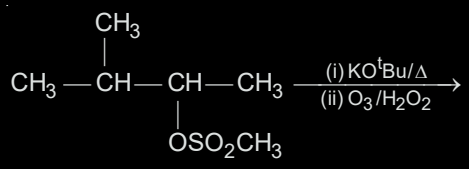
(1) $Br(CH_2)_3CH(CH_3)_2$

(2) $CH_3CH(Br)CH_2CH(CH_3)_2$

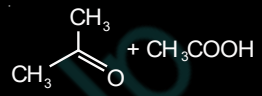
(3) $CH_3CH_2CH(Br)CH(CH_3)_2$

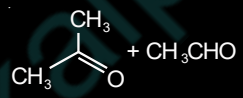
(4) $CH_3CH_2CH_2C(Br)(CH_3)_2$

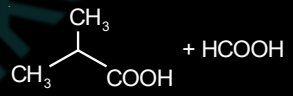
43. The major products of the following reaction are

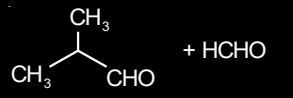


[JEE (Main)-2020]

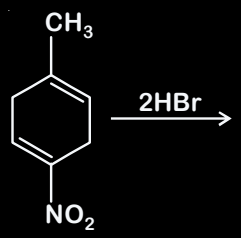
(1) 

(2) 

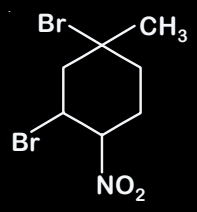
(3) 

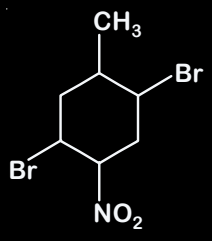
(4) 

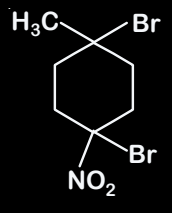
44. The major product of the following reaction is

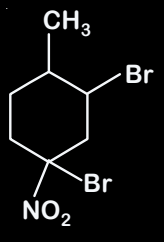


[JEE (Main)-2020]

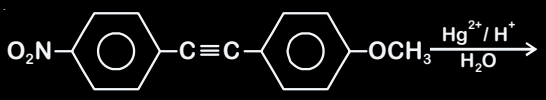
(1) 

(2) 

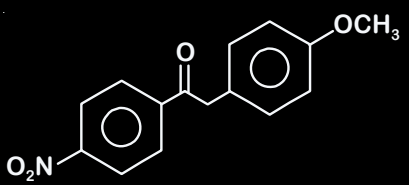
(3) 

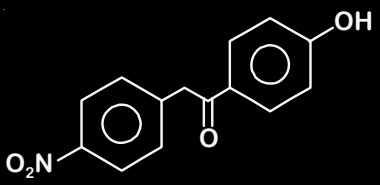
(4) 

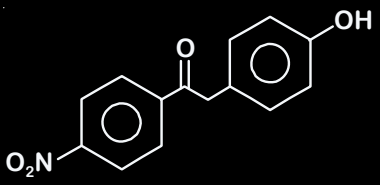
45. The major product obtained from the following reaction is

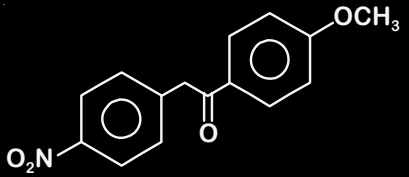


[JEE (Main)-2020]

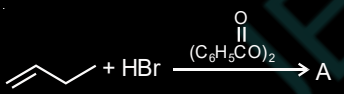
(1) 

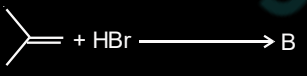
(2) 

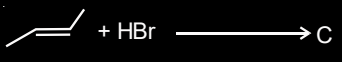
(3) 

(4) 

46. The increasing order of the boiling points of the major products A, B and C of the following reactions will be

(a) 

(b) 

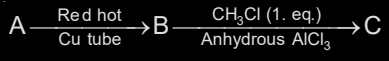
(c) 

[JEE (Main)-2020]

(1) A < C < B (2) C < A < B

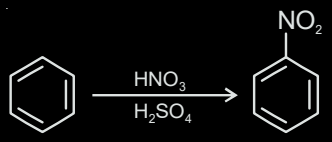
(3) B < C < A (4) A < B < C

47. In the following sequence of reactions the maximum number of atoms present in molecule 'C' in one plane is _____.



(A is a lowest molecular weight alkyne)

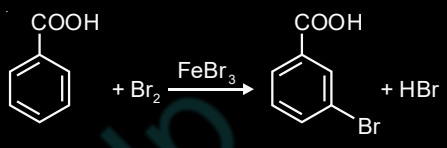
[JEE (Main)-2020]

48. 

In the above reaction, 3.9 g of benzene on nitration gives 4.92 g of nitrobenzene. The percentage yield of nitrobenzene in the above reaction is _____%.

(Round off to the Nearest Integer)

(Given atomic mass : C : 12.0 u, H : 1.0 u, O : 16.0 u, N : 14.0 u) **[JEE (Main)-2021]**

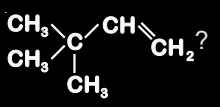
49. 

Consider the above reaction where 6.1 g of Benzoic acid is used to get 7.8 g of m-bromobenzoic acid. The percentage yield of the product is ____.

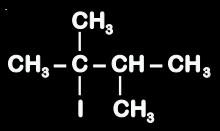
(Round off to Nearest Integer).

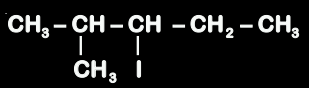
[Given : Atomic masses : C : 120 u, H : 1.0 u, O : 16.0 u, Br : 80.0 u] **[JEE (Main)-2021]**

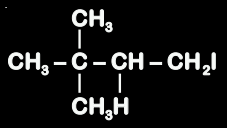
50. Methylation of 10 g of benzene gave 9.2 g of toluene. Calculate the percentage yield of toluene _____. (Nearest integer) **[JEE (Main)-2021]**

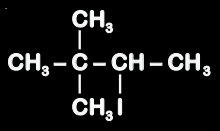
51. What is the major product formed by HI on reaction with 

[JEE (Main)-2021]

(1) 

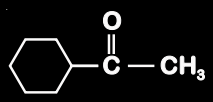
(2) 

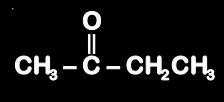
(3) 

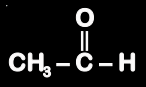
(4) 

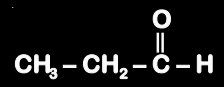
52. Which one of the following carbonyl compounds cannot be prepared by addition of water on an alkyne in the presence of $HgSO_4$ and H_2SO_4?

[JEE (Main)-2021]

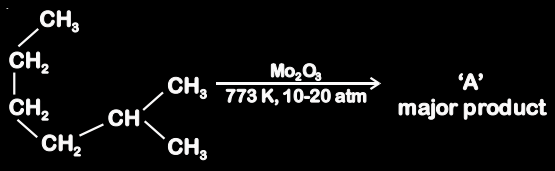
(1) 

(2) 

(3) 

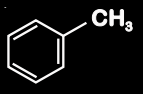
(4) 

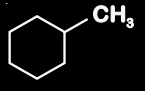
53. Identify A in the given chemical reaction.



[JEE (Main)-2021]

(1) 

(2) 

(3) 

(4) 

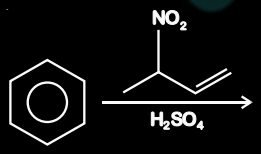
54. Consider the following chemical reaction.

$$CH \equiv CH \xrightarrow[2)CO,HCl,AlCl_3]{1)\text{ Red hot Fe tube, 873K}} \text{Product}$$

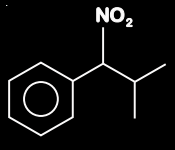
The number of sp^2 hybridized carbon atom(s) present in the product is _____.

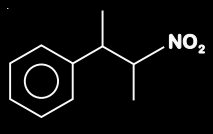
[JEE (Main)-2021]

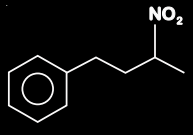
55. The major product of the following reaction is:

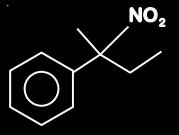


[JEE (Main)-2021]

(1) 

(2) 

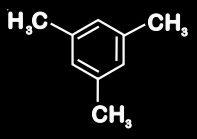
(3) 

(4) 

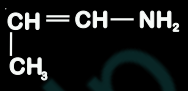
56. For the given reaction :

What is 'A'? **[JEE (Main)-2021]**

(1) 

(2) 

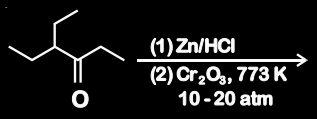
(3) $CH_3CH_2CH_2NH_2$

(4) 

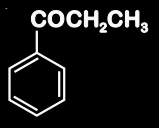
57. In $\overset{1}{CH_2} = \overset{2}{C} = \overset{3}{CH} - \overset{4}{CH_3}$ molecule, the hybridization of carbon 1, 2, 3 and 4 respectively, are : **[JEE (Main)-2021]**

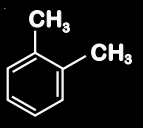
(1) sp^2, sp^2, sp^2, sp^3 (2) sp^2, sp, sp^2, sp^3

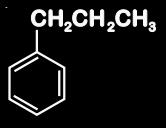
(3) sp^3, sp, sp^3, sp^3 (4) sp^2, sp^3, sp^2, sp^3

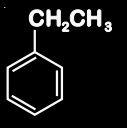
58. 

Considering the above reaction, the major product among the following is : **[JEE (Main)-2021]**

(1) 

(2) 

(3) 

(4) 

59. Which of the following is Lindlar catalyst ?

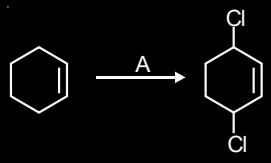
[JEE (Main)-2021]

(1) Cold dilute solution of $KMnO_4$

(2) Partially deactivated palladised charcoal

(3) Zinc chloride and HCl

(4) Sodium and Liquid NH_3

60. 

Identify the reagent(s) 'A' and condition(s) for the reaction **[JEE (Main)-2021]**

(1) A = HCl ; Anhydrous $AlCl_3$

(2) A = Cl_2 ; UV light

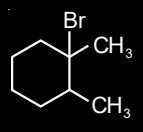
(3) A = Cl_2 ; dark, Anhydrous $AlCl_3$

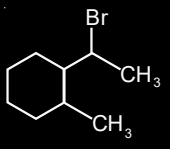
(4) A = HCl, $ZnCl_2$

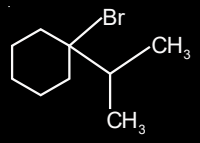
61. 

