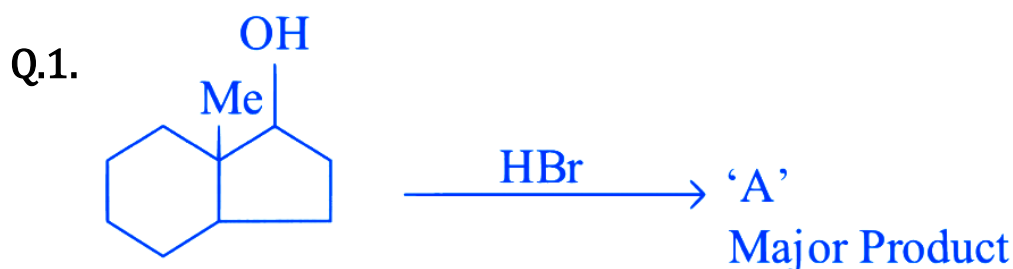


# Alcohols, Phenols and Ethers



## Numerical

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The number of hyperconjugation structures involved to stabilize  
JEE Main 2023 (Online) 11th April Morning Shift

Q.2. The denticity of the ligand present in the Fehling's reagent is \_\_\_\_\_.

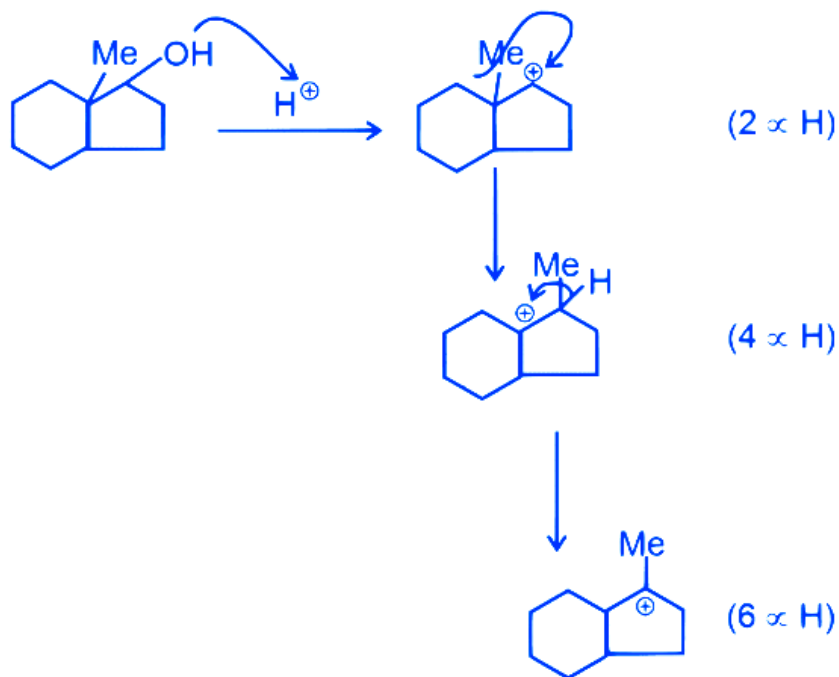
JEE Main 2023 (Online) 29th January Evening Shift

## Answer Key & Explanation

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1. **Ans.** Correct answer is 7

**Explanation**



So, number of hyperconjugation structures in most stable carbocation

$$= 6 + 1 = 7$$

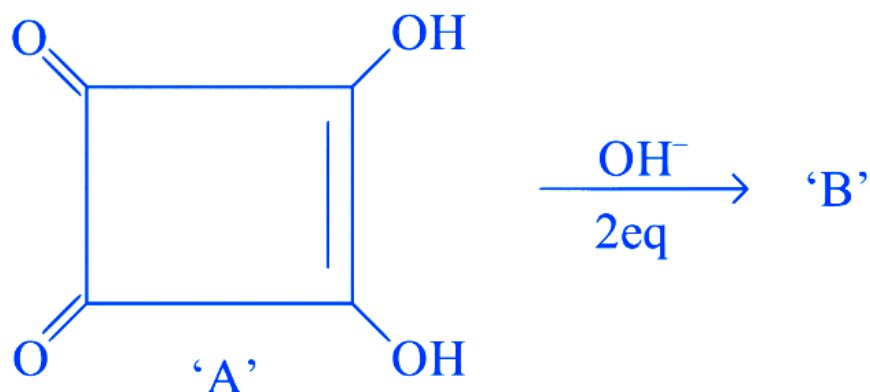
**2. Ans.** Correct answer is 4

### Explanation

The ligand present in Fehling's reagent is tartrate, specifically potassium sodium tartrate ( $\text{KNaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$ ), which acts as a chelating agent. The denticity of tartrate is four, meaning that it can bond to a metal ion through four different atoms, in this case, two oxygen atoms from each of the two carboxylate groups and two oxygen atoms from the two hydroxyl groups. This chelation allows the copper ions in Fehling's A to remain in solution, preventing them from precipitating out as insoluble copper hydroxides. The chelation also helps to stabilize the intermediate copper complexes formed during the redox reaction with reducing sugars, allowing for the formation of the brick-red precipitate of copper(I) oxide ( $\text{Cu}_2\text{O}$ ).

## MCQ (Single Correct Answer)

Q.1. Correct statements for the given reaction are :



- A. Compound 'B' is aromatic
- B. The completion of above reaction is very slow
- C. 'A' shows tautomerism
- D. The bond lengths of C-C in compound B are found to be same

Choose the correct answer from the options given below:

A B, C and D only

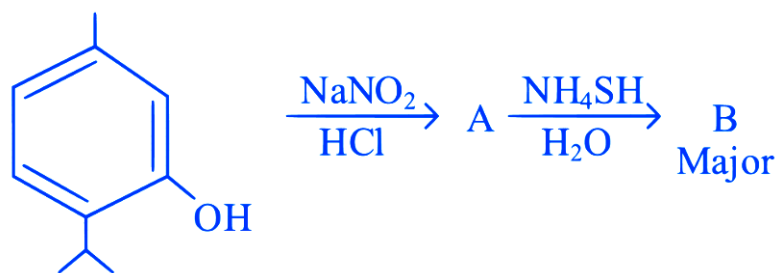
B A, C and D only

C A, B and D only

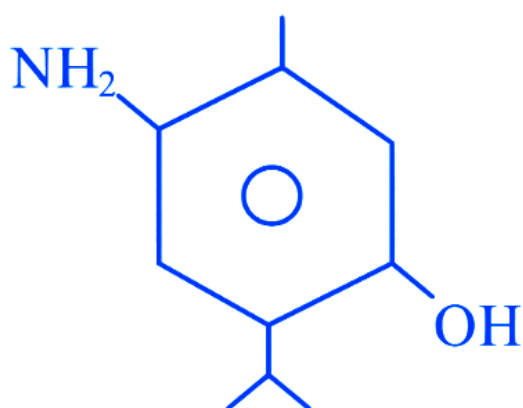
D A, B and C only

JEE Main 2023 (Online) 12th April Morning Shift

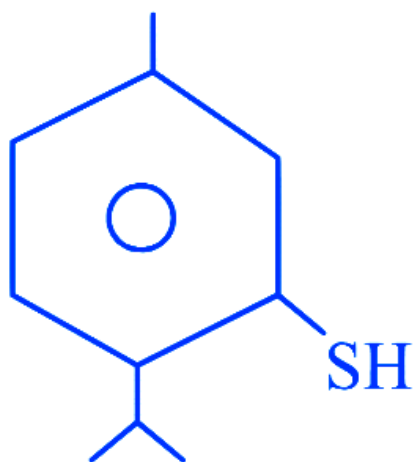
Q.2. Compound 'B' is



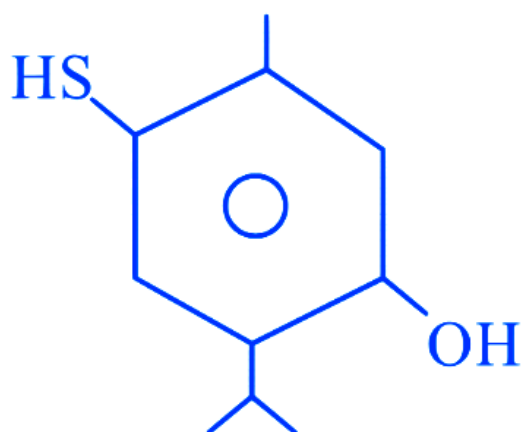
A



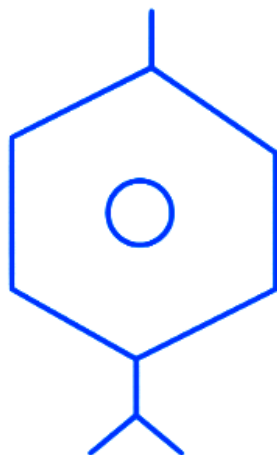
B



C

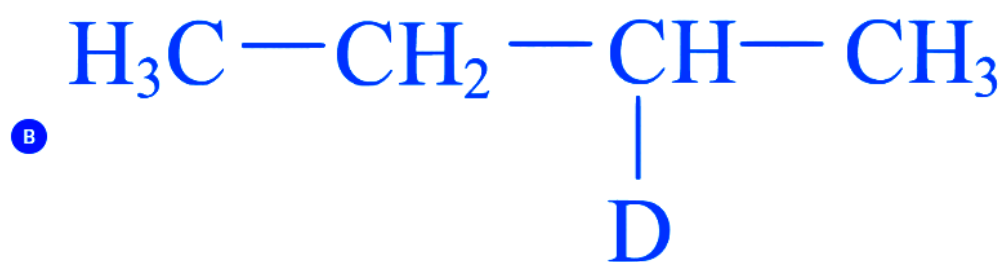
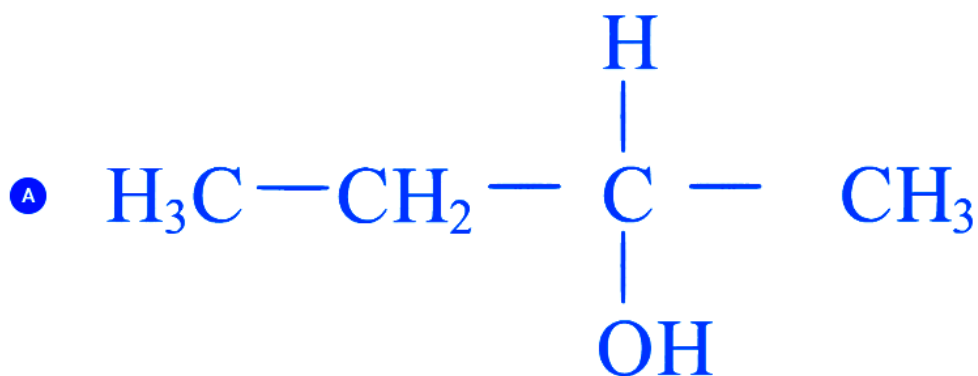
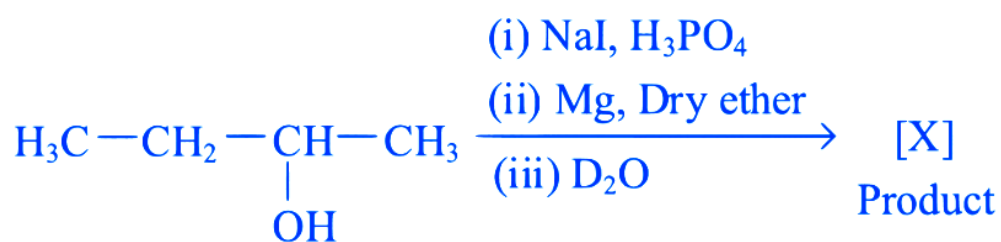


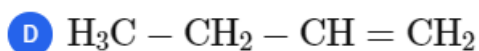
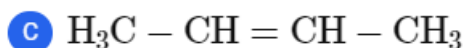
D



JEE Main 2023 (Online) 11th April Evening Shift

Q.3.





### JEE Main 2023 (Online) 11th April Evening Shift

Q.4. Incorrect method of preparation for alcohols from the following is:

**A** Hydroboration-oxidation of alkene.

**B** Reaction of Ketone with  $\text{RMgBr}$  followed by hydrolysis.

**C** Ozonolysis of alkene.

**D** Reaction of alkyl halide with aqueous  $\text{NaOH}$ .

### JEE Main 2023 (Online) 10th April Evening Shift

Q.5. Suitable reaction condition for preparation of Methyl phenyl ether is

**A** Benzene,  $\text{MeBr}$

**B**  $\text{PhO}^\ominus\text{Na}^\oplus$ ,  $\text{MeBr}$

**C**  $\text{Ph} - \text{Br}$ ,  $\text{MeO}^\ominus\text{Na}^\oplus$

**D**  $\text{PhO}^\ominus\text{Na}^\oplus$ ,  $\text{MeOH}$

### JEE Main 2023 (Online) 10th April Morning Shift

**Q.6.** Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: Butan -1- ol has higher boiling point than ethoxyethane.

Reason R: Extensive hydrogen bonding leads to stronger association of molecules.

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

A A is false but R is true

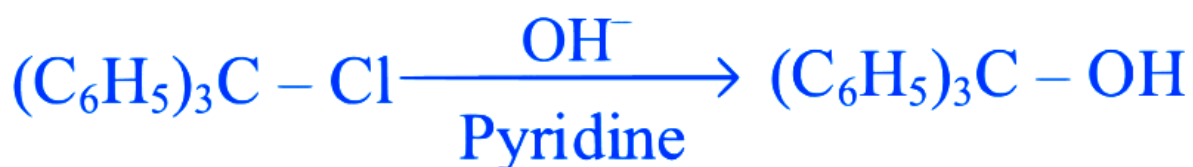
B Both A and R are true but R is not the correct explanation of A

C Both A and R are true and R is the correct explanation of A

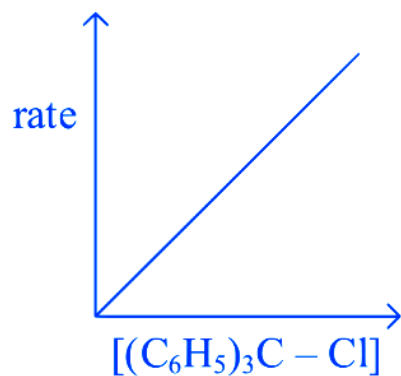
D A is true but R is false

### JEE Main 2023 (Online) 8th April Morning Shift

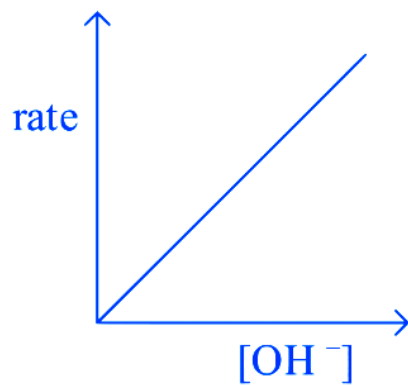
**Q.7.** The graph which represents the following reaction is :



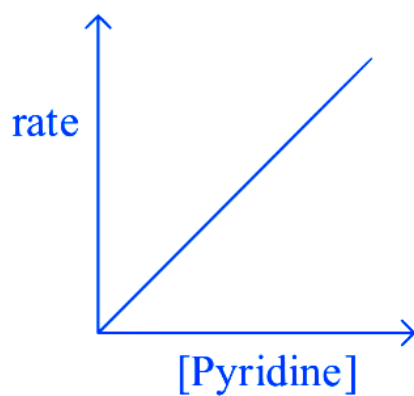
A



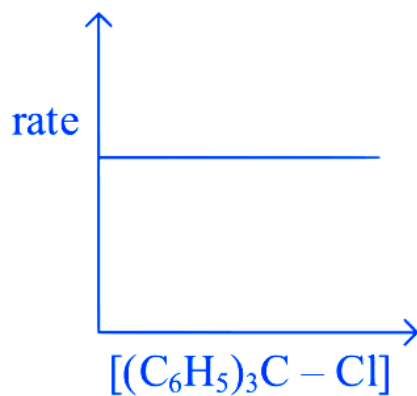
B



C



D

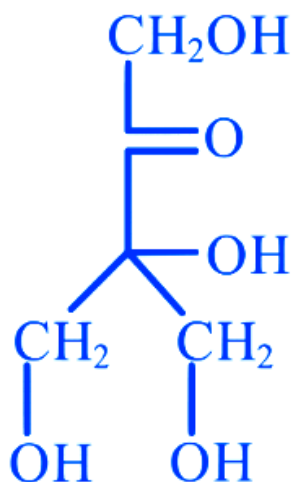


JEE Main 2023 (Online) 1st February Evening Shift

Q.8. Compound A,  $C_5H_{10}O_5$ , given a tetraacetate with  $Ac_2O$  and



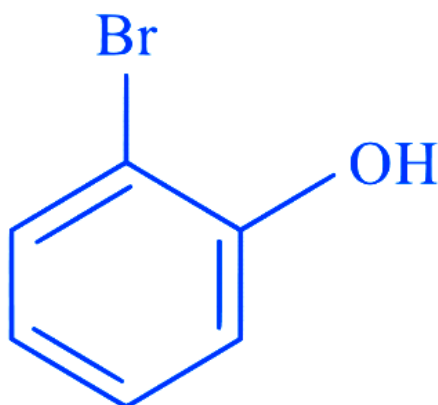
D



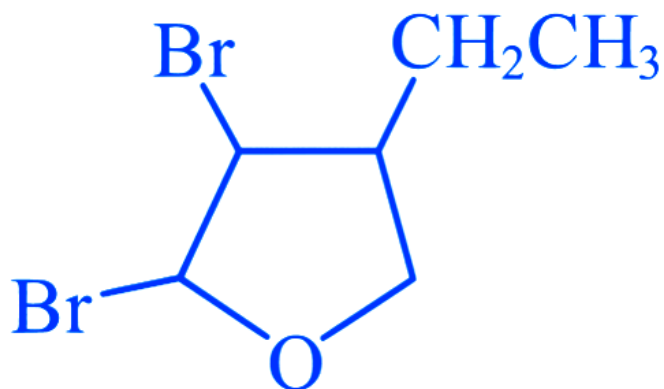
JEE Main 2023 (Online) 31st January Evening Shift

Q.9. An organic compound 'A' with empirical formula  $C_6H_6O$  gives sooty flame on burning. Its reaction with bromine solution in low polarity solvent results in high yield of B. B is

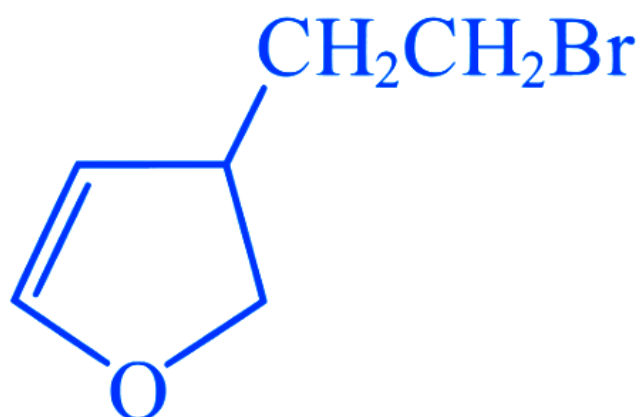
A



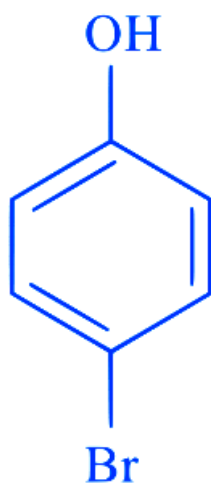
B



C



D



JEE Main 2023 (Online) 31st January Morning Shift

Q.10. A solution of  $\text{CrO}_5$  in amyl alcohol has a \_\_\_\_\_ colour.

A Yellow

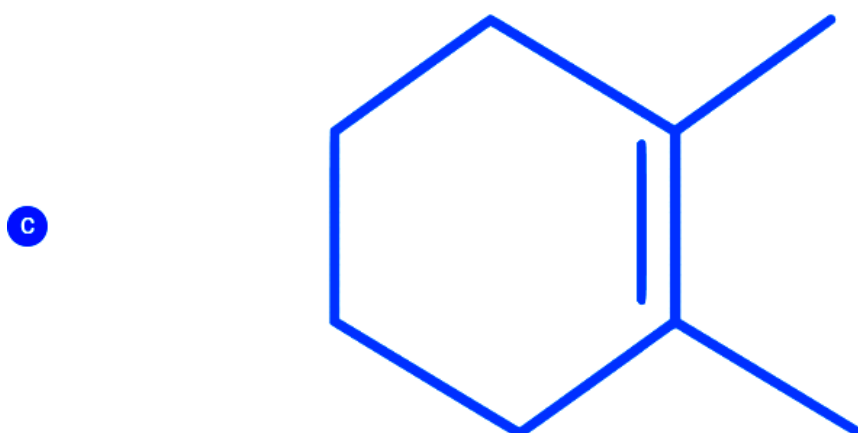
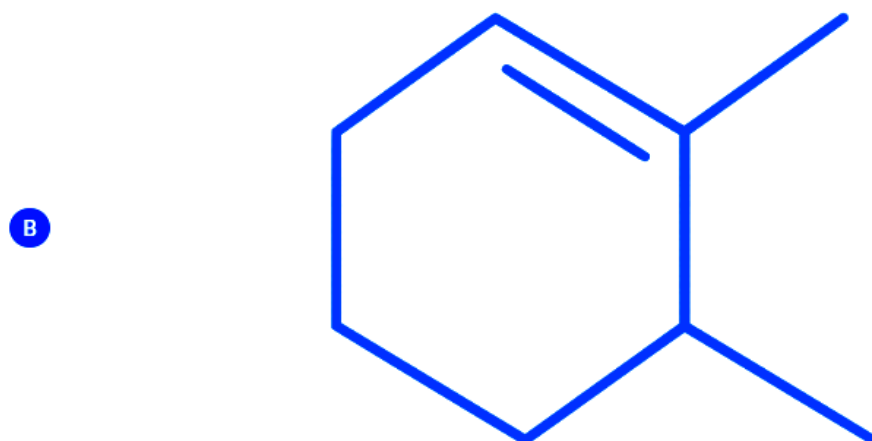
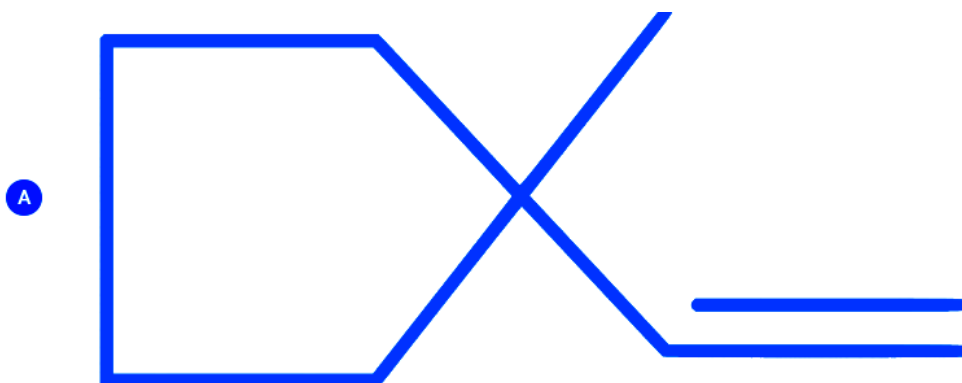
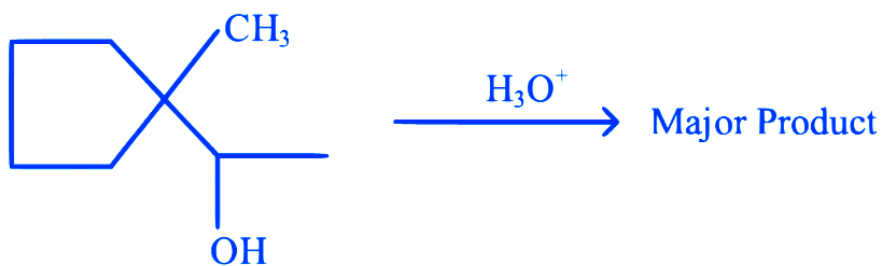
B Orange-Red

C Green

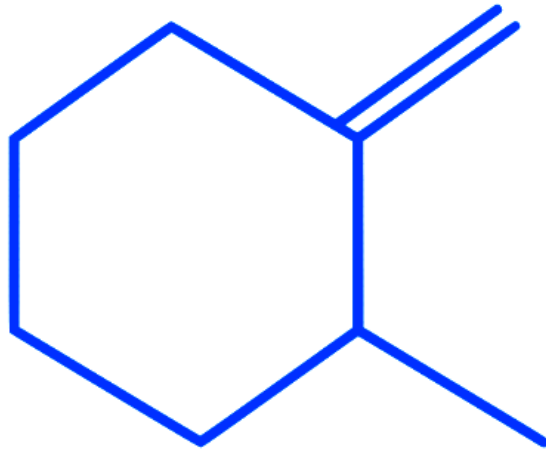
D Blue

JEE Main 2023 (Online) 29th January Evening Shift

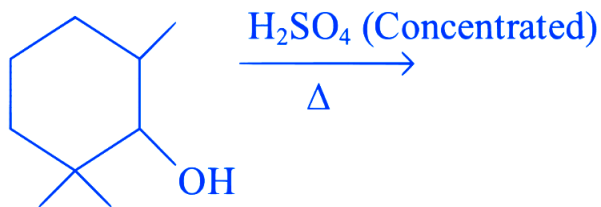
Q.11. Find out the major product for the following reaction.



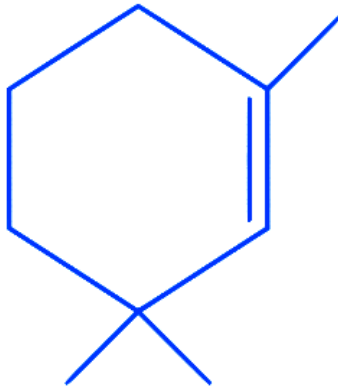
D



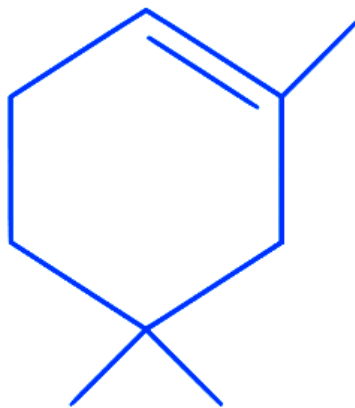
Q.12. Find out the major product from the following reaction.



