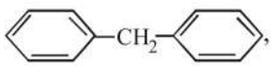
Organic Chemistry - Some Basic Principles and Techniques

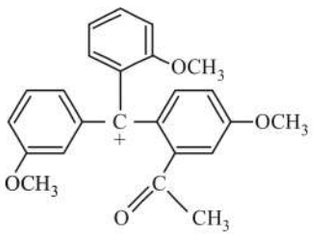
1. The molecular formula of diphenyl methane,



, is $C_{13}H_{12}$.

How many structural isomers are possible when one of the hydrogens is replaced by a chlorine atom?

2.



The positive charge of carbocation can be delocalized over how many oxygen atoms in the resonating structures?

3. How many carbocations are possible for molecular formula $C_3H_5^+$?

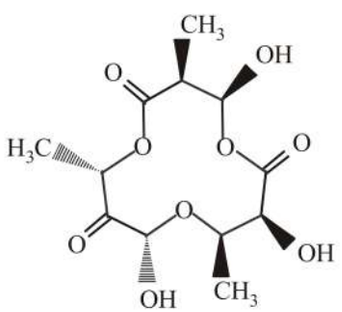
4. The compound (X) has molecular formula C_4H_7Cl. Find out the number of its cyclic isomers (structural and geometrical only excluding optical isomers).

5. Find out the number of stereoisomers obtained by bromination of *trans*-2-butene.

6. From the following compounds/ions, how many are electrophiles?

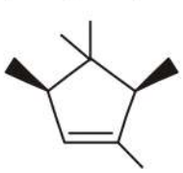
$\overset{+}{C}H_3$, $\overset{+}{N}H_4$, BF_3, NH_3, $NH_2–NH_2$, PCl_3, PCl_5, $SbCl_5$, $GaCl_3$, $AlCl_3$, F^-, $\overset{+}{C}N$, $CH_3–Cl$ ("C" atom of halide)

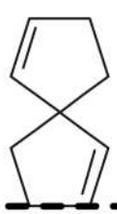
7. How many stereocentres are possible for the given compound?

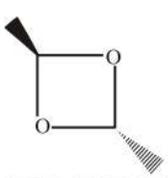


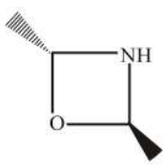
8. From the given compound, how many are optically inactive?

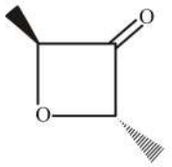
(i) 

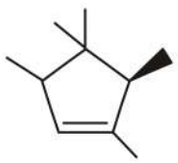
(ii) 

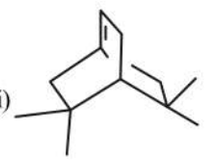
(iii) 

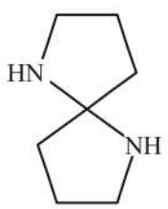
(iv) 

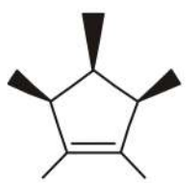
(v) 

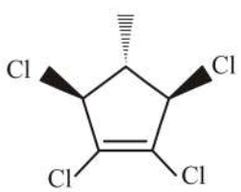
(vi) 

(vii) 

(viii) 

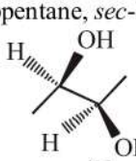
(ix) 

(x) 

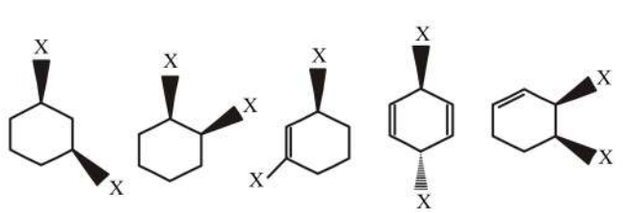
(xi) 

