

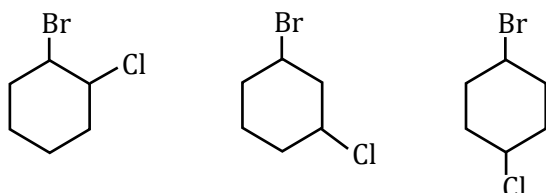
Structural Isomerism

SOLUTIONS

EXERCISE - O

1. **Ans. (A)**

Three isomers :

2. **Ans. (C)**

They are functional isomers.

3. **Ans. (A)**

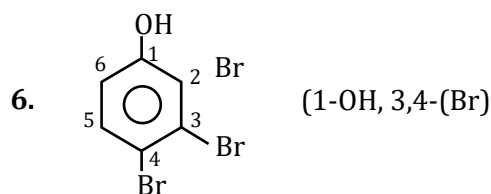
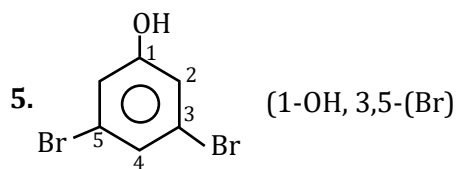
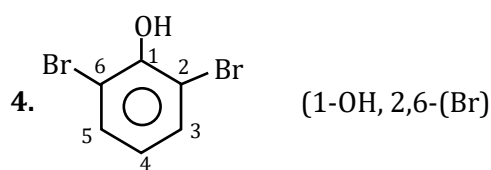
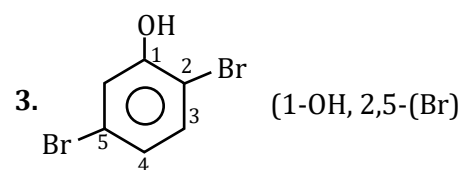
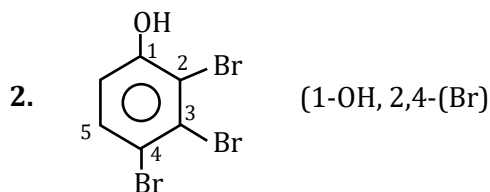
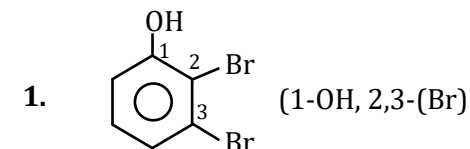
Acids and esters with same C atoms are functional isomers.

4. **Ans. (B)**

Aldehydes and ketones are functional isomers

5. **Ans. (B)**As only in (B) nature of 'R' group is different across -COO- .

(Esters are mostly metamers)

6. **Ans. (C)**7. **Ans. (A)**

Refer to the solution of Q. No. (6) above

8. **Ans. (C)**

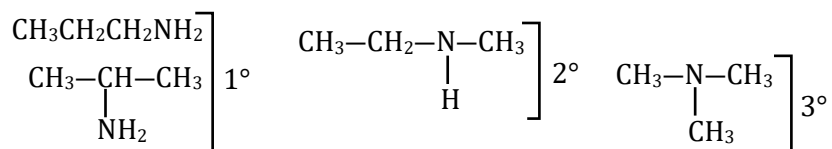
Factual

9. **Ans. (A)**

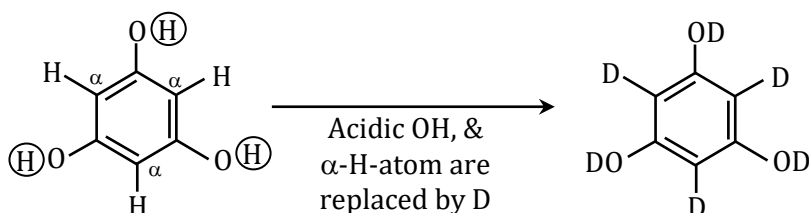
Only (A) has four carbon atoms, others have three

10. **Ans. (C)**(i) and (iv) are functional isomers . (1° and 2° amine)11. **Ans. (C)**

Total four

 1° amines (2), 2° amine (1), 3° amine (1)12. **Ans. (C)**

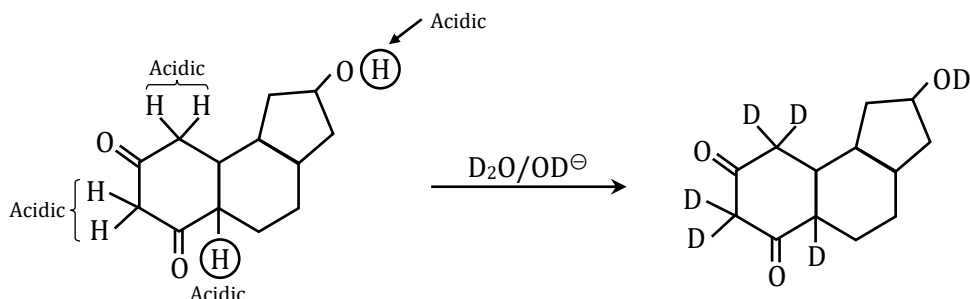
Six H-atoms

13. **Ans. (B)**All have sp^3 hybridized carbons but all hydrogens are identical only in (B)14. **Ans. (B)**