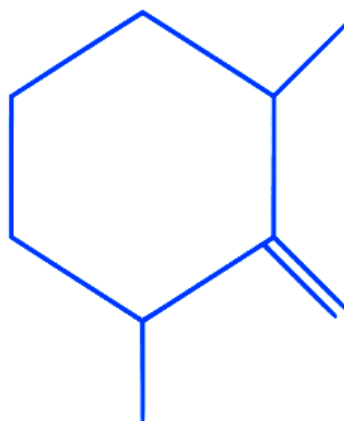
A



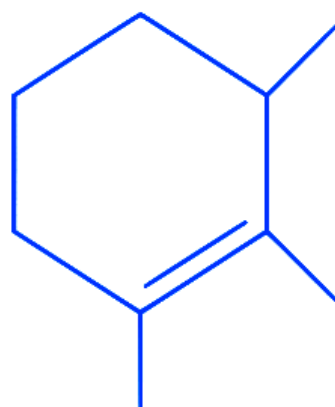
B



C



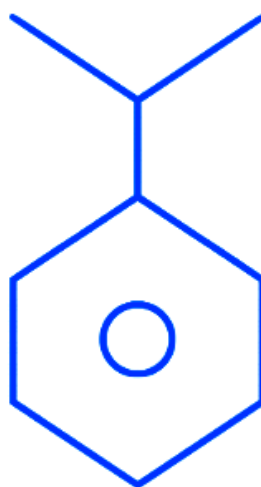
D



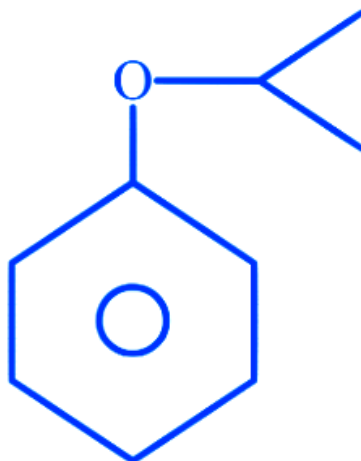
JEE Main 2023 (Online) 25th January Evening Shift

Q.13. In the cumene to phenol preparation in presence of air, the intermediate is

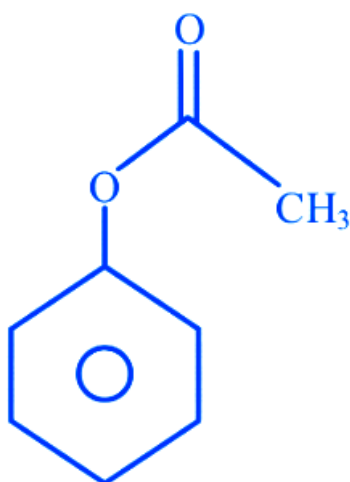
A



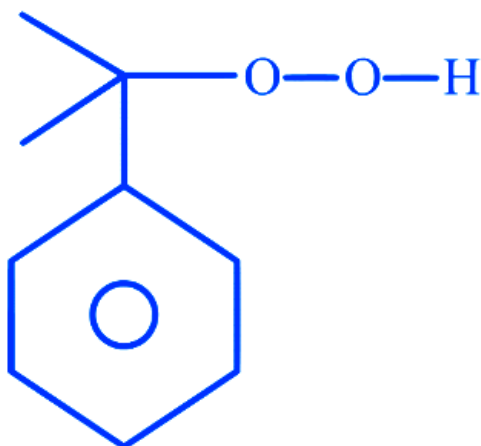
B



C

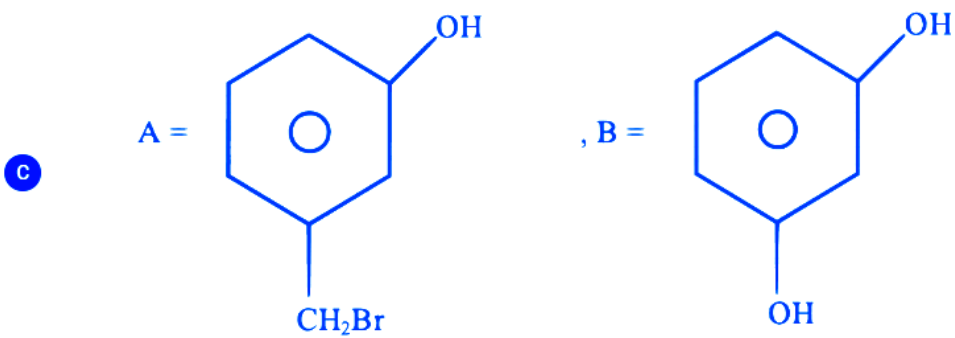
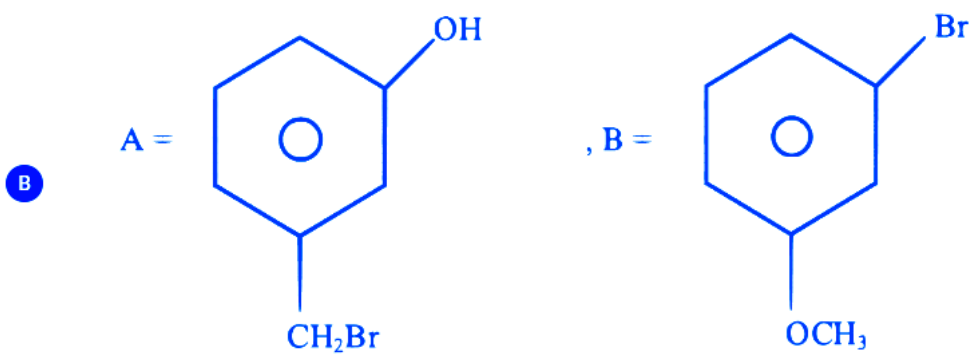
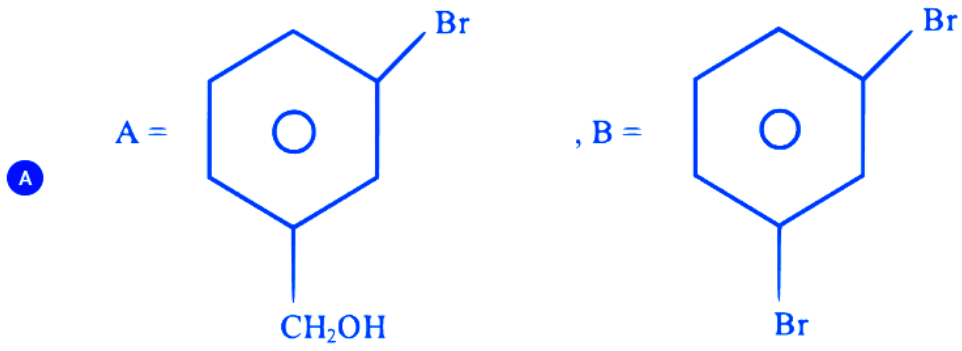
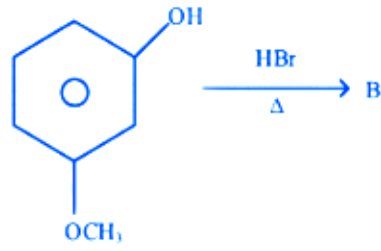
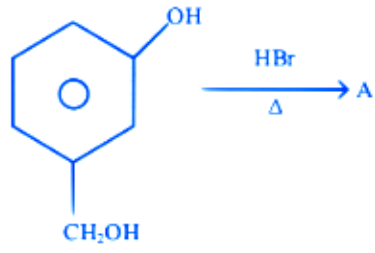


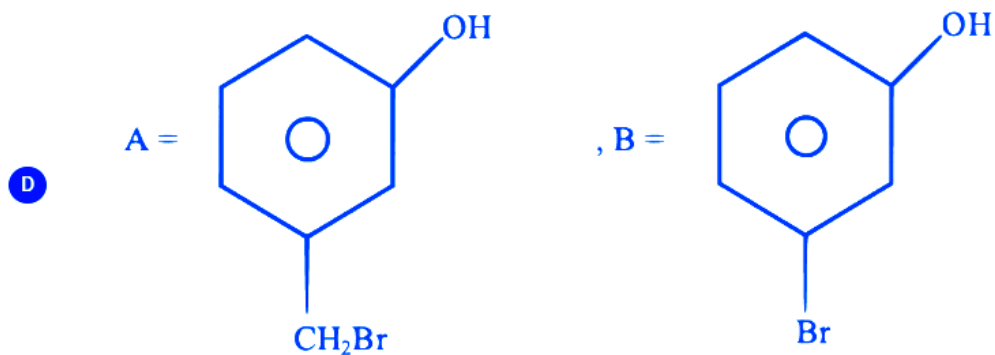
D



JEE Main 2023 (Online) 25th January Morning Shift

Q.14. 'A' and 'B' formed in the following set of reactions are :



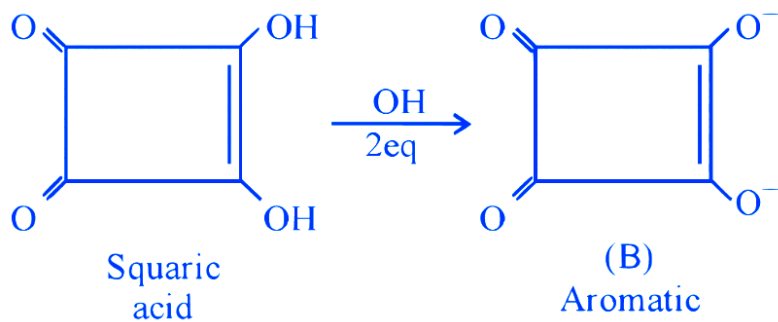


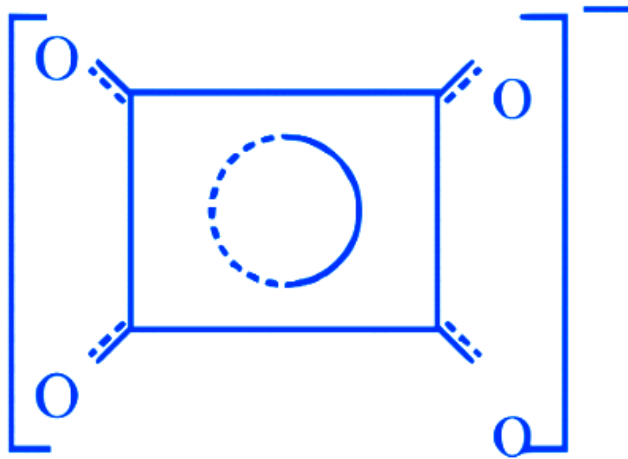
JEE Main 2023 (Online) 24th January Morning Shift

## Answer Key & Explanation

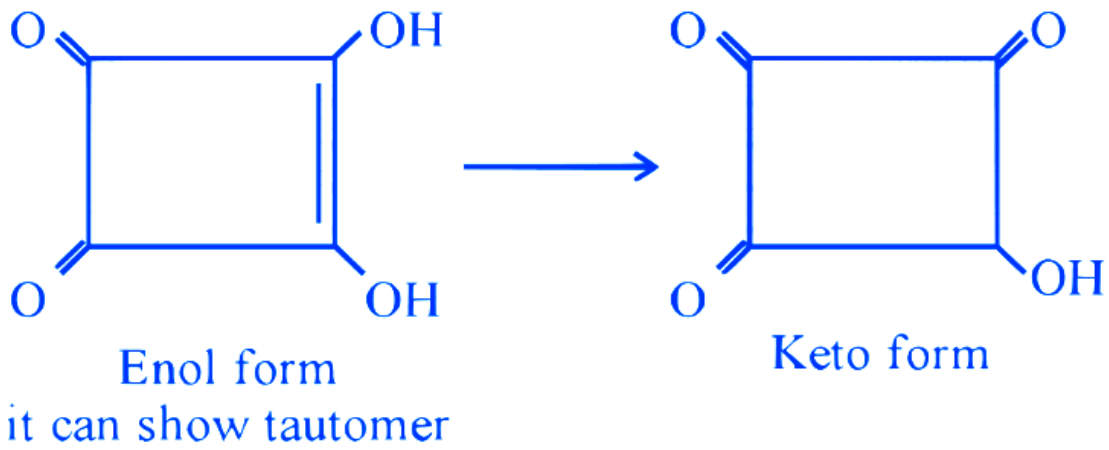
1. Ans. (B)

Explanation



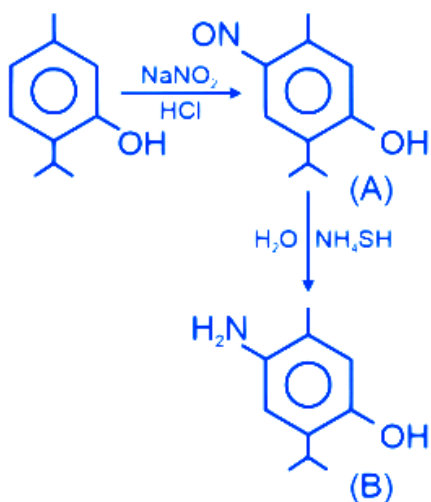


Resonance hybrid of B showing all C-C bond length same



2. Ans. (A)

Explanation



3. Ans. (B)



The boiling point of a substance is dependent on the strength of the intermolecular forces between its molecules. Stronger intermolecular forces require more energy to overcome, thus resulting in a higher boiling point.

In the case of butan-1-ol and ethoxyethane (diethyl ether), they are both composed of similar numbers of similar atoms, but the type of intermolecular force between the molecules differs due to their functional groups.

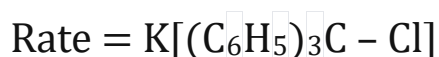
Butan-1-ol is an alcohol and has a -OH group, which allows for hydrogen bonding, a strong type of dipole-dipole interaction. This happens when the hydrogen atom in a polar bond (especially -OH, -NH, -HF) is attracted to some electronegative atom (like O, N, or F) in another molecule. Because of this, butan-1-ol molecules "stick together" more strongly, requiring more heat energy to separate them and thus exhibiting a higher boiling point.

On the other hand, ethoxyethane, being an ether, does not have the ability to form hydrogen bonds since it lacks the -OH group. The primary intermolecular forces in ethers are relatively weaker van der Waals forces. Therefore, it requires less heat energy to break these forces, resulting in a lower boiling point compared to butan-1-ol.

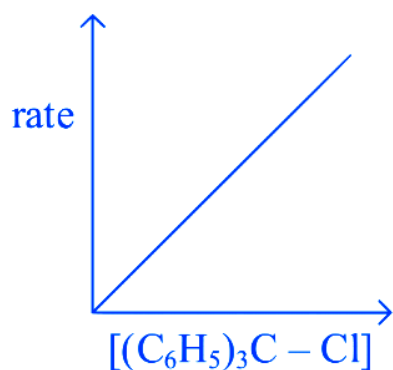
So, both A and R are true and R is indeed the correct explanation for A.

## 7. Ans. (A)

### Explanation

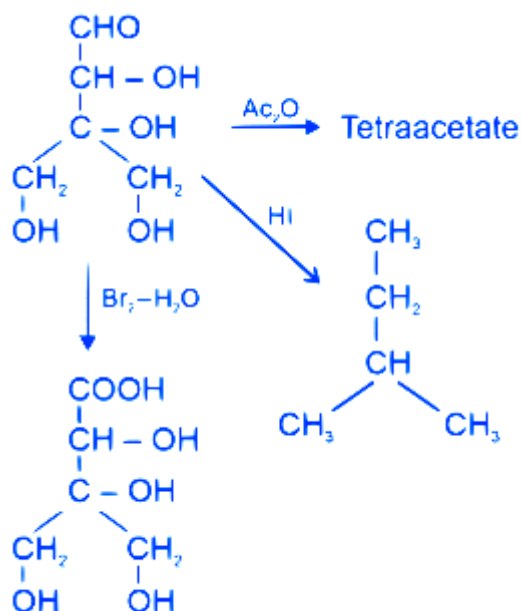


It is SN1 reaction so rate of reaction depends on the concentration of alkyl halide only.



8. Ans. (B)

Explanation

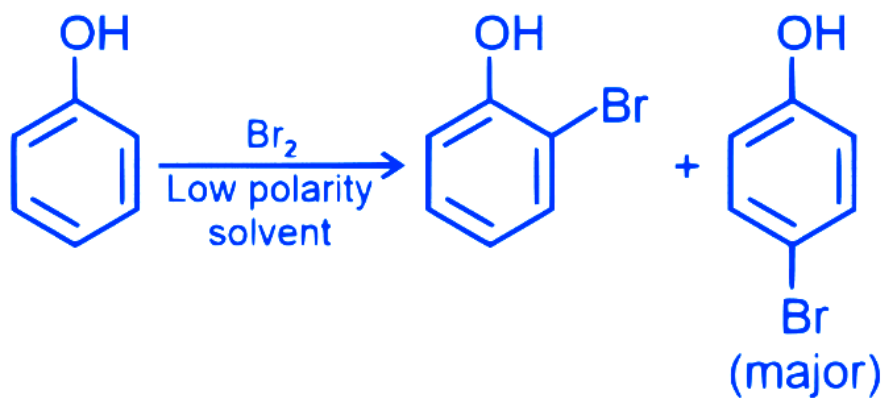


Formation of tetraacetate with  $\text{AcO}_2$  means compound A has four  $-\text{OH}$  linkage.

Reduction of A with HI gives Isopentane i.e. molecule contains five carbon atoms.

9. Ans. (D)

Explanation



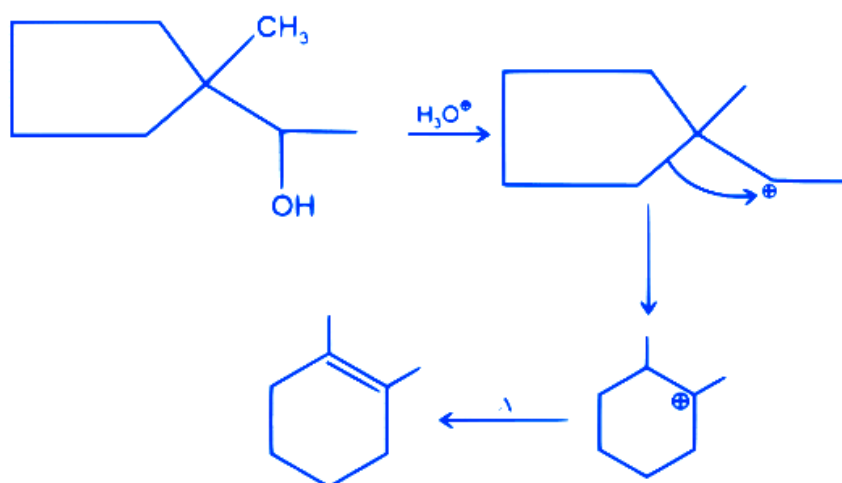
10. Ans. (D)

Explanation

$\text{CrO}_5$  is blue in colour in amyl alcohol.

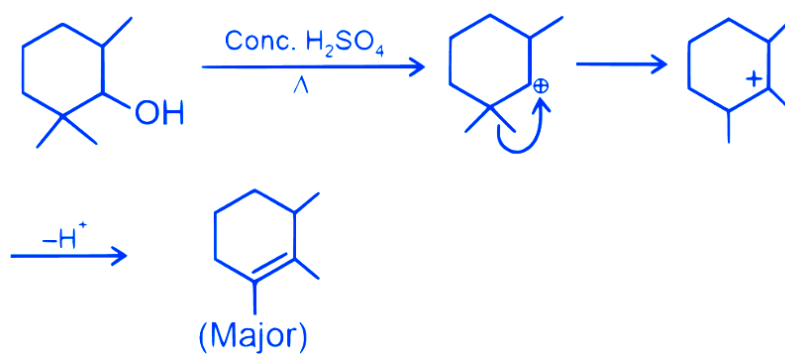
11. Ans. (C)

Explanation



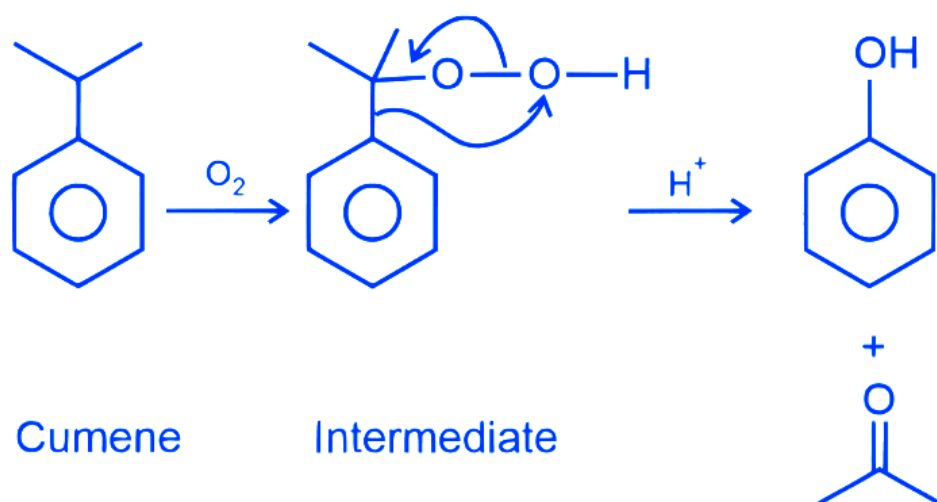
12. Ans. (D)

Explanation



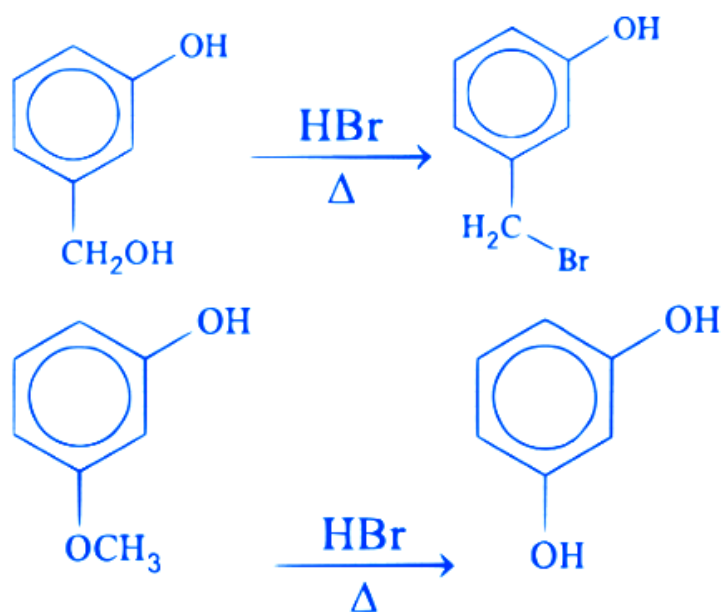
13. Ans. (D)

Explanation



14. Ans. (C)

Explanation



# 2022

## Numerical

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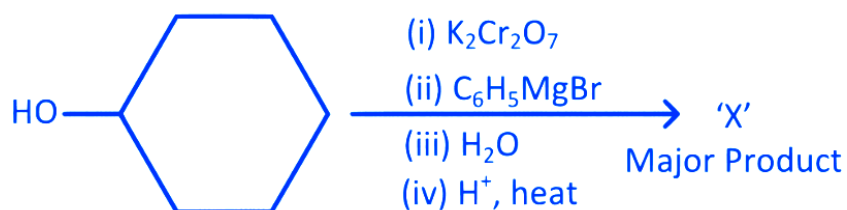
**Q.1.** The number of chlorine atoms in bithionol is \_\_\_\_\_.

JEE Main 2022 (Online) 29th July Evening Shift

**Q.2.** The number of chiral alcohol(s) with molecular formula  $C_4H_{10}O$  is \_\_\_\_\_.

JEE Main 2022 (Online) 29th June Evening Shift

**Q.3.** In the given reaction,



the number of  $sp^2$  hybridised carbon(s) in compound 'X' is \_\_\_\_\_.

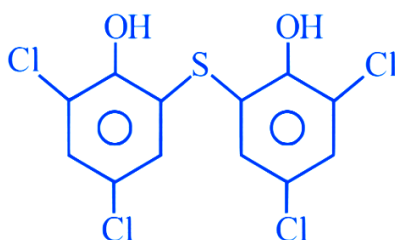
## Answer Key & Explanation

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**1. Ans.** Correct answer is 4

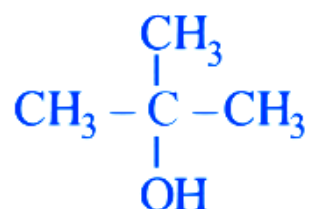
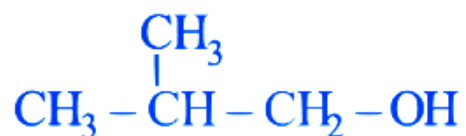
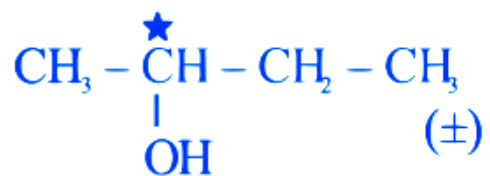
### Explanation

Number of chlorine atoms in bithionol = 4



2. **Ans.** Correct answer is 2

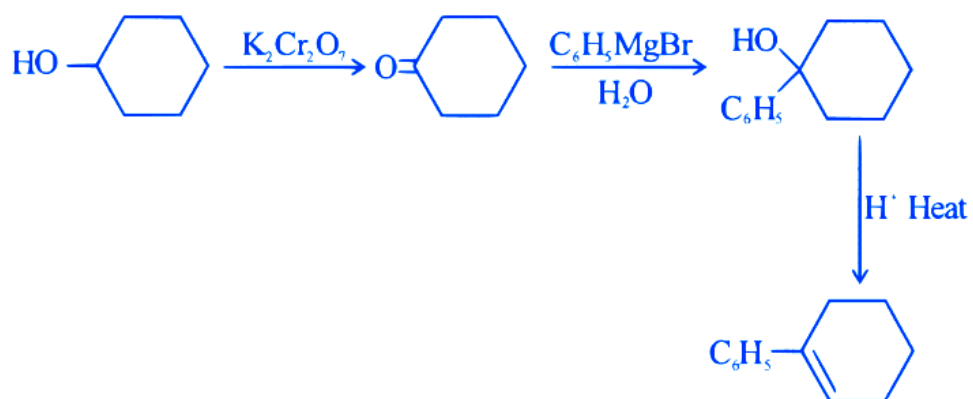
**Explanation**



Out of which only two are chiral

3. **Ans.** Correct answer is 8

**Explanation**



## MCQ (Single Correct Answer)

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**Q.1.** When ethanol is heated with conc.  $\text{H}_2\text{SO}_4$ , a gas is produced. The compound formed, when this gas is treated with cold dilute aqueous solution of Baeyer's reagent, is

A formaldehyde

B formic acid

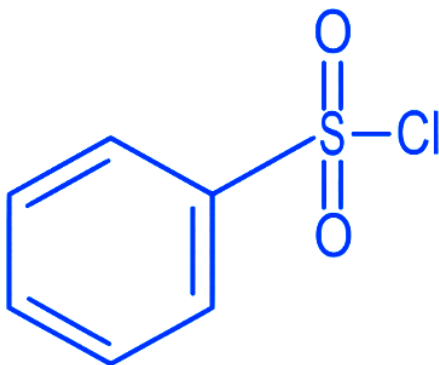
C glycol

D ethanoic acid

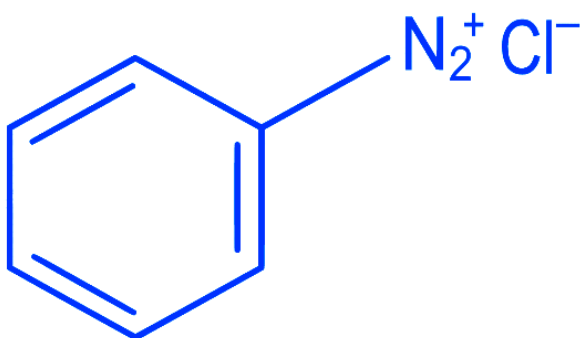
**JEE Main 2022 (Online) 29th July Evening Shift**

**Q.2.** The Hinsberg reagent is

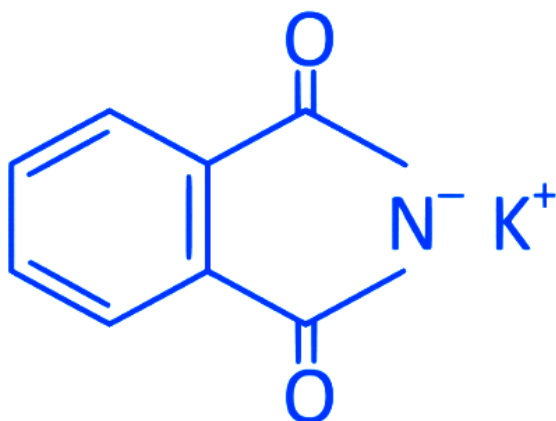
A



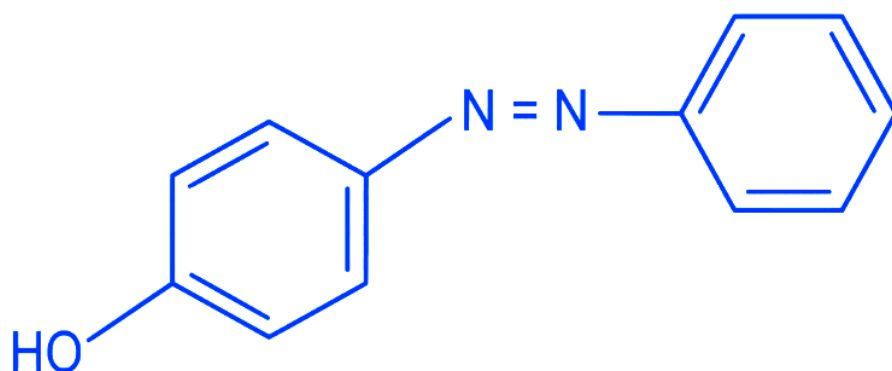
B



C

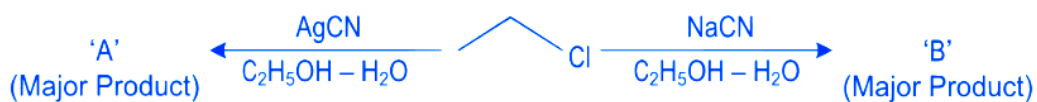


D

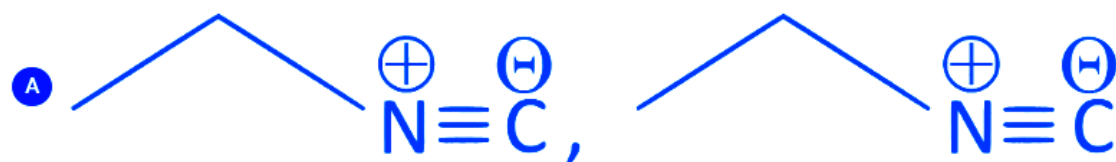


JEE Main 2022 (Online) 29th July Evening Shift

Q.3.



Considering the above reactions, the compound 'A' and compound 'B' respectively are :

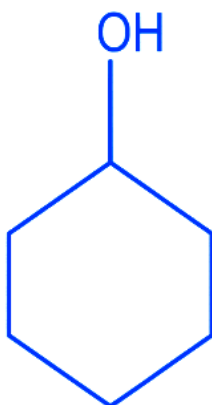




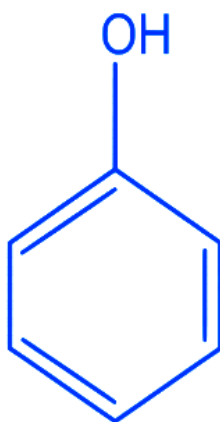
JEE Main 2022 (Online) 29th July Morning Shift

Q.4. A compound 'X' is acidic and it is soluble in NaOH solution, but insoluble in  $\text{NaHCO}_3$  solution. Compound 'X' also gives violet colour with neutral  $\text{FeCl}_3$  solution. The compound 'X' is :

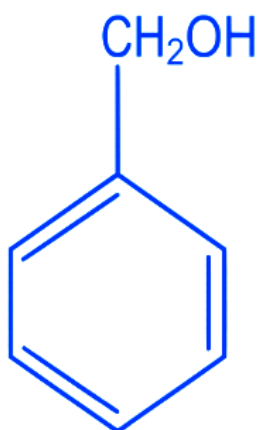
A



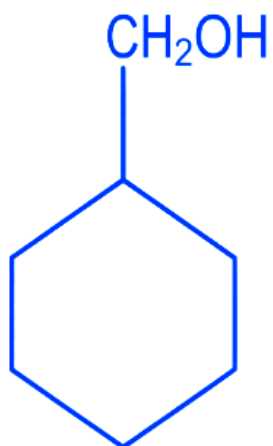
B



C

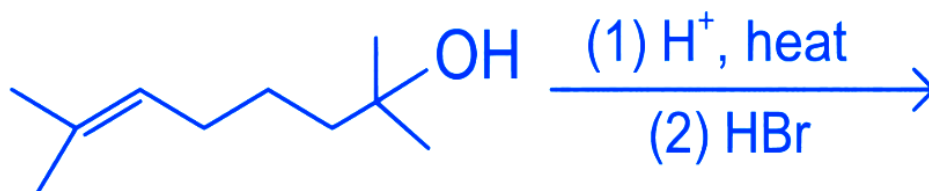


D



JEE Main 2022 (Online) 29th July Morning Shift

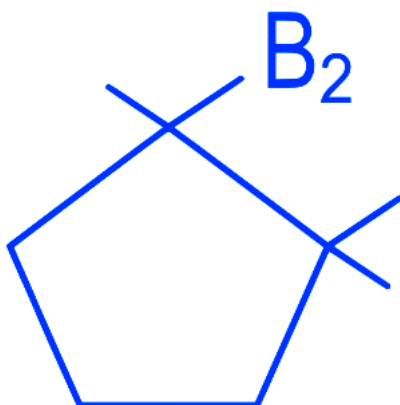
Q.5. The major product in the given reaction is



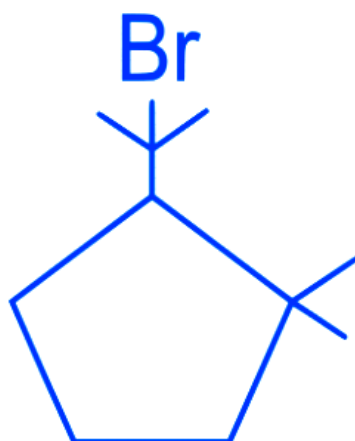
A



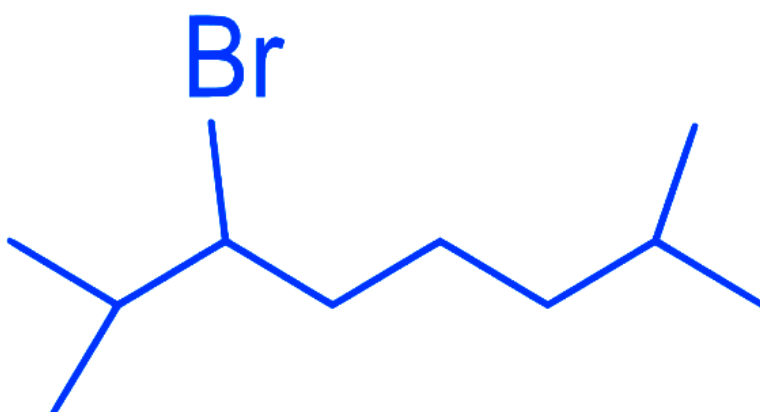
B



C

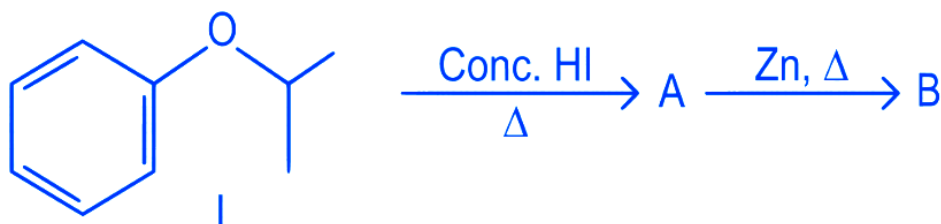


D



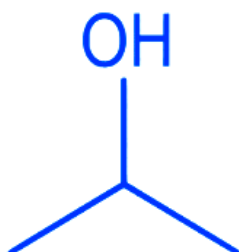
JEE Main 2022 (Online) 28th July Evening Shift

Q.6. Compound I is heated with Conc. HI to give a hydroxy compound A which is further heated with Zn dust to give compound B. Identify A and B.



