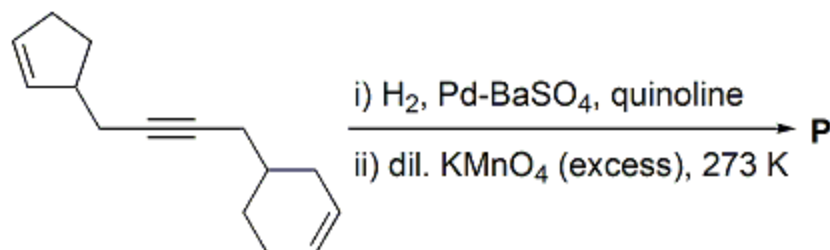


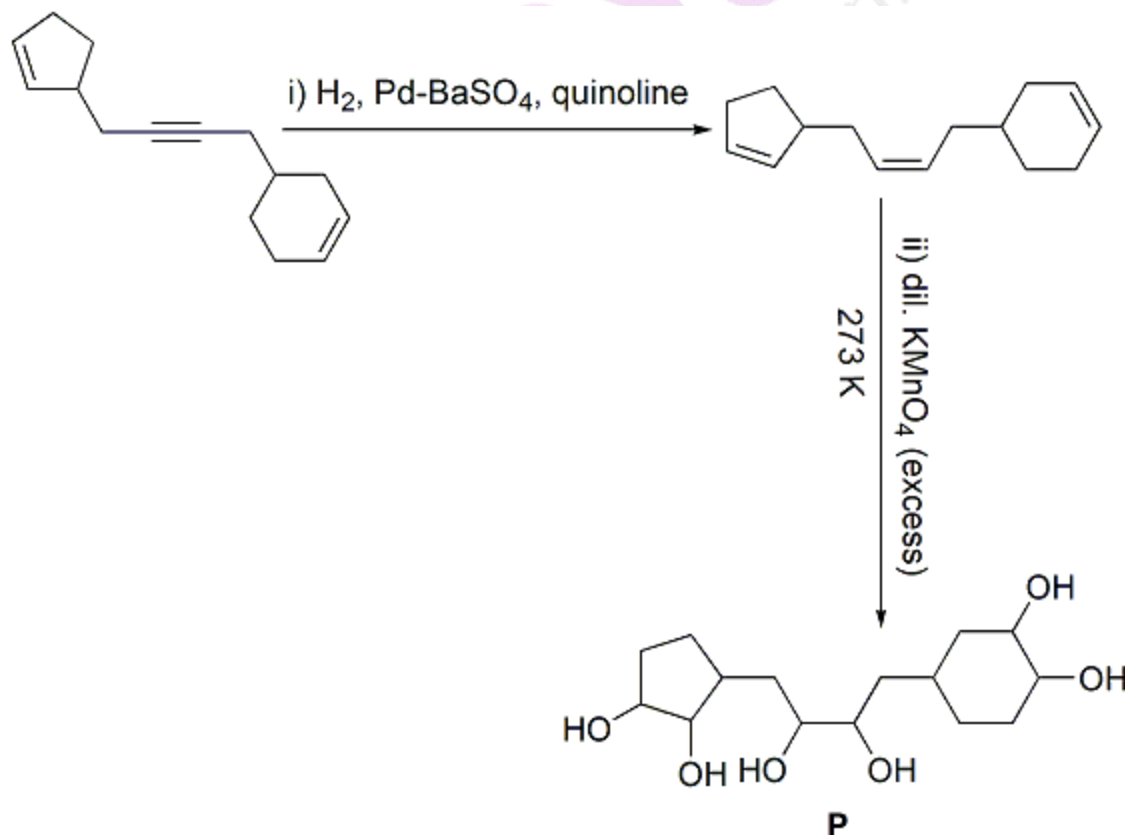
JEE Advanced Previous Year Questions on Alcohol and Ether

Question 1. Total number of hydroxyl groups present in a molecule of the major product P is.