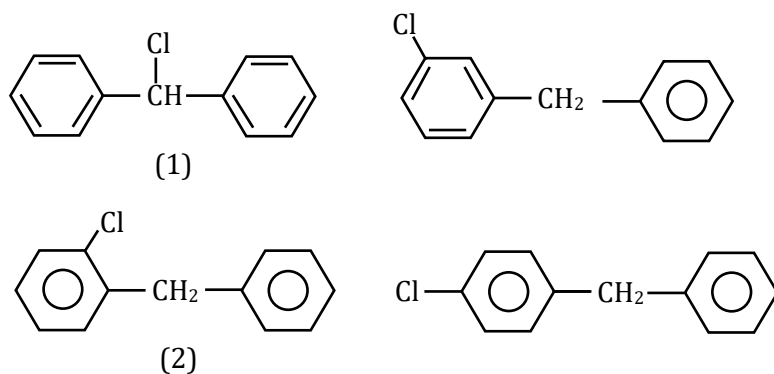
(1, 3, 4) have H-atom at 3-position, for formation of end but (B) does not have.

15. **Ans. (D)**

Six H-atoms

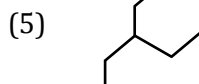
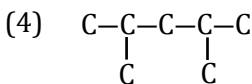
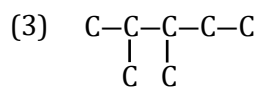
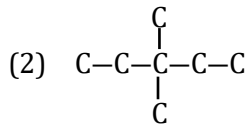
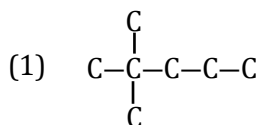


EXERCISE - S

1. **Ans. (4)**

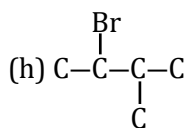
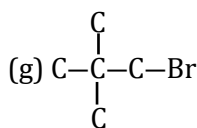
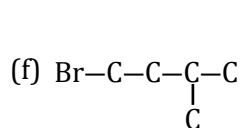
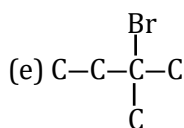
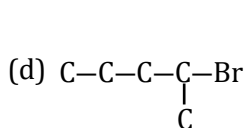
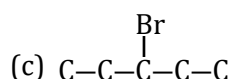
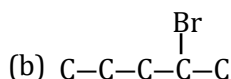
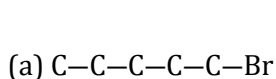
2. **Ans. (5)**

[C₇H₁₆]

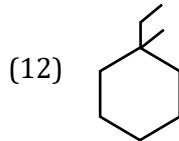
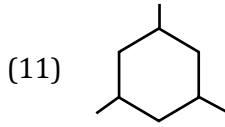
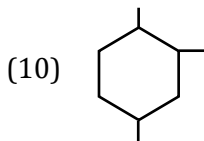
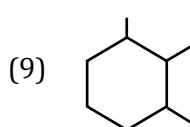
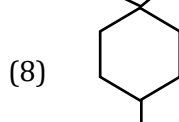
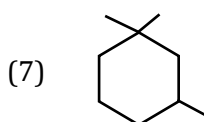
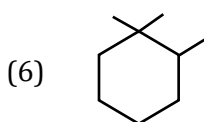
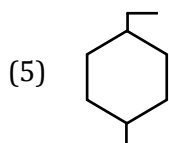
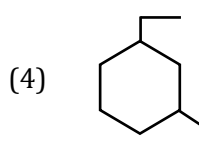
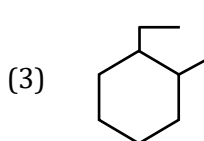
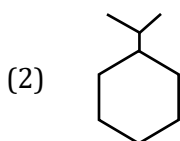
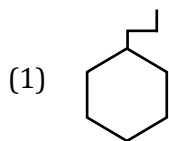


3. **Ans. (8)**

[C₅H₁₁Br] ; Total = 8

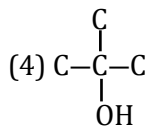
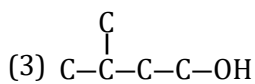
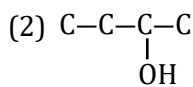
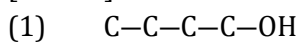


4. **Ans. (12)**



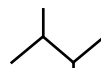
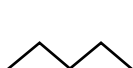
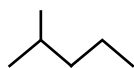
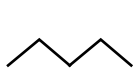
5. **Ans. (4)**

[C₄H₁₀O]



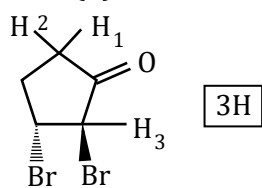
6. **Ans. (5)**

C₆H₁₄

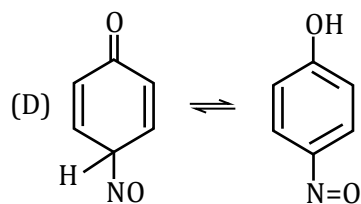
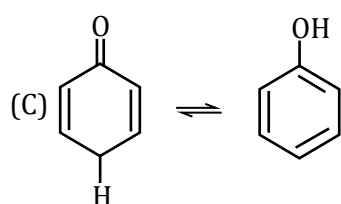
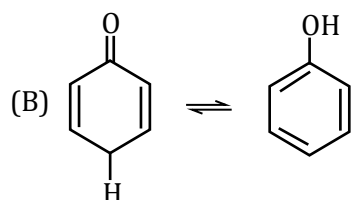
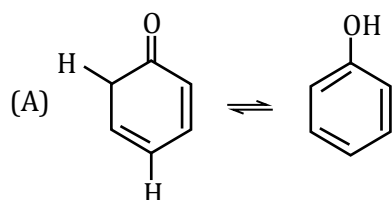