9. How many structural formulae are possible for isomeri alcohols having the molecular formula $C_4H_{10}O$?

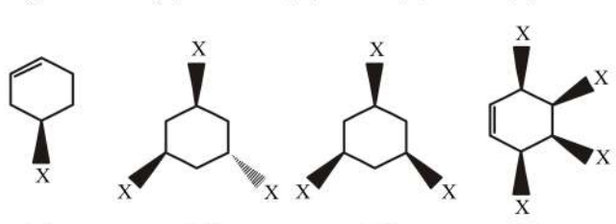
10. How many of the following are not ambiguous?
Pentane, Neopentane, *sec*-Butanol, *sec*-Pentanol

11. Compound  is a vicinal diol. How man vicinal diols are possible with the same molecular formula

12. Which of the following compound(s) is/are optically active

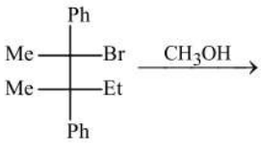


(i) (ii) (iii) (iv) (v)



(vi) (vii) (viii) (ix)

13. Find the number of fractions obtained after the completion of the reaction.

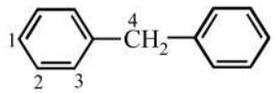


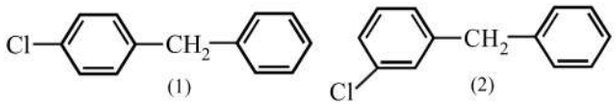
14. How many cyclic isomers of molecular formula $C_7H_{13}Br$ can form 1-methylcyclohexan-1-ol on reaction with H_2O/acetone/Ag^+ (consider only structural isomers)?

15. How many stereoisomers are possible for 1, 3-dichloro-cyclopentane?

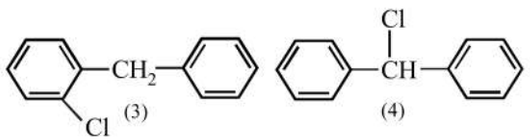
SOLUTIONS

1. **(4)** In diphenylmethane monochlorination at following positions will produce structured isomers



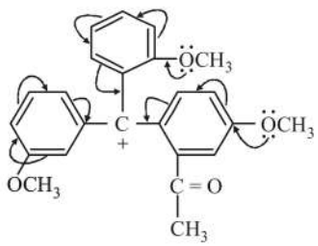


(1) (2)



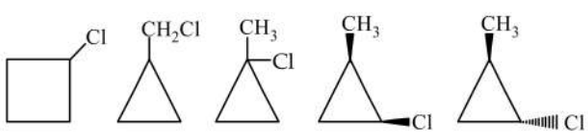
(3) (4)

2. **(2)**



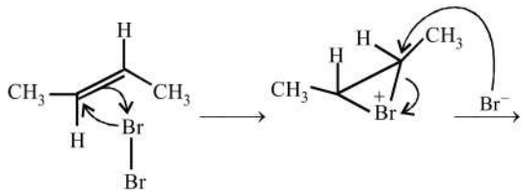
3. **(3)** $C=C-\overset{+}{C}$, $C=\underset{+}{C}-C$, $\underset{+}{C}=C-C$

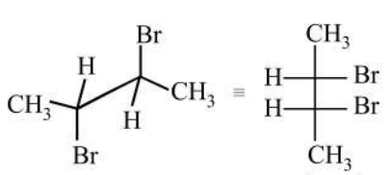
4. **(5)** X= C_4H_7Cl Degree of unsaturation $= 5-\frac{8}{2}=1$



cis– and *trans*–

5. **(1)**

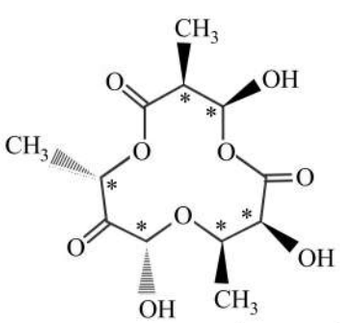




(meso)

6. **(8)** Among the given compounds/ions $\overset{+}{C}H_3$, BF_3, $AlCl_3$, $GaCl_3$, $SbCl_5$, PCl_5, PCl_3 and CH_3-Cl are electrophiles. In CH_3-Cl, Cl—C bond is polar bond. Hence, carbon will have low energy anti-bonding orbitals.