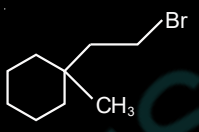
Product "A" in the above chemical reaction is

[JEE (Main)-2021]

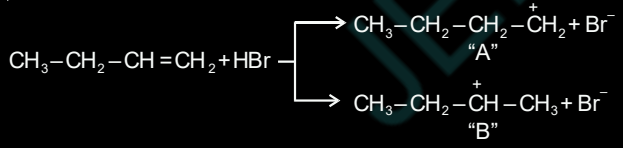
(1) 

(2) 

(3) 

(4) 

62. Choose the **correct** statement regarding the formation of carbocations A and B given.



[JEE (Main)-2021]

(1) Carbocation A is more stable and formed relatively at slow rate

(2) Carbocation A is more stable and formed relatively at faster rate

(3) Carbocation B is more stable and formed relatively at slow rate

(4) Carbocation B is more stable and formed relatively at faster rate

63. Given below are two statements :

Statement I : 2-methylbutane on oxidation with $KMnO_4$ gives 2-methylbutan-2-ol.

Statement II : n-alkanes can be easily oxidised to corresponding alcohols with $KMnO_4$.

Choose the **correct** option. **[JEE (Main)-2021]**

(1) Both **statement I** and **statement II** are incorrect

(2) **Statement I** is correct but **statement II** is incorrect

(3) **Statement I** is incorrect but **statement II** is correct

(4) Both **statement I** and **statement II** are correct

64. Match **List-I** with **List-II**

List-I (Chemicals)	**List-II (Use/Preparation/ Constituent)**
(a) Alcoholic potassium hydroxide	(i) electrodes in batteries
(b) $Pd/BaSO_4$	(ii) obtained by addition reaction
(c) BHC (Benzene hexachloride)	(iii) used for β-elimination reaction
(d) Polyacetylene	(iv) Lindlar's Catalyst

Choose the **most appropriate** match

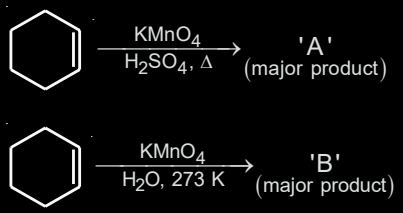
[JEE (Main)-2021]

(1) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

(2) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

(3) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

(4) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

65. 

For above chemical reactions, identify the correct statement from the following. **[JEE (Main)-2021]**

(1) Compound 'A' is dicarboxylic acid and compound 'B' is diol.

(2) Compound 'A' is diol and compound 'B' is dicarboxylic acid.

(3) Both compound 'A' and compound 'B' are dicarboxylic acids.

(4) Both compound 'A' and compound 'B' are diols.

66. Benzene on nitration gives nitrobenzene in presence of HNO_3 and H_2SO_4 mixture, where : **[JEE (Main)-2021]**

(1) HNO_3 acts as a base and H_2SO_4 acts as an acid

(2) Both H_2SO_4 and HNO_3 act as an acids

(3) HNO_3 acts as an acid and H_2SO_4 acts as a base

(4) Both H_2SO_4 and HNO_3 act as a bases

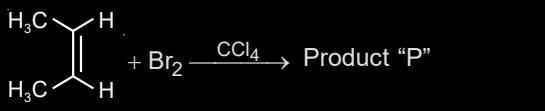
67. An Organic compounds 'A' C_4H_8 on treatment with $KMnO_4/H^+$ yields compound 'B' C_3H_6O. Compound 'A' also yields compound 'B' an ozonolysis. Compound 'A' is **[JEE (Main)-2021]**

(1) Cyclobutane

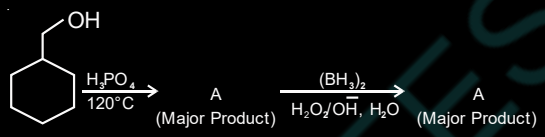
(2) 2-Methylpropene

(3) But-2-ene

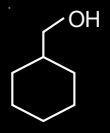
(4) 1-Methylcyclopropane

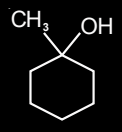
68. 

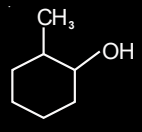
Consider the above chemical reaction. The total number of stereoisomers possible for Product 'P' is _____. **[JEE (Main)-2021]**

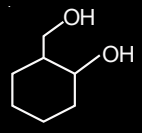
69. 

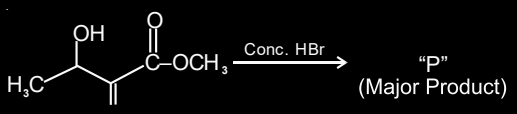
Consider the above reaction and identify the Product P **[JEE (Main)-2021]**

(1) 

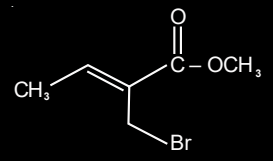
(2) 

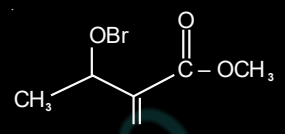
(3) 

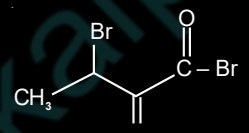
(4) 

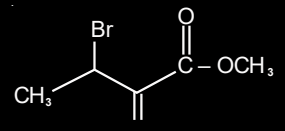
70. 

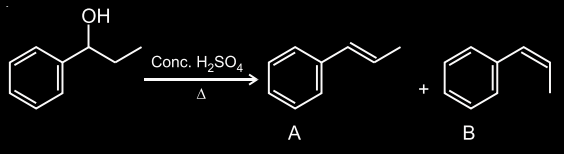
Consider the above reaction, the major product "P" formed is, **[JEE (Main)-2021]**

(1) 

(2) 

(3) 

(4) 

71. 

Consider the above reaction, and choose the correct statement : **[JEE (Main)-2021]**

(1) Both compounds **A** and **B** are formed equally

(2) Compound **A** will be the major product

(3) Compound **B** will be the major product

(4) The reaction is not possible in acidic medium

72. The correct sequential addition of reagents in the preparation of 3-nitrobenzoic acid from benzene is: **[JEE (Main)-2021]**

(1) HNO_3/H_2SO_4, Br_2/ $AlBr_3$, Mg/ ether, CO_2, H_3O^+

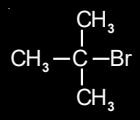
(2) Br_2/ $AlBr_3$, HNO_3/H_2SO_4, Mg/ ether, CO_2, H_3O^+

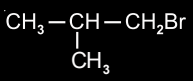
(3) Br_2/ $AlBr_3$, NaCN, H_3O^+, HNO_3/H_2SO_4

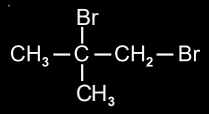
(4) Br_2/ $AlBr_3$, HNO_3/H_2SO_4, NaCN, H_3O^+

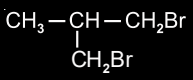
73. Excess of isobutane on reaction with Br_2 in presence of light at 125°C gives which one of the following, as the major product?

[JEE (Main)-2021]

(1) 

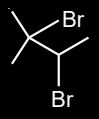
(2) 

(3) 

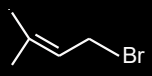
(4) 

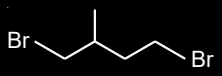
74. The major product formed in the following reaction is :

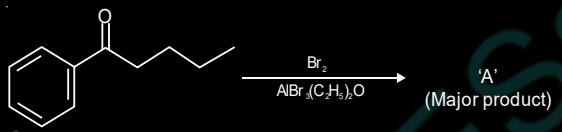
[JEE (Main)-2021]

(1) 

(2) 

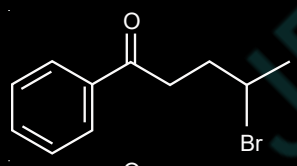
(3) 

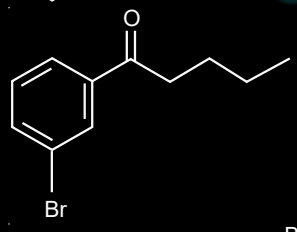
(4) 

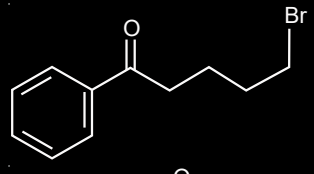
75. 

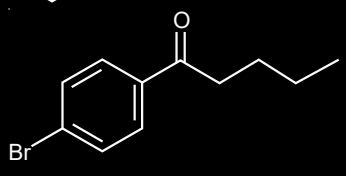
Consider the given reaction, the Product A is

[JEE (Main)-2021]

(1) 

(2) 

(3) 

(4) 

76. A chloro compound "A"

(i) forms aldehydes on ozonolysis followed by the hydrolysis.

(ii) when vaporized completely 1.53 g of A, gives 448 mL of vapour at STP.

The number of carbon atoms in a molecule of compound A is _____. **[JEE (Main)-2021]**

77. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A) : Treatment of bromine water with propene yields 1-bromopropan-2-ol.

Reason (R) : Attack of water on bromonium ion follows Markovnikov rule and results in 1-bromopropan-2-ol.

In the light of the above statements, choose the **most appropriate** answer from the options given below : **[JEE (Main)-2021]**

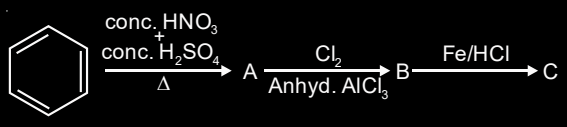
(1) Both **(A)** and (R) are true and **(R)** is the correct explanation of (A)

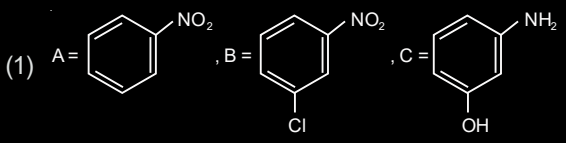
(2) **(A)** is true but **(R)** is false

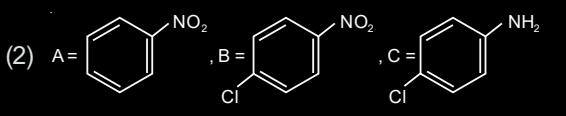
(3) Both **(A)** and **(R)** are true but **(R)** is NOT the correct explanation of (A)

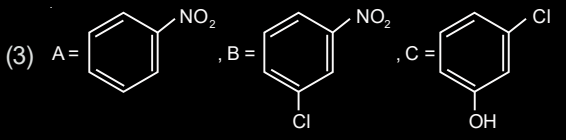
(4) **(A)** is false but **(R)** is true

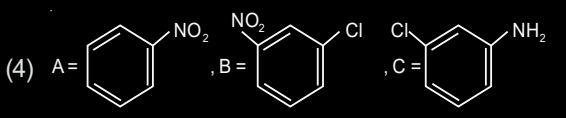
78. Identify correct A, B and C in the reaction sequence given below: **[JEE (Main)-2021]**