Total = 5

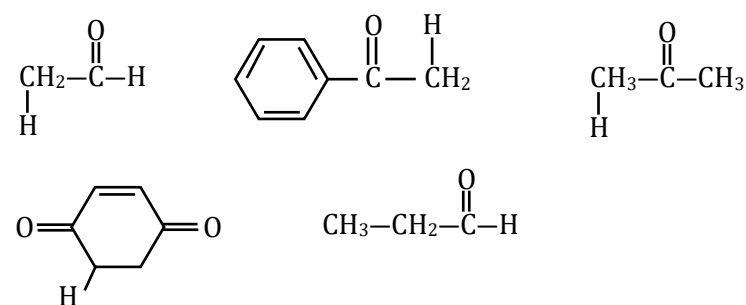
7. **Ans. (3)**



8. **Ans. (4)**

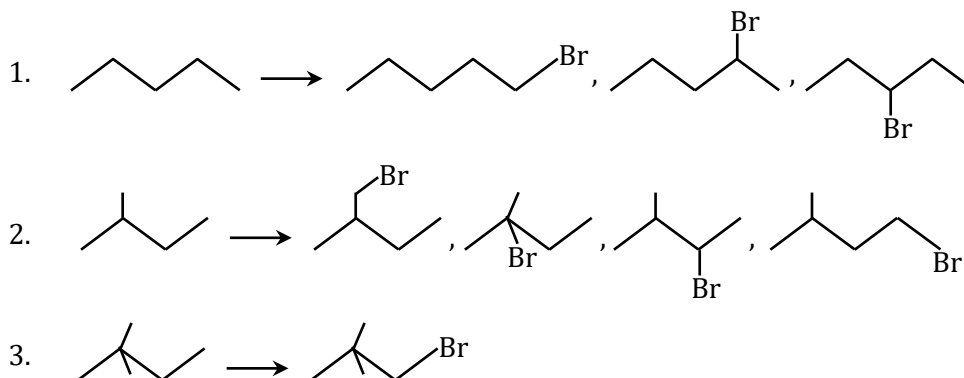


9. **Ans. (5)**



9. Ans. (8)

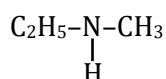
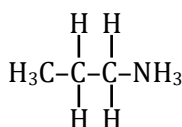
The Alkanes and their monobromodervative are



10. Ans. (4)

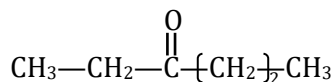
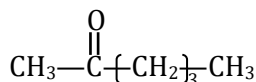
(A) Propanamine

N-Methylethanamine

 $\Rightarrow$ Functional isomers

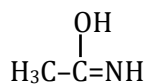
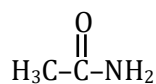
(B) Hexan-2-one

Hexan-3-one

 $\Rightarrow$ Metamers

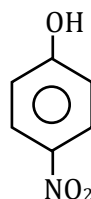
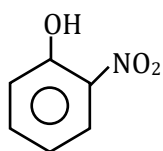
(C) Ethanamide

Hydroxyethanimine

 $\Rightarrow$ Tautomers

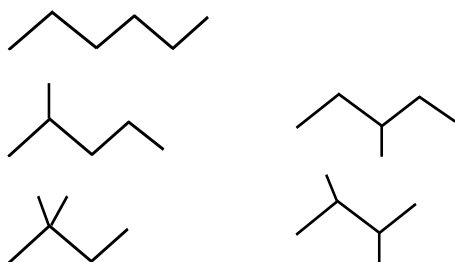
(D) o-Nitrophenol

p-nitrophenol

 $\Rightarrow$ Positional isomers

EXERCISE - JEE (Advanced) PYQ

1. Ans. (C)



(5-structural isomers)

2. **Ans. (A,B,C,D)**

The combination of names for isomeric alcohols with molecular formula $C_4H_{10}O$ is/are

Formula	Names
$CH_3CH_2CH_2CH_2OH$	n-butyl alcohol / n-butanol / butan-1-ol
$\begin{array}{c} CH_3-CH-CH_2-OH \\ \\ CH_3 \end{array}$	Isobutyl alcohol / 2-methyl propan-1-ol
$\begin{array}{c} CH_3-CH_2-CH-OH \\ \\ CH_3 \end{array}$	Secondary butyl alcohol / butan-2-ol
$\begin{array}{c} CH_3 \\ \\ CH_3-C-OH \\ \\ CH_3 \end{array}$	Tertiary butyl alcohol / tert butanol / 2-methyl propan-2-ol / 1,1-dimethyl ethan-1-ol

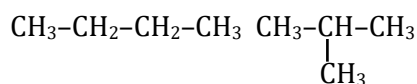
Reference : National Institute of standards and technology (NIST)