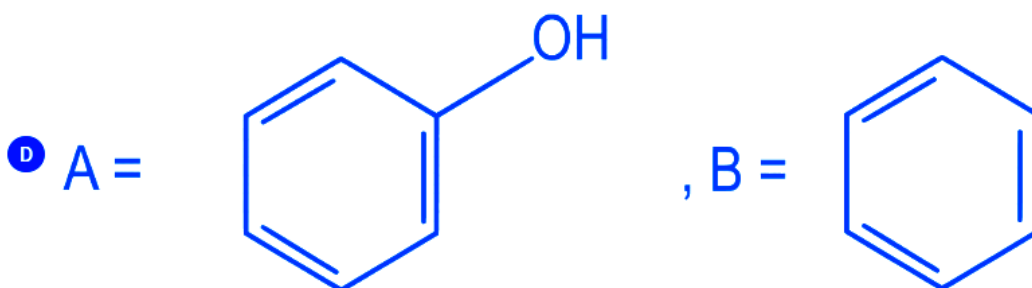
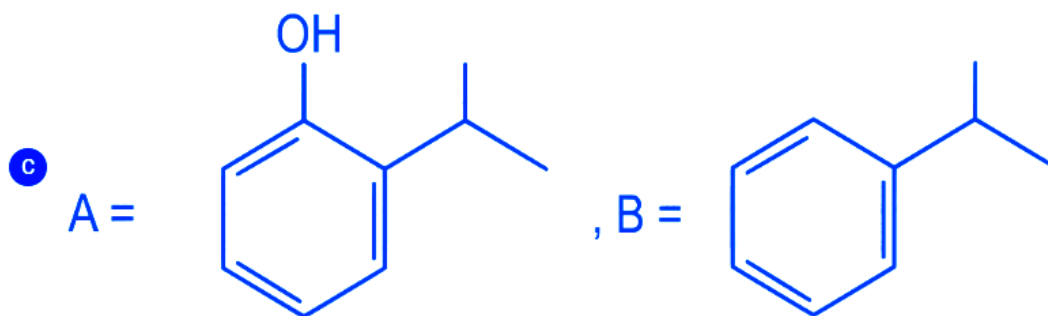
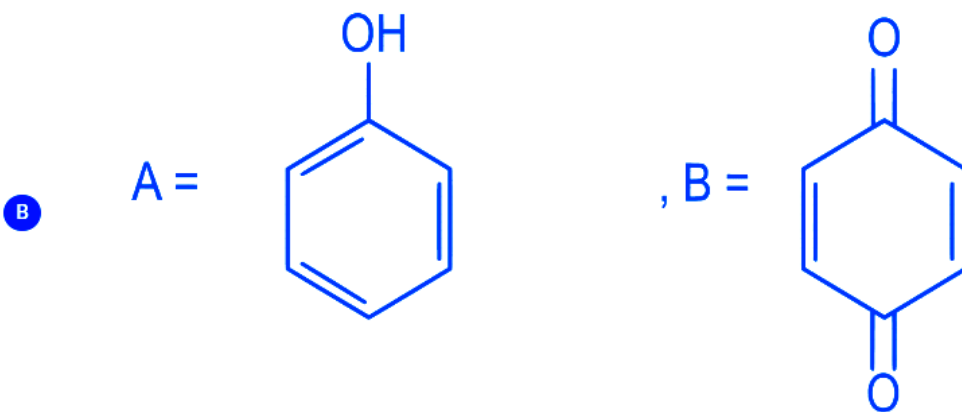
A

A =



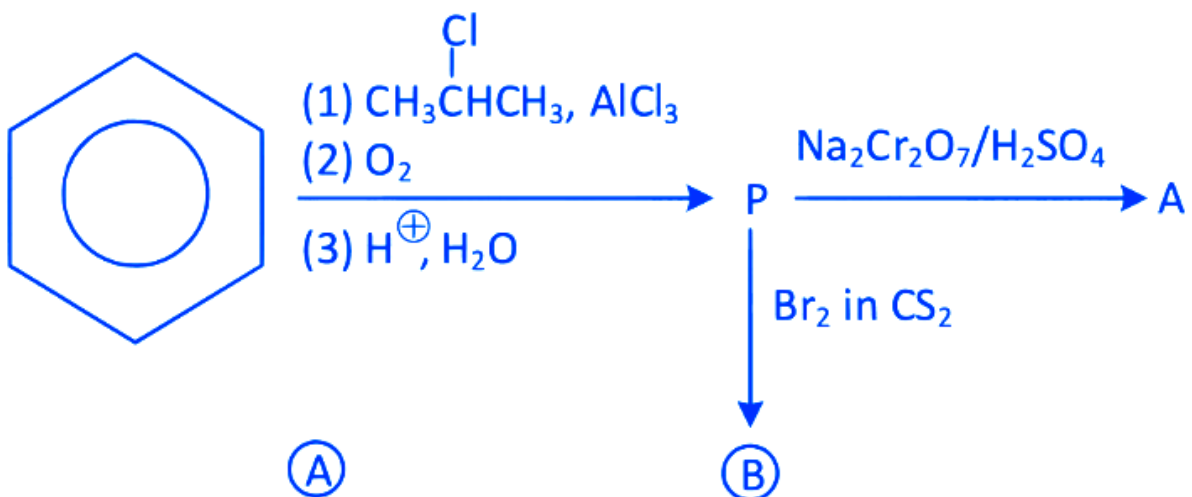
, B =



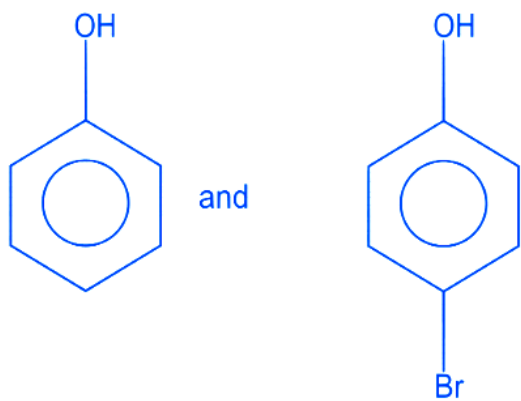


JEE Main 2022 (Online) 28th July Evening Shift

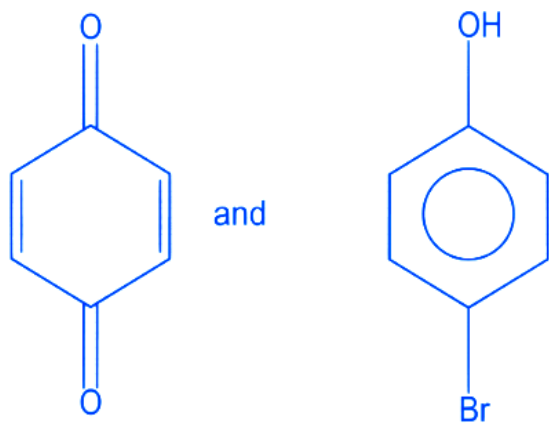
Q.7. Identify the major products A and B for the below given reaction sequence.



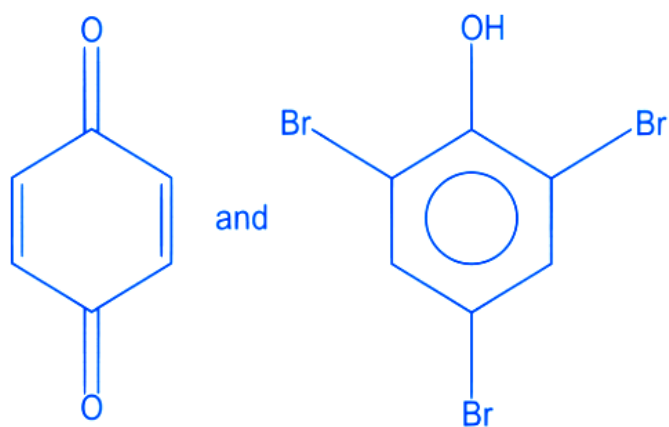
A



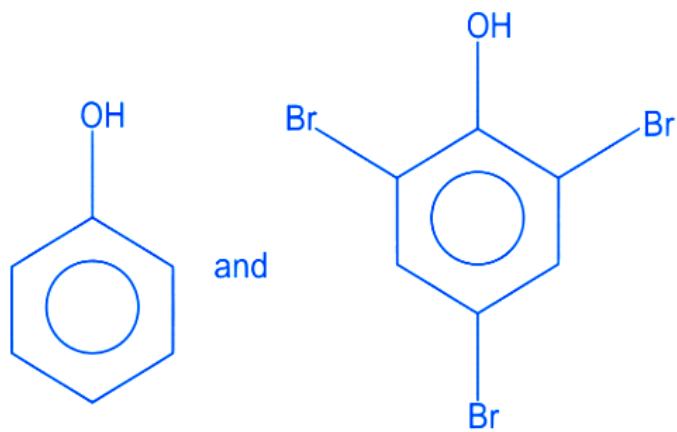
B



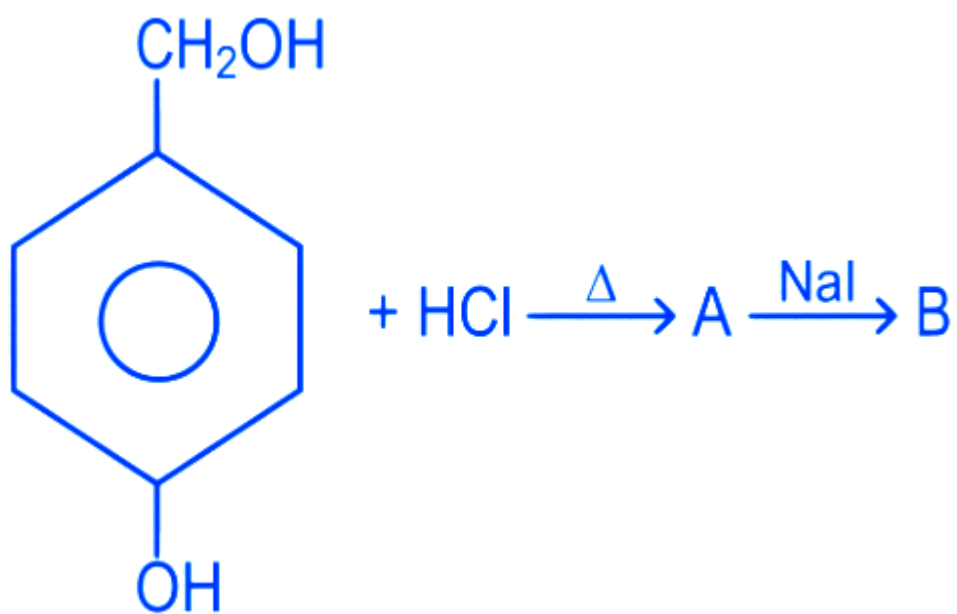
C



D



Q.8.



In the above reaction product B is :

A



B



C



D



JEE Main 2022 (Online) 27th July Morning Shift

Q.9. The difference in the reaction of phenol with bromine in chloroform and bromine in water medium is due to :

A Hyperconjugation in substrate

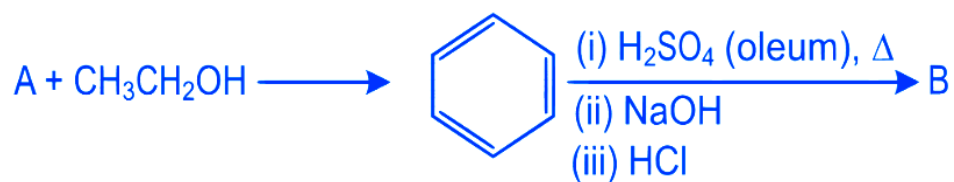
B Polarity of solvent

C Free radical formation

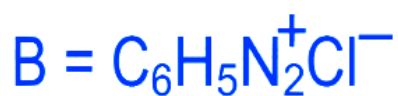
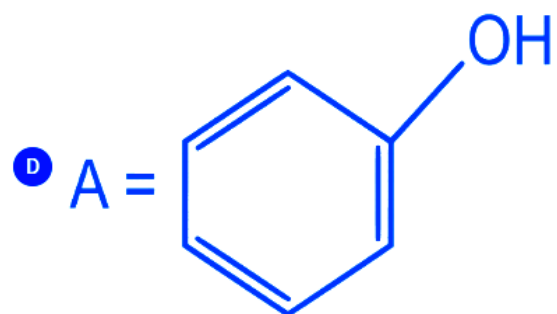
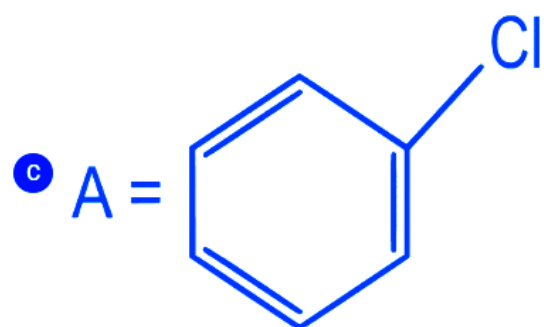
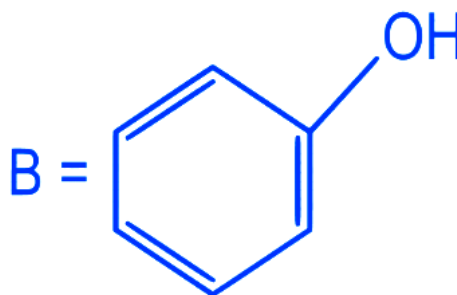
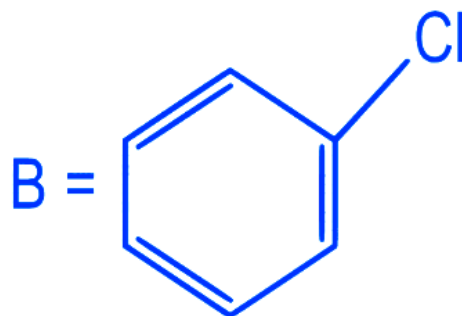
D Electromeric effect the substrate

JEE Main 2022 (Online) 26th July Morning Shift

Q.10.



Consider the above reaction sequence. Identify the component A and component B :



**Q.11.** The reagent neutral ferric chloride is used to detect the presence of

**A** sulphide ion and alcoholic  $-OH$  group.

**B** acetate ion and phenolic  $-OH$  group.

**C** sulphide ion and phenolic  $-OH$  group.

**D** acetate ion and alcoholic  $-OH$  group.

**JEE Main 2022 (Online) 30th June Morning Shift**

**Q.12.** Given below are two statements :

Statement I : Phenols are weakly acidic.

Statement II : Therefore they are freely soluble in NaOH solution and are weaker acids than alcohols and water.

Choose the most appropriate option :

**A** Both Statement I and Statement II are correct.

**B** Both Statement I and Statement II are incorrect.

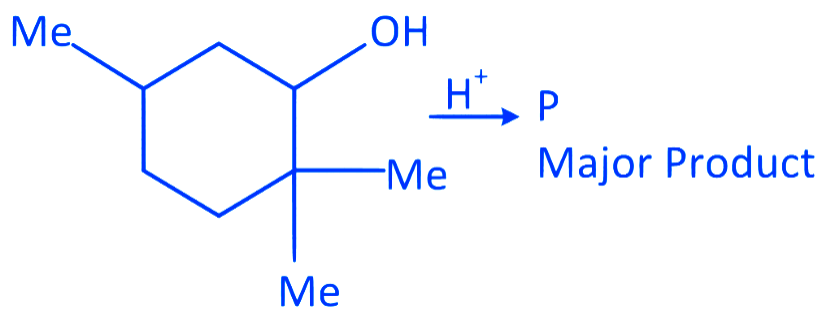
**C** Statement I is correct but Statement II is incorrect.

**D** Statement I is incorrect but Statement II is correct.

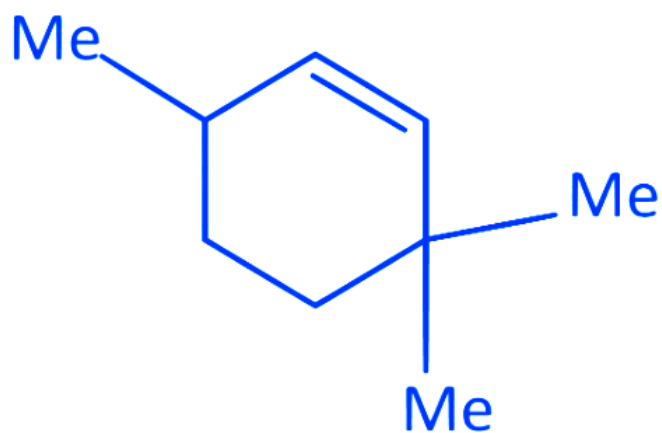
**JEE Main 2022 (Online) 29th June Morning Shift**

Q.13. The major product (P) of the given reaction is

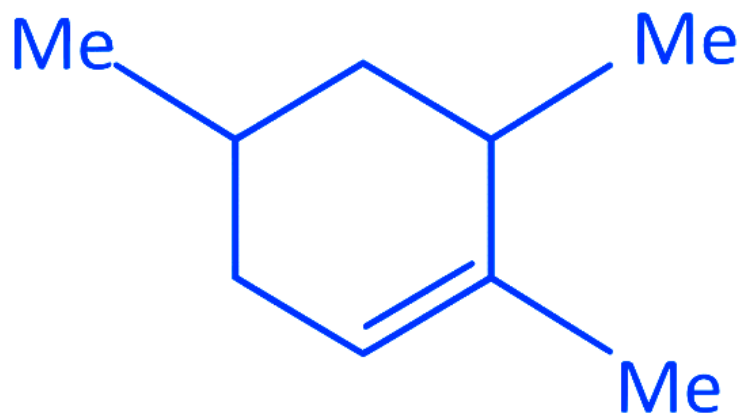
(where, Me is  $-\text{CH}_3$ )



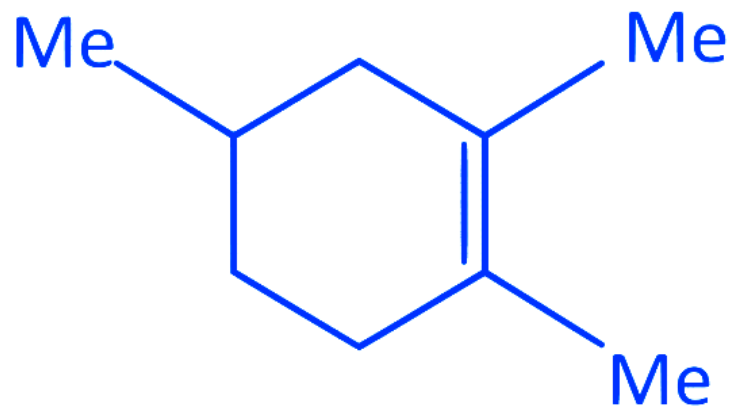
A



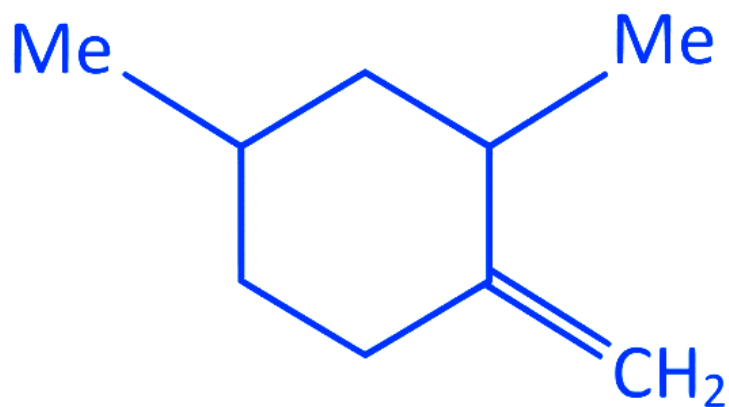
B



C

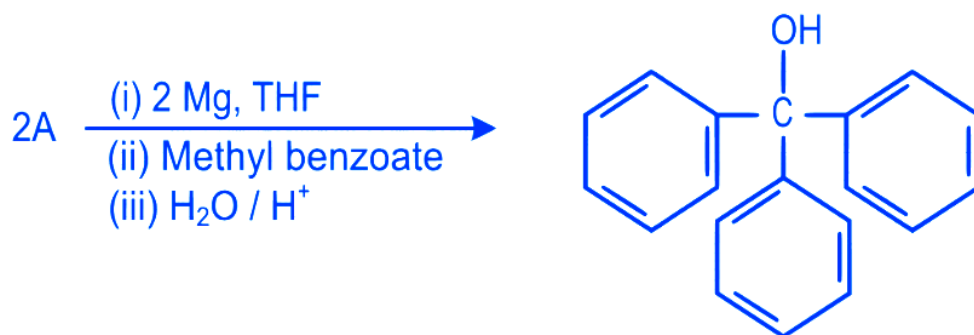


D



JEE Main 2022 (Online) 28th June Evening Shift

Q.14. In the given reaction



'A' can be

A benzyl bromide

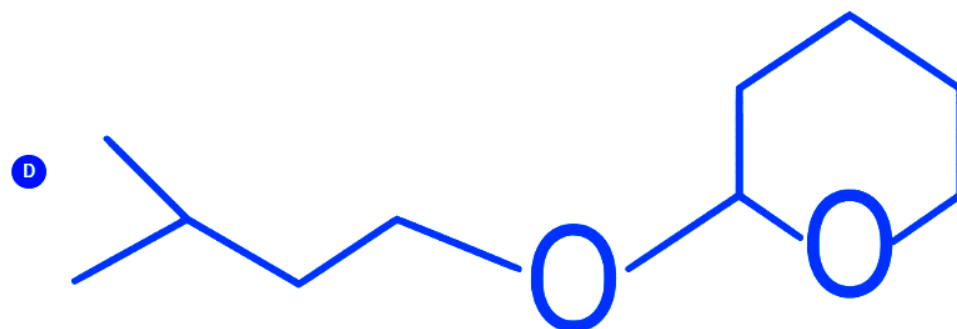
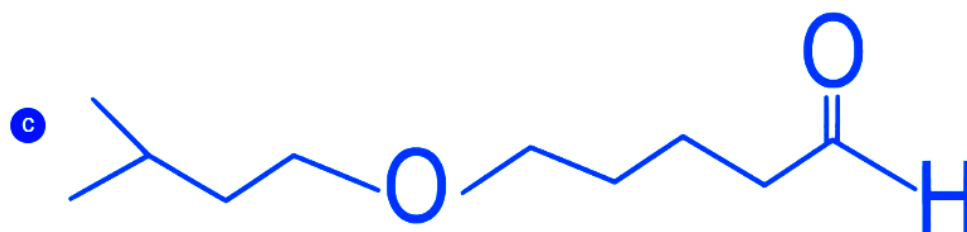
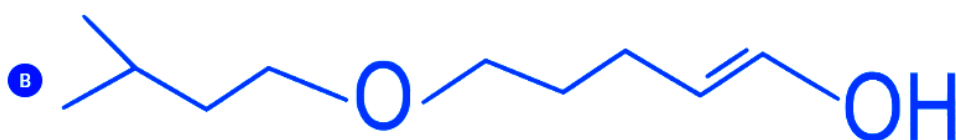
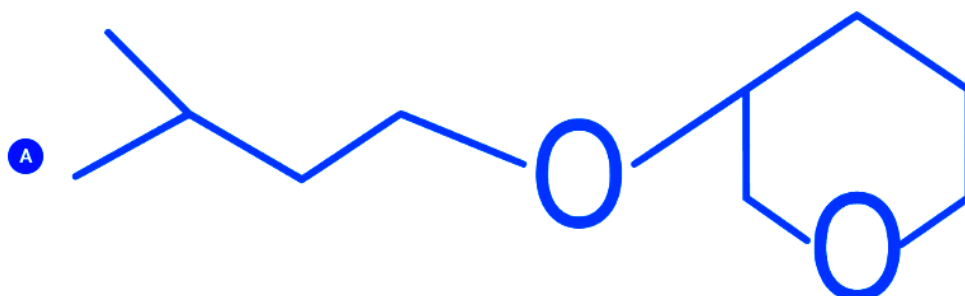
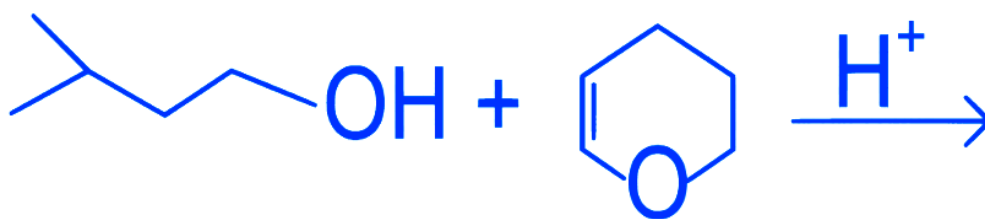
B bromobenzene

C cyclohexyl bromide

D methyl bromide

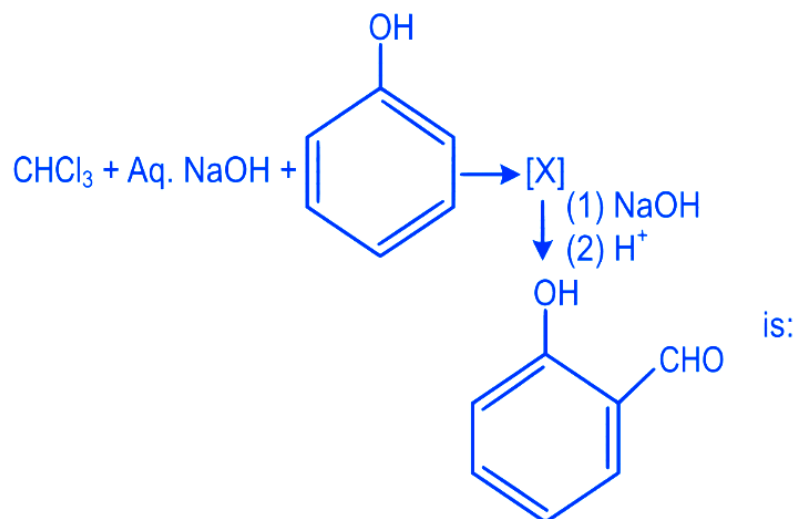
JEE Main 2022 (Online) 25th June Evening Shift

Q.15. The major product formed in the following reaction, is

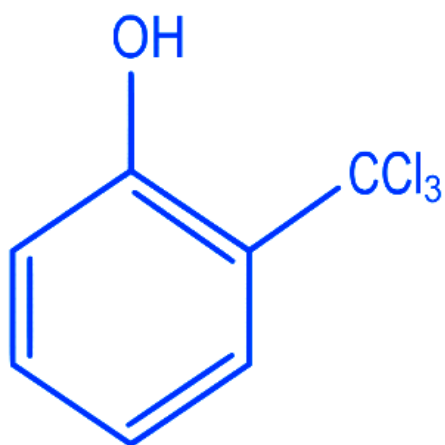


JEE Main 2022 (Online) 25th June Evening Shift

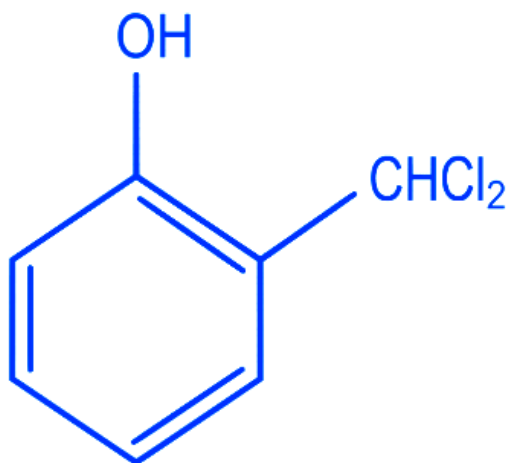
Q.16. The intermediate X, in the reaction :



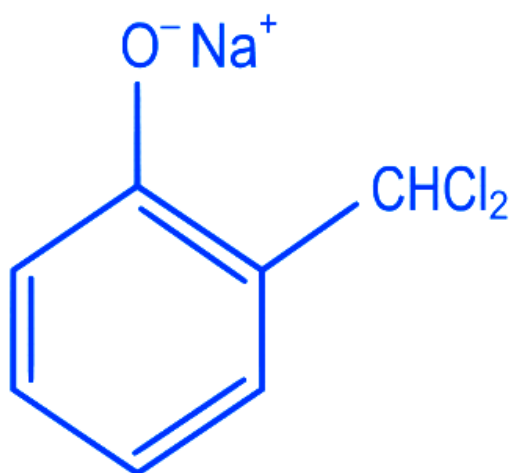
A



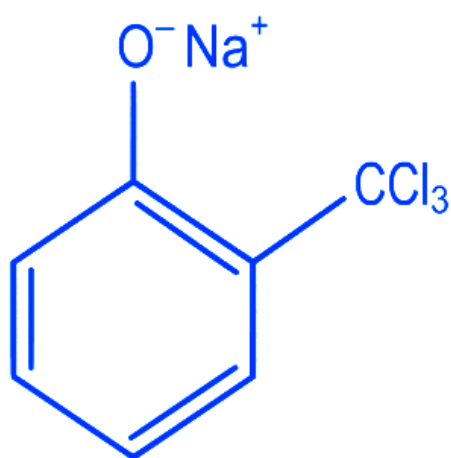
B



C



D



JEE Main 2022 (Online) 25th June Morning Shift

Q.17. Hex-4-ene-2-ol on treatment with PCC gives 'A'. 'A' on reaction with sodium hypoiodite gives 'B', which on further heating with soda lime gives 'C'. The compound 'C' is :

A 2-pentene

B propanaldehyde

C 2-butene

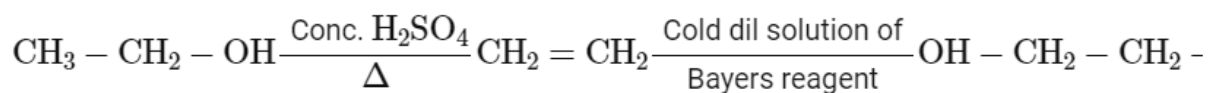
D 4-methylpent-2-ene

## Answer Key & Explanation

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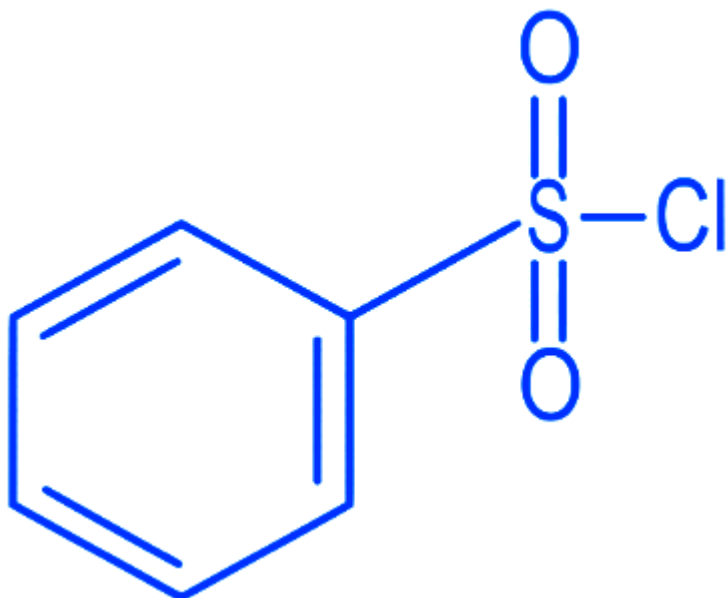
1. Ans. (C)

Explanation



2. Ans. (A)

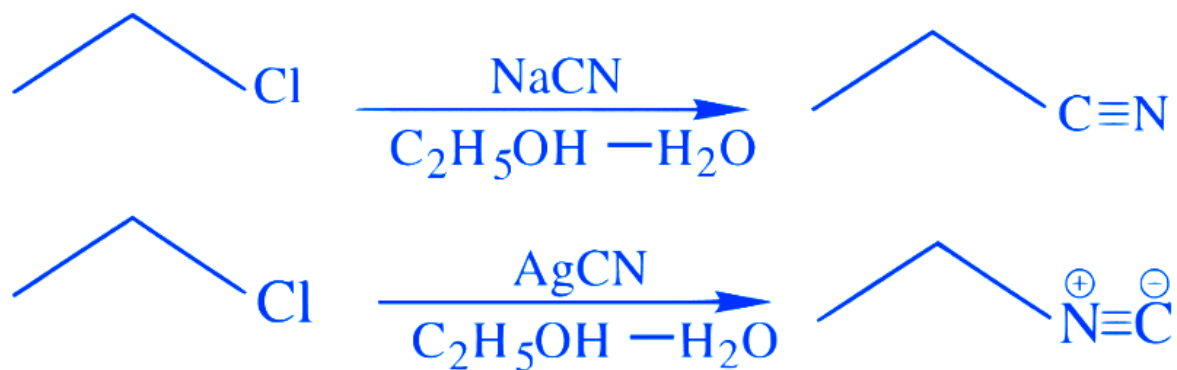
Explanation



B.S.C (Benzene sulphonyl chloride) is known as Hinsberg Reagent.