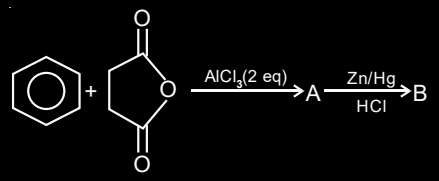
(1) 

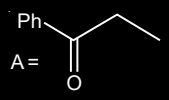
(2) 

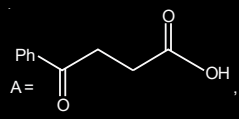
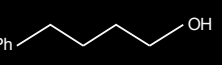
(3) 

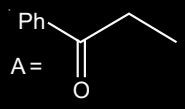
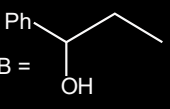
(4) 

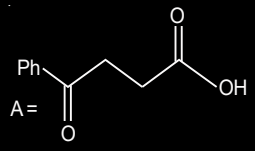
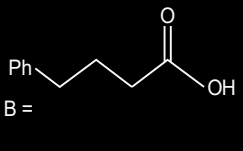
79. The structures of A and B formed in the following reaction are : [Ph = $-C_6H_5$] **[JEE (Main)-2021]**



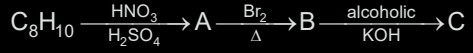
(1) A =  , B = 

(2) A =  , B = 

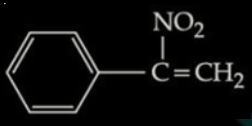
(3) A =  , B = 

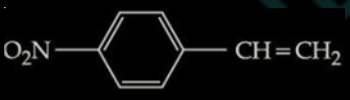
(4) A =  , B = 

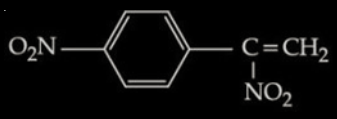
80. In the given reaction sequence, the major product 'C' is:

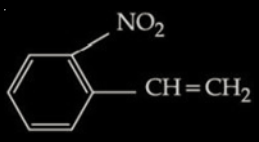


[JEE (Main)-2022]

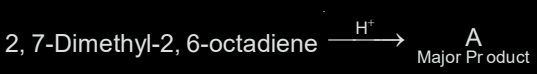
(1) 

(2) 

(3) 

(4) 

81. The major product 'A' of the following given reaction has _____ sp^2 hybridized carbon atoms.



[JEE (Main)-2022]

82. Given below are two statements.

Statement I: The presence of weaker π-bonds make alkenes less stable than alkanes.

Statement II: The strength of the double bond is greater than that of carbon-carbon single bond.

In the light of the above statements, choose the *correct* answer from the options given below.

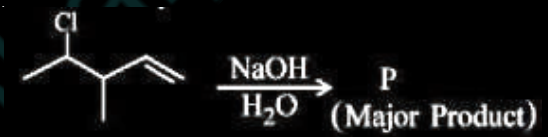
[JEE (Main)-2022]

(1) Both Statement I and Statement II are correct.

(2) Both Statement I and Statement II are incorrect.

(3) Statement I is correct but Statement II is incorrect.

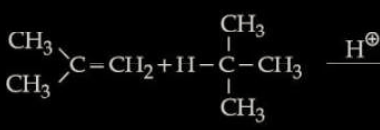
(4) Statement I is correct but Statement II is correct.

83. 

Consider the above reaction. The number of π electrons present in the product 'P' is_____.

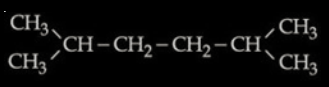
[JEE (Main)-2022]

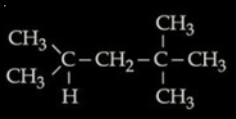
84. The product formed in the following reaction.

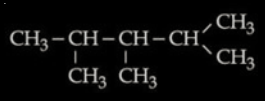


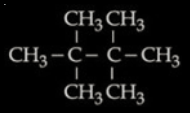
is:

[JEE (Main)-2022]

(1) 

(2) 

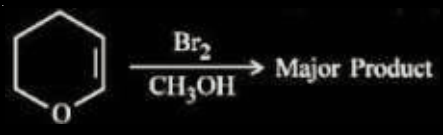
(3) 

(4) 

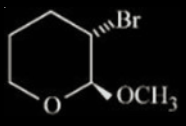
85. Number of grams of bromine that will completely react with 5.0 g of pent-1-ene is _____ $\times 10^{-2}$g. (Atomic mass of Br = 80 g/mol) [Nearest integer]

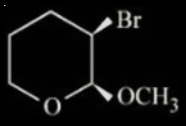
[JEE (Main)-2022]

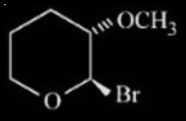
86. Amongst the following, the major product of the given chemical reaction is

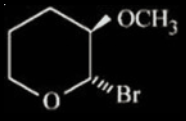


[JEE (Main)-2022]

(1) 

(2) 

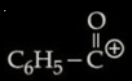
(3) 

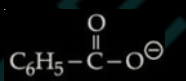
(4) 

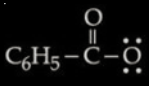
87. $(C_7H_5O_2)_2 \xrightarrow{h\nu} [X] \rightarrow 2C_6H_5 + 2CO_2$

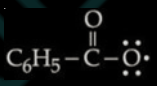
Consider the above reaction and identify the intermediate 'X'

[JEE (Main)-2022]

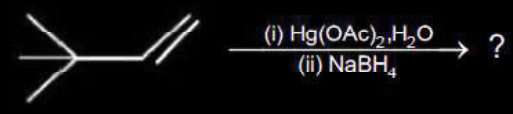
(1) 

(2) 

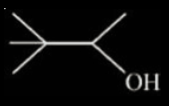
(3) 

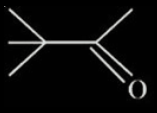
(4) 

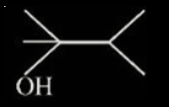
88. The major product in the following reaction



[JEE (Main)-2022]

(1) 

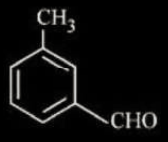
(2) 

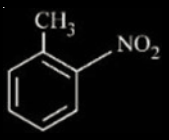
(3) 

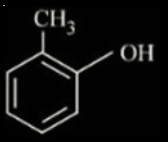
(4) 

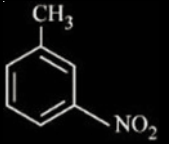
89. Halogenation of which one of the following will yield m-substituted product with respect to methyl group as a major product?

[JEE (Main)-2022]

(1) 

(2) 

(3) 

(4) 

90. 'A' and 'B' respectively are:

$A \xrightarrow[(2)\ Zn-H_2O]{(1)\ O_3}$ Ethane-1, 2-dicarbaldehyde + Glyoxal/Oxaldehyde

$B \xrightarrow[(2)\ Zn-H_2O]{(1)\ O_3} 5-$oxohexanal

[JEE (Main)-2022]

(1) 1-methylcyclohex-1, 3-diene & cyclopentene

(2) Cyclohex-1, 3-diene & cyclopentene

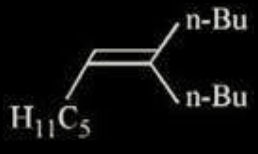
(3) 1-methylcyclohex-1, 4-diene & 1-methylcyclo-pent-ene

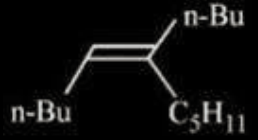
(4) Cyclohex-1, 3-diene & 1-methylcyclopent-1-ene

91. What will be the major product of following sequence of reactions?

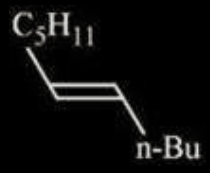
$n-Bu-\equiv \xrightarrow[(ii)\ Lindlar\ cat,\ H_2]{(i)\ n-BuLi,\ n-C_5H_{11}Cl}$

[JEE (Main)-2022]

(1) 

(2) 

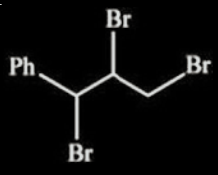
(3) 

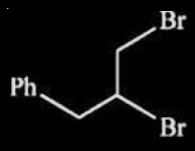
(4) 

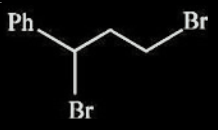
92. The major product (P) in the reaction

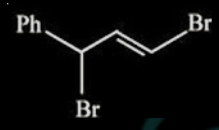
is

[JEE (Main)-2022]

(1) 

(2) 

(3) 

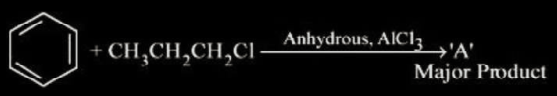
(4) 

93. Two isomers 'A' and 'B' with molecular formula C_4H_8 give different products on oxidation with $KMnO_4/H^+$ results in effervescence of a gas and gives ketone. The compound 'A' is

[JEE (Main)-2022]

(1) But-1-ene (2) cis-But-2-ene

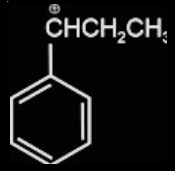
(3) trans-But-2-ene (4) 2-methyl propene

94. 

The stable carbocation formed in the above reaction is

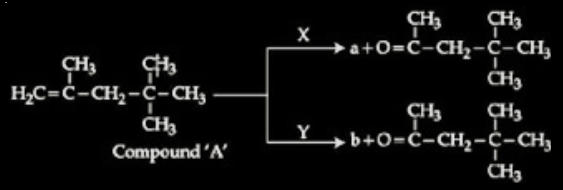
[JEE (Main)-2022]

(1) $CH_3CH_2\overset{\oplus}{C}H_2$ (2) $CH_3\overset{\oplus}{C}H_2$

(3) $CH_3-\overset{\oplus}{C}H-CH_3$ (4) 

Phase-II

95. A compound 'A' on reaction with 'X' and 'Y' produces the same major product but different by product 'a' and 'b'. Oxidation of 'a' gives a substance produced by ants.