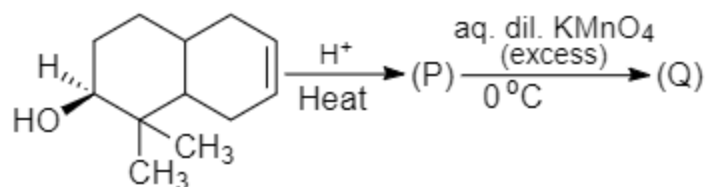
Solution: (6)

The total number of hydroxyl groups present in a molecule of the major product P is 6

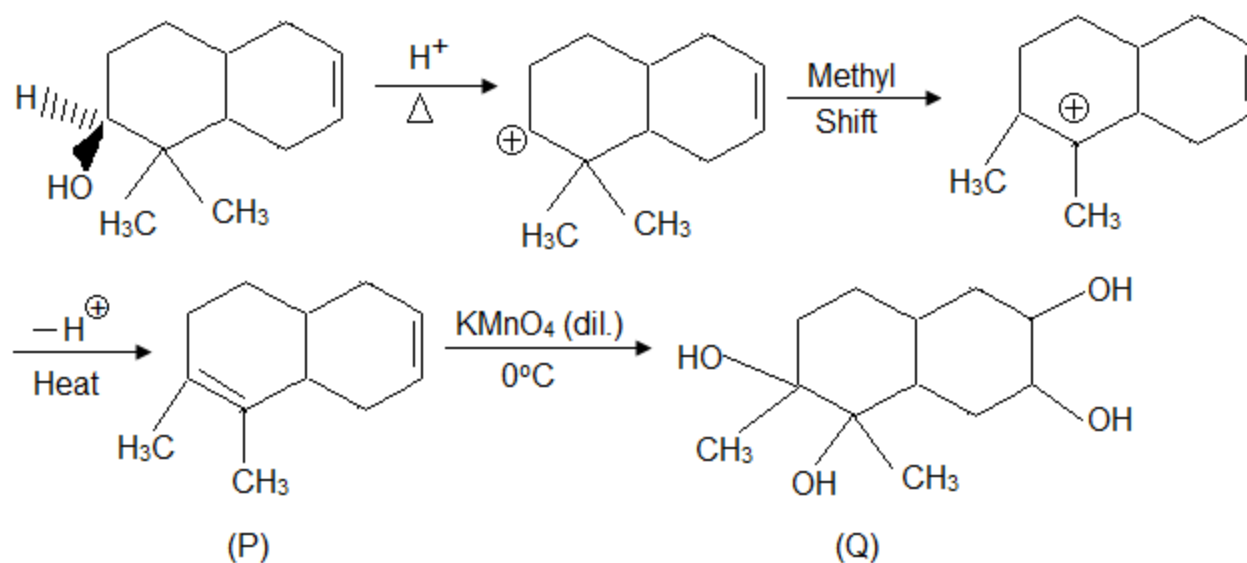


In step (i), the Lindlar catalyst converts the given alkyne into a cis alkene. Further in step (ii), syn dihydroxylation takes place with the help of dilute KMnO₄.

Question 2. The number of the hydroxyl group(s) in Q is ____



Solution: (4)



∴ The total number of hydroxyl groups in Q is four.