3. Ans. (C)

Explanation

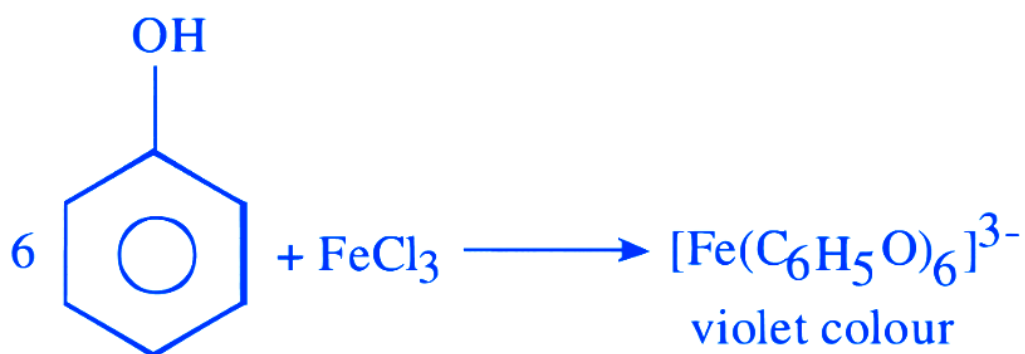


In NaCN; carbon is more nucleophilic atom.

Whereas in AgCN; Ag - C has covalent bond.

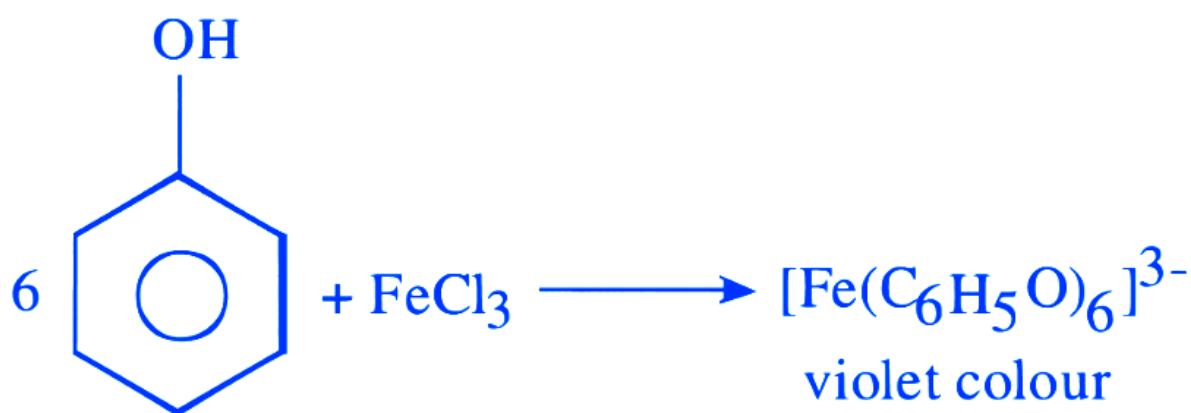
4. Ans. (B)

Explanation



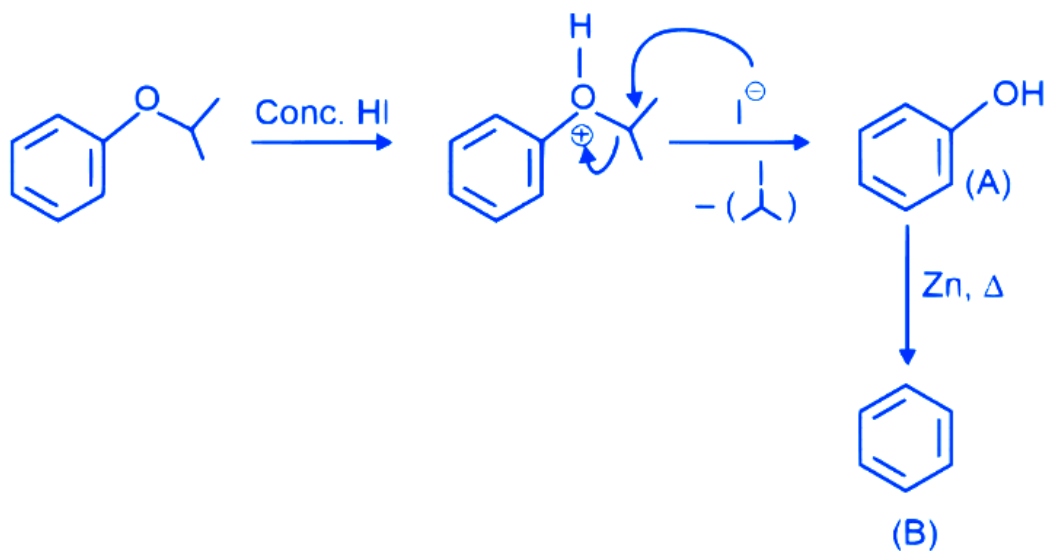
5. Ans. (C)

Explanation



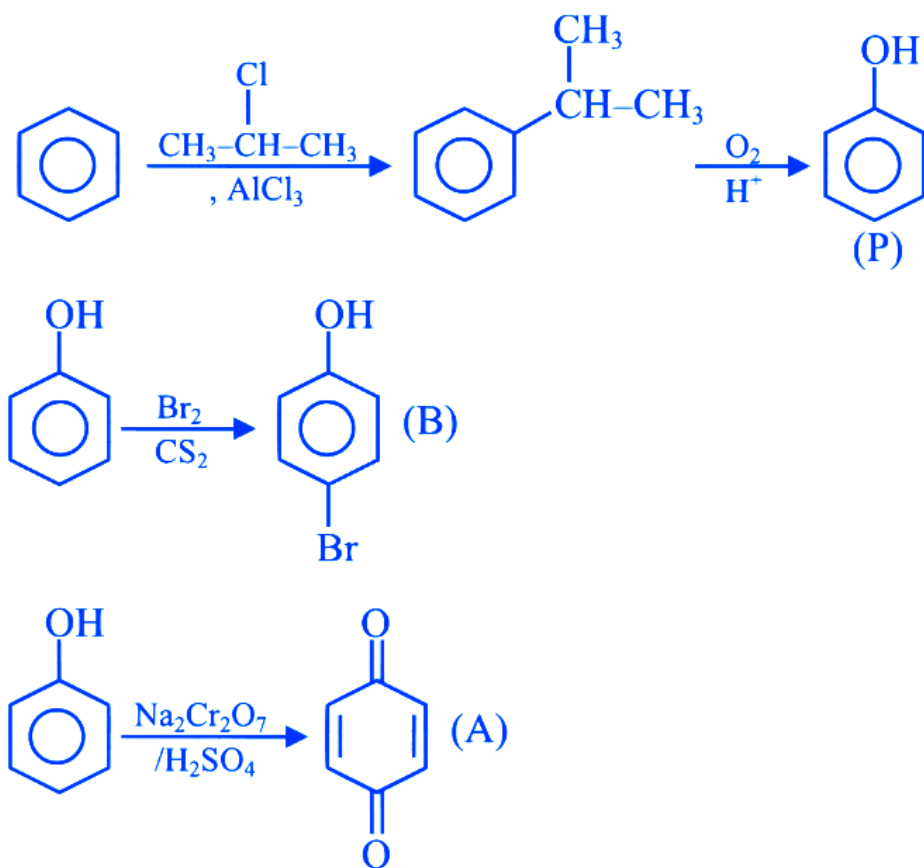
6. Ans. (D)

Explanation



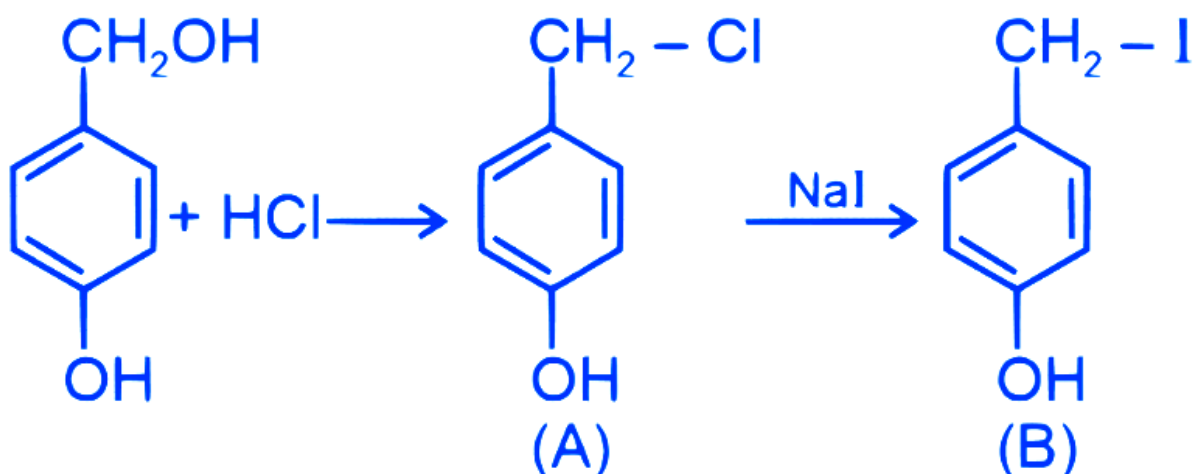
7. Ans. (B)

Explanation



8. Ans. (A)

Explanation



Product B is 4-iodomethylphenol.

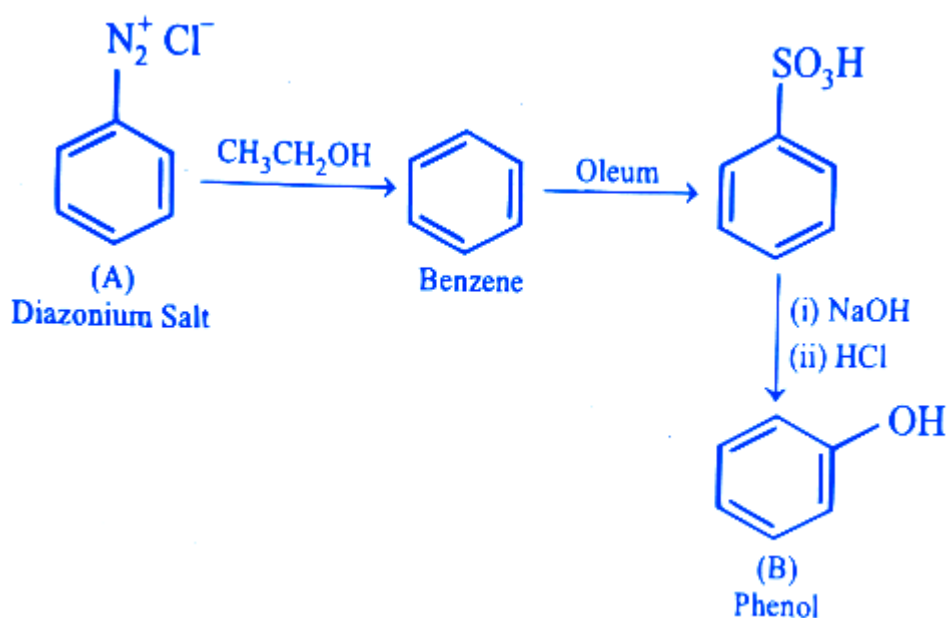
9. Ans. (B)

**Explanation**

Phenol gives different products with bromine in chloroform and water medium due to the polarity difference between chloroform and water acting as solvent

10. Ans. (B)

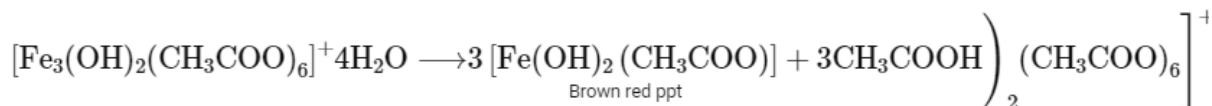
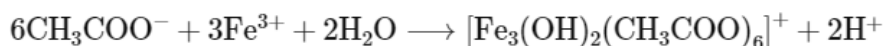
**Explanation**



11. Ans. (B)

**Explanation**

Acetate ions gives deep red colour ppt on reaction with neutral ferric chloride solution.



Phenol reacts with freshly prepared ferric chloride solution and gives violet colour complex.



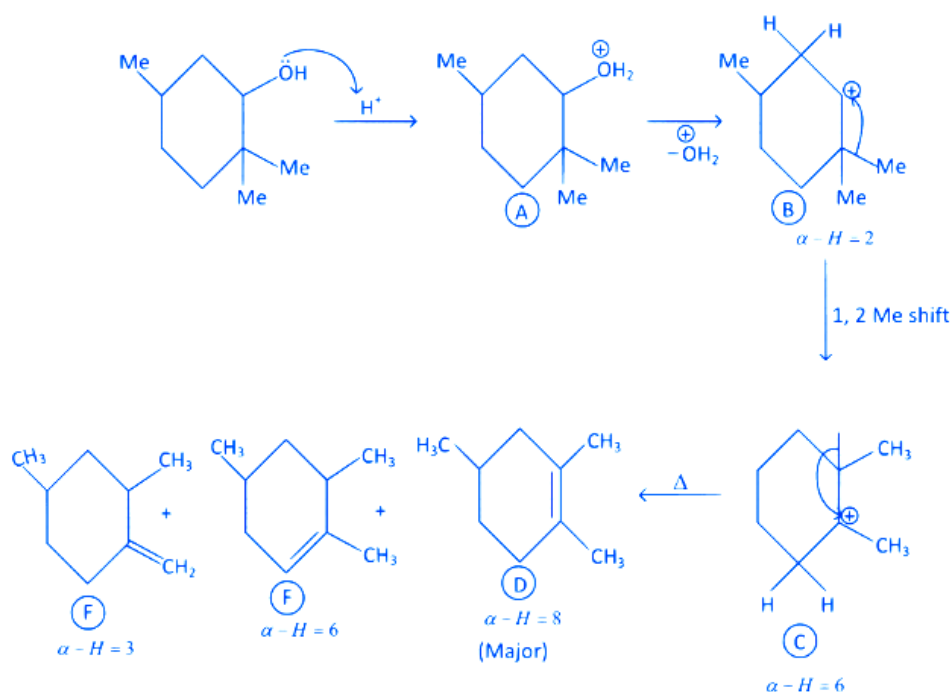
12. Ans. (C)

**Explanation**

Phenol are weakly acidic. Phenol is more acidic than alcohol & H<sub>2</sub>O statement (I) is correct. (II) is incorrect.

13. Ans. (C)

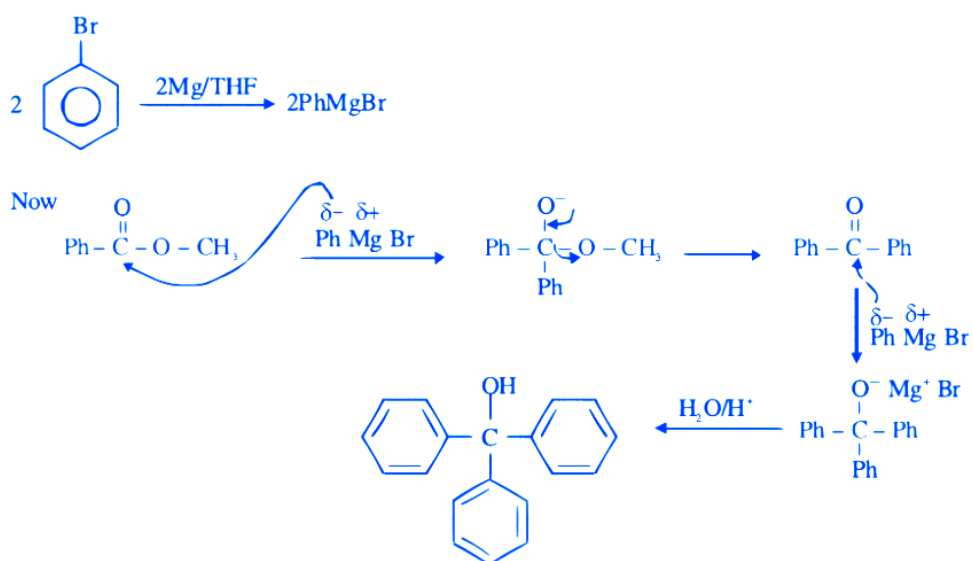
**Explanation**



- (1) In compound A, positive charge on O atom is not stable that is why  $\text{OH}_2^{\oplus}$  get's removed.
- (2) In Carbocation (B), two  $\alpha$ -H present and after 1, 2-methyl shift number of  $\alpha$ -H becomes six so it becomes more stable as far carbocation when number of  $\alpha$ -H increases stability increases.
- (3) Among product D, E and F, D is major product as in case of alkene most stable, alkene are those which have more  $\alpha$ -H. And every reactant produce that product which is more stable.

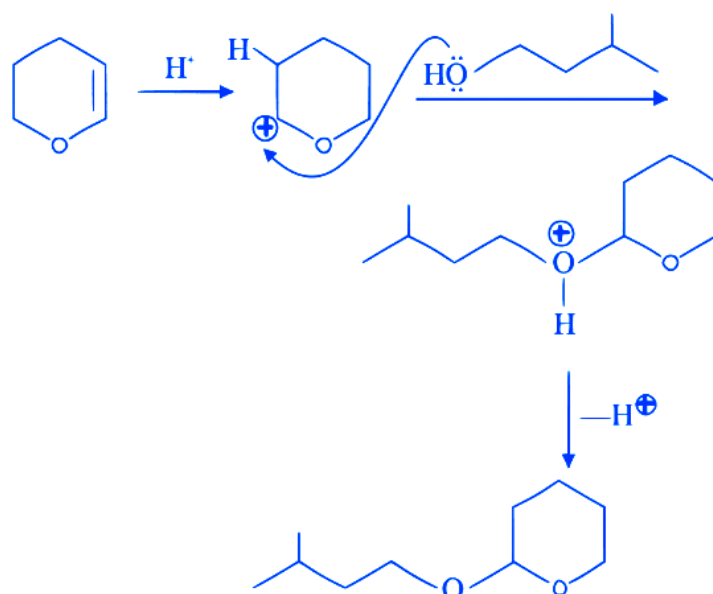
## 14. Ans. (B)

### Explanation



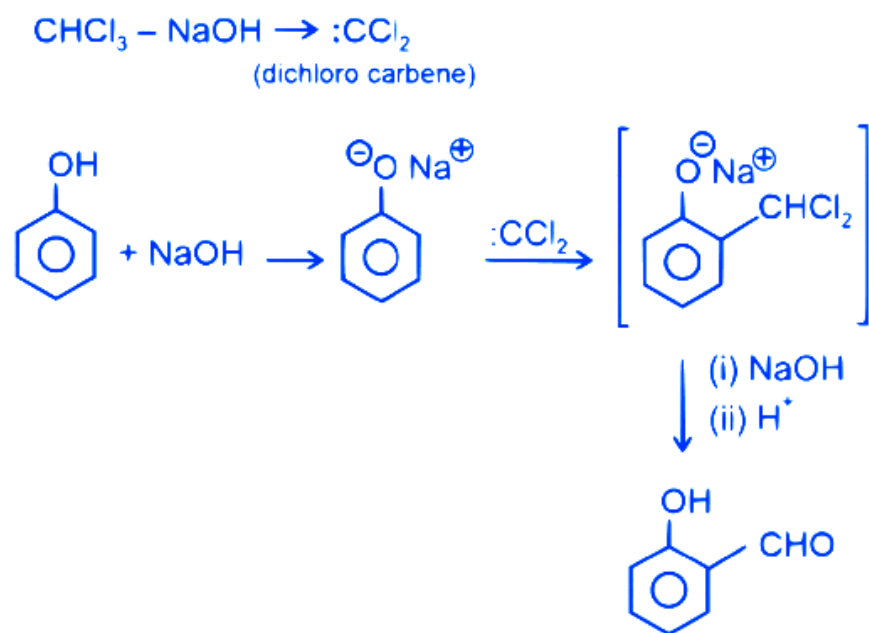
## 15. Ans. (D)

### Explanation



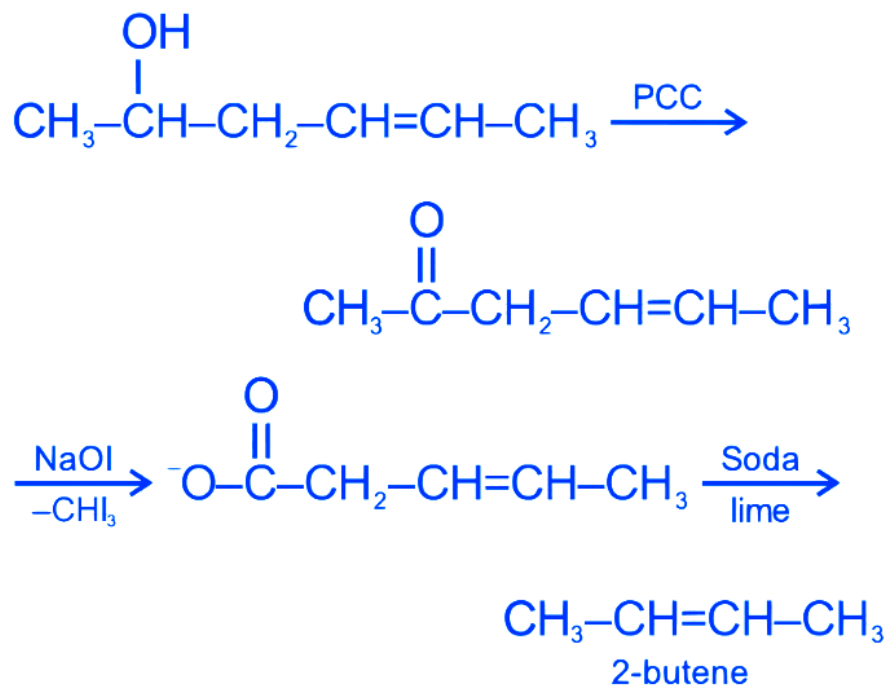
16. Ans. (C)

Explanation



17. Ans. (C)

Explanation



# 2021

## Numerical

**Q.1** To synthesize 1.0 mole of 2-methylpropan-2-ol from Ethylethanoate \_\_\_\_\_ equivalents of  $\text{CH}_3\text{MgBr}$  Reagent will be required. (Integer value)

**20th July Morning Shift 2021**

**Q.2** On complete reaction of  $\text{FeCl}_3$  with oxalic acid in aqueous solution containing  $\text{KOH}$ , resulted in the formation of product A. The secondary valency of Fe in the product A is \_\_\_\_\_. (Round off to the Nearest Integer).

**17th March Evening Shift 2021**

## Numerical Answer Key

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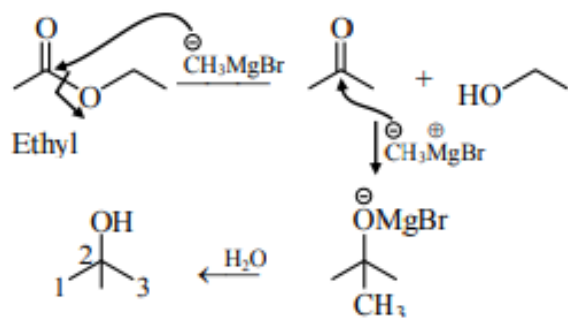
**1. Ans. (2)**

**2. Ans. (6)**

## Numerical Explanation

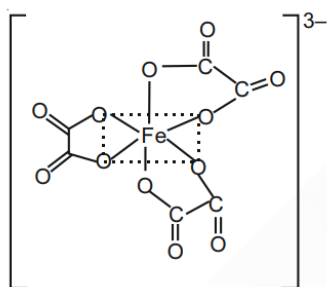
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Ans 1.



2-Methylpropan-2-ol

Ans 2.  $\text{FeCl}_3 + 3\text{H}_2\text{C}_2\text{O}_4 + 6\text{KOH} \rightarrow \text{K}_3[\text{Fe}(\text{C}_2\text{O}_4)_3] + 3\text{KCl} + 6\text{H}_2\text{O}$



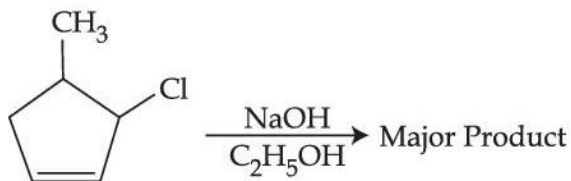
Coordination number = 6

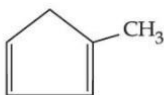
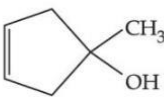
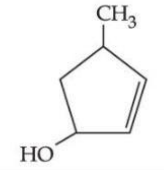
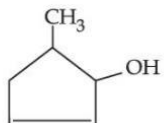
Secondary valency is 6

## MCQ (Single Correct Answer)

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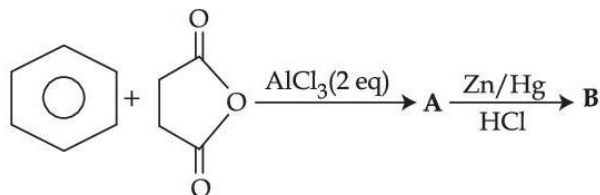
Q.1 The major product of the following reaction is :

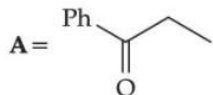
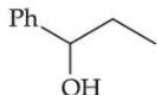
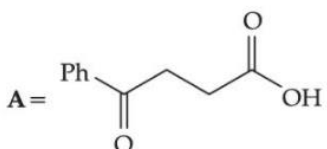

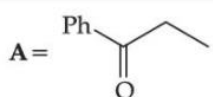

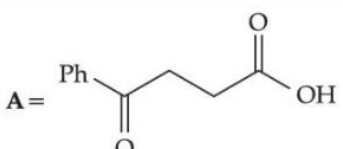
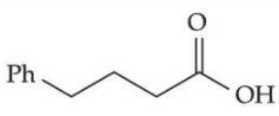


- A 
- 
- B 
- 
- C 
- 
- D 

31st Aug Evening Shift 2021

Q.2 The structures A and B formed in the following reaction are : [Ph = -C<sub>6</sub>H<sub>5</sub>]



- A  , 
- 
- B  , 
- 
- C  , 
- 
- D  , 

31st Aug Evening Shift 2021

Q.3 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 :

A Both (A) and (R) are true but (R) is not the correct explanation of (A)

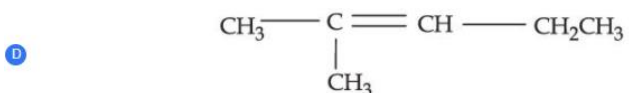
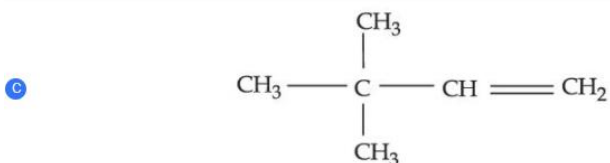
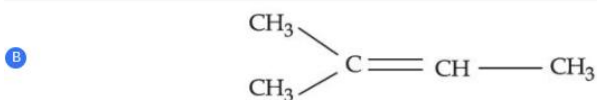
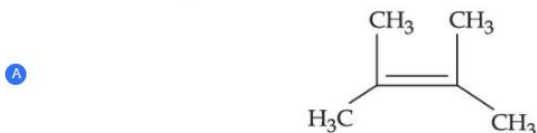
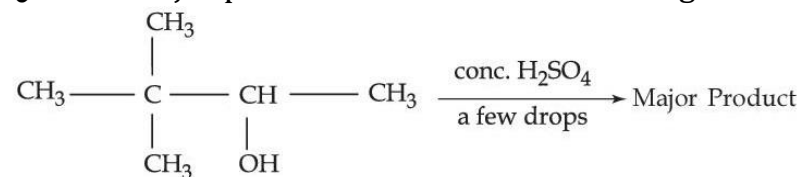
B (A) is false but (R) is true

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

D (A) is true but (R) is false

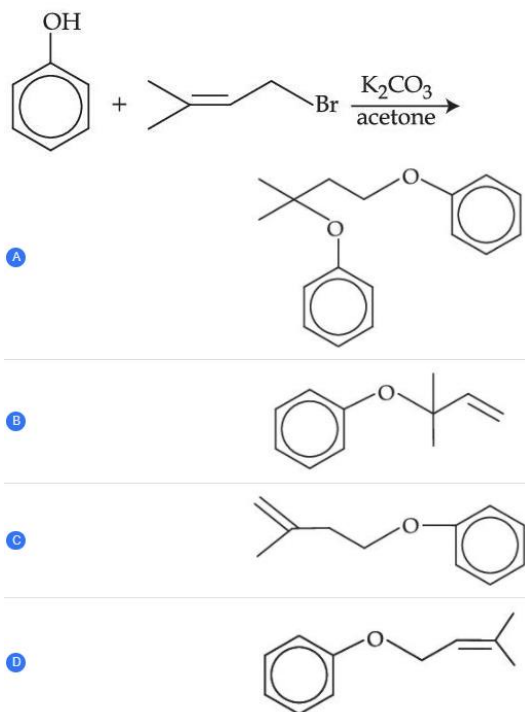
**31st Aug Morning Shift 2021**

**Q.4** The major product formed in the following reaction is :



**31st Aug Morning Shift 2021**

**Q.5** The major product of the following reaction, if it occurs by  $\text{S}_{\text{N}}2$  mechanism is :



### 27th Aug Evening Shift 2021

**Q.6** Given below are two statements :

Statement I : Ethyl pent-4-yn-oate on reaction with  $\text{CH}_3\text{MgBr}$  gives a  $3^\circ$  - alcohol.