'X' and 'Y' respectively are

[JEE (Main)-2022]

(1) $KMnO_4/H^+$ and dil. $KMnO_4$, 273 K

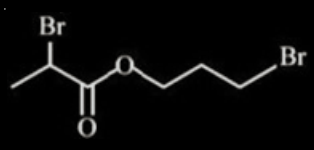
(2) $KMnO_4$(dilute), 273 K and $KMnO_4/H^+$

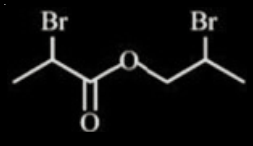
(3) $KMnO_4/H^+$ and O_3, H_2O/Zn

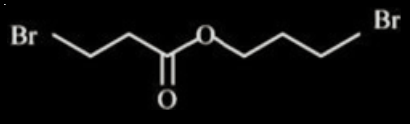
(4) O_3, H_2O/Zn and $KMnO_4/H^+$

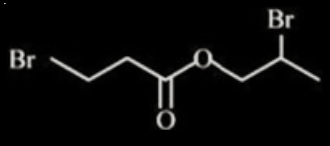
96. Major product of the following reaction is

[JEE (Main)-2022]

(1) 

(2) 

(3) 

(4) 

97. In the presence of sunlight, benzene reacts with Cl_2 to give product X. The number of hydrogens in X is _____.

[JEE (Main)-2022]

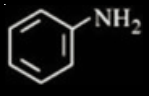
98. Which of the following is not an example of benzenoid compound?

[JEE (Main)-2022]

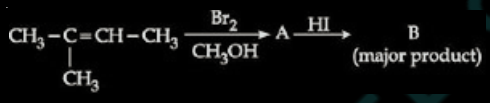
(1) 

(2) 

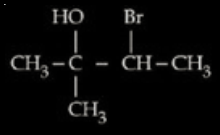
(3) 

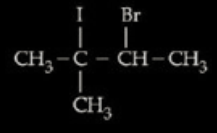
(4) 

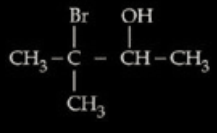
99. Major product 'B' of the following reaction sequence is:

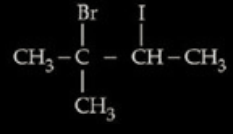


[JEE (Main)-2022]

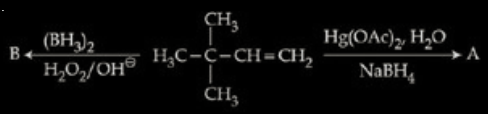
(1) 

(2) 

(3) 

(4) 

100. Choose the correct option for the following reactions.



[JEE (Main)-2022]

(1) 'A' and 'B' are both Markovnikov addition products

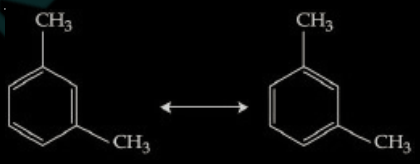
(2) 'A' is Markovnikov product and 'B' is anti-Markovnikov product

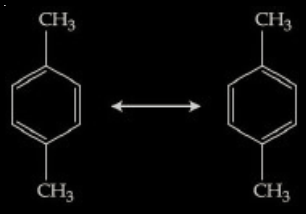
(3) 'A' and 'B' are both anti-Markovnikov products

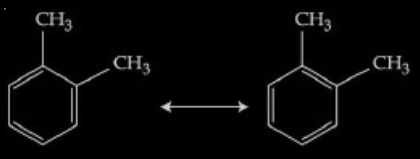
(4) 'B' is Markovnikov and 'A' is anti-Markovnikov product

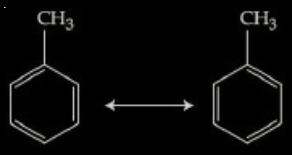
101. Which among the following pairs of the structures will give different products on ozonolysis? (Consider the double bonds in the structures are rigid and not delocalized)

[JEE (Main)-2022]

(1) 

(2) 

(3) 

(4) 

102. In bromination of Propyne, with Bromine 1,1,2,2-tetrabromopropane is obtained in 27% yield. The amount of 1,1,2,2-tetrabromopropane obtained from 1 g of Bromine in this reaction is _____ $\times 10^{-1}$ g. (Nearest integer)

(Molar Mass : Bromine = 80 g/mol)

[JEE (Main)-2022]

103. Arrange the following in increasing order of reactivity towards nitration

A. p-xylene

B. bromobenzene

C. mesitylene

D. nitrobenzene

E. benzene

[JEE (Main)-2022]

(1) C < D < E < A < B

(2) D < B < E < A < C

(3) D < C < E < A < B

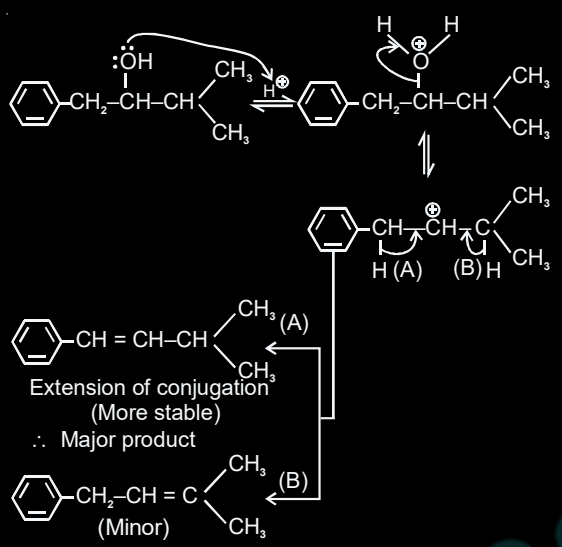
(4) C < D < E < B < A

❑ ❑ ❑

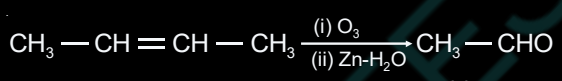
Chapter 22

Hydrocarbons

1. Answer (2)



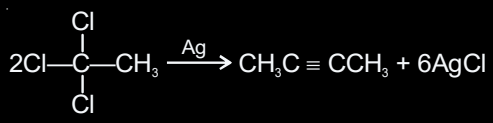
2. Answer (4)



3. Answer (1)

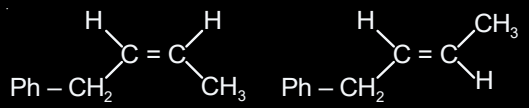
4. Answer (1)

5. Answer (3)



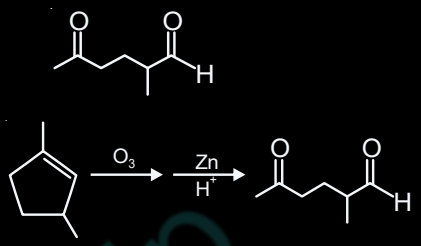
6. Answer (1)

For geometrical isomerism doubly bonded carbon must be bonded to two different groups which is only satisfied by 1 - Phenyl - 2 - butene.

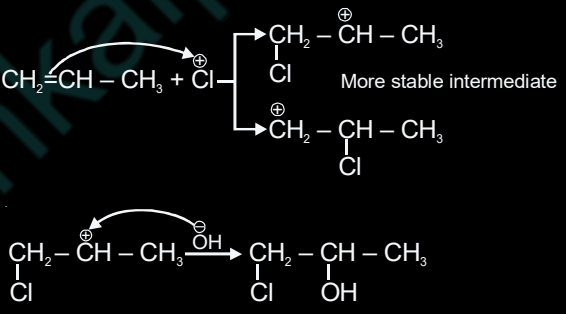


7. Answer (2)

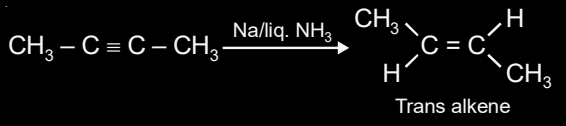
5-keto-2-methylhexanal is



8. Answer (1)

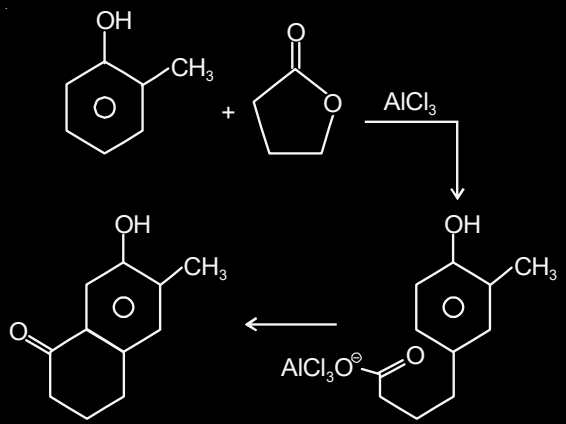


9. Answer (3)

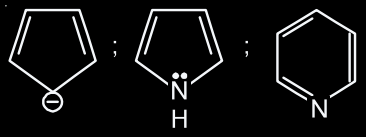


So, option (3) is correct.

10. Answer (1)



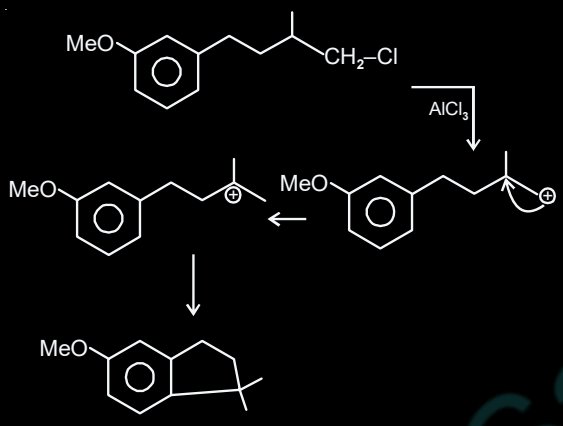
11. Answer (4)



Contain $6\pi e^-$ in complete conjugation and are aromatic.

is anti-aromatic as it has $4\pi e^-$ in complete conjugation.

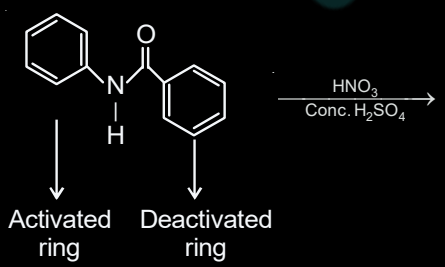
12. Answer (2)



13. Answer (1)

$$CH_3 - CH_2 - CH = CH_2 + Br_2 \xrightarrow{h\nu} CH_3 - \underset{\underset{Br}{|}}{CH} - CH = CH_2$$

14. Answer (2)

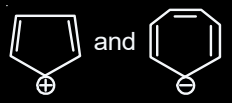


∴ Major product will be formed as per activating group.

∴ Product formed is 

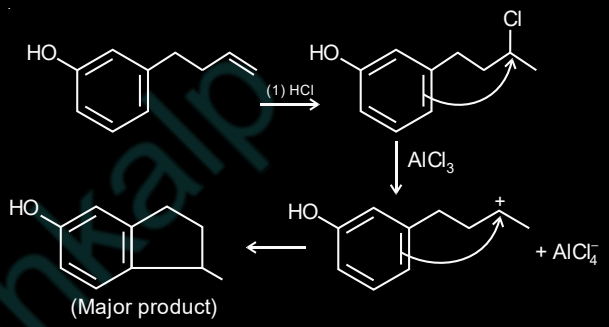
15. Answer (1)

 is aromatic as it has $2\pi e^-$ in complete conjugation

 and are antiaromatic.

 is non aromatic

16. Answer (1)

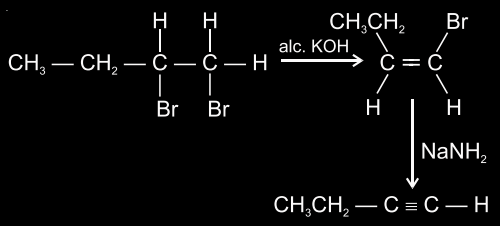


Para attack will form major product because at ortho position steric crowding is applicable.