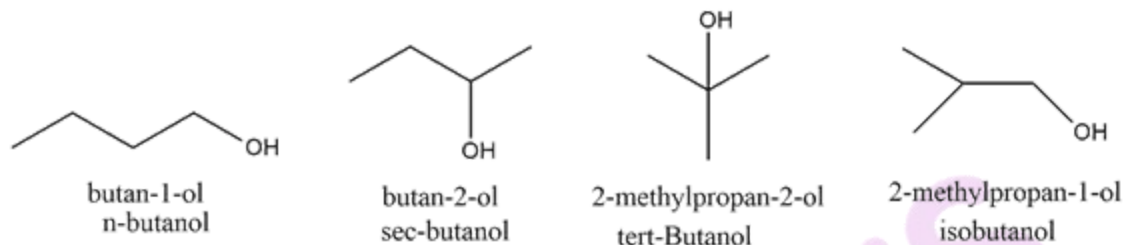
In the first step, the acid-catalyzed dehydration of alcohol takes place to obtain an alkene. In this reaction, secondary carbocation rearranges to tertiary carbocation to form a more stable alkene. The next step is the dihydroxylation of two double bonds which introduces 4 -OH groups in the molecule.

Question 3. The correct combination of names for isomeric alcohols with molecular formula C₄H₁₀O is/are.

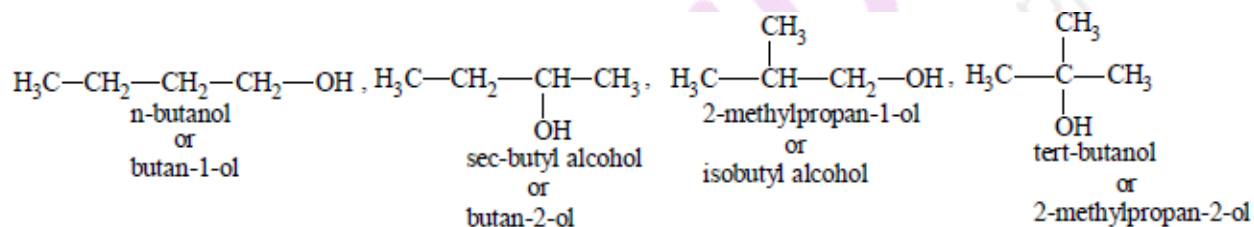
- A. tert-butanol and 2-methylpropan-2-ol
- B. tert-butanol and 1,1-dimethylethan-1-ol
- C. n-butanol and butan-1-ol
- D. Isobutyl alcohol and 2-methylpropan-1-ol

Solution: (A, C and D)

Isomeric alcohols of $C_4H_{10}O$ are:



OR



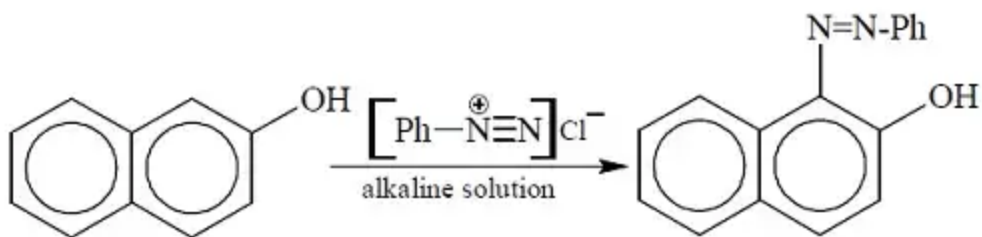
Question 4. For the identification of β -naphthol using dye test, it is necessary to use:

- A. Dichloromethane solution of β -naphthol
- B. Acidic solution of β -naphthol
- C. Neutral solution of β -naphthol
- D. Alkaline solution of β -naphthol

Solution: (D)

In alkaline solution $-OH$ convert to $-O^-$ which reacts with azo compound i.e, $Ph - N \equiv N^+$ to form an azo dye.

D is the correct option.



Question 5. An organic compound ($C_8H_{10}O_2$) rotates plane-polarized light. It produces pink colour with a neutral $FeCl_3$ solution. What is the total number of all the possible isomers for this compound?