Statement II : In this reaction one mole of ethyl pent-4-yn-oate utilizes two moles of  $\text{CH}_3\text{MgBr}$ .

In the light of the above statements, choose the most appropriate answer from the options given below :

- A** Both Statement I and Statement II are false.
- B** Statement I is false but Statement II is true.
- C** Statement I is true but Statement II is false.
- D** Both Statement I and Statement II are true.

### 27th Aug Evening Shift 2021

**Q.7** Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : Synthesis of ethyl phenyl ether may be achieved by Williamson synthesis.

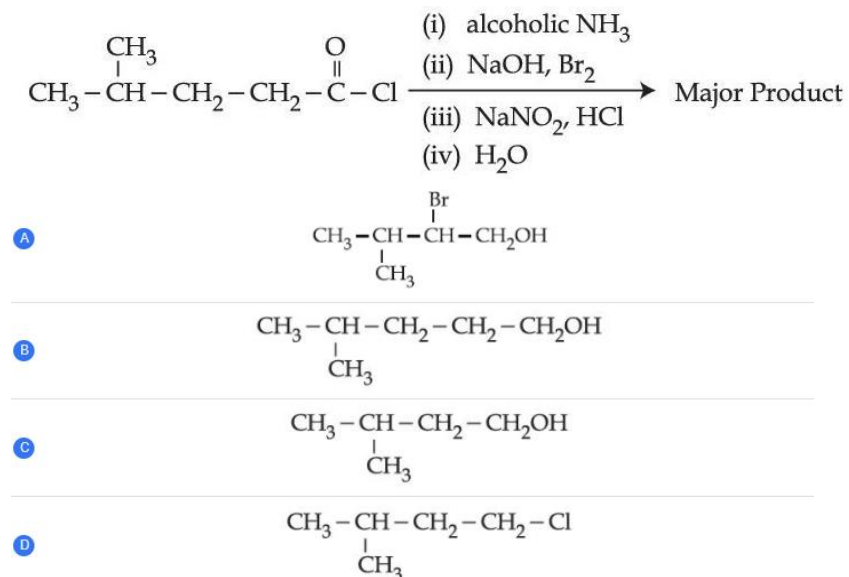
Reason (R) : Reaction of bromobenzene with sodium ethoxide yields ethyl phenyl ether.

In the light of the above statements, choose the most appropriate answer from the options given below :

- A** Both (A) and (R) are correct and (R) is the correct explanation of (A)
- 
- B** (A) is correct but (R) is not correct
- 
- C** (A) is not correct but (R) is correct
- 
- D** Both (A) and (R) are correct but (R) is not the correct explanation of (A).

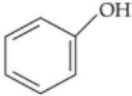

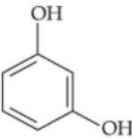
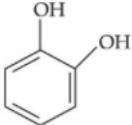
### 27th Aug Morning Shift 2021

**Q.8** The major product of the following reaction is :



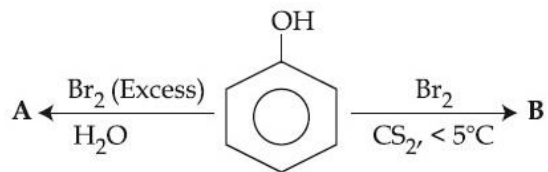
### 27th Aug Morning Shift 2021

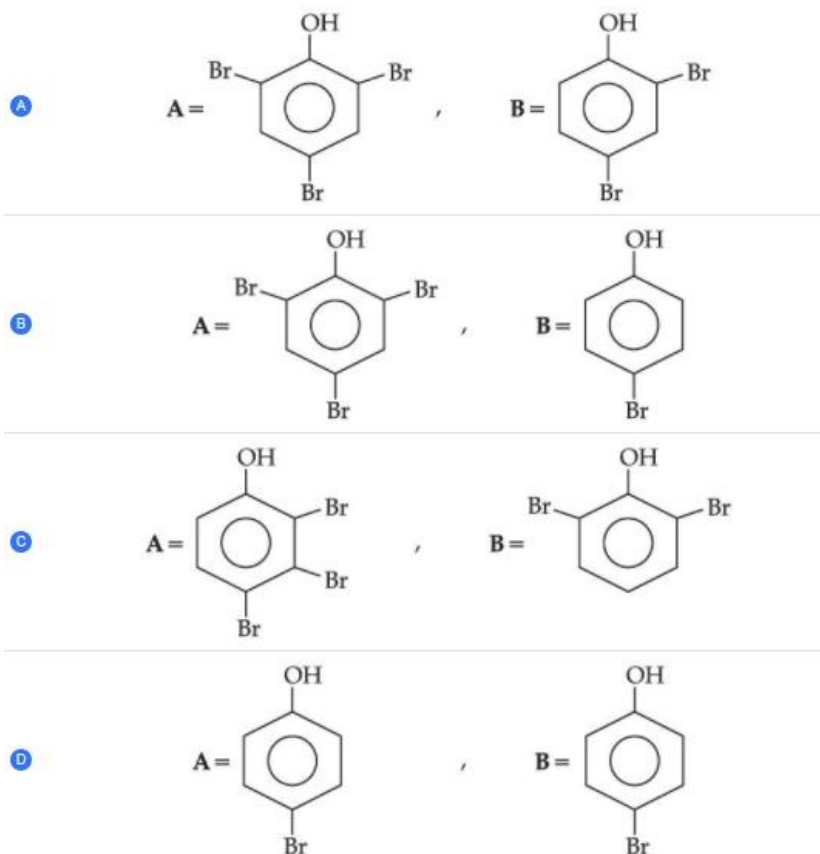
**Q.9** Which one of the following phenols does not give colour when condensed with phthalic anhydride in presence of conc. H<sub>2</sub>SO<sub>4</sub> ?

- A 
- 
- B 
- 
- C 
- 
- D 

**26th Aug Evening Shift 2021**

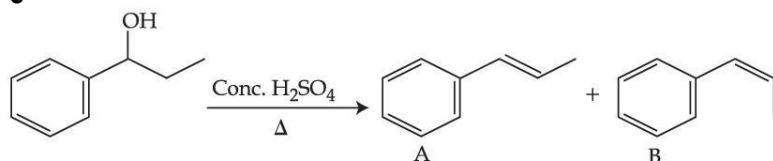
**Q.10** The correct options for the products **A** and **B** of the following reactions are :





**26th Aug Morning Shift 2021**

**Q.11**



Consider the above reaction, and choose the correct statement :

- A** The reaction is not possible in acidic medium

---

- B** Both compounds A and B are formed equally

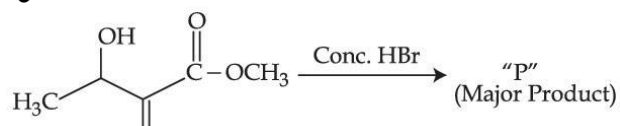
---

- C** Compound A will be the major product

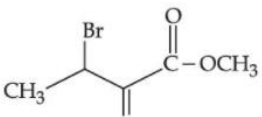
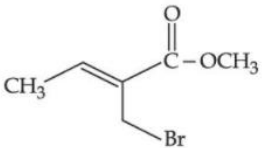
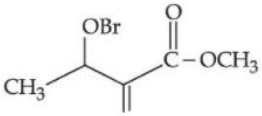
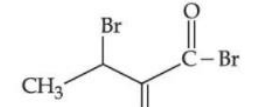
---

- D** Compound B will be the major product

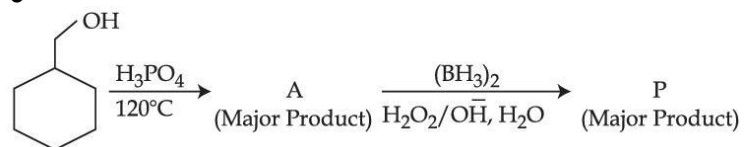
**27th July Evening Shift 2021**

**Q.12**

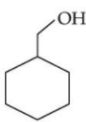
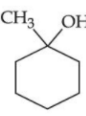
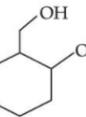
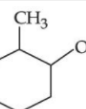
Consider the above reaction, the major product "P" formed is :

- A** 
- 
- B** 
- 
- C** 
- 
- D** 

**27th July Evening Shift 2021**

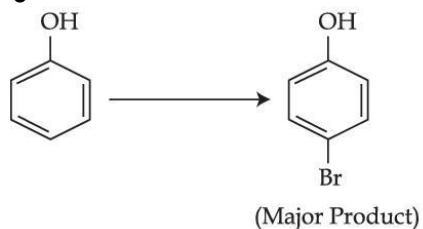
**Q.13**

Consider the above reaction and identify the Product P :

- A** 
- 
- B** 
- 
- C** 
- 
- D** 

**27th July Morning Shift 2021**

**Q. 14**



The given reaction can occur in the presence of :

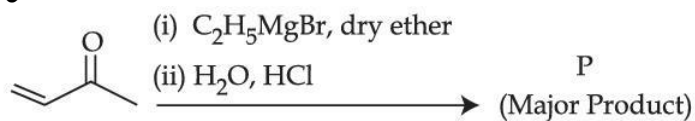
- (a) Bromine water
- (b) Br<sub>2</sub> in CS<sub>2</sub>, 273 K
- (c) Br<sub>2</sub>/FeBr<sub>3</sub>
- (d) Br<sub>2</sub> in CHCl<sub>3</sub>, 273 K

Choose the correct answer from the options given below :

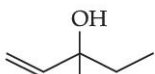
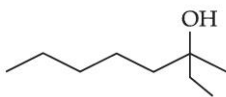
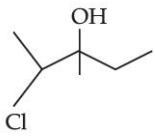
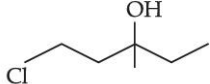
- A (b) and (d) only
- B (a) and (c) only
- C (b), (c) and (d) only
- D (a), (b) and (d) only

**25th July Morning Shift 2021**

**Q.15**



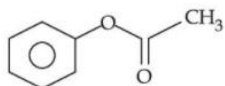
Consider the above reaction, the major product 'P' is :

- A 
- B 
- C 
- D 

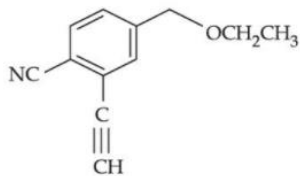
**25th July Morning Shift 2021**

**Q.16** Which of the following compounds will provide a tertiary alcohol or reaction with excess of  $\text{CH}_3\text{MgBr}$  followed by hydrolysis?

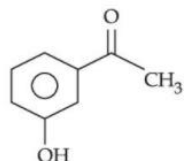
A



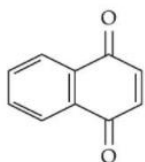
B



C



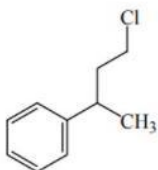
D



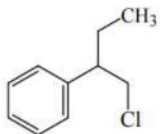
**22th July Evening Shift 2021**

**Q.17** Reaction of Grignard reagent,  $\text{C}_2\text{H}_5\text{MgBr}$  with  $\text{C}_8\text{H}_8\text{O}$  followed by hydrolysis gives compound "A" which reacts instantly with Lucas reagent to give compound B,  $\text{C}_{10}\text{H}_{13}\text{Cl}$ . The Compound B is :

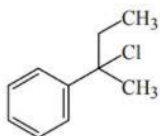
A



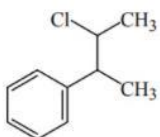
B



C



D



**18th March Morning Shift 2021**

**Q.18** Given below are two statements :

Statement I : 2-methylbutane on oxidation with  $\text{KMnO}_4$  gives 2-methylbutan-2-ol.

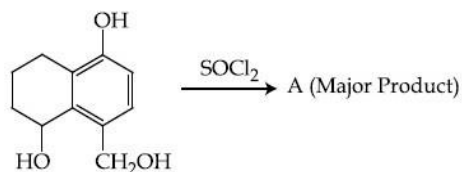
Statement II : n-alkanes can be easily oxidised to corresponding alcohols with  $\text{KMnO}_4$ .

Choose the correct option :

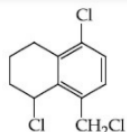
- A Both statement I and statement II are incorrect
- B Both statement I and statement II are correct
- C Statement I is correct but statement II is incorrect
- D Statement I is incorrect but statement II is correct

**17th March Evening Shift 2021**

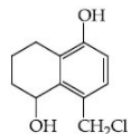
**Q.19** Identify A in the given reaction.



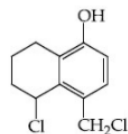
A



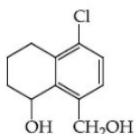
B



C



D



**26th Feb Evening Shift 2021**

**Q.20** Ceric ammonium nitrate and  $\text{CHCl}_3/\text{alc. KOH}$  are used for the identification of functional groups present in \_\_\_\_\_ and \_\_\_\_\_ respectively.

A amine, alcohol

---

B alcohol, phenol

---

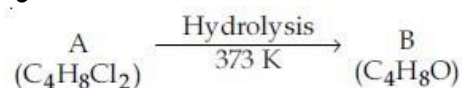
C alcohol, amine

---

D amine, phenol

### 26th Feb Evening Shift 2021

#### Q.21



B reacts with Hydroxyl amine but does not give Tollen's test. Identify A and B.

A 1, 1-Dichlorobutane and Butanal

---

B 2, 2-Dichlorobutane and Butan-2-one

---

C 1, 1-Dichlorobutane and 2-Butanone

---

D 2, 2-Dichlorobutane and Butanal

### 26th Feb Morning Shift 2021

#### Q.22 Given below are two statements :

Statement I : o-Nitrophenol is steam volatile due to intramolecular hydrogen bonding.

Statement II : o-Nitrophenol has high melting due to hydrogen bonding.

In the light of the above statements, choose the most appropriate answer from the options given below :

A Both Statement I and Statement II are true

---

B Statement I is true but Statement II is false

---

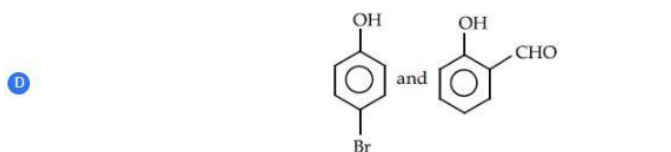
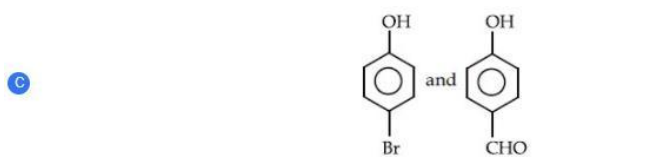
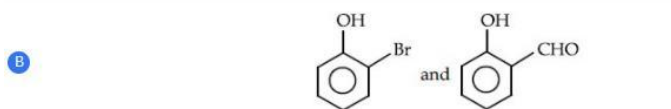
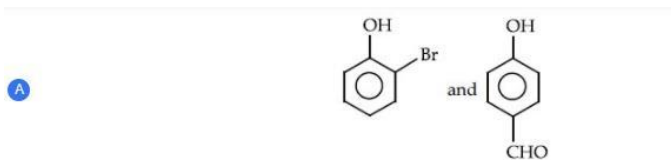
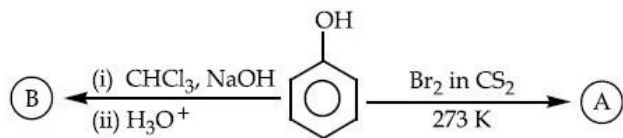
C Statement I is false but Statement II is true

---

D Both Statement I and Statement II are false

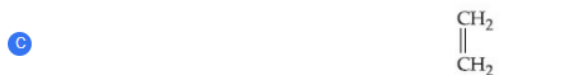
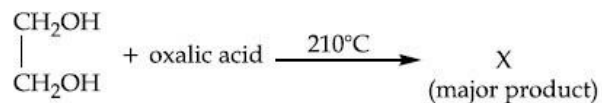
### 26th Feb Morning Shift 2021

**Q.23** Identify the major products A and B respectively in the following reactions of phenol :



**26th Feb Morning Shift 2021**

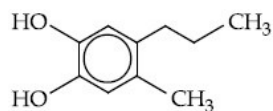
**Q.24** What is 'X' in the given reaction?



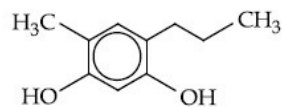
**25th Feb Evening Shift 2021**

**Q.25** Which of the following compound gives pink colour on reaction with phthalic anhydride in conc.  $\text{H}_2\text{SO}_4$  followed by treatment with  $\text{NaOH}$  ?

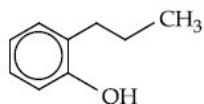
**A**



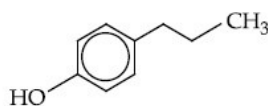
**B**



**C**



**D**



**24th Feb Morning Slot 2021**

### MCQ Answer Key

1. Ans. (D)

2. Ans. (D)

3. Ans. (C)

4. Ans. (A)

5. Ans. (D)

6. Ans. (C)

7. Ans. (B)

8. Ans. (C)

9. Ans. (B)

10. Ans. (B)

11. Ans. (C)

12. Ans. (B)

13. Ans. (D)

14. Ans. (C)

15. Ans. (C)

16. Ans. (A)

17. Ans. (C)

18. Ans. (C)

19. Ans. (C)

20. Ans. (C)

21. Ans. (B)

22. Ans. (B)

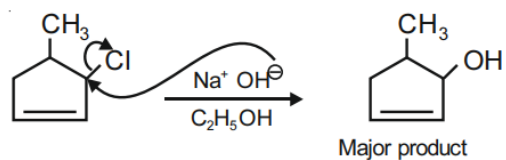
23. Ans. (D)

24. Ans. (C)

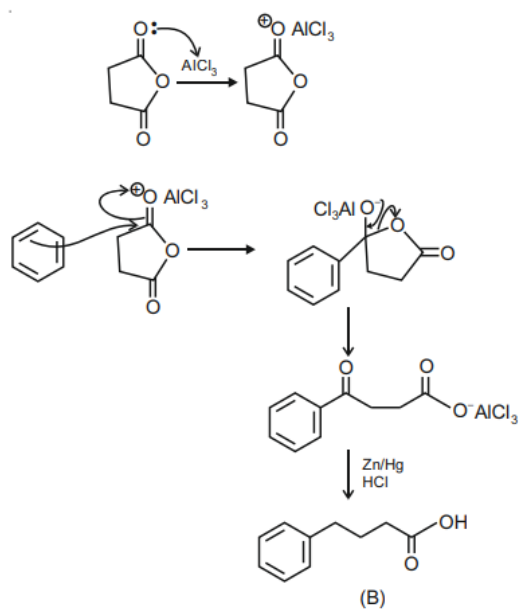
25. Ans. (C)

## MCQ Explanation

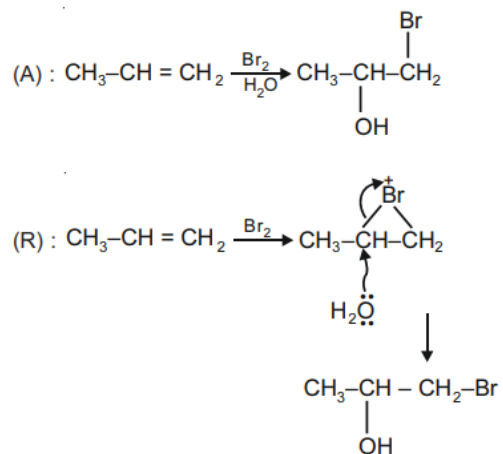
**Ans 1.** NaOH + EtOH is known as alcoholic NaOH, so it give E<sup>2</sup> reaction with given alkyl halide.



**Ans 2.**



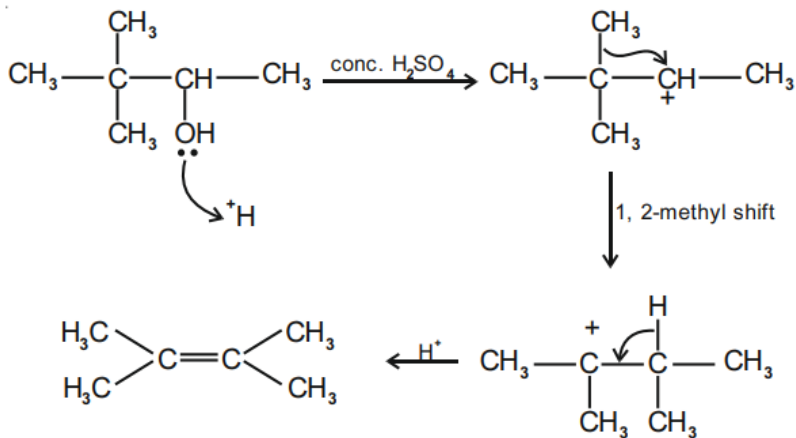
**Ans 3.**



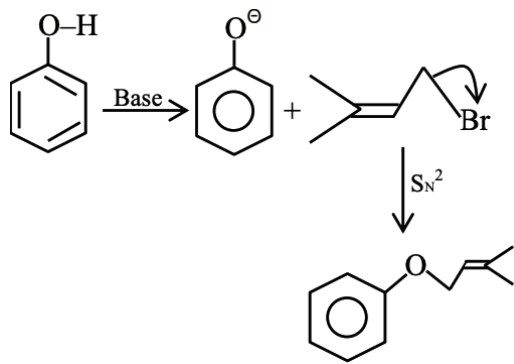
Its IUPAC name 1-bromopropan-2-ol

A and R are true and (R) is the correct explanation of (A).

**Ans 4.**



**Ans 5.**



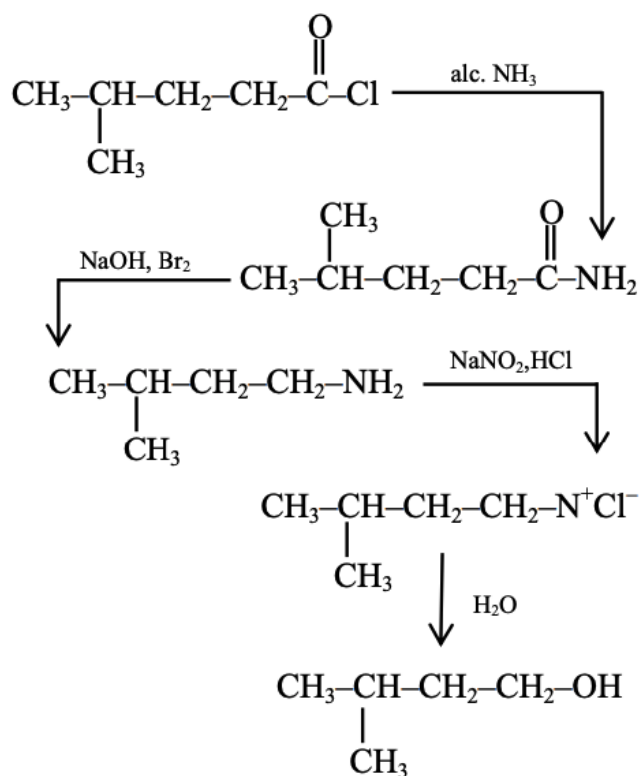
**Ans 6.** Statement I is true

But it consume 3 moles of G R

So Statement II is false.

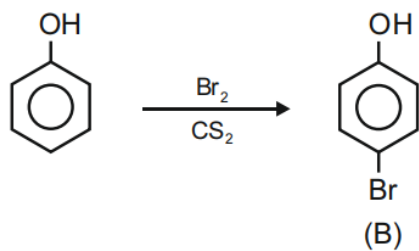
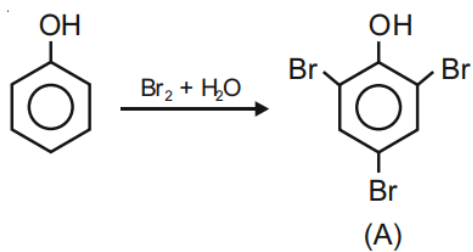


Ans 8.

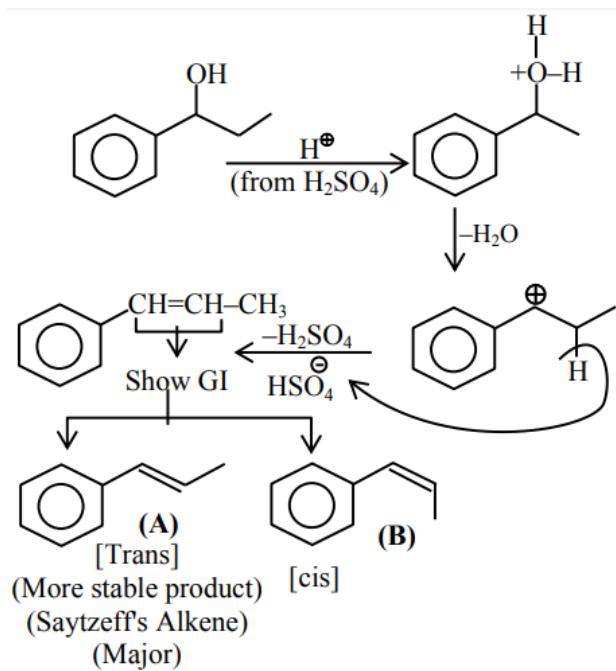


Ans 9. Only p-methyl, phenol does not give any colour with phthalic anhydride with cons.  $\text{H}_2\text{SO}_4$ .

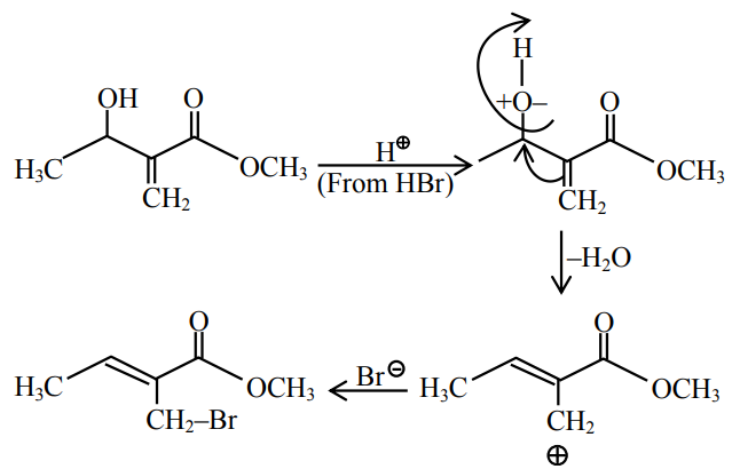
Ans 10.



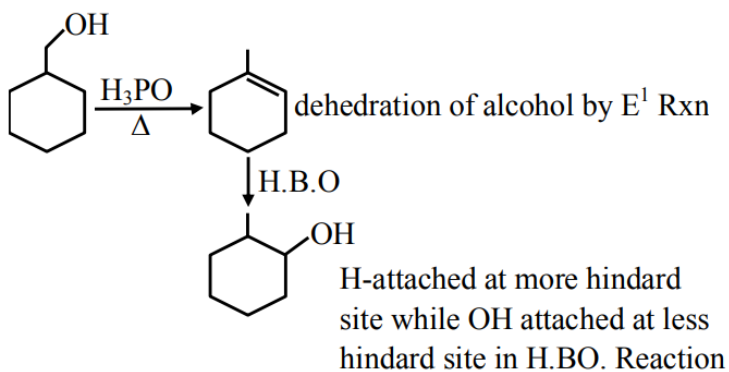
Ans 11.



Ans 12.