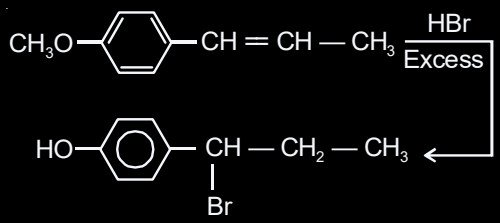
17. Answer (1)

In general, polarity increases the intermolecular force of attraction and as a result increases the melting point.

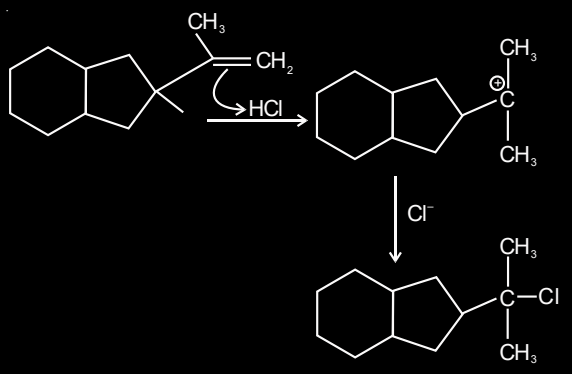
18. Answer (1)



19. Answer (3)

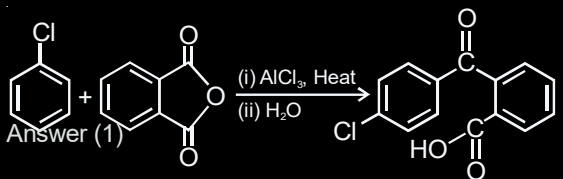


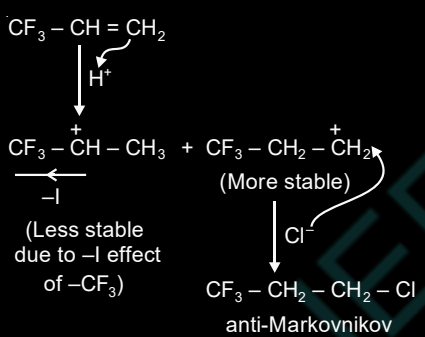
20. Answer (3)



21. Answer (2)

22. Answer (1)

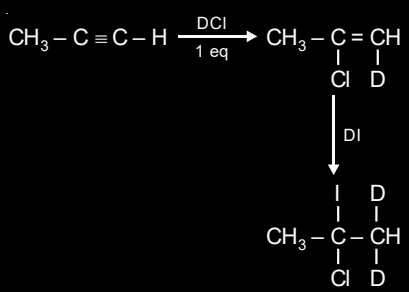




23. Answer (4)

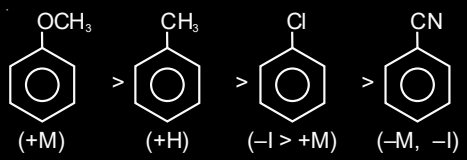
Polysubstitution is a major drawback in Friedel Craft's alkylation.

24. Answer (1)



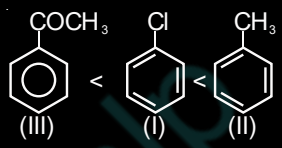
Both addition follow Markownikov's rule.

25. Answer (2)



26. Answer (4)

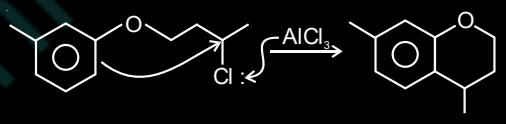
CH_3 group when bonded to benzene increases the electron density of benzene by +I and hyper conjugation effects and hence makes the compound more reactive towards EAS. Cl group decreases the electron density of benzene by –I effect, and CH_3CO group strongly decreases the electron density of benzene by –I and –R effects. Therefore, correct increasing order the given compounds towards EAS is



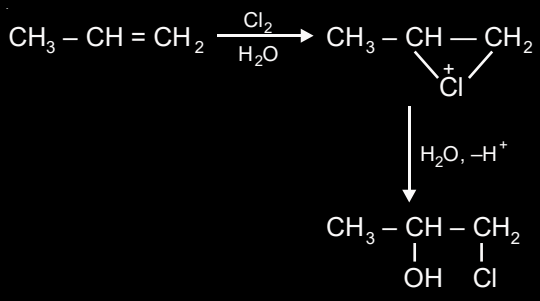
27. Answer (1)

Angle strain is not present in acyclic compounds.

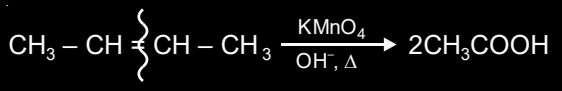
28. Answer (1)



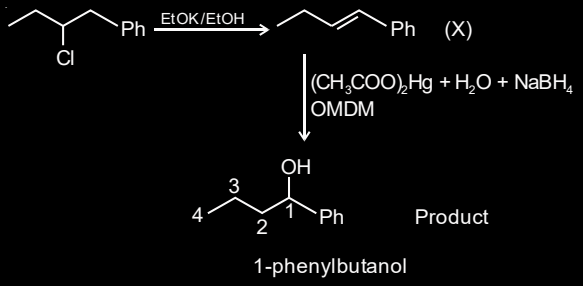
29. Answer (4)



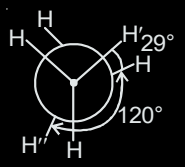
30. Answer (2)



31. Answer (1)



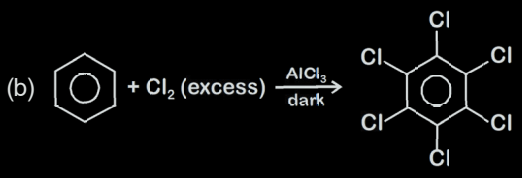
32. Answer (4)

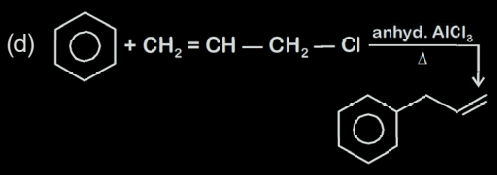


∴ Angle between H′ and H″ = 120° + 29° = 149°

33. Answer (1)

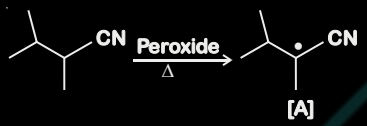
Vinyl halide and aryl halide do not give Friedel Craft's reaction. The reactions which are possible are :



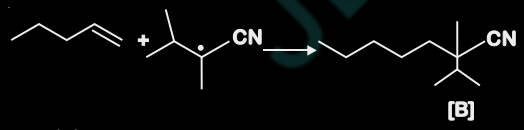


34. Answer (4)

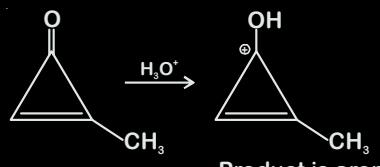
Peroxide generates a radical that abstracts H-atom from the C-atom adjacent to CN group to give more stable radical



[A] attacks 1-pentene to give 2° radical that picks up H-atom to give [B]



35. Answer (4)



Product is aromatic

36. Answer (4)

Aniline and phenol form complex with Lewis acid.

∴ Highest yield in Friedel Craft reaction among given species is for chlorobenzene i.e.

37. Answer (4)

a
Trans config. around both double bond

b
Trans config. around one double bond

c
Cis config. around both double bond

Order of stability : a > b > c

Order of heat of combustion : c > b > a

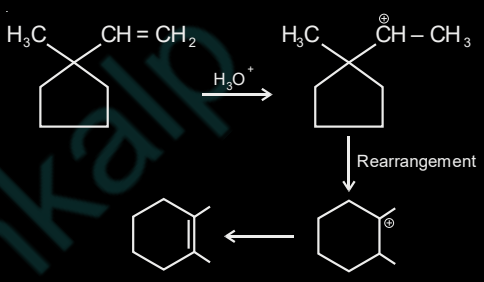
38. Answer (2)

Each carbon atom is sp^2 hybrid

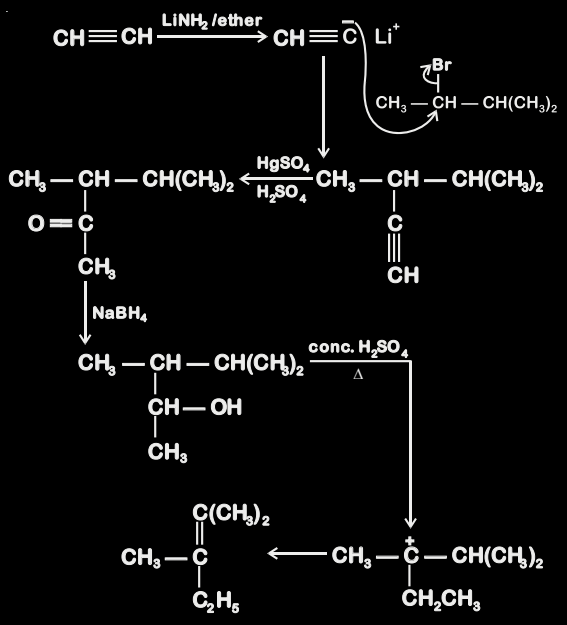
∴ 3 sp^2 hybrid orbitals are formed by each carbon atom

Total sp^2 orbitals = 6 × 3 = 18

39. Answer (3)

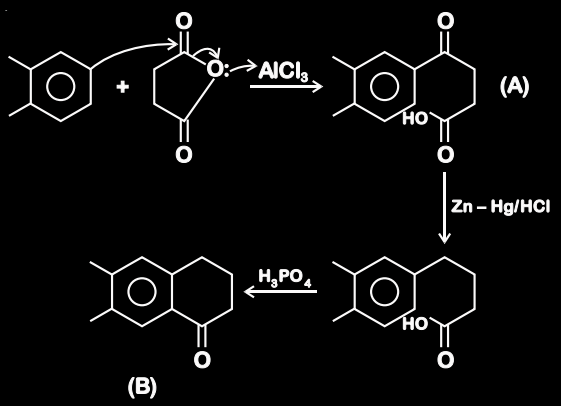


40. Answer (3)

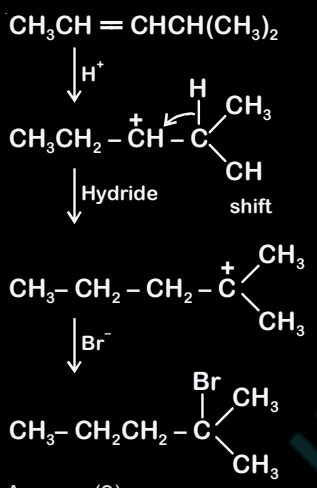


(after Hydride shift)