Solution: (6)

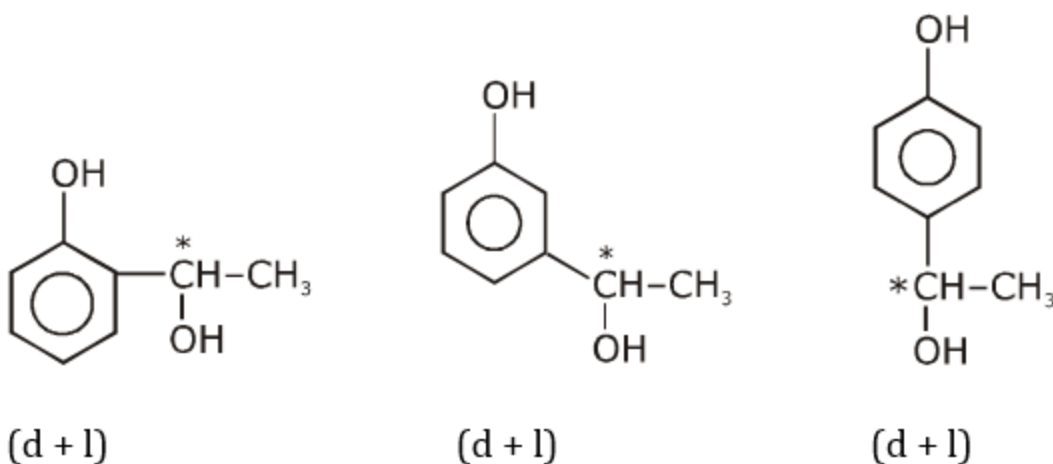
DBE (Double bond equivalent) of $C_8H_{10}O_2$ is

$$= \text{Number of carbon atoms} - (\text{Number of monovalent atoms}) / 2 + 1$$

$$= 8 - 10 / 2 + 1 = 4$$

It gives pink colour with a neutral $FeCl_3$ solution. It means the phenolic group should be present in the compound.

Note: C^* represent chiral carbon. So it will have (d and l) optically active isomers.

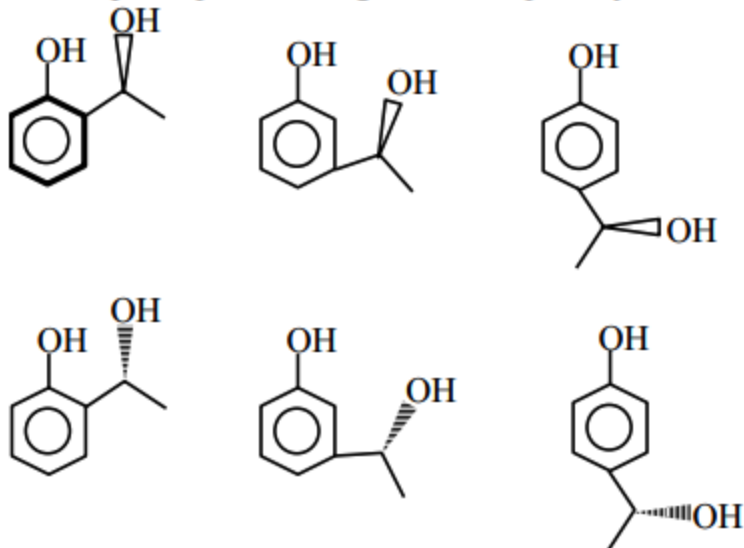


Total optically active isomer = 6

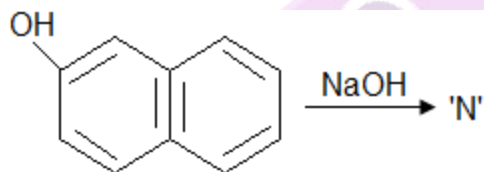
$C_8H_{10}O_2 \rightarrow$ Gives $FeCl_3$ test means Phenol derivative