JEE (Main) Practice Paper

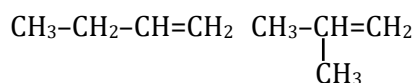
SECTION-A

1. **Ans. (4)**

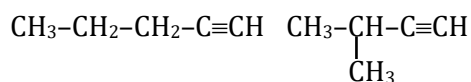
For Alkane $\Rightarrow$ 4 carbon



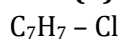
For Alkine $\Rightarrow$ 4 carbon



For Alkyne $\Rightarrow$ 5 carbon



2. **Ans. (1)**



$$DU = \frac{1}{2}(2C + 2 - m + t)$$

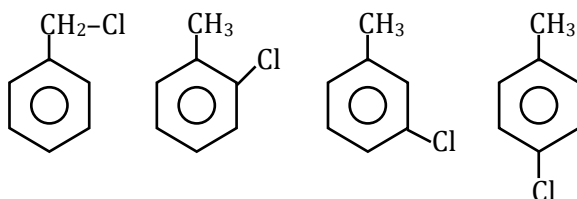
where $m \Rightarrow$ no. of mono valent atoms

$t \Rightarrow$ no. of trivalent atoms

$$= \frac{1}{2}(2 \times 7 + 2 - 8)$$

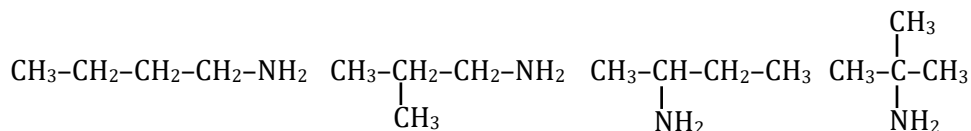
$$= \frac{1}{2}(16 - 8) = 4$$

Benzoidal isomers

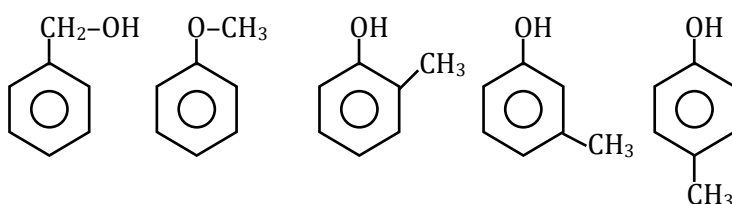
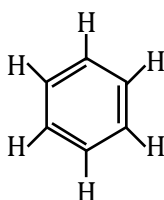


3. **Ans. (3)** $C_4H_{11}N$ (Primary Amines)

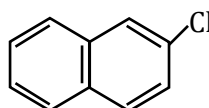
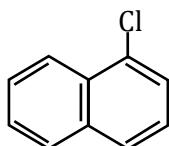
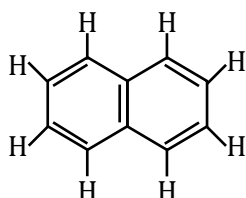
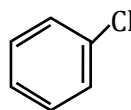
$$DU = \frac{1}{2}(2 \times 4 + 2 - 11 + 1) = 0$$

4. **Ans. (3)**Benzoid structure (C_7H_8O)

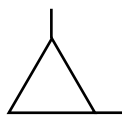
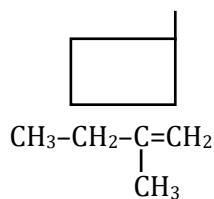
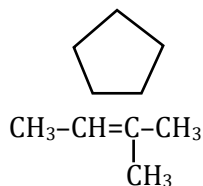
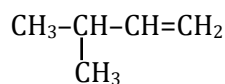
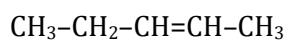
$$DU = \frac{1}{2}(2 \times 7 + 2 - 8) = 4$$

5. **Ans. (2)**

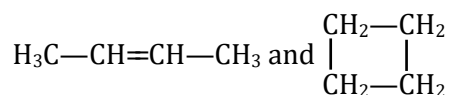
Benzene

6. **Ans. (1)** C_5H_{10}

$$DU = \frac{1}{2}(2 \times 5 + 2 - 10) = 1$$



7. **Ans. (1)**



C_4H_8

C_4H_8

Acyclic

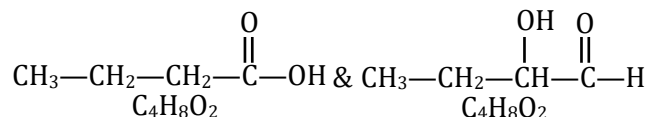
Cyclic

$\text{DU} = 1$

$\text{DU} = 1$

$\Rightarrow$ ring chain isomers.