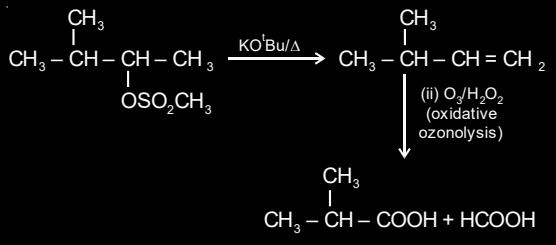
41. Answer (1)



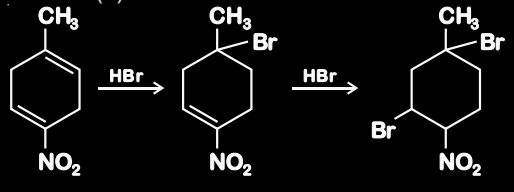
42. Answer (4)



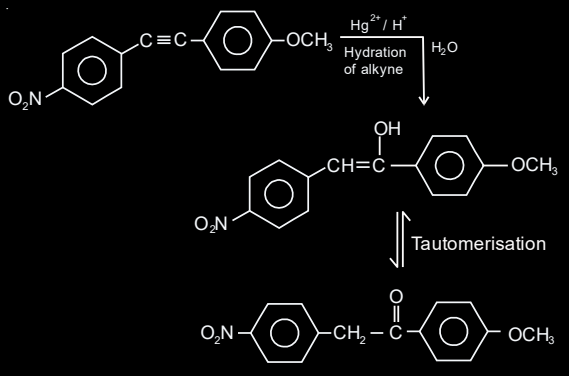
43. Answer (3)



44. Answer (1)

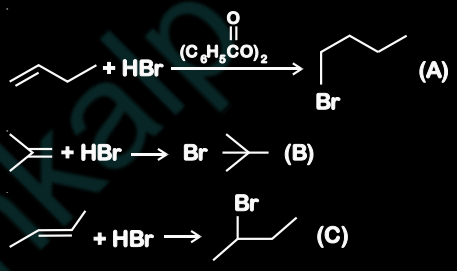


45. Answer (4)



Ethers are least reactive and their cleavage takes place under drastic conditions.

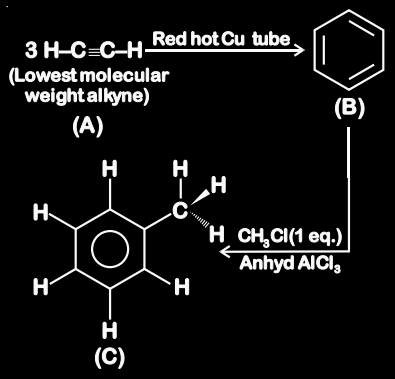
46. Answer (3)



Boiling point decreases with branching

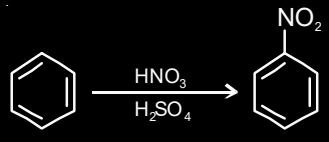
$\therefore$ order of B.P. is A > C > B

47. Answer (13.00)



Number of atoms in one plane = 13

48. Answer (80)



Number of moles of $C_6H_6 = \frac{3.9}{78} = 0.05$

Theoretical moles of nitrobenzene = 0.05

Actual number of moles of nitrobenzene

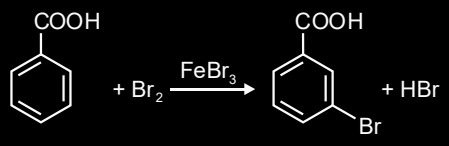
$$= \frac{4.92}{123} = 0.04$$

Percentage yield of nitrobenzene

$$= \frac{0.04}{0.05} \times 100$$

$$= 80\%$$

49. Answer (78)



mass in gram	6.1 g	7.8 g

$$\text{moles } \frac{6.1}{122} = 0.05$$

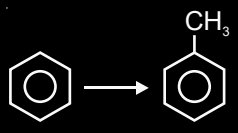
1 mol of benzoic acid give 1 mol of m-bromobenzoic acid. 0.05 mol of benzoic acid will give 0.05 mol of m-bromobenzoic acid.

So, percentage yield is

$$\% \text{ yield} = \frac{7.8 \times 100}{0.05 \times 201} = 77.61\%$$

$$\approx 78\%$$

50. Answer (78)



10 g of C_6H_6 = $\frac{10}{78}$ moles

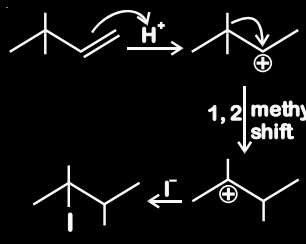
moles of methylbenzene should be obtained

$$= \frac{10}{78} \text{ mole}$$

$$= \frac{10}{78} \times 92 \text{ g}$$

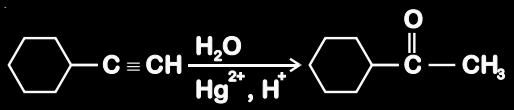
$$\% \text{ yield} = \frac{9.2}{10 \times 92} \times 78 \times 100 = 78\%$$

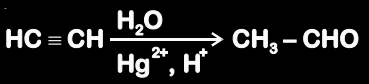
51. Answer (1)

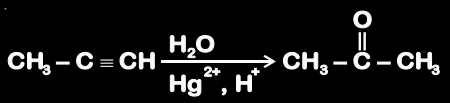


52. Answer (4)

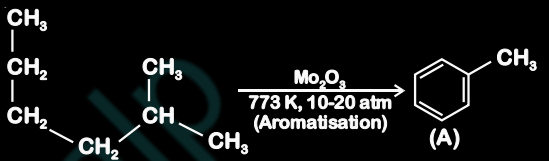
$CH_3 - CH_2 - CHO$ (Propanaldehyde) cannot be prepared by addition of water on alkyne in the presence of $HgSO_4$ and H_2SO_4.



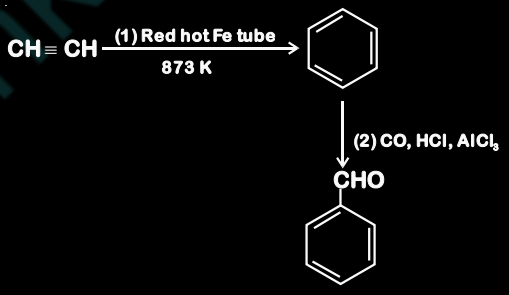




53. Answer (2)

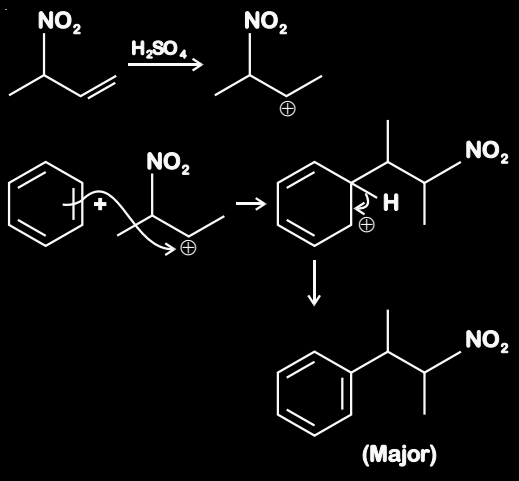


54. Answer (7)

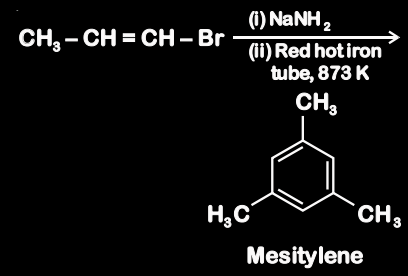


All the 7-carbon-atoms in product are sp^2 hybridised.

55. Answer (2)



56. Answer (2)



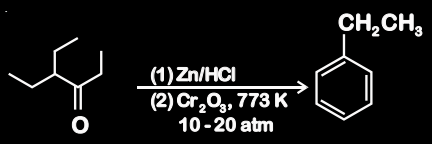
So the correct option should be (2).

57. Answer (2)

$\underset{sp^2}{CH_2} = \underset{sp}{C} = \underset{sp^2}{CH} - \underset{sp^3}{CH_3}$

Hybridization of carbon 1, 2, 3 and 4 respectively are sp^2, sp, sp^2 and sp^3

58. Answer (4)

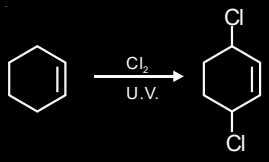


59. Answer (2)

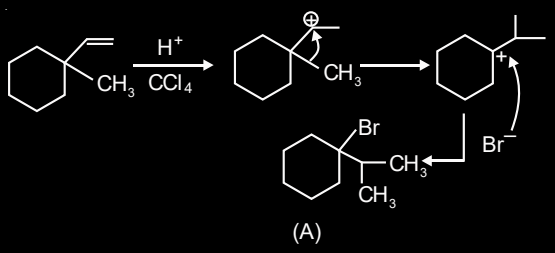
Partially deactivated palladised charcoal is called as Lindlar's catalyst.

60. Answer (2)

In presence of U.V. light, free radical substitution reaction occurs, at allylic position.



61. Answer (3)



The reaction involves the formation of 2° carbocation followed by methanide shift to give 3° carbocation. Br^- ion attacks the 3° carbocation to give the major product.

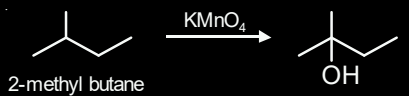
62. Answer (4)

Carbocation B is more stable as it is secondary carbocation having more number of α-hydrogens and having greater +I effect.

$\therefore$ Carbocation B formed at a faster rate than carbocation A.

63. Answer (2)

Alkanes having tertiary H can be oxidised to corresponding alcohols by $KMnO_4$.

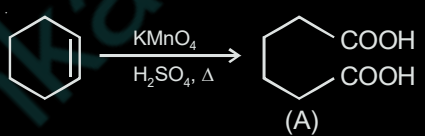


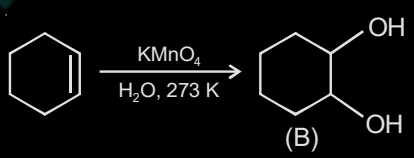
whereas ordinary alkanes resist oxidation.