Rotate plane polarized light means optically active

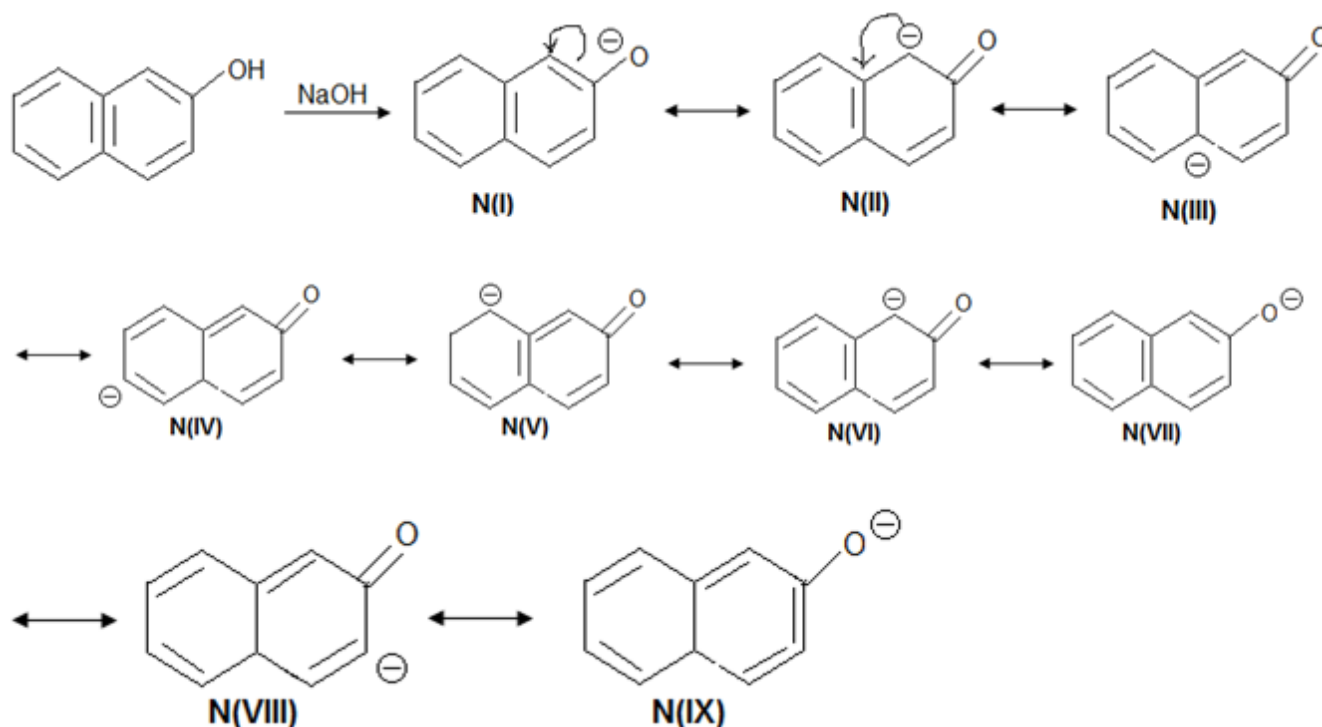


Question 6. The number of resonance structures for 'N' is ____.

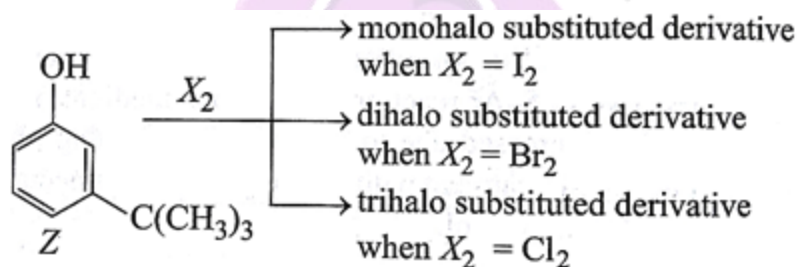


Solution: (9)

Naphthalen-2-ol acts as an acid and reacts with NaOH to form salt sodium naphthalen-2-olate which is compound N. The number of resonance structures for N is 9.