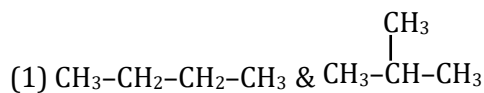
8. **Ans. (2)**



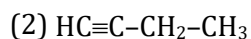
$\Rightarrow$ different functional groups

$\Rightarrow$ Functional isomers

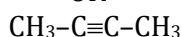
9. **Ans. (2)**



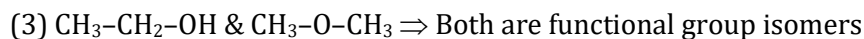
$\Rightarrow$ Both are chain isomers



OR



$\Rightarrow$ Both can't show chain isomers



$\text{C}_2\text{H}_6\text{O}$

$\text{C}_2\text{H}_6\text{O}$

-OH functional

-O- functional

group

group



$\text{C}_3\text{H}_6\text{O}$

$\text{C}_3\text{H}_6\text{O}$

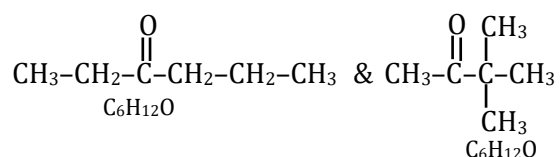
-OH functional

-CHO functional

group

group

10. **Ans. (2)**

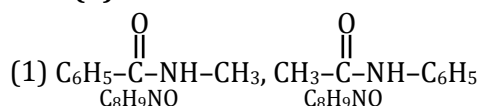
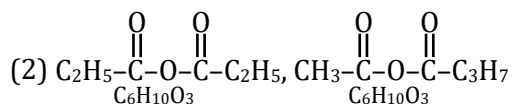


$\Rightarrow$ same bivalent functional group

$\Rightarrow$ difference groups on one side of functional group

$\Rightarrow$ Both are metamers.

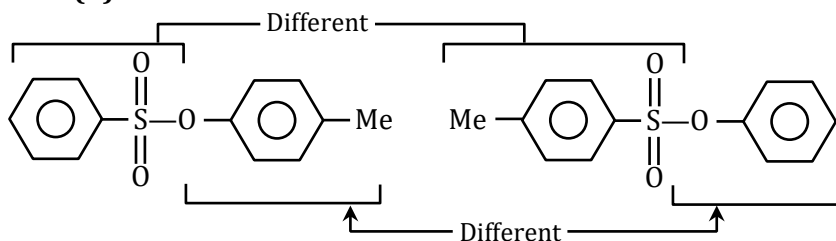
11. Ans. (3)

 $\Rightarrow$ same bivalent functional group $\Rightarrow$ Two different groups on same side of functional group $\Rightarrow$ Metamers $\Rightarrow$ same bivalent functional group $\Rightarrow$ Two different groups on same side of functional group $\Rightarrow$ Metamers

12. Ans. (3)

Aldehyde and ketone are different functional group, so functional isomer.

13. Ans. (3)

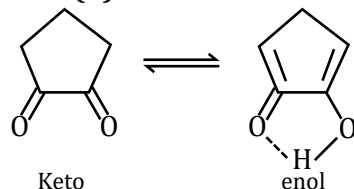


Different group/substituent attached to polyvalent functional group :- Metamerism

14. Ans. (4)

All will show tautomerism through space tautomerism.

15. Ans. (3)



cyclic vicinal di keto form is unstable due to repulsion.

(R) and (S) has active methylene group $-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-$, so on basis of enolate ion stability.

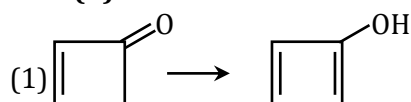
16. Ans. (2)

Ketone and Alcohol are different functional group.

17. Ans. (3)

Both are 1, 3-dimethyl cyclohexane (identical)

18. Ans. (3)



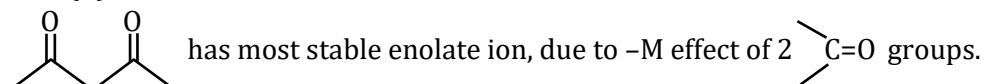
enol form don't exist as ring formed is anti-aromatic.

(2) Double bond (sp^2) is highly unstable at bridge head.

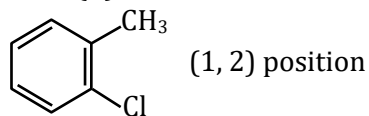
(3) possible

(4) No α -Hydrogen to show tautomerism.

19. Ans. (1)



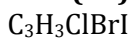
20. Ans. (4)



1-Chloro toluene is positional isomer of 4-Chloro toluene

SECTION-B

1. Ans. (10)

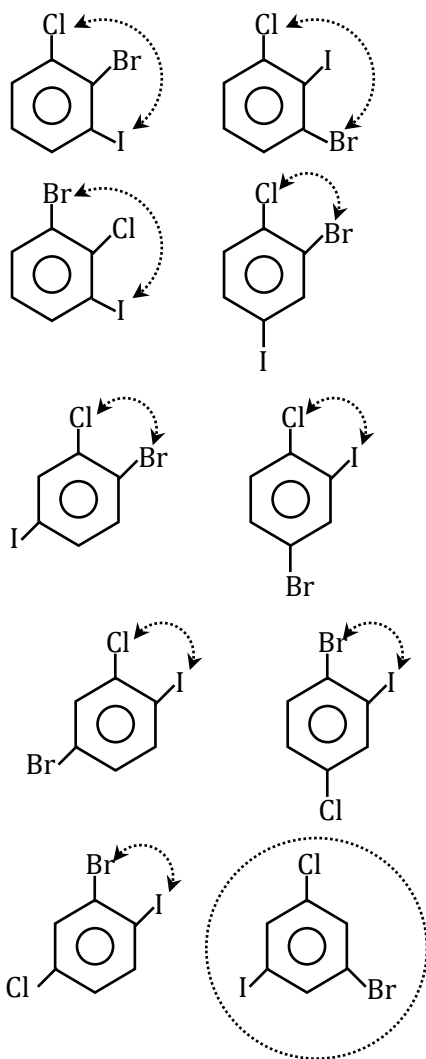


total benzoid isomers

$$\text{DU} = \frac{1}{2} (2C + 2 - M + t)$$

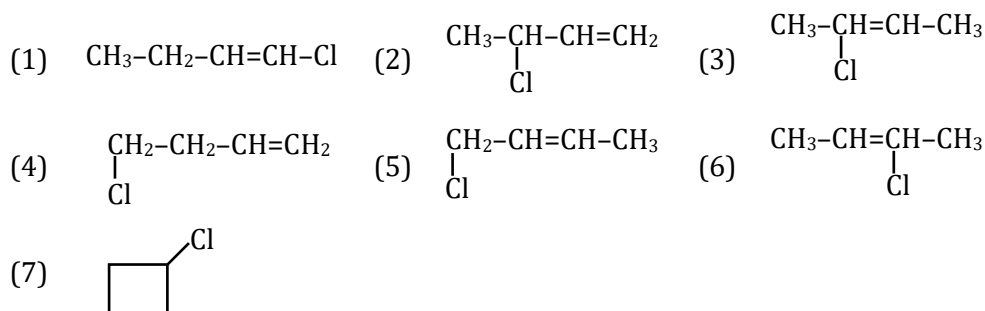
$$= \frac{1}{2} (12 + 2 - 6 + 0)$$

$$= 4$$

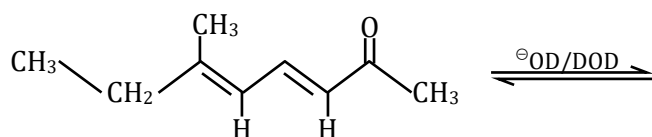


Total isomers $\Rightarrow$ 10

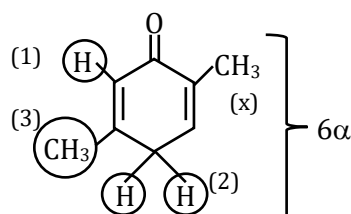
2. Ans. (7)



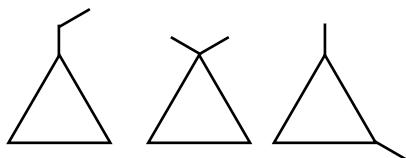
3. Ans. (10)

Number of replaced deuterium $\Rightarrow 3+3+2+1+1 = 10$

4. Ans. (6)

Number of deuterium present in final product $\Rightarrow 2+3+1 = 6$

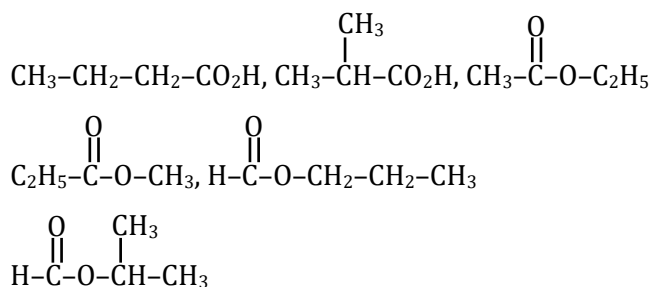
5. Ans. (3)



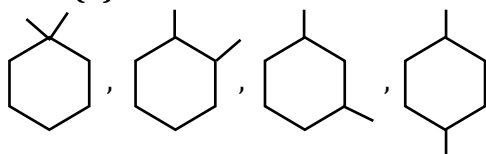
6. Ans. (7)

Compound must have alpha H to show tautomerism

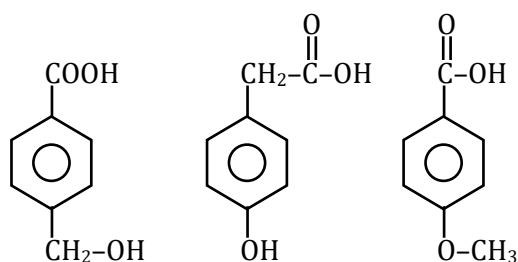
7. Ans. (6)



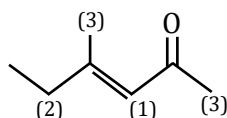
8. Ans. (4)



9. Ans. (3)



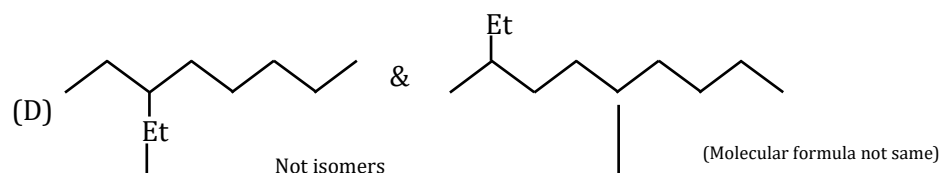
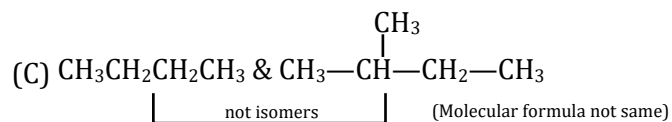
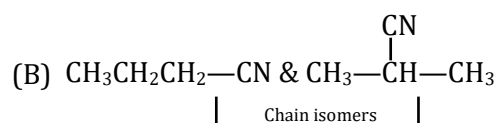
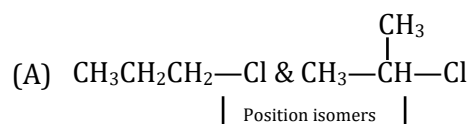
10. Ans. (9)



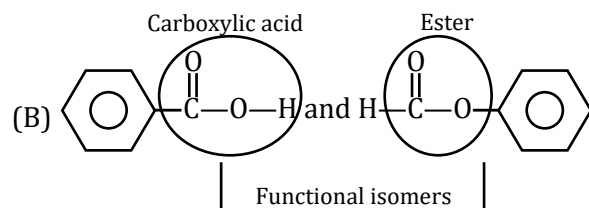
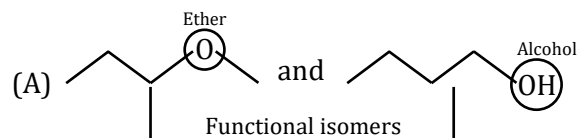
Total 9 hydrogens are replaced.

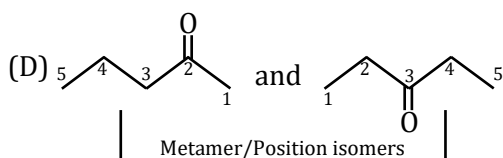
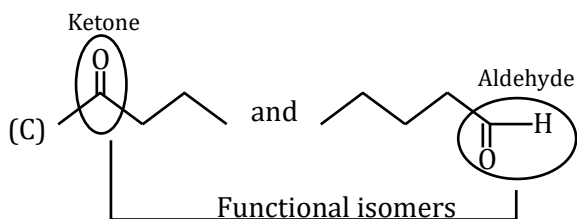
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1. Ans. (B)



2. Ans. (D)

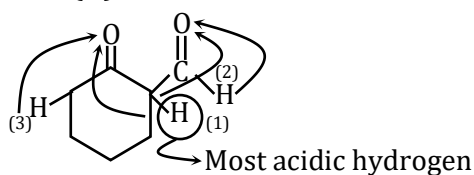




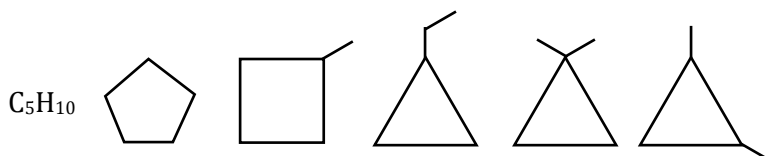
3. **Ans. (D)**

Tautomerism is catalysed by acid and base

4. **Ans. (D)**



5. **Ans. (B)**



6. **Ans. (A)**

molecular formula is not same as others

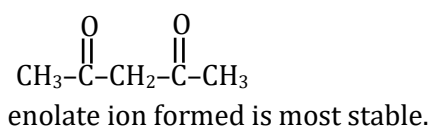
7. **Ans. (B)**

molecular formula is not same in 2nd option

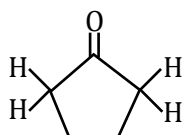
8. **Ans. (A)**

All statements are correct.

9. **Ans. (C)**

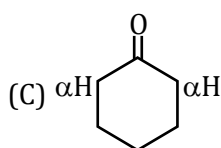
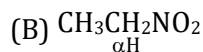
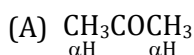


10. **Ans. (B)**



alpha hydrogens are replaced by deuterium.

11. **Ans. (A,B,C)**



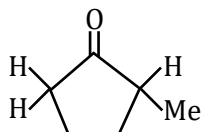
12. **Ans. (A,B,D)**

- (i) I is 1° Amine and II is 2° amine so functional isomers.
 (ii) Both are metamers as different group around 2° amine.
 (iii) I, IV are functional isomer
 (iv) I & III has difference in chain length.

13. **Ans. (B,D)**

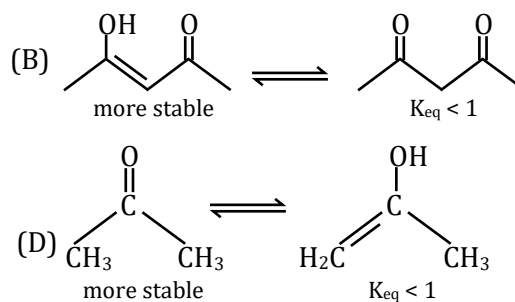
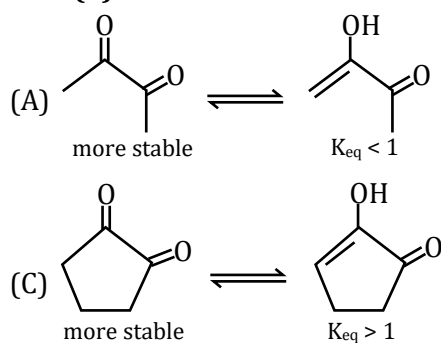
$\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$ and $\text{H}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OCH}_3$ are functional isomers.
 $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2$ and $\text{CH}_3-\underset{\text{NH}_2}{\text{CH}}-\text{CH}_3$ are position isomers.

14. **Ans. (B)**

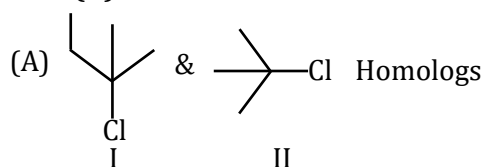


3 α H are present.

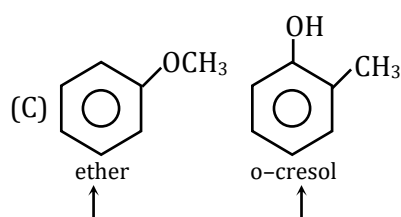
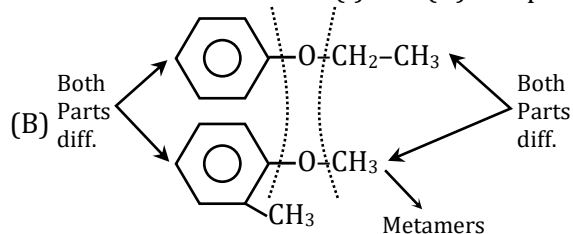
15. **Ans. (C)**



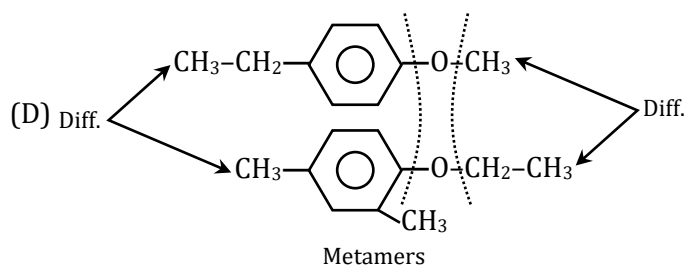
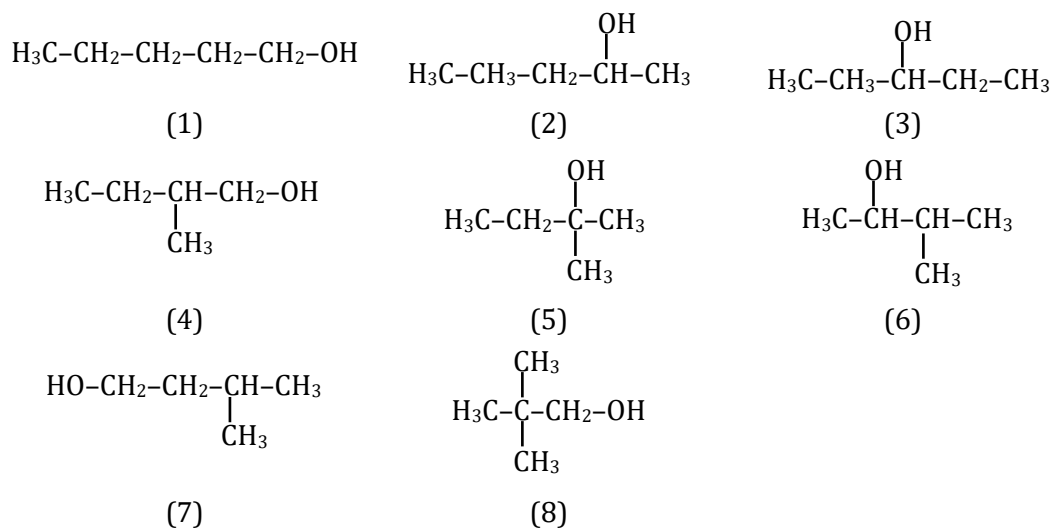
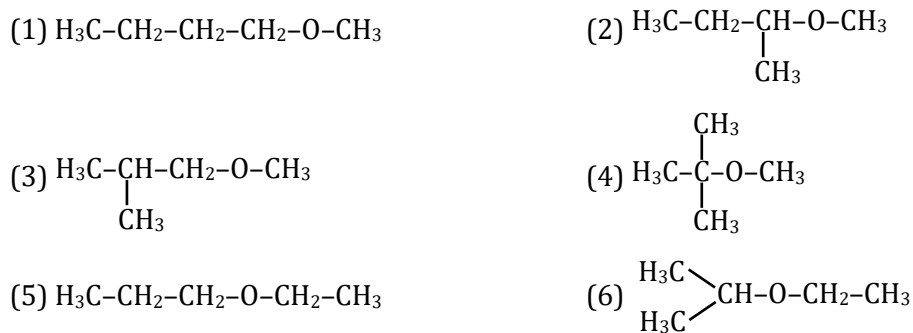
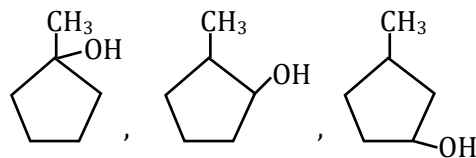
16. **Ans. (A)**



Difference of $-\text{CH}_2-$ in (I) and (II) compound that's why these are homologs.



Both have diff. chemical properties that's why these are functional isomers

17. **Ans. (8)****Alcohol :