64. Answer (1)

- Alc. KOH causes elimination
- Pd / $BaSO_4$ – Lindlar's catalyst
- BHC is obtained by the addition reaction of Cl_2 with benzene in presence of U.V.
- Thin film of polyacetylene can be used as electrode in batteries.

65. Answer (1)

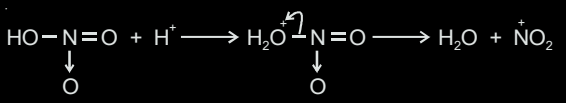


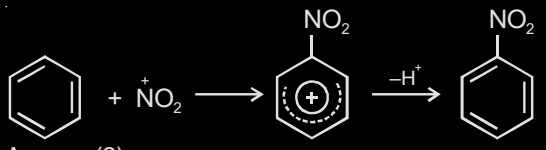


66. Answer (1)

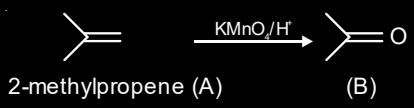
In the nitration of benzene using nitrating mixture, HNO_3 acts as a base and H_2SO_4 acts as an acid to generate NO_2^+ ion.

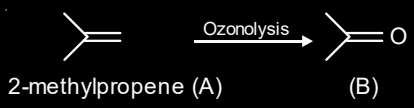
$H_2SO_4 \longrightarrow H^+ + HSO_4^-$



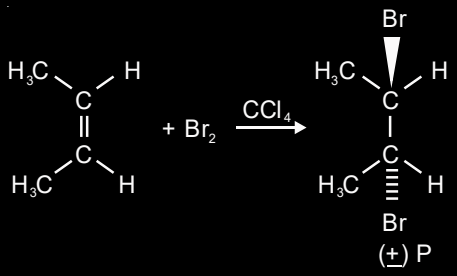


67. Answer (2)





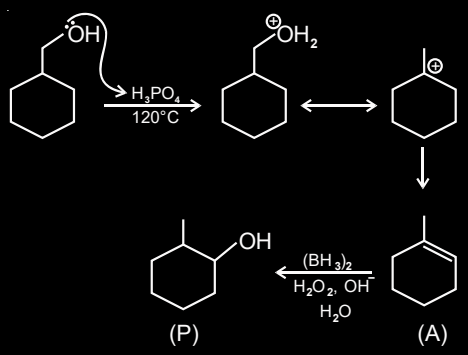
68. Answer (2)



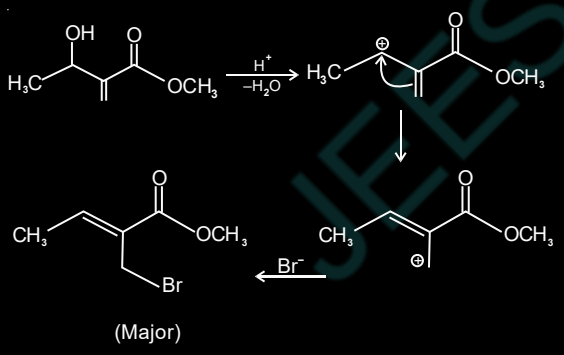
Addition of Br_2 to alkene is anti addition.

Two stereoisomers are formed in the given reaction.

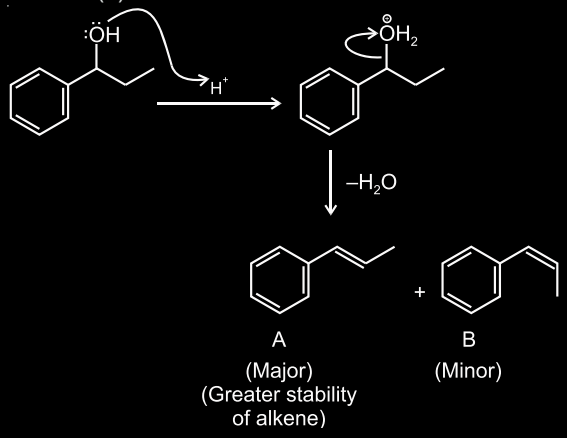
69. Answer (3)



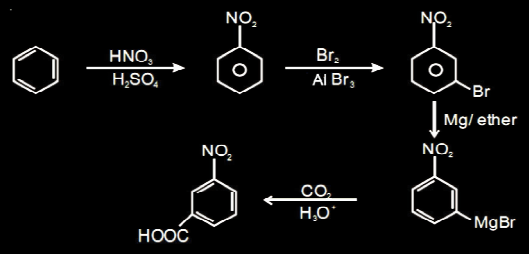
70. Answer (1)



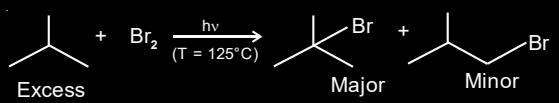
71. Answer (2)



72. Answer (1)



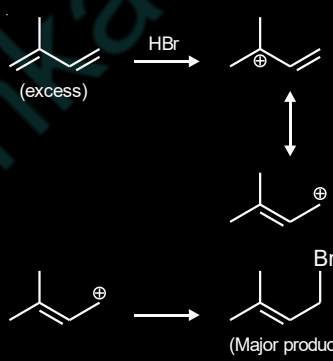
73. Answer (1)



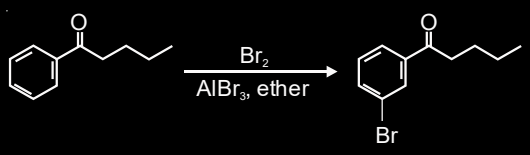
Bromination is highly selective, reactivity order –

3° >> 2° > 1

74. Answer (3)

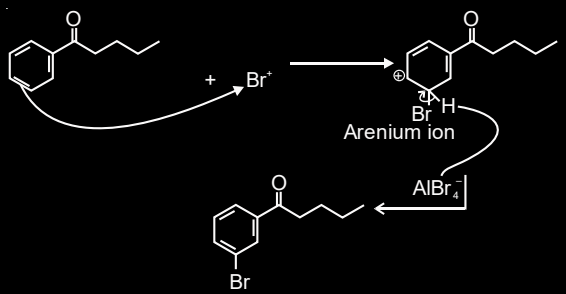


75. Answer (2)



Ketones are meta directors.

$Br_2 + AlBr_3 \longrightarrow AlBr_4^- + Br^+$



76. Answer (3)

$$\text{Mole} = \frac{\text{Given mass}}{\text{Molar mass}}$$

$$= \frac{\text{Given volume (at STP in L)}}{22.4}$$

$$\frac{1.53}{\text{Molar mass}} = \frac{448\times10^{-3}}{22.4}$$

$$\text{Molar mass} = \frac{1.53\times22.4}{448\times10^{-3}} = 76.5 \text{ g mol}^{-1}$$

There can not be more than one chlorine atom per molecule because molar mass 76.5. One of the possible compounds is $Cl - CH_2 - CH = CH_2$.

$Cl - CH_2 - CH = CH_2$

$\xrightarrow[\text{(ii) Zn/ACOH}]{\text{(i) } O_3} ClCH_2 - CHO + HCHO$

77. Answer (1)

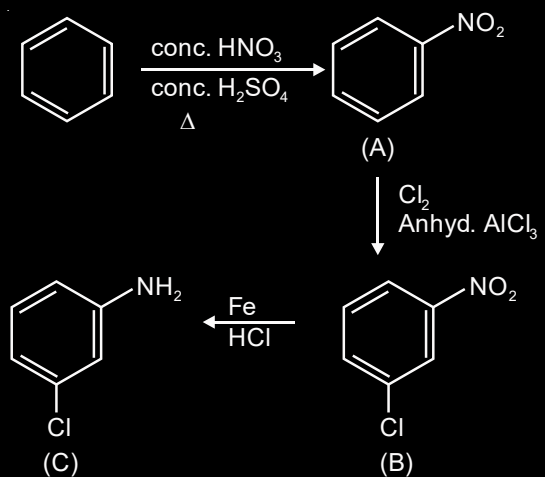
(A) : $CH_3-CH = CH_2 \xrightarrow[H_2O]{Br_2} CH_3-\underset{OH}{\underset{|}{CH}}-\overset{Br}{\overset{|}{CH_2}}$

(R) : $CH_3-CH = CH_2 \xrightarrow{Br_2} CH_3-\overset{\overset{+}{Br}}{\underset{|}{CH}}-CH_2$

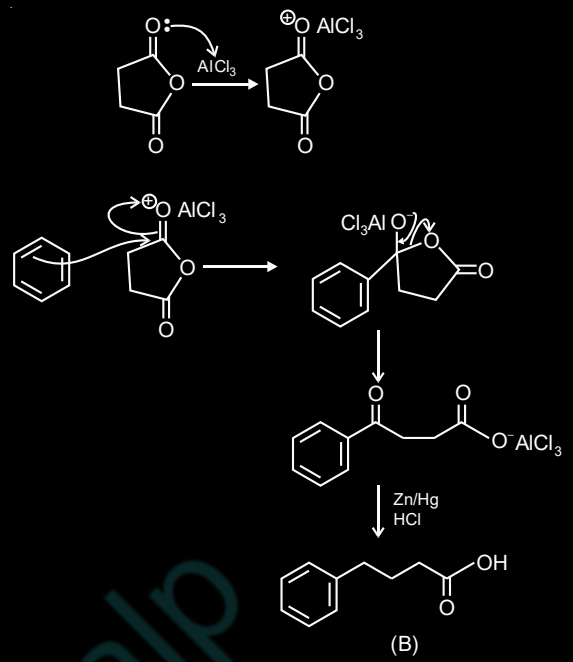
$H_2\ddot{O}$

$CH_3-\underset{OH}{\underset{|}{CH}}-CH_2-Br$

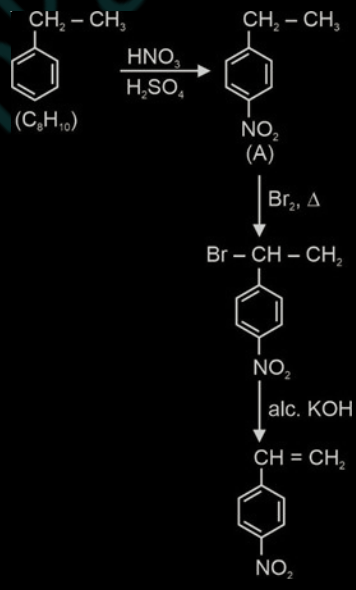
78. Answer (4)



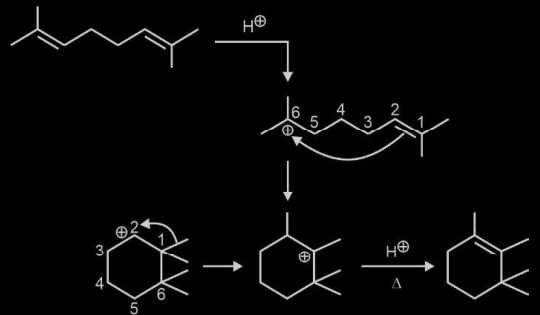
79. Answer (4)



80. Answer (2)



81. Answer (2)



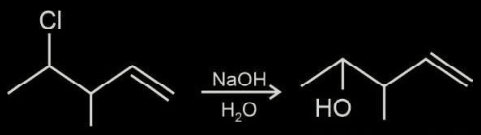
Number of sp^2 hybridised carbon atoms = 2

82. Answer (1)

The π -bond present is alkenes is weaker than σ -bond present in alkanes. That makes alkenes less stable than alkanes. Therefore, statement-I is correct.