Question 7. The reactivity of compound Z with different halogens under appropriate conditions is given below:



The observed pattern of electrophilic substitution can be explained by:

- The steric effect on the halogen
- The steric effect of the tert – butyl group
- The electronic effect of the phenolic group
- The electronic effect of the tert – butyl group

Solution: (A, B and C)

This problem includes the concept of the effect of steric and electronic effects on the reactivity of organic compounds.

The steric effect of halogens is as follows

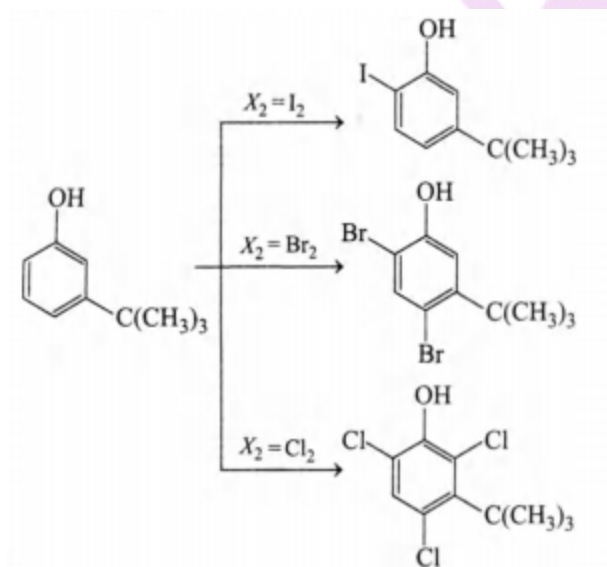


The electronic effect of the phenolic group directs the approaching electrophile towards ortho and para positions.

The tertiary butyl group has a large size so it causes a steric effect around the aromatic nucleus.

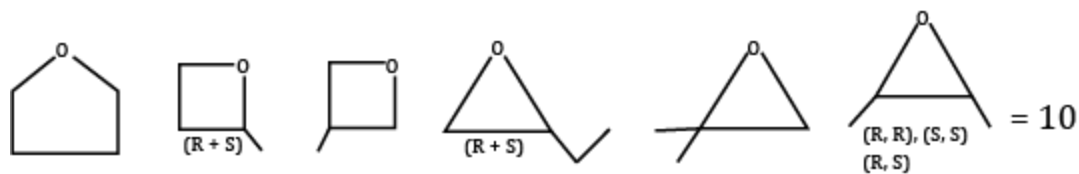
Hence orientation in electrophilic substitution reaction is decided by -

- (A) The steric effect of halogen
- (B) The steric effect of the tertiary butyl group
- (C) The electromeric effect of phenolic group



Question 8. Total number of isomers, considering both structural and stereoisomers, of cyclic ethers with the molecular formula $\text{C}_4\text{H}_8\text{O}$ is ____.

Solution: (10)

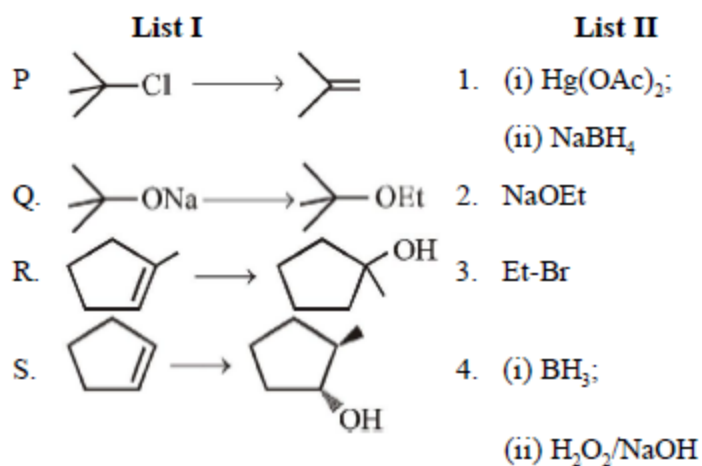


One of the four-membered cyclic structures exists as pair of enantiomers, contributing 2 to the total.