7. **(6)**



6-stereocentres

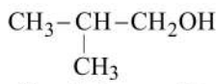
Asymmetric compound

8. **(5)** Optically inactive: (i), (iv), (viii), (x), (xi)

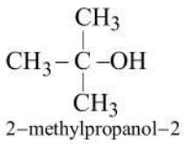
9. **(4)** $C_4H_{10}O$ represents 4 isomeric alcohols :

butanol–1

butanol–2

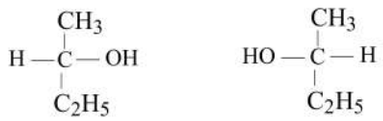


2–methyl–propanol–1



2–methylpropanol–2

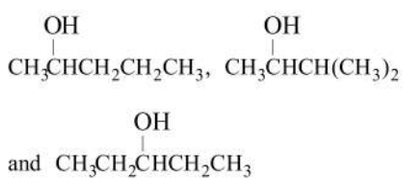
Further, butanol-2 shows optical isomerism, as it has one asymmetric carbon atom and exists into two optically active forms shown below :



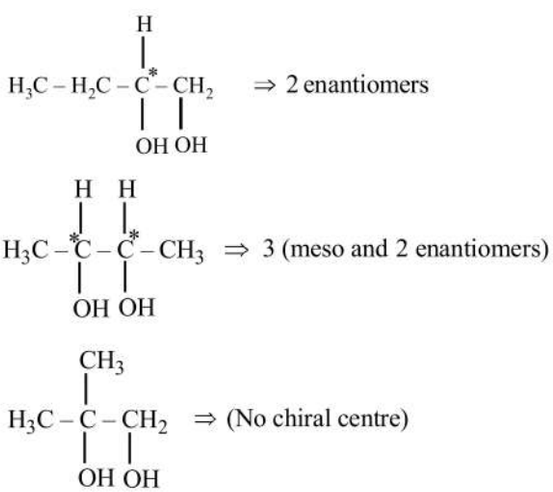
Enantiomers

10. **(3)** Three of the given four names have only one possible structure. The fourth one, *sec*-pentanol has three possible structures and hence it can not be ambiguous.

Three structures possible for *sec*-pentanol are as follows:

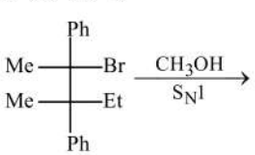


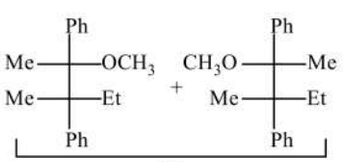
11. **(6)**



12. **(3)** (iii), (v), (vi)

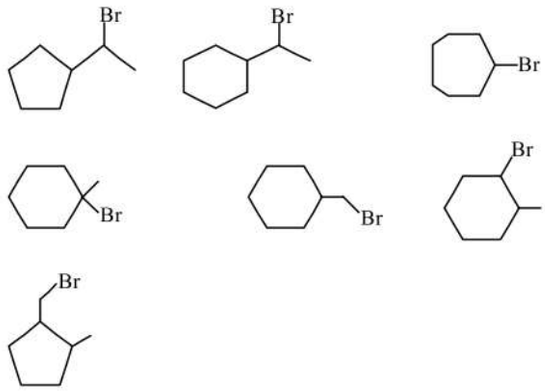
13. **(2)**





(2)

14. **(7)**



15. **(3)**

(i) *cis*-1, 3-dichlorocyclopentane

(ii) *trans*-1, 3-dichlorocyclopentane (enantiomeric pair)