Carbon-carbon double bond is stronger than Carbon-carbon single bond because more energy is required to break 1 sigma and 1 pi bond than to break 1 sigma bond only. Therefore, statement-II is also correct.

83. Answer (2)

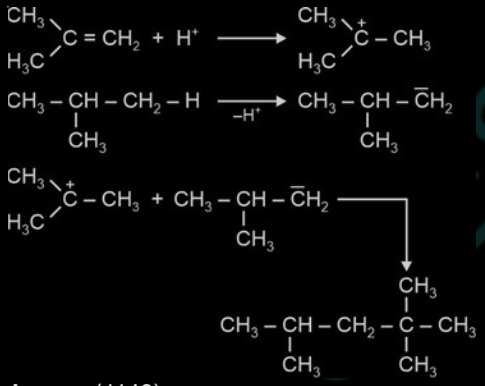


P (Major product)

The given reaction undergoes nucleophilic substitution by SN2 mechanism at room temperature

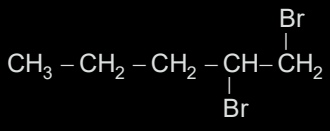
$\therefore$ No. of π electrons present in P = 2

84. Answer (2)



85. Answer (1143)

$CH_3–CH_2–CH_2–CH = CH_2 + Br_2$



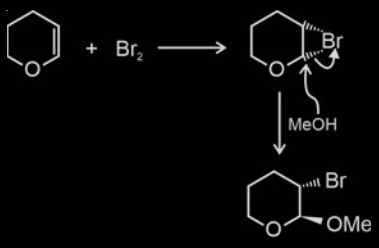
$\frac{5}{70}$ moles of pentene will react with $\frac{5}{70}$ moles of Br_2

$= \frac{5}{70} \times 160$

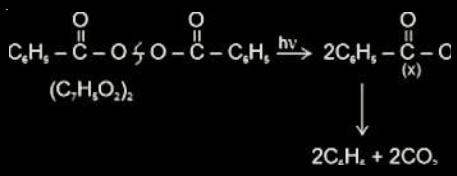
= 11.43 g

$= 1143 \times 10^{-2}$ g

86. Answer (1)

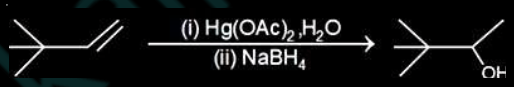


87. Answer (4)

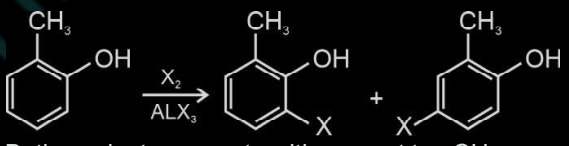


88. Answer (1)

Oxymercuration-demercuration follows Markovnikov's addition of water without rearrangement.

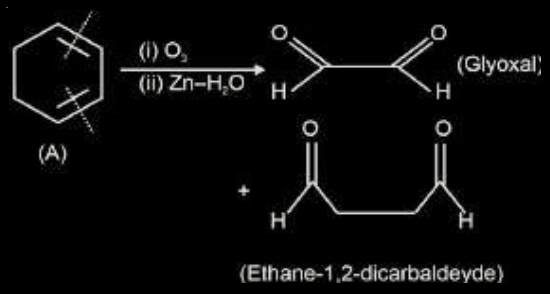


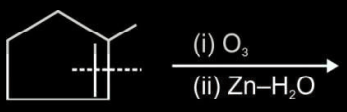
89. Answer (3)



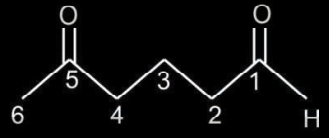
Both products are meta with respect to $–CH_3$.

90. Answer (4)





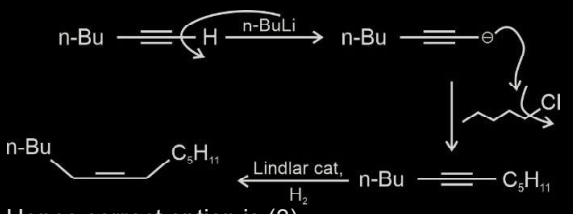
(B)



(S-oxohexanal)

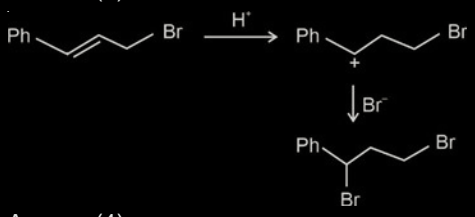
(B) should be 1-methylcyclopent-1-ene.

91. Answer (3)

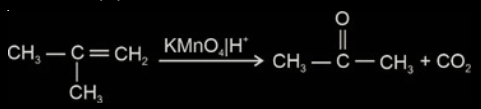


Hence correct option is (3).

92. Answer (3)



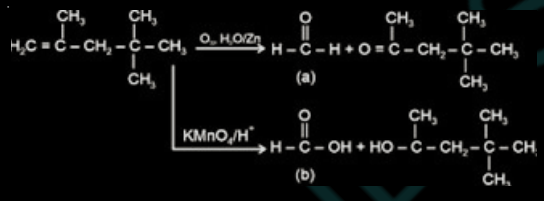
93. Answer (4)



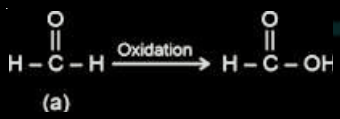
94. Answer (3)

Initially $CH_3 - CH_2 - \overset{+}{C}H_2$ is formed. On rearrangement $CH_3 - \overset{+}{C}H - CH_3$ stable carbocation is formed.

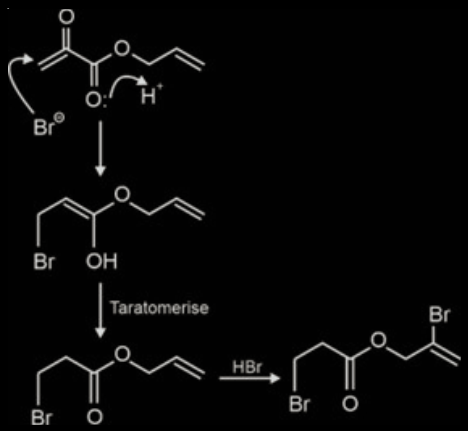
95. Answer (4)



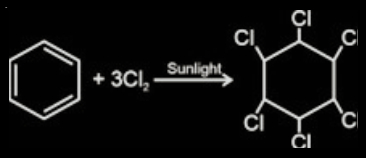
* Ants produces formic acid in their venom gland.



96. Answer (4)

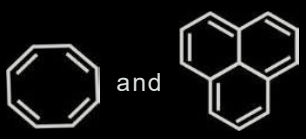


97. Answer (6)



Total number of hydrogens are 6.

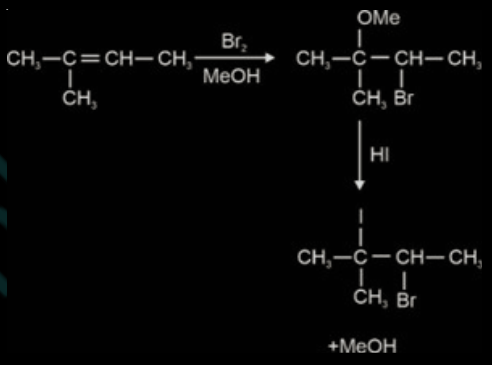
98. Answer (1) and (2)



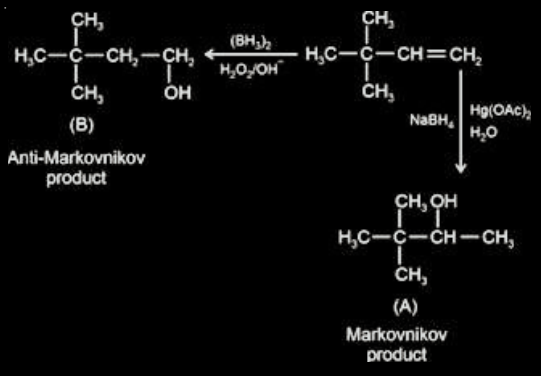
and

are not benzenoid compounds, since benzenoid compound contains benzene ring.

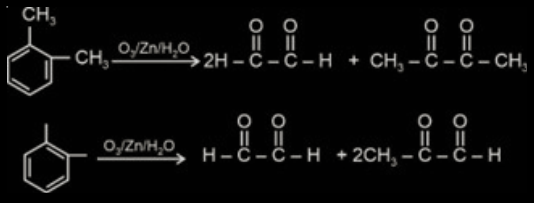
99. Answer (2)



100. Answer (2)

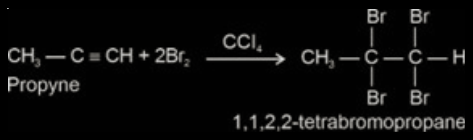


101. Answer (3)



$\therefore$ in option (3) different products are produced.

102. Answer (3)



2 moles $Br_2 \equiv$ 1 mole 1,1,2,2-tetrabromopropane

$\frac{1}{160}$ mole Br_2

$\equiv \frac{1}{2} \times \frac{1}{160}$ mole 1,1,2,2-tetrabromopropane

But yield of reaction is only 27%

Moles of 1,1,2,2-tetrabromopropane

$= \frac{1}{2} \times \frac{1}{160} \times \frac{27}{100}$

Molar mass of 1,1,2,2-tetrabromopropane = 360 g

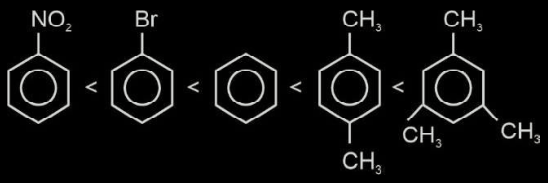
Mass of 1,1,2,2-tetrabromopropane

$= \frac{1}{2} \times \frac{1}{160} \times \frac{27}{100} \times 360$ g

$\approx 3 \times 10^{-1}$ g

103. Answer (2)

The correct order of reactivity towards nitration is



as electron releasing groups on benzene ring facilitate the nitration at benzene ring.

❑ ❑ ❑