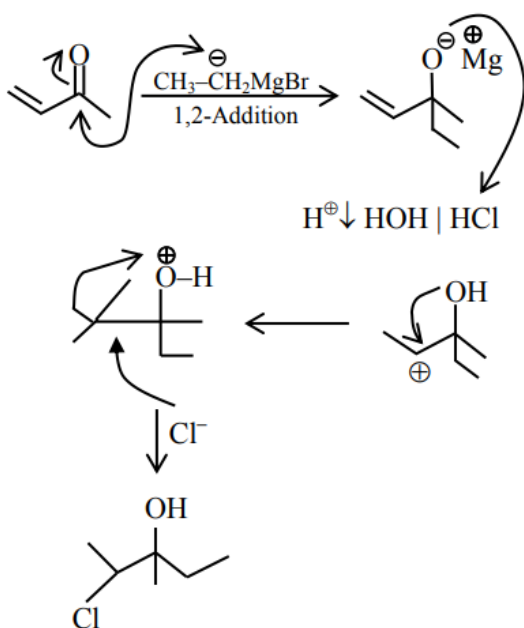


**Ans 13.**

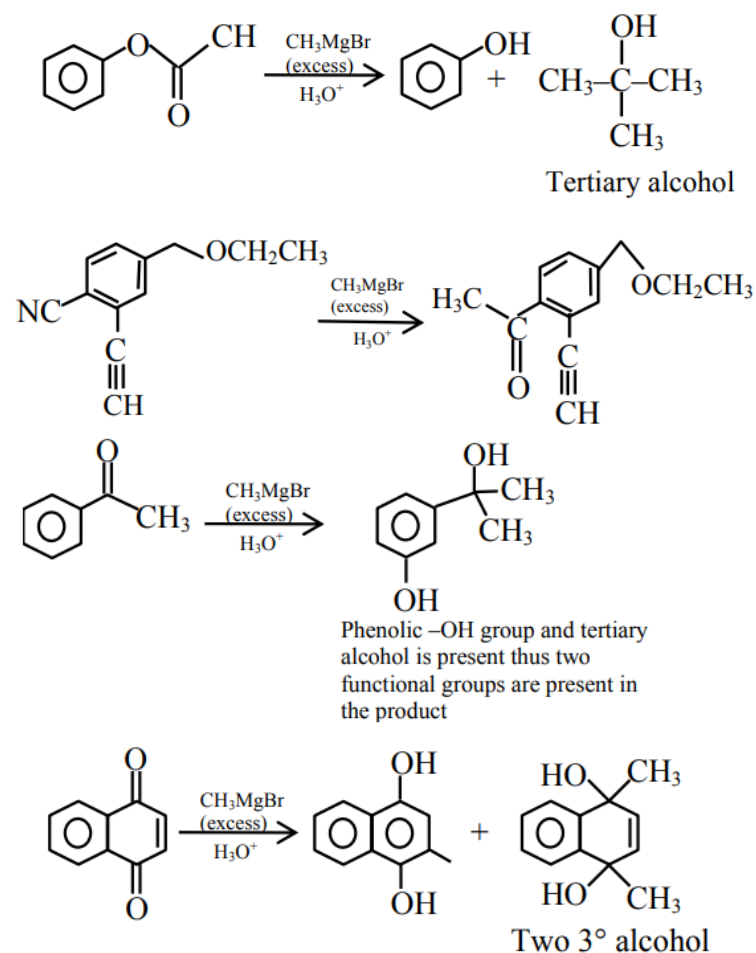


**Ans 14.** Bromine water gives tribromo products, other gives monobromo products in which para is major product.

**Ans 15.**

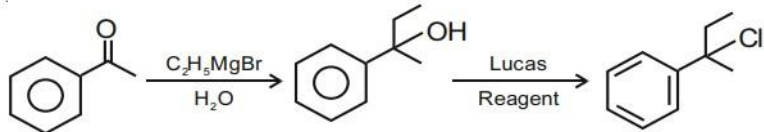


**Ans 16.**

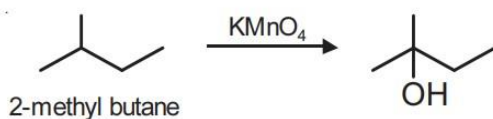


Since, the given question is single correct choice the best appropriate option is (A).

**Ans 17.** Reaction occur through formation of carbocation.

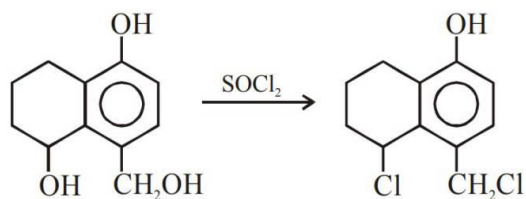


**Ans 18.** Alkanes having tertiary H can be oxidized to corresponding alcohols by  $\text{KMnO}_4$ .



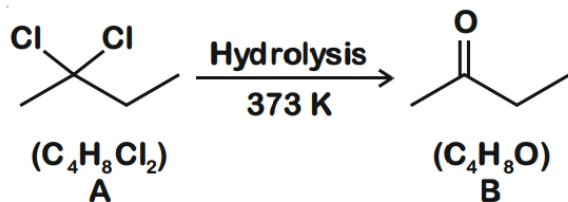
whereas ordinary alkanes resist oxidation.

**Ans 19.**



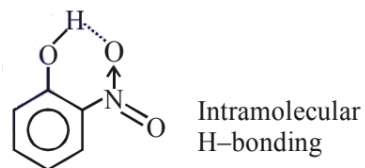
**Ans 20.** Alcohol give positive test with ceric ammonium nitrate and primary amines gives carbyl amine test with  $\text{CHCl}_3$ ,  $\text{KOH}$ .

**Ans 21.**



Compound 'B' does not give Tollen's test due to presence of ketonic group but reacts with hydroxyl amine.

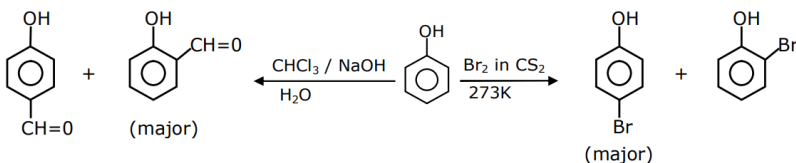
**Ans 22.**



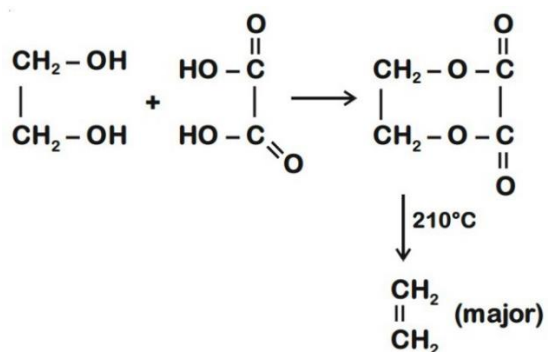
So it is more volatile due to intramolecular H-bonding.

Melting point depends on packing efficiency not on H-bonding thus statement II is false.

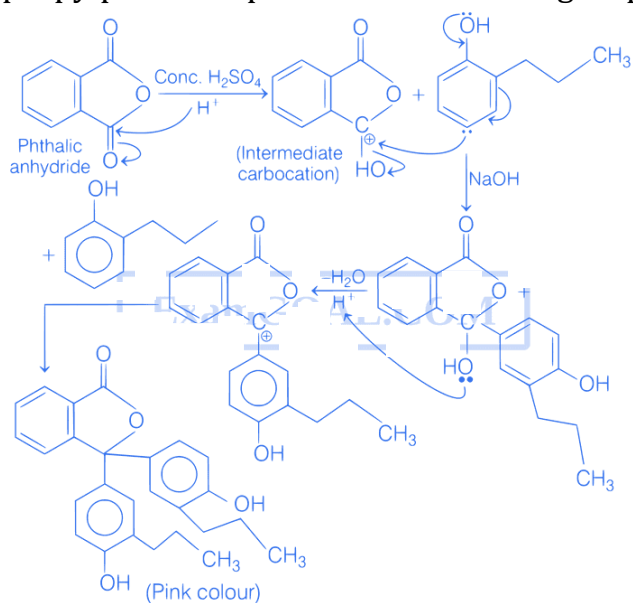
**Ans 23.**



Ans 24.



Ans 25. Firstly phthalic anhydride in presence of conc.  $\text{H}_2\text{SO}_4$  undergoes protonation to give an intermediate carbocation. This carbocation reacts with 2-propylphenol in presence of  $\text{NaOH}$  to give pink colour compound.

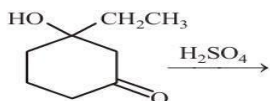


**TOPIC 1 Preparation and Properties of Alcohols**



1. The major product of the following reaction is :

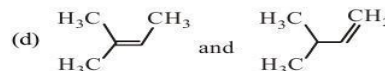
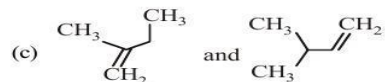
[Sep. 05, 2020 (II)]



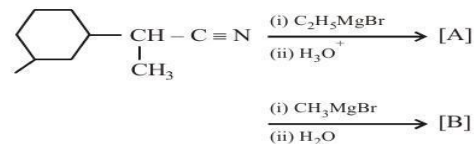
- (a) (b)
- (c) (d)

2. When neopentyl alcohol is heated with an acid, it slowly converted into an 85 : 15 mixture of alkenes A and B, respectively. What are these alkenes? [Sep. 04, 2020 (I)]

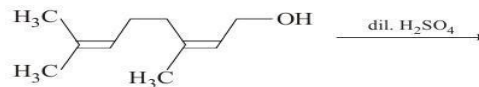
- (a) and
- (b) and



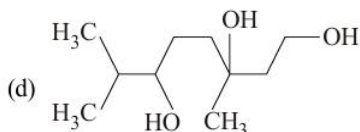
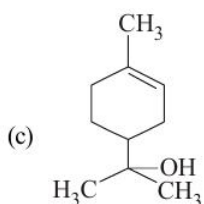
3. The number of chiral centres present in [B] is \_\_\_\_\_.  
[Sep. 04, 2020 (I)]



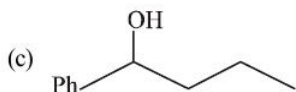
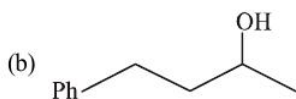
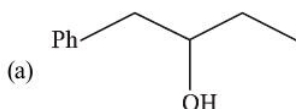
4. The major product of the following reaction is:  
[Jan. 08, 2020 (I)]



- (a)
- (b)

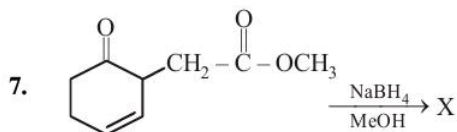


5. Heating of 2-chloro-1-phenylbutane with EtOK/EtOH gives X as the major product. Reaction of X with  $\text{Hg}(\text{OAc})_2/\text{H}_2\text{O}$  followed by  $\text{NaBH}_4$  gives Y as the major product. Y is : [April 12, 2019 (II)]

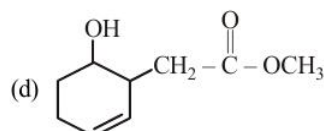
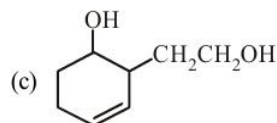
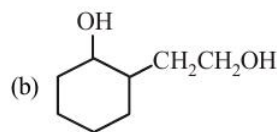
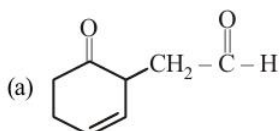


6.  $\text{CH}_3\text{CH}_2 - \overset{\text{OH}}{\underset{\text{Ph}}{\text{C}}} - \text{CH}_3$  cannot be prepared by: [Jan. 12, 2019 (I)]

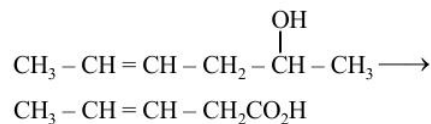
- (a)  $\text{CH}_3\text{CH}_2\text{COCH}_3 + \text{PhMgX}$   
 (b)  $\text{PhCOCH}_2\text{CH}_3 + \text{CH}_3\text{MgX}$   
 (c)  $\text{PhCOCH}_3 + \text{CH}_3\text{CH}_2\text{MgX}$   
 (d)  $\text{HCHO} + \text{PhCH}(\text{CH}_3)\text{CH}_2\text{MgX}$



[Jan. 10, 2019 (I)]

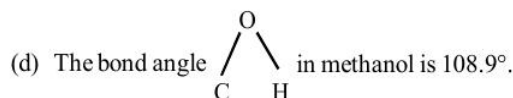


8. Which is the most suitable reagent for the following transformation? [Jan. 10, 2019 (II)]



- (a) Tollen's reagent      (b)  $\text{I}_2/\text{NaOH}$   
 (c)  $\text{CrO}_2\text{Cl}_2/\text{CS}_2$       (d) alkaline  $\text{KMnO}_4$
9. The gas evolved on heating  $\text{CH}_3\text{MgBr}$  in methanol is : [Online April 9, 2016]
- (a) Methane      (b) Ethane  
 (c) Propane      (d) HBr
10. The most suitable reagent for the conversion of  $\text{R} - \text{CH}_2 - \text{OH} \rightarrow \text{R} - \text{CHO}$  is: [2014]
- (a)  $\text{KMnO}_4$   
 (b)  $\text{K}_2\text{Cr}_2\text{O}_7$   
 (c)  $\text{CrO}_3$   
 (d) PCC (Pyridinium chlorochromate)
11. Which one of the following statements is not correct? [Online April 11, 2014]

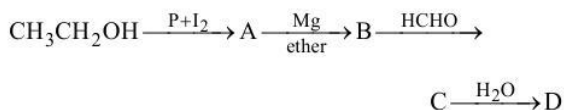
- (a) Alcohols are weaker acids than water  
 (b) Acid strength of alcohols decreases in the following  $\text{RCH}_2\text{OH} > \text{R}_2\text{CHOH} > \text{R}_3\text{COH}$   
 (c) Carbon-oxygen bond length in methanol,  $\text{CH}_3\text{OH}$  is shorter than that of C - O bond length in phenol.



12. In the Victor-Meyer's test, the colour given by  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  alcohols are respectively: [Online April 12, 2014]
- (a) Red, colourless, blue      (b) Red, blue, colourless  
 (c) Colourless, red, blue      (d) Red, blue, violet
13. An unknown alcohol is treated with the "Lucas reagent" to determine whether the alcohol is primary, secondary or tertiary. Which alcohol reacts fastest and by what mechanism : [2013]

- (a) secondary alcohol by  $S_N1$   
 (b) tertiary alcohol by  $S_N1$   
 (c) secondary alcohol by  $S_N2$   
 (d) tertiary alcohol by  $S_N2$
14. Rate of dehydration of alcohols follows the order:  
**[Online April 9, 2013]**  
 (a)  $2^\circ > 1^\circ > \text{CH}_3\text{OH} > 3^\circ$  (b)  $3^\circ > 2^\circ > 1^\circ > \text{CH}_3\text{OH}$   
 (c)  $2^\circ > 3^\circ > 1^\circ > \text{CH}_3\text{OH}$  (d)  $\text{CH}_3\text{OH} > 1^\circ > 2^\circ > 3^\circ$
15. Amongst the following alcohols which would react fastest with conc. HCl and  $\text{ZnCl}_2$ ? **[Online April 22, 2013]**  
 (a) pentanol (b) 2-methyl butanol  
 (c) 2-pentanol (d) 2-methyl butan-2-ol
16. Reagent used to convert allyl alcohol to acrolein is  
**[Online May 19, 2012]**  
 (a)  $\text{MnO}_2$  (b)  $\text{H}_2\text{O}_2$   
 (c)  $\text{OsO}_4$  (d)  $\text{KMnO}_4$
17. Consider thiol anion ( $\text{RS}^\ominus$ ) and alkoxy anion ( $\text{RO}^\ominus$ ). Which of the following statements is correct? **[2011RS]**  
 (a)  $\text{RS}^\ominus$  is less basic but more nucleophilic than  $\text{RO}^\ominus$   
 (b)  $\text{RS}^\ominus$  is more basic and more nucleophilic than  $\text{RO}^\ominus$   
 (c)  $\text{RS}^\ominus$  is more basic but less nucleophilic than  $\text{RO}^\ominus$   
 (d)  $\text{RS}^\ominus$  is less basic and less nucleophilic than  $\text{RO}^\ominus$
18. From amongst the following alcohols, the one that would react fastest with conc. HCl and anhydrous  $\text{ZnCl}_2$ , is **[2010]**  
 (a) 2-Butanol (b) 2-Methylpropan-2-ol  
 (c) 2-Methylpropanol (d) 1-Butanol
19. The main product of the following reaction is  
 $\text{C}_6\text{H}_5\text{CH}_2\text{CH}(\text{OH})\text{CH}(\text{CH}_3)_2 \xrightarrow{\text{conc. H}_2\text{SO}_4} ?$  **[2010]**
- (a)  $\text{H}_5\text{C}_6 \diagdown \text{C} = \text{C} \diagup \text{H}$   
 $\text{H} \diagup \text{CH}(\text{CH}_3)_2 \diagdown$
- (b)  $\text{C}_6\text{H}_5\text{CH}_2 \diagdown \text{C} = \text{C} \diagup \text{CH}_3$   
 $\text{H} \diagup \text{CH}_3 \diagdown$
- (c)  $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2 \diagdown \text{C} = \text{CH}_2$   
 $\text{H}_3\text{C} \diagup$
- (d)  $\text{C}_6\text{H}_5 \diagdown \text{C} = \text{C} \diagup \text{CH}(\text{CH}_3)_2$   
 $\text{H} \diagup \text{H} \diagdown$

20. In the following sequence of reactions, **[2007]**



the compound D is

- (a) propanal (b) butanal  
 (c) *n*-butyl alcohol (d) *n*-propyl alcohol.
21. Among the following the one that gives positive iodoform test upon reaction with  $\text{I}_2$  and NaOH is **[2006]**

- (a)  $\text{CH}_3 - \overset{\text{CH}_3}{\underset{|}{\text{C}}}\text{HCH}_2\text{OH}$   
 (b)  $\text{PhCHOHCH}_3$   
 (c)  $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{CH}_3$   
 (d)  $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{OH}$

22. The best reagent to convert pent-3-en-2-ol into pent-3-en-2-one is **[2005]**

- (a) Pyridinium chlorochromate  
 (b) Chromic anhydride in glacial acetic acid  
 (c) acidic dichromate  
 (d) Acidic permanganate

23. Among the following compounds which can be dehydrated very easily? **[2004]**

- (a)  $\text{CH}_3\text{CH}_2 - \overset{\text{CH}_3}{\underset{\text{OH}}{\underset{|}{\text{C}}}} - \text{CH}_2\text{CH}_3$   
 (b)  $\text{CH}_3\text{CH}_2\text{CH}_2\overset{\text{OH}}{\underset{|}{\text{C}}}\text{HCH}_3$   
 (c)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$   
 (d)  $\text{CH}_3\text{CH}_2\overset{\text{CH}_3}{\underset{|}{\text{C}}}\text{HCH}_2\text{CH}_2\text{OH}$

24. During dehydration of alcohols to alkenes by heating with conc.  $\text{H}_2\text{SO}_4$ , the initiation step is **[2003]**

- (a) formation of carbocation  
 (b) elimination of water  
 (c) formation of an ester  
 (d) protonation of alcohol molecule

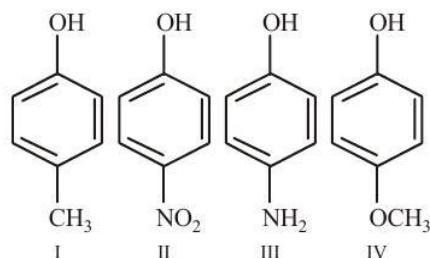
## TOPIC 2 Preparation and Properties of Phenols



25. A solution of phenol in chloroform when treated with aqueous NaOH gives compound P as a major product. The mass percentage of carbon in P is \_\_\_\_\_. (to the nearest integer) (Atomic mass: C = 12; H = 1; O = 16)

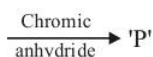
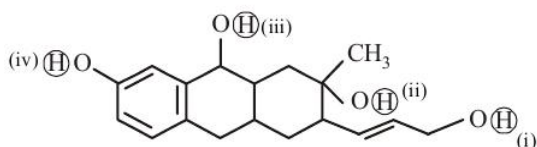
**[NV, Sep. 06, 2020 (II)]**

26. The increasing order of boiling points of the following compounds is : **[Sep. 05, 2020 (II)]**



- (a) I < III < IV < II      (b) I < IV < III < II  
 (c) IV < I < II < III      (d) III < I < II < IV

27. Consider the following reaction : [Sep. 03, 2020 (II)]

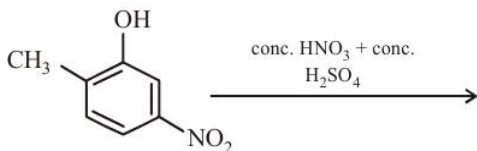


The product 'P' gives positive ceric ammonium nitrate test. This is because of the presence of which of these -OH group(s) ? [Sep. 03, 2020 (II)]

- (a) (ii) only      (b) (iii) and (iv)  
 (c) (iv) only      (d) (ii) and (iv)

28. The major product of the following reaction is :

[Sep. 02, 2020 (II)]



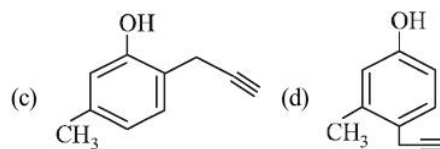
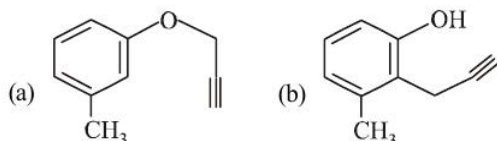
- (a) (b)   
 (c) (d)

29. Arrange the following compounds in increasing order of C - OH bond length: methanol, phenol, *p*-ethoxyphenol

[Jan. 08, 2020 (I)]

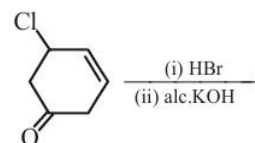
- (a) methanol < *p*-ethoxyphenol < phenol  
 (b) phenol < methanol < *p*-ethoxyphenol  
 (c) phenol < *p*-ethoxyphenol < methanol  
 (d) methanol < phenol < *p*-ethoxyphenol

30. What will be the major product when *m*-cresol is reacted with propargyl bromide (HC≡C-CH<sub>2</sub>Br) in presence of K<sub>2</sub>CO<sub>3</sub> in acetone ? [April 12, 2019 (II)]



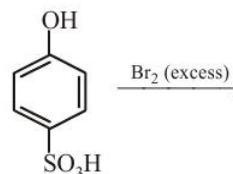
31. The major product of the following reaction is :

[Jan. 11, 2019 (I)]



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

32. The major product of the following reaction is :

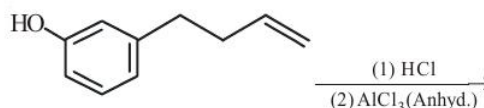


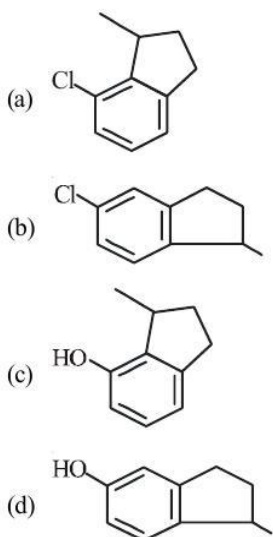
[Jan. 11, 2019 (I)]

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

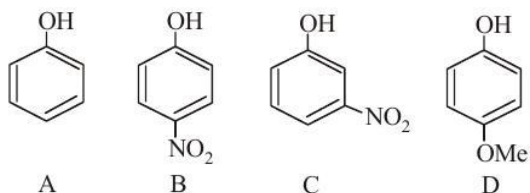
33. The major product of the following reaction is :

[Jan. 11, 2019 (II)]

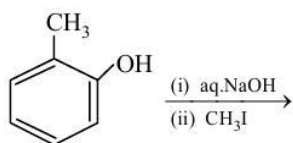




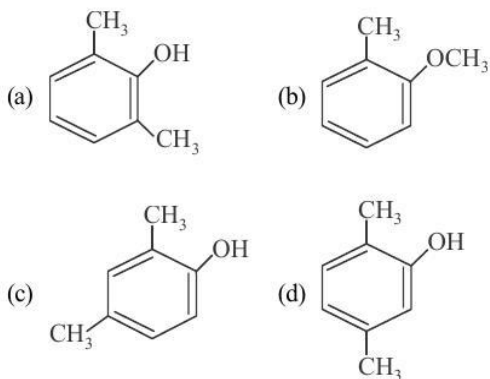
34. The increasing order of the  $pK_a$  values of the following compounds is: [Jan. 10, 2019 (I)]



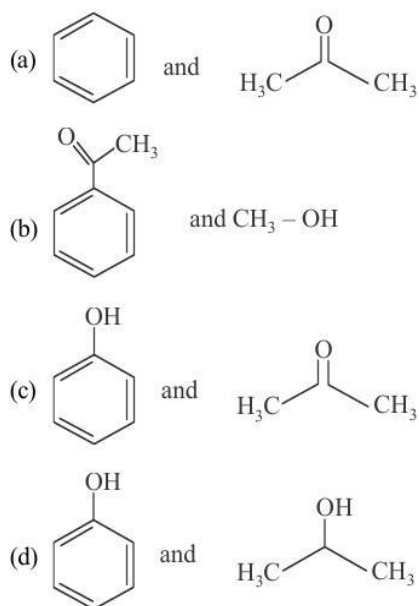
- (a)  $C < B < A < D$  (b)  $B < C < D < A$   
 (c)  $D < A < C < B$  (d)  $B < C < A < D$
35. The major product of the following reaction is:



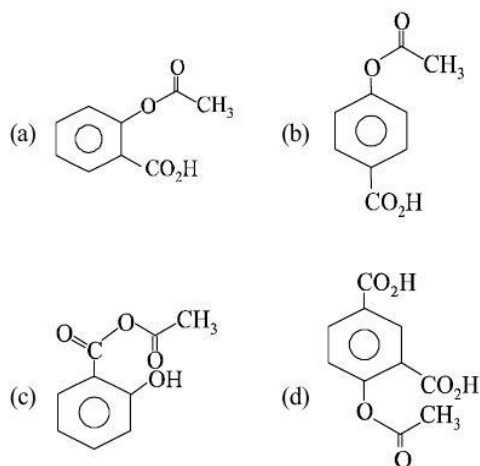
[Jan. 10, 2019 (II)]



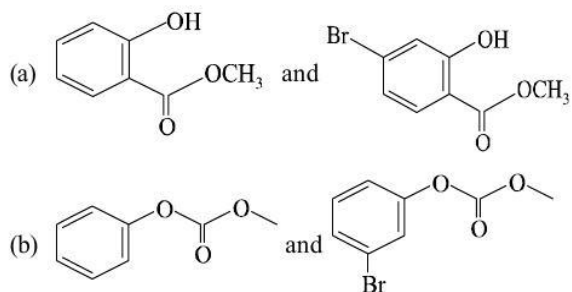
36. The products formed in the reaction of cumene with  $O_2$  followed by treatment with dil. HCl are: [Jan. 9, 2019 (II)]

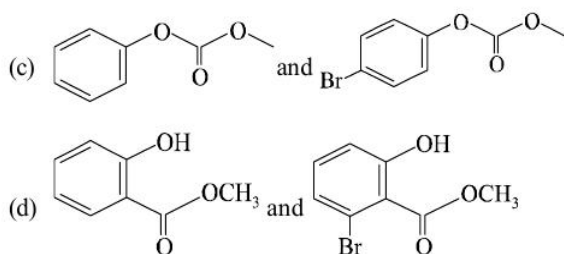


37. Phenol on treatment with  $CO_2$  in the presence of NaOH followed by acidification produces compound X as the major product. X on treatment with  $(CH_3CO)_2O$  in the presence of catalytic amount of  $H_2SO_4$  produces: [2018]

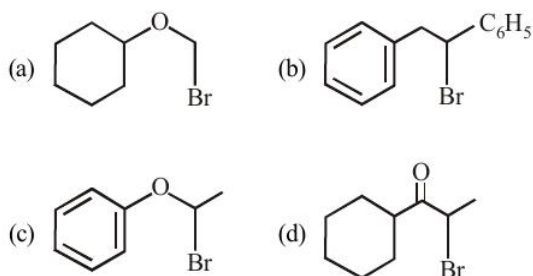


38. Phenol reacts with methyl chloroformate in the presence of NaOH to form product A. A reacts with  $Br_2$  to form product B. A and B are respectively: [2018]

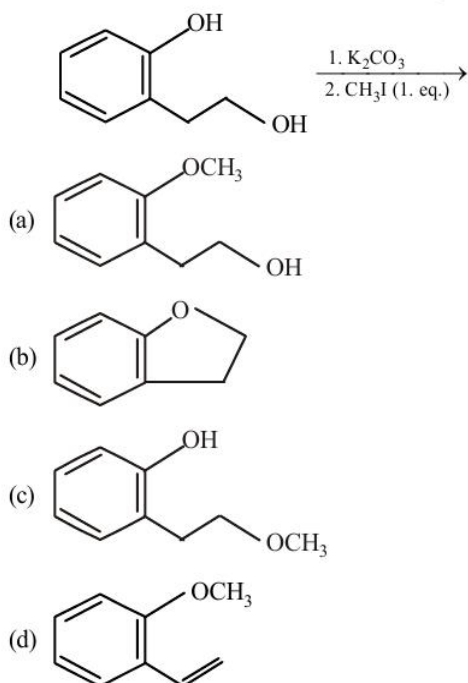




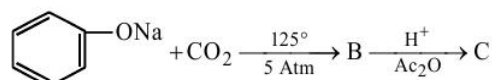
39. Which of the following, upon treatment with *tert*-BuONa followed by addition of bromine water, fails to decolorize the colour of bromine? [2017]



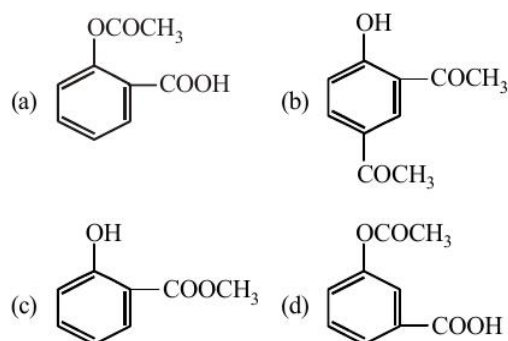
40. The major product of the following reaction is : [Online April 8, 2017]



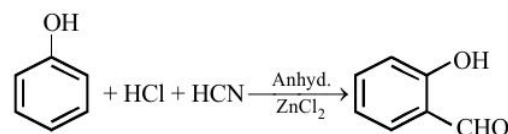
41. Sodium phenoxide when heated with  $\text{CO}_2$  under pressure at  $125^\circ\text{C}$  yields a product which on acetylation produces C [2014]



The major product C would be



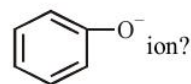
42. The following reaction



is known as:

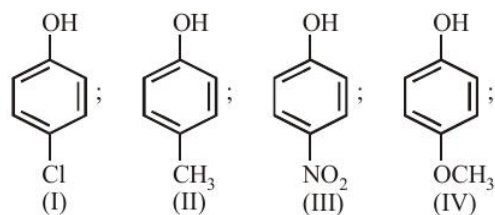
[Online April 11, 2014]

- (a) Perkin reaction  
 (b) Gatterman-Koch Formylation  
 (c) Kolbe's reaction  
 (d) Gattermann reaction
43. Which one of the following substituents at *para*-position is most effective in stabilizing the phenoxide

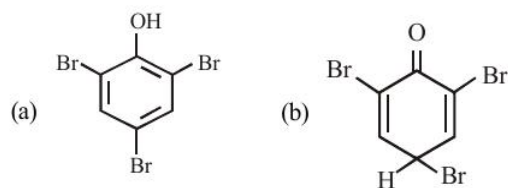


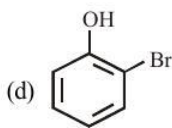
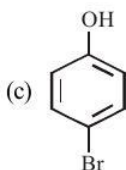
[Online April 19, 2014]

- (a)  $-\text{CH}_3$  (b)  $-\text{OCH}_3$   
 (c)  $-\text{COCH}_3$  (d)  $-\text{CH}_2\text{OH}$
44. Which one of the following compounds will not be soluble in sodium bicarbonate? [Online April 19, 2014]
- (a) 2, 4, 6 - Trinitrophenol (b) Benzoic acid  
 (c) *o* - Nitrophenol (d) Benzene sulphonic acid
45. Arrange the following compounds in order of decreasing acidity: [2013]



- (a) II > IV > I > III (b) I > II > III > IV  
 (c) III > I > II > IV (d) IV > III > I > II
46. What is the structure of the major product when phenol is treated with bromine water? [Online April 22, 2013]

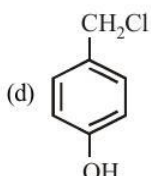
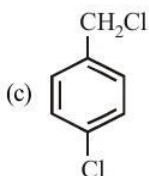
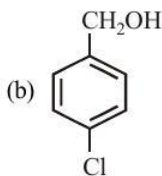
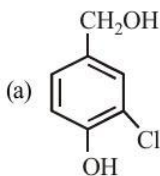
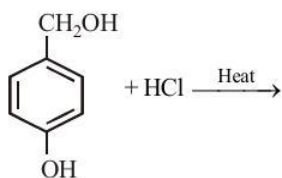




47. The reaction of phenol with benzoyl chloride to give phenyl benzoate is known as : **[Online April 23, 2013]**

- (a) Claisen reaction  
 (b) Schotten-Baumann reaction  
 (c) Reimer-Tiemann reaction  
 (d) Gatterman-Koch reaction

48. The major product in the following reaction is : **[Online April 25, 2013]**



49. Phenol on heating with  $\text{CHCl}_3$  and  $\text{NaOH}$  gives salicylaldehyde. The reaction is called :

**[Online April 25, 2013]**

- (a) Reimer - Tiemann reaction  
 (b) Claisen reaction  
 (c) Cannizzaro's reaction  
 (d) Hell - Volhard - Zelinsky reaction

50. The correct order of acid strength of the following compounds : **[2011RS]**

- (A) Phenol (B) *p*-Cresol  
 (C) *m*-Nitrophenol (D) *p*-Nitrophenol  
 (a)  $D > C > A > B$  (b)  $B > D > A > C$   
 (c)  $A > B > D > C$  (d)  $C > B > A > D$

51. Consider the following reaction :



Among the following, which one cannot be formed as a product under any conditions ? **[2011RS]**

- (a) Ethylene (b) Acetylene  
 (c) Diethyl ether (d) Ethylhydrogen sulphate

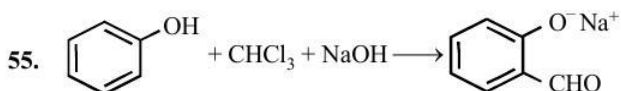
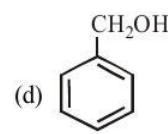
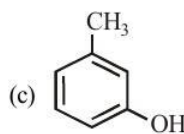
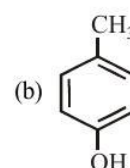
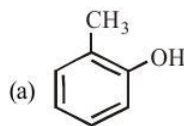
52. The major product obtained on interaction of phenol with sodium hydroxide and carbon dioxide is **[2009]**

- (a) salicylaldehyde  
 (b) salicylic acid  
 (c) phthalic acid  
 (d) benzoic acid

53. Phenol, when it reacts first with concentrated sulphuric acid and then with concentrated nitric acid, gives **[2008]**

- (a) 2, 4, 6-trinitrobenzene  
 (b) *o*-nitrophenol  
 (c) *p*-nitrophenol  
 (d) nitrobenzene

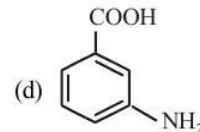
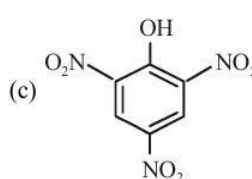
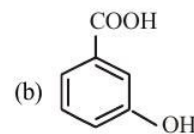
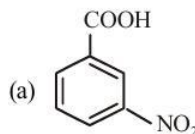
54. The structure of the compound that gives a tribromo derivative on treatment with bromine water is **[2006]**



The electrophile involved in the above reaction is **[2006]**

- (a) trichloromethyl anion ( $\ominus\text{CCl}_3$ )  
 (b) formyl cation  
 (c) phenoxide ion  
 (d) dichlorocarbene

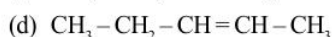
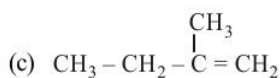
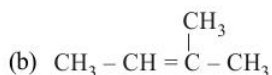
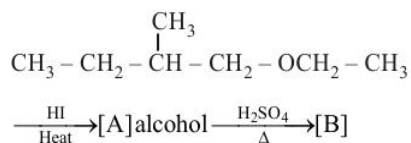
56. Picric acid is: **[2002]**



**TOPIC 3 Preparation and Properties of Ethers**

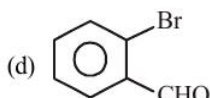
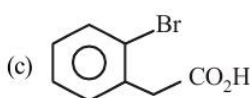
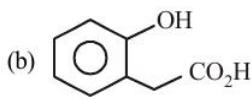
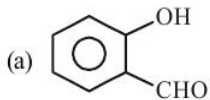
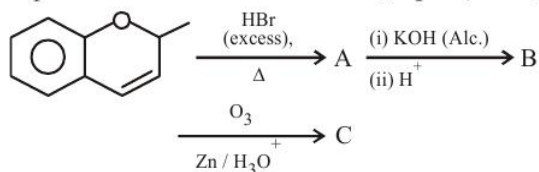

57. The major product [B] in the following reactions is :

[Sep. 04, 2020 (II)]



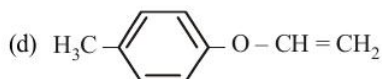
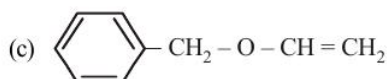
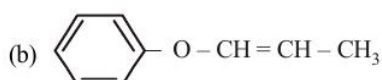
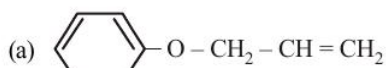
58. The major aromatic product C in the following reaction sequence will be :

[Sep. 02, 2020 (I)]



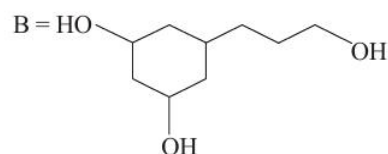
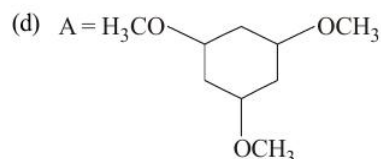
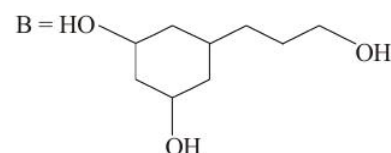
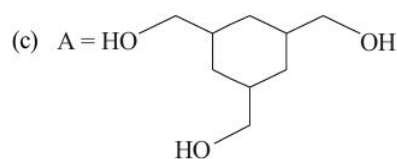
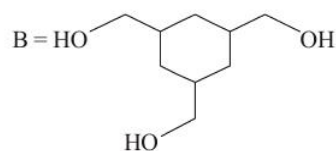
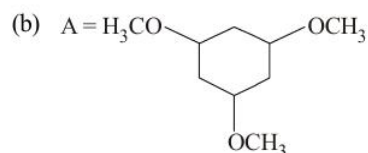
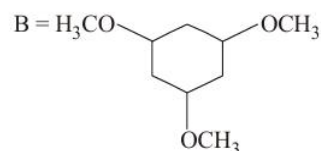
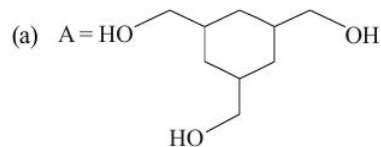
59. An organic compound 'A' ( $\text{C}_9\text{H}_{10}\text{O}$ ) when treated with conc. HI undergoes cleavage to yield compounds 'B' and 'C'. 'B' gives yellow precipitate with  $\text{AgNO}_3$  where as 'C' tautomerizes to 'D'. 'D' gives positive iodoform test. 'A' could be :

[Sep. 02, 2020 (II)]



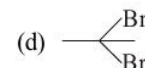
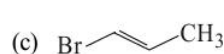
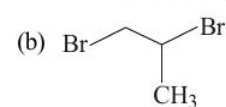
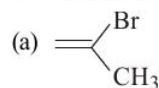
60. Among the compounds A and B with molecular formula  $\text{C}_9\text{H}_{18}\text{O}_3$ , A is having higher boiling point than B. The

possible structures of A and B are: [Jan. 08, 2020 (II)]



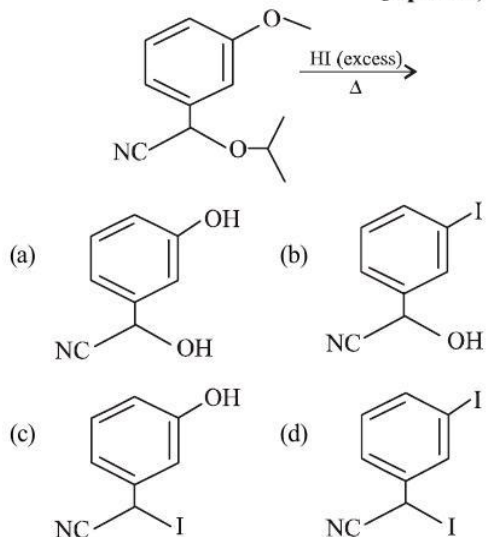
61. 1-methyl ethylene oxide when treated with an excess of HBr produces:

[Jan. 07, 2020 (I)]



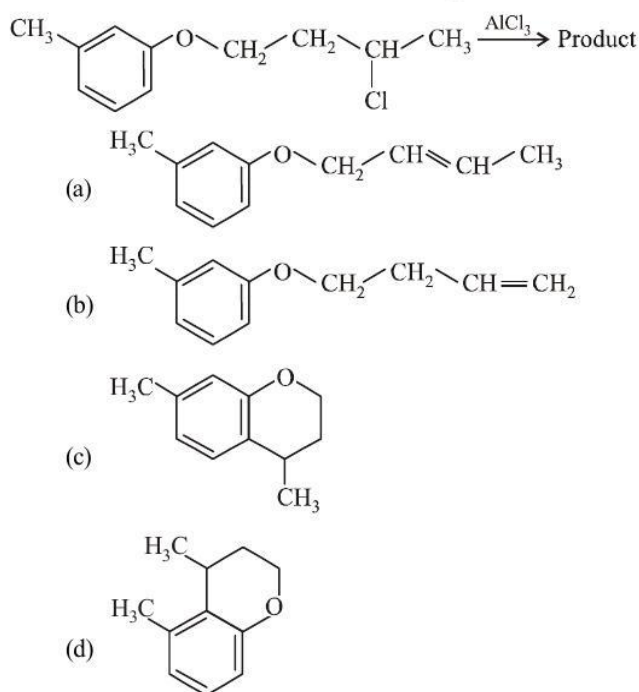
62. The major product of the following reaction is:

[April 10, 2019 (I)]

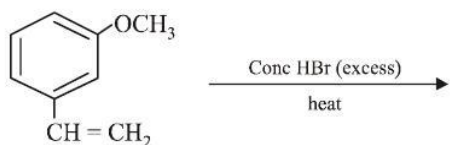


63. The major product obtained in the given reaction is:

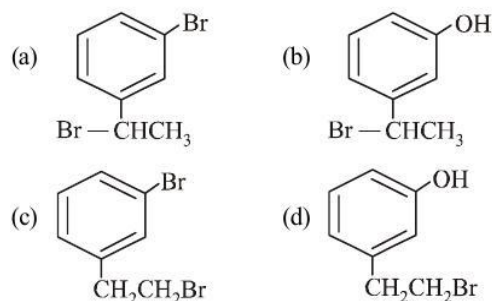
[April 10, 2019 (II)]



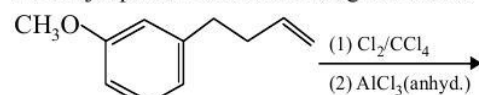
64. The major product of the following reaction is:



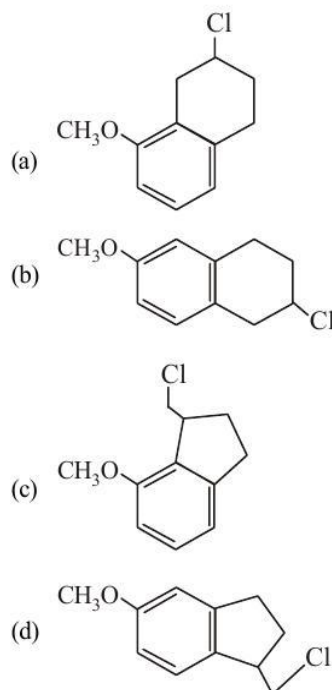
[April 8, 2019 (I)]



65. The major product of the following reaction is:

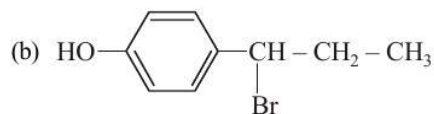
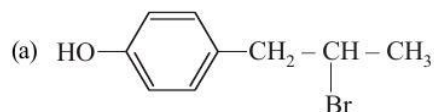
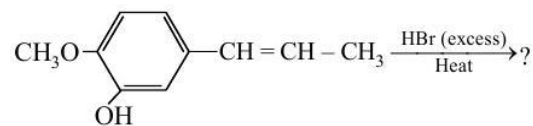


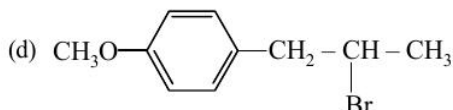
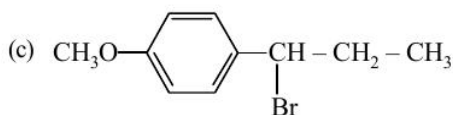
[Jan. 12, 2019 (I)]



66. The major product in the following conversion is:

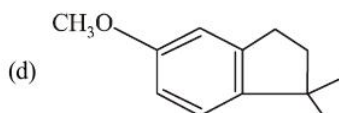
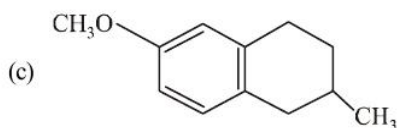
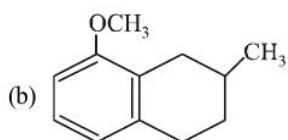
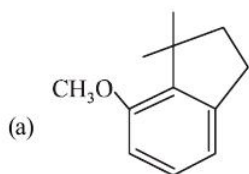
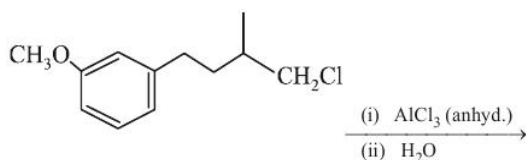
[Jan. 12, 2019 (II)]



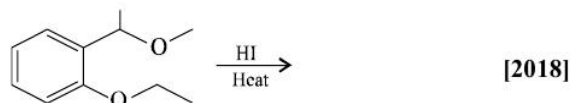


67. The major product of the following reaction is:

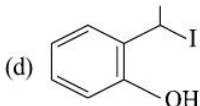
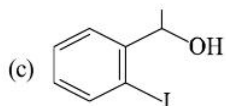
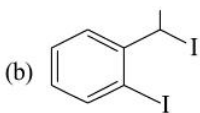
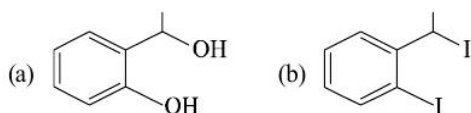
[Jan. 10, 2019 (I)]



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

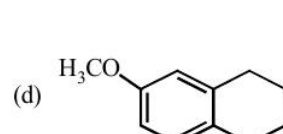
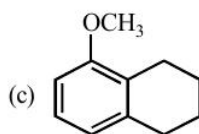
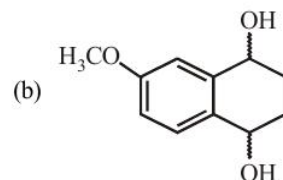
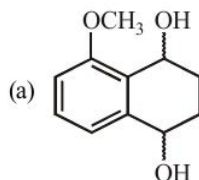
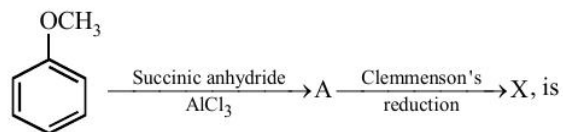


[2018]



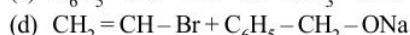
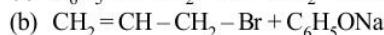
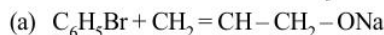
69. Consider the reaction sequence below :

[Online April 10, 2016]



70. Allyl phenyl ether can be prepared by heating:

[Online April 9, 2014]



71. Williamson synthesis of ether is an example of:

[Online April 19, 2014]

(a) Nucleophilic addition

(b) Electrophilic addition

(c) Electrophilic substitution

(d) Nucleophilic substitution

72. An ether (A),  $C_5H_{12}O$ , when heated with excess of hot concentrated HI produced two alkyl halides which when treated with NaOH yielded compounds (B) and (C). Oxidation of (B) and (C) gave a propanone and an ethanoic acid respectively. The IUPAC name of the ether (A) is :

[Online April 9, 2013]

(a) 2-ethoxypropane

(b) ethoxypropane

(c) methoxybutane

(d) 2-methoxybutane

73. In Williamson synthesis of mixed ether having a primary and a tertiary alkyl group if tertiary halide is used, then :

[Online April 22, 2013]

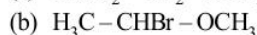
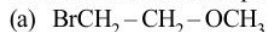
(a) Rate of reaction will be slow due to slow cleavage of carbon-halogen bond.

(b) Alkene will be the main product.

(c) Simple ether will form instead of mixed ether.

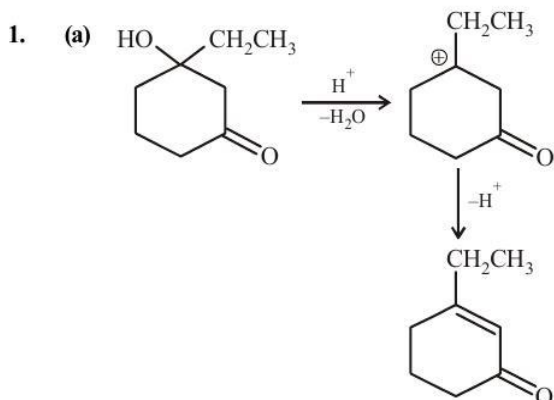
(d) Expected mixed ether will be formed.

74. HBr reacts with  $CH_2 = CH - OCH_3$  under anhydrous conditions at room temperature to give [ 2006]

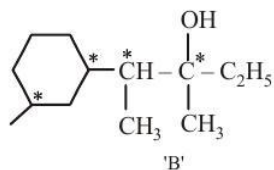
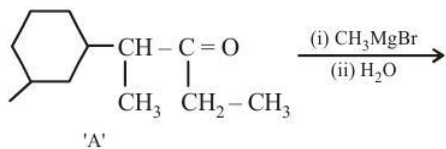
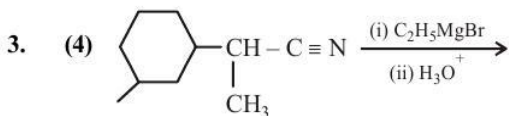
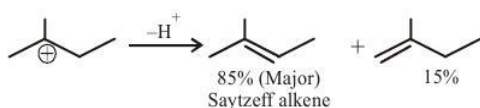
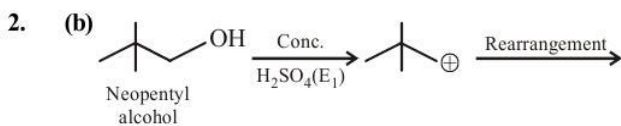
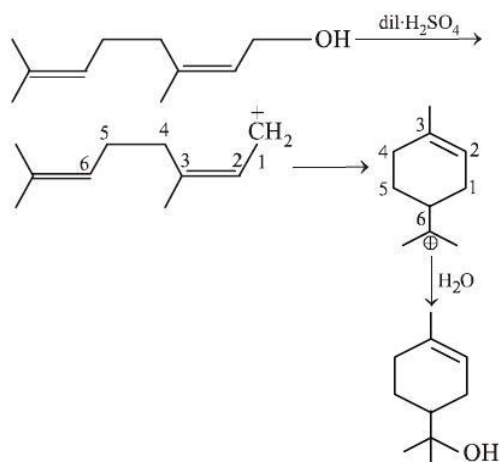




# Hints & Solutions

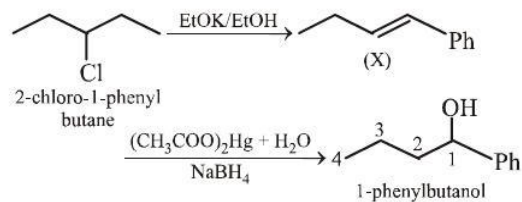


4. (c)

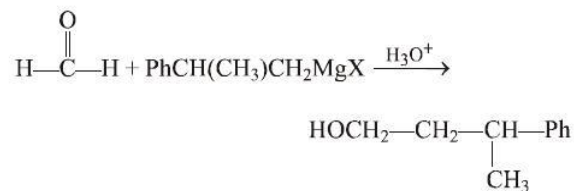


Number of chiral centres, represented as (\*) in the product (B) = 4

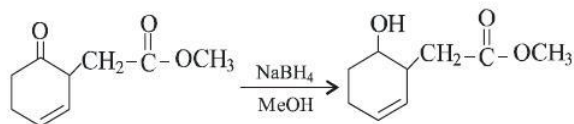
5. (c)



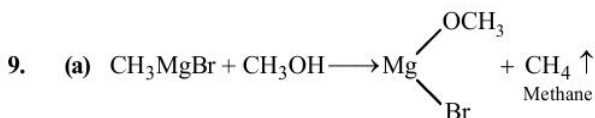
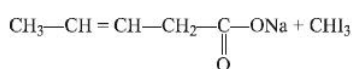
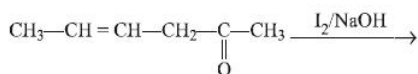
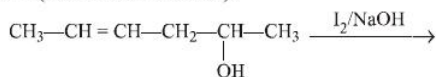
6. (d) Tertiary alcohol is prepared by the reaction of Grignard reagent with a ketone (formaldehyde is used to prepare primary alcohol).



7. (d)  $\text{NaBH}_4$  is a selective reducing agent, used for the reduction of aldehydes and ketones, it does not affect alkene and ester.



8. (b) The most suitable reagent for the given reaction is  $I_2/NaOH$  (Iodoform reaction).

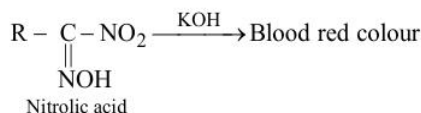
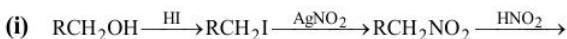


10. (d) An excellent reagent for oxidation of  $1^\circ$  alcohols to aldehydes is PCC (consult Q.3 also).

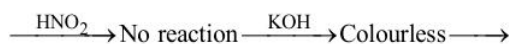
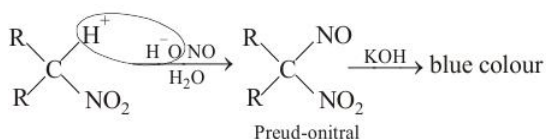
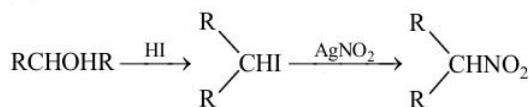


11. (c) The C–O bond length in alcohols is 142 pm and in Phenol it is 136 pm. The C–O bond length in phenol is shorter than that in methanol due to the conjugation of unshared pair of electrons on oxygen with the ring, which imparts double bond character to the C–O bond.

12. (b) **Victor Meyer's test:** The various steps involved are



(ii)



13. (b) Reaction of alcohols with Lucas reagent proceeds through carbocation formation. Further  $3^\circ$  carbocations (from tertiary alcohols) are highly stable thus reaction proceeds through  $S_N1$  mechanism.

14. (b) The order of dehydration among three type of alcohols is  $3^\circ > 2^\circ > 1^\circ > CH_3OH$ . This behaviour is related to the relative stabilities of carbocations ( $3^\circ > 2^\circ > 1^\circ$ ).

15. (d)  $ZnCl_2 + \text{conc. HCl}$  is Lucas reagent. Lucas reagent reacts fastest with tertiary alcohol.

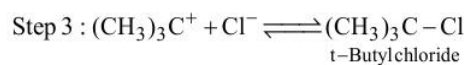
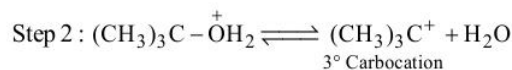
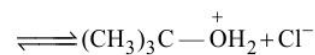
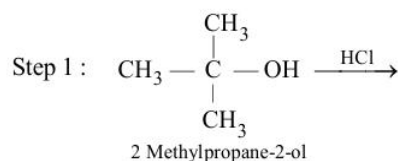
$3^\circ$  alcohol + Lucas reagent = Immediate turbidity

16. (a)  $MnO_2$  being a mild oxidising agent stops the oxidation of  $-CH_2OH$  group at aldehyde stage.

17. (a) On moving down a group, the basicity & nucleophilicity are inversely related, i.e. nucleophilicity increases while basicity decreases. i.e.  $RS^\ominus$  is more nucleophilic but less basic than  $RO^\ominus$ . This opposite behaviour is because of the fact that basicity and nucleophilicity depends upon different factors. Basicity is directly related to the strength of the H–element bond, while nucleophilicity is indirectly related to the electronegativity of the atom to which proton is attached.

18. (b) Tertiary alcohols react fastest with conc. HCl and anhydrous  $ZnCl_2$  (Lucas reagent) as its mechanism proceeds through the formation of stable tertiary carbocation.

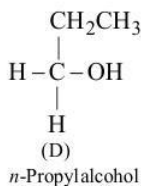
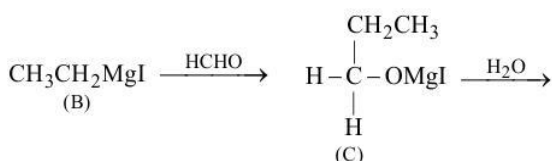
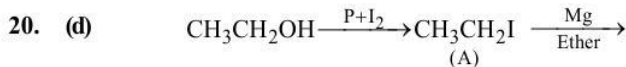
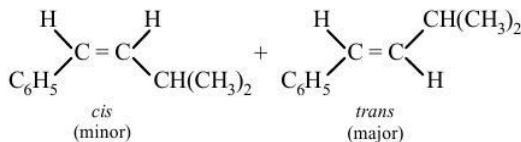
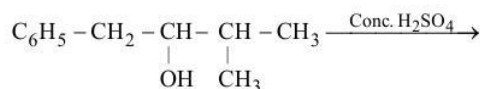
**Mechanism :**



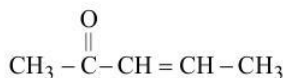
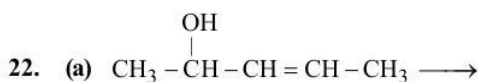
19. (a) Whenever dehydration can produce two different alkenes, major product is formed according to **Saytzeff rule** i.e. more substituted alkene (alkene having lesser number of hydrogen atoms on the two doubly bonded carbon atoms) is the major product.

Such reactions which can produce two or more structural isomers but one of them in greater amounts than the other are called **regioselective**; in case a reaction is 100% regioselective, it is termed as **regiospecific**.

In addition to being regioselective, alcohol dehydrations are **stereoselective** (a reaction in which a single starting material can yield two or more stereoisomeric products, but gives one of them in greater amount than any other).

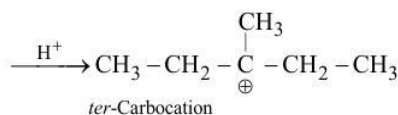
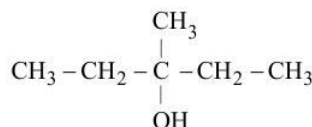


21. (b) Ethanol and only those 2° alcohols which contain -CHOHCH<sub>3</sub> group undergo haloform reaction.



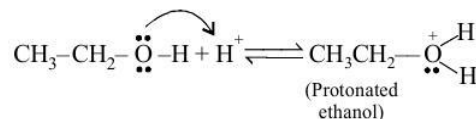
Pyridinium chlorochromate (PCC) oxidises 1° and 2° alcohols to aldehyde and ketones.

23. (a) 3-Methyl pentan-3-ol will be dehydrated most readily since it produces a very stable, tertiary carbonium ion as intermediate.

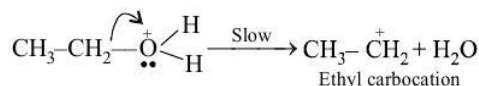


24. (d) The dehydration of alcohol to form alkene occurs in following three steps. Step (1) is initiation step.

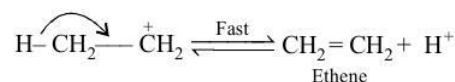
Step (1) Formation of protonated alcohol.



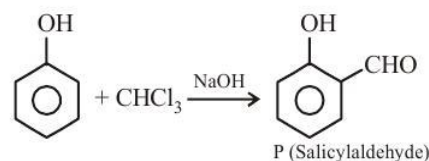
Step (2) Formation of carbocation



Step (3) Elimination of a proton to form alkene



25. (69)

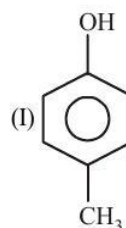


Molecular formula of product 'P' = C<sub>7</sub>H<sub>6</sub>O<sub>2</sub>

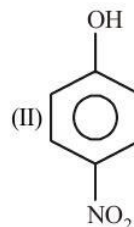
So, mass % of C in 'P'

$$= \frac{12 \times 7}{84 + 6 + 32} \times 100 = 68.85\% \approx 69\%$$

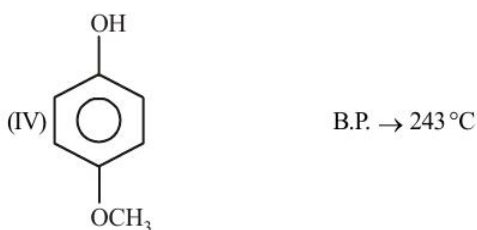
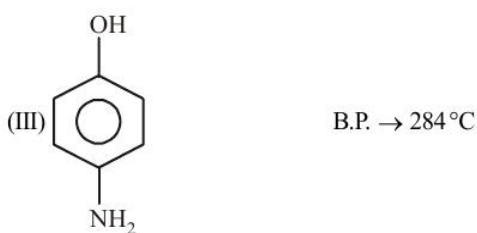
26. (b) (II) and (III) compounds almost have same boiling point. In the given options, option (b) will be the correct answer.



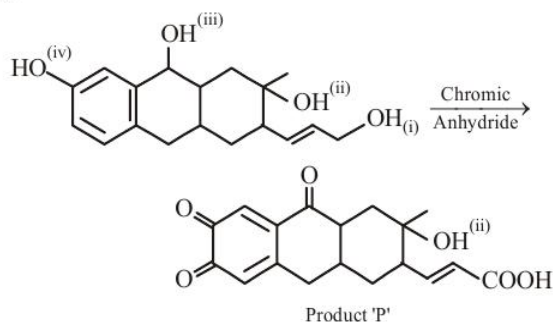
B.P. → 202 °C



B.P. → 279 °C

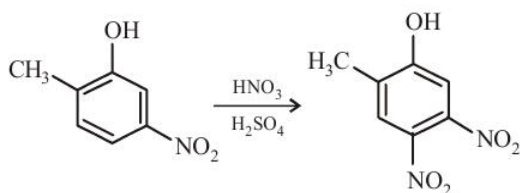


27. (a)



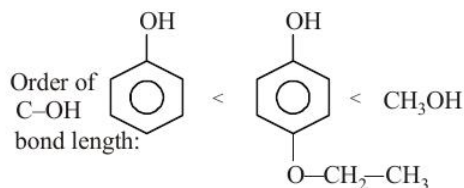
Generally CAN test is done for alcohols which give pink or red colour. But for phenols and phenolic compounds it gives brown or black colour. So, this test helps to differentiate phenols from alcohols.

28. (c)



It is an example of electrophilic substitution reaction. Position of electrophile is directed by the strong ring activating group ( $-\text{OH}$ ), present in the ring.

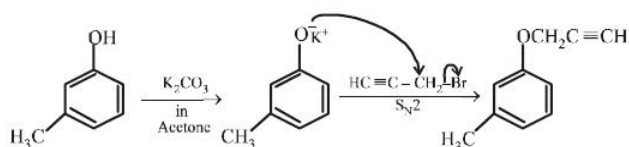
29. (c)



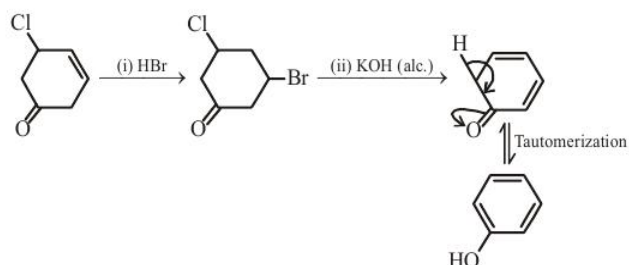
Resonance is a deciding factor to determine the order of bond length in given compounds. Phenol exhibits least

C-OH bond length due to resonance, whereas methanol will show maximum bond length due to lack of resonance and *p*-ethoxyphenol will have some intermediate value of bond length.

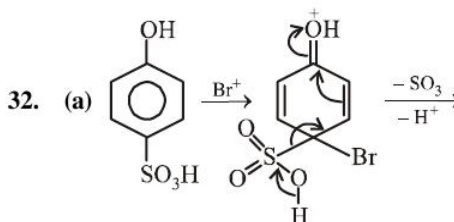
30. (a)



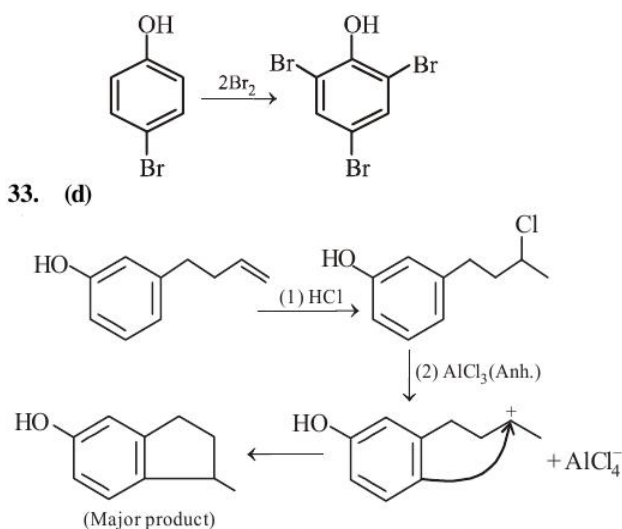
31. (b)



32. (a)

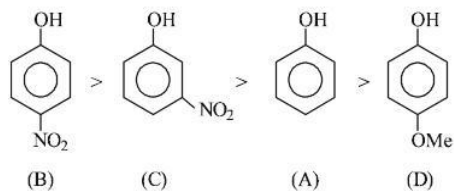


33. (d)



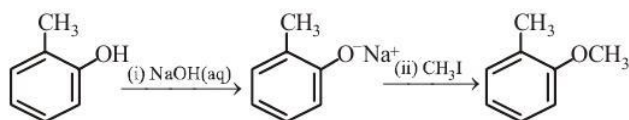
34. (d) Electron withdrawing substituents increase the acidic strength, while electron releasing groups decrease the acidic strength.

$$\therefore \text{Acidic strength} \propto K_a \propto \frac{1}{pK_a}$$

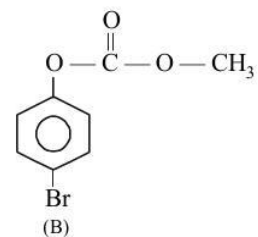
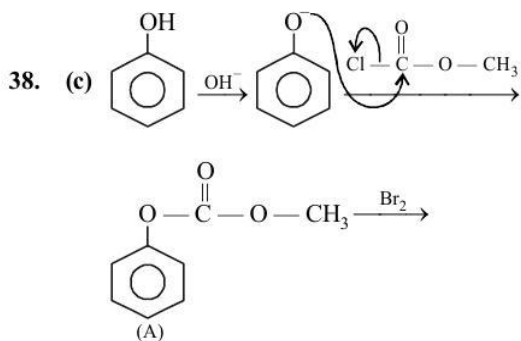
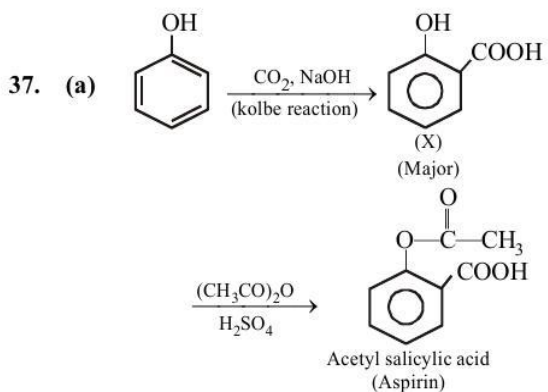
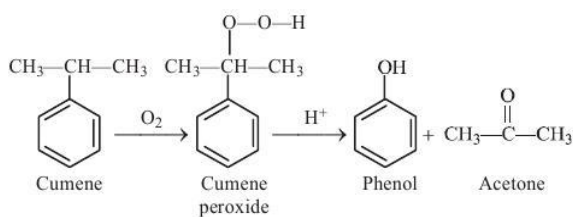


$$pK_a : B < C < A < D$$

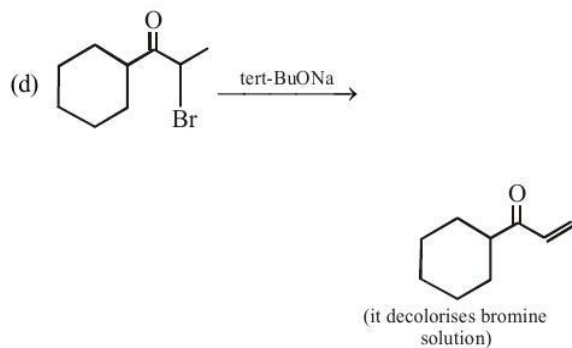
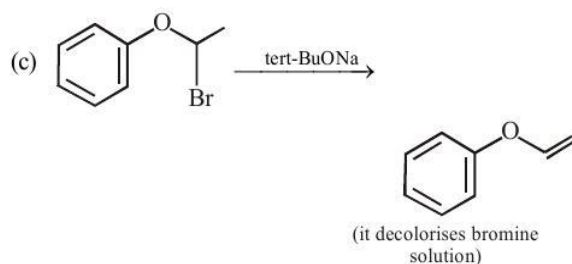
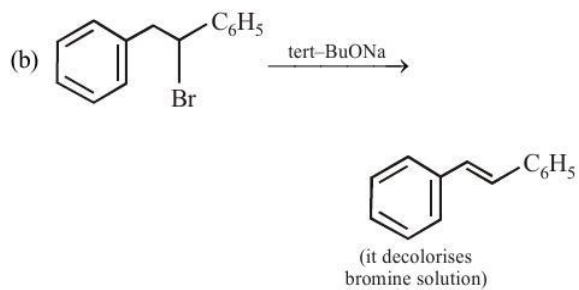
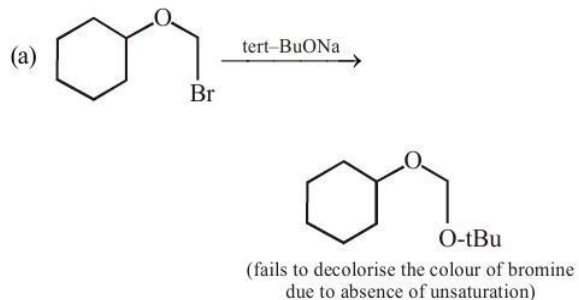
35. (b) Reaction involved:

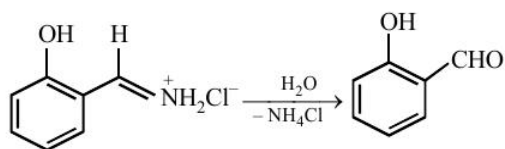
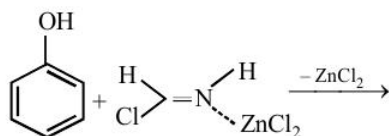
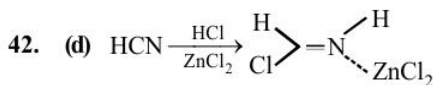
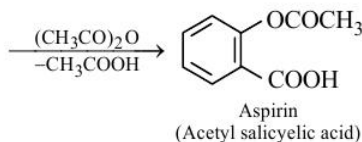
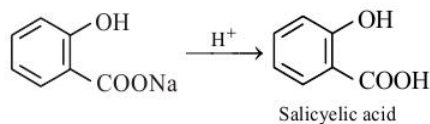
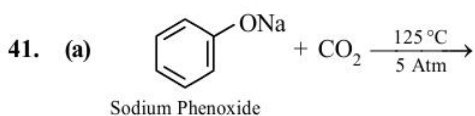
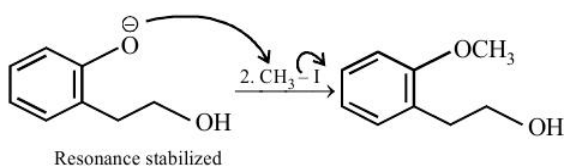
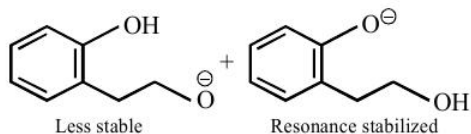
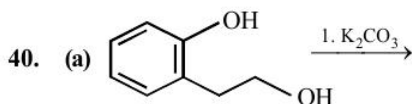


36. (3) Reaction involved:



39. (a)



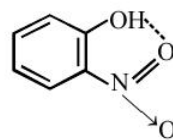


**Note :** Gattermann Koch reaction is a variation of Gattermann reaction, and this reaction involves the use of carbon monoxide instead of HCN.

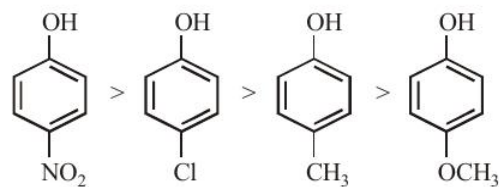
43. (c) Electron withdrawing group stabilises the benzene ring due to delocalisation of charge.

$-\text{CH}_3$  and  $-\text{CH}_2\text{OH}$  are electron donating group and hence decrease the stability of benzene ring  $-\text{OCH}_3$  is weaker electron withdrawing group than  $-\text{COCH}_3$ . Hence  $-\text{COCH}_3$  group more stabilizes the phenoxide ion at  $p$ -position.

44. (b) Due to intramolecular hydrogen bonding this will not be soluble in sodium bicarbonate.

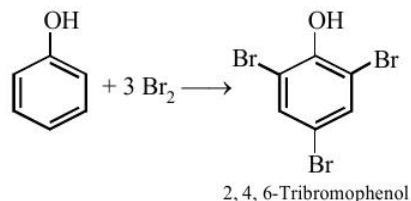


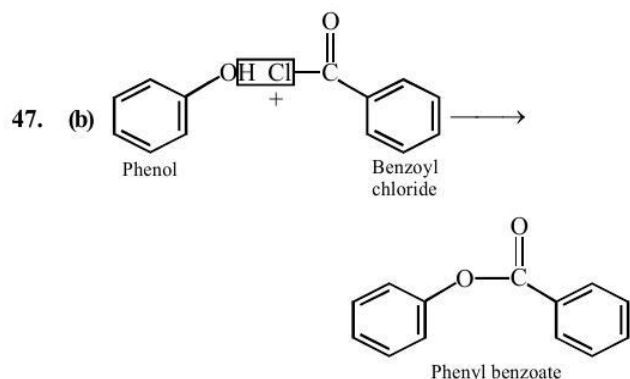
45. (c) Electron withdrawing substituents like  $-\text{NO}_2$ ,  $-\text{Cl}$  increase the acidity of phenol while electron releasing substituents like  $-\text{CH}_3$ ,  $-\text{OCH}_3$  decrease acidity. hence the correct order of acidity will be



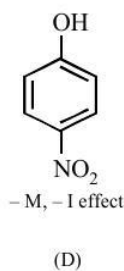
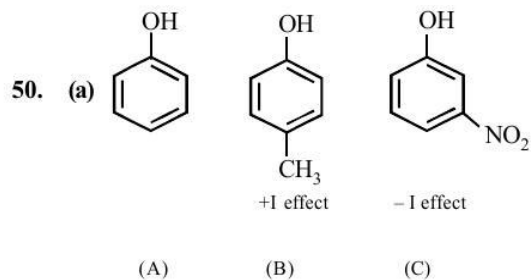
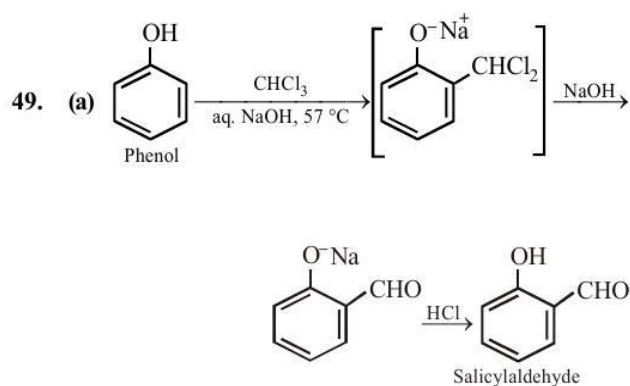
(-M, -I) (-I > +M) (+I, +HC) (+M)

46. (a) Phenol has activating (electron releasing)  $-\text{OH}$  group and bromine water supplies  $\text{Br}^+$  ion easily, hence under such conditions reaction does not stop at monobromo or dibromo stage but a fully brominated (2,4,6-tribromophenol) compound is the final product.

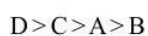




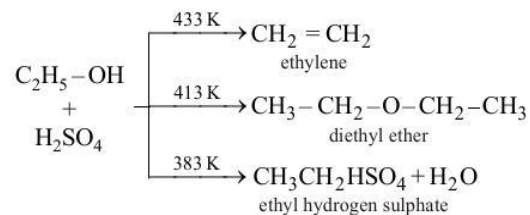
48. (c)



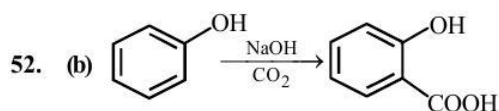
Electron withdrawing substituents increase the acidity of phenols; while electron releasing substituents decrease acidity. Thus the correct order is



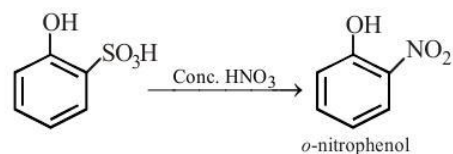
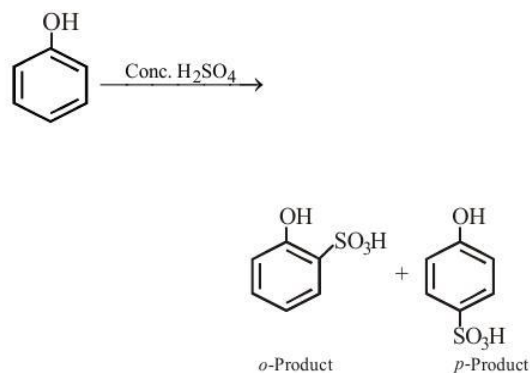
51. (b)



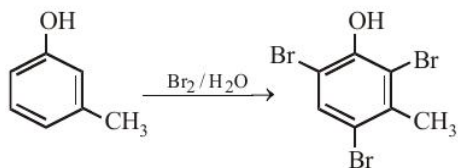
Acetylene is not formed under any condition.



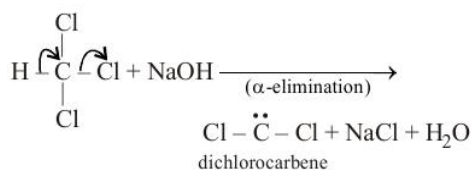
53. (b) Phenol on reaction with conc.  $\text{H}_2\text{SO}_4$  gives a mixture of *o*- and *p*- products (i.e.,  $-\text{SO}_3\text{H}$  group occupies *o*-, *p*- position). At room temperature, *o*-product is more stable, which on treatment with conc.  $\text{HNO}_3$  will yield *o*-nitrophenol.



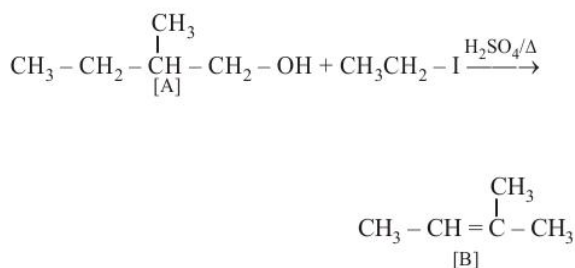
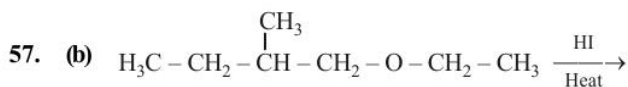
54. (c) In (c) both groups are activating and undergo electrophilic substitution in the same positions.



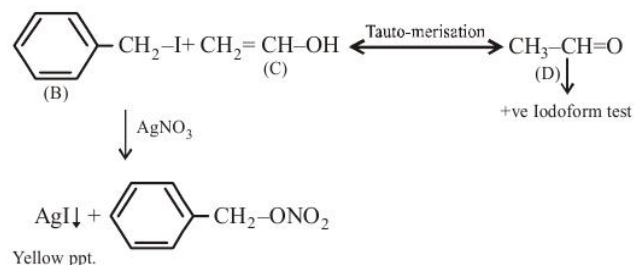
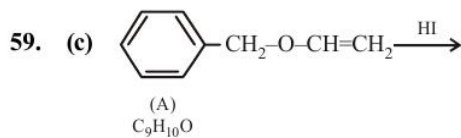
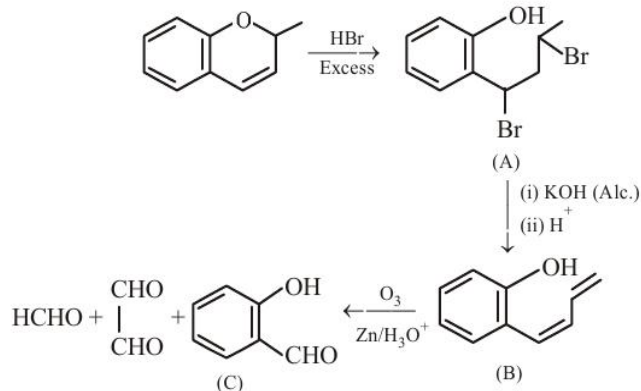
55. (d) This is Reimer-Tiemann reaction and the electrophile is dichlorocarbene.



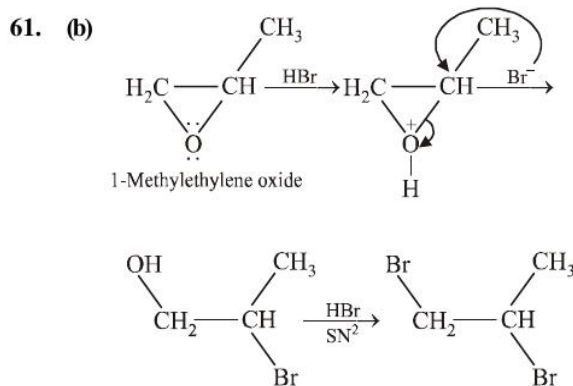
56. (c) 2,4,6-Trinitrophenol is also known as picric acid.



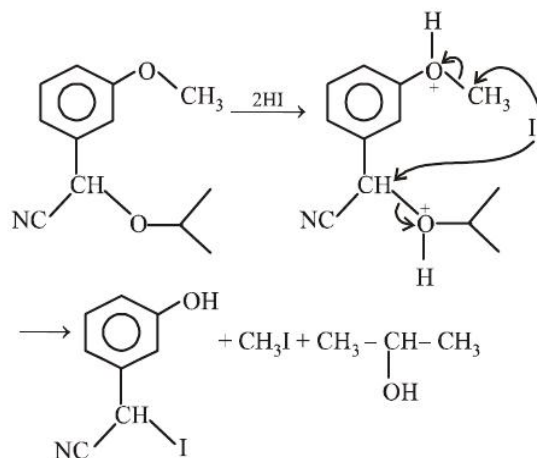
58. (a)

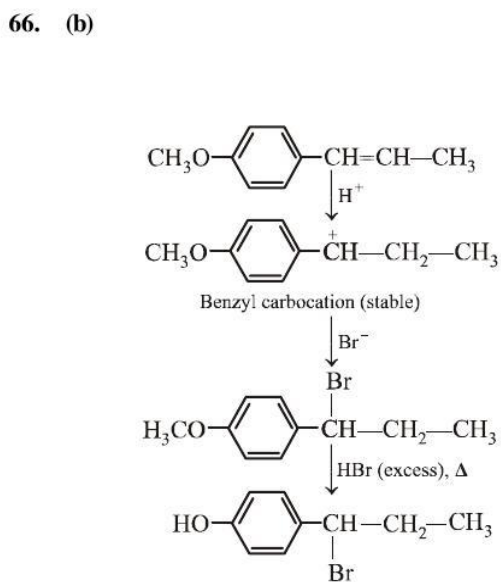
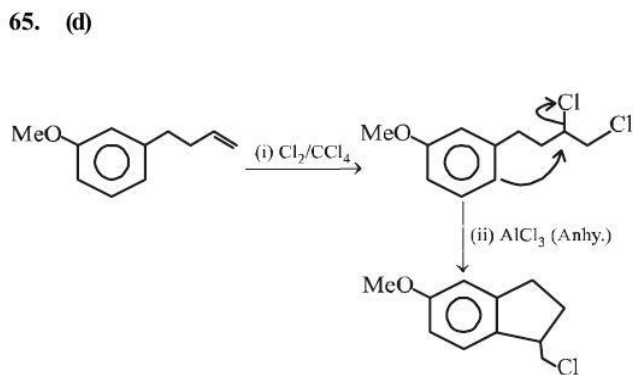
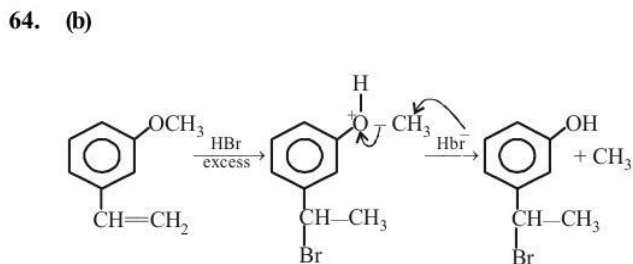
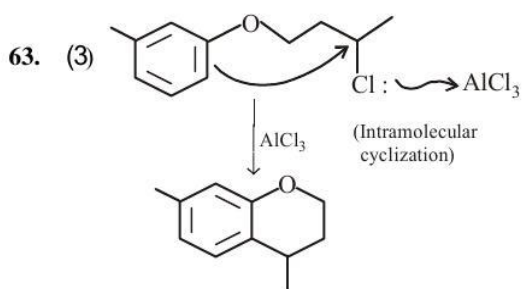


60. (a) In (A),  $-\text{OH}$  group is present, so inter-molecular H-bonding is possible while in (B), due to methoxy group there is no possibility of inter-molecular H-bonding. So A is having higher boiling point than B.

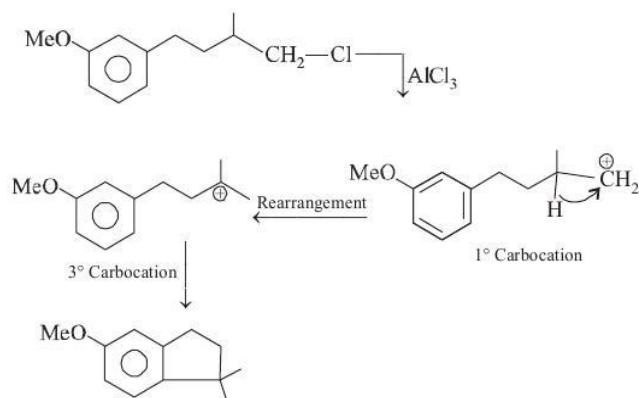


62. (c)

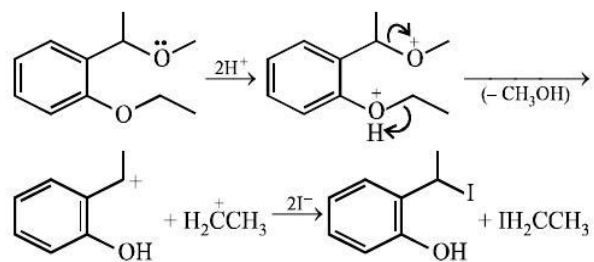




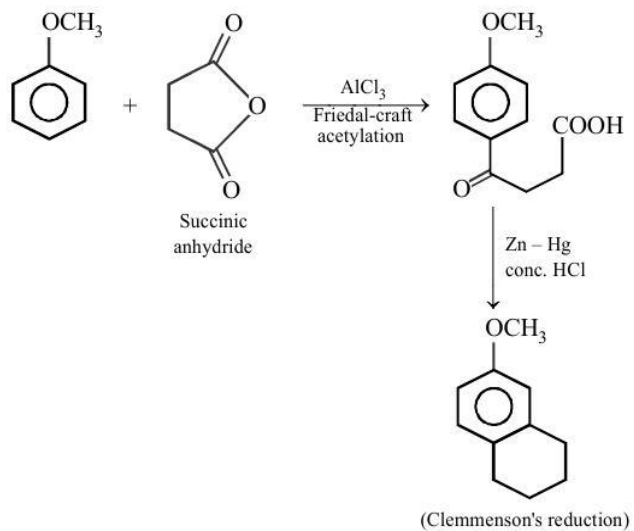
67. (d)

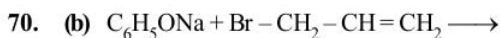


68. (d)



69. (d)

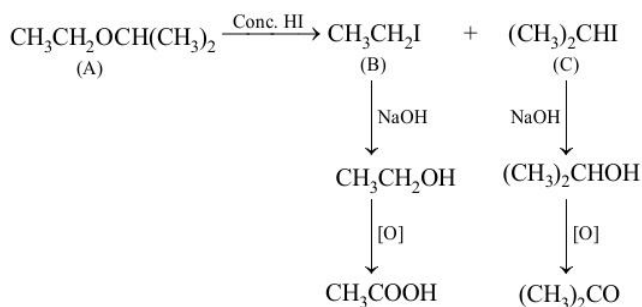




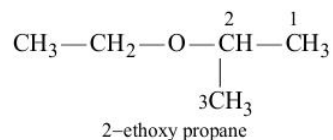
Allyl phenyl ether

71. (d) This method is suitable for the preparation of a wide variety of unsymmetrical ethers. The nucleophilic substitution of halides with alkoxide leads to desired product.

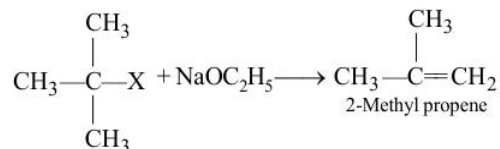
72. (a)



Hence the IUPAC name of compound (A) is



73. (b) The tertiary alkyl halide undergo elimination reaction to give alkenes.



74. (b) Methyl vinyl ether under anhydrous condition at room temperature undergoes addition reaction.