Two of the three-membered cyclic structures exist as pairs of enantiomers, contributing 4 to the total.

Also one of the three-membered structures exhibits geometrical isomerism adding 1 to the total structure.

Question 9. Match the chemical conversions in List-I with appropriate reagents given in List-II.



P Q R S

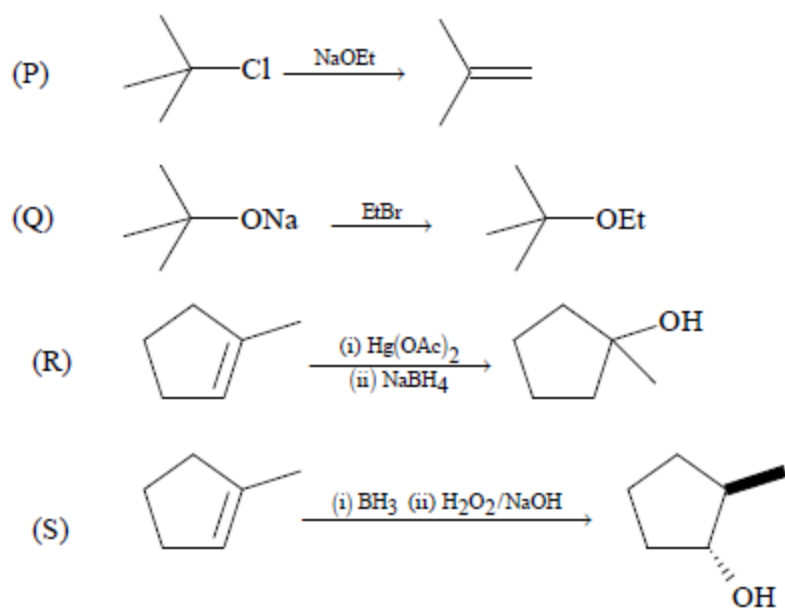
A 2 3 1 4

B 3 2 1 4

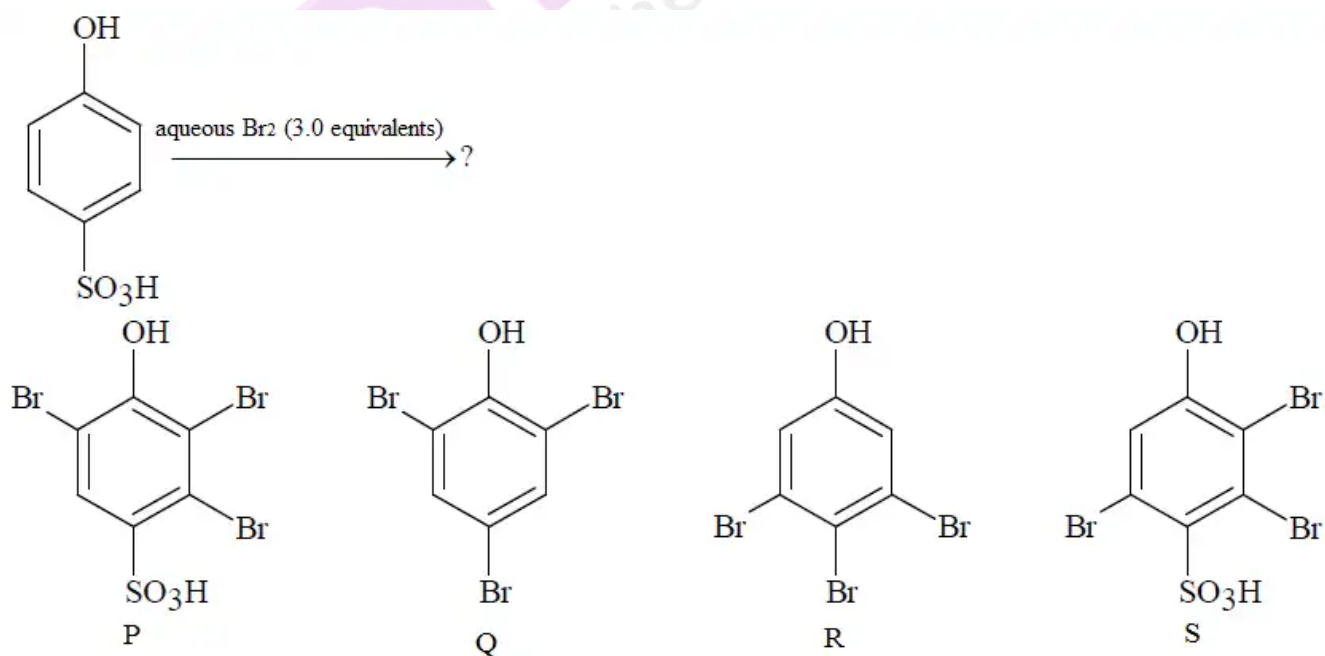
C 2 3 4 1

D 3 2 4 1

Solution: (A)



Question 10. The major product(s) of the following reaction is(are):



A. P

B. Q

C. R

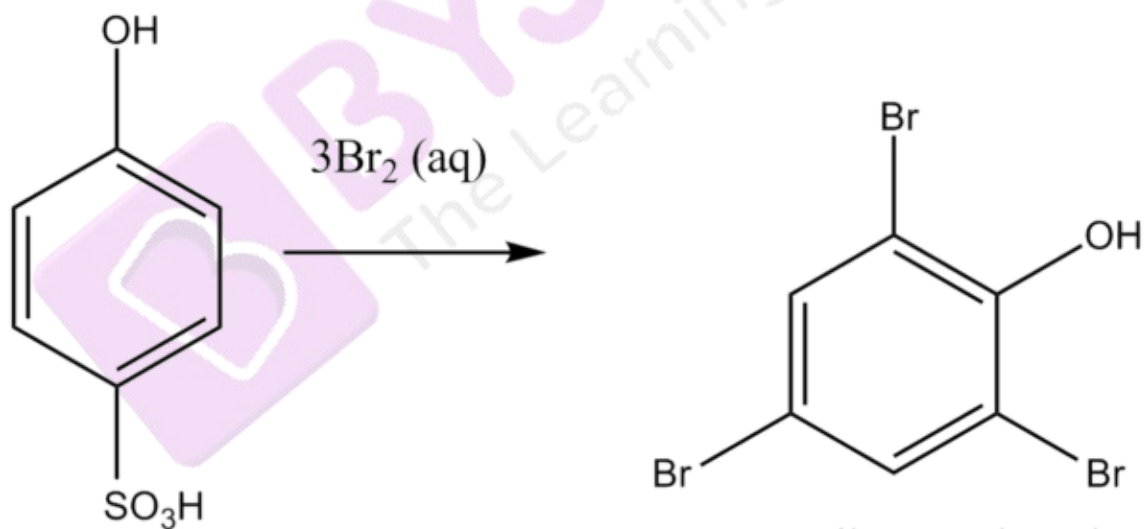
D. S

Solution: (B)

If we look at phenol, we can say that the hydroxide group is the ortho and para directing group. Thus, bromination occurs at ortho and para positions to form 2,4,6-tribromophenol.

On the other hand, SO_3 is a good leaving group. The sulphonic acid group is also replaced with bromine. Thus, the product is Q.

Generally, phenols are very reactive towards bromine water, that even substituents like $-\text{SO}_3\text{H}$, etc. that are present in o- and p-positions, are replaced by halogens.



4-hydroxybenzenesulfonic acid

2,4,6-tribromophenol

(white ppt)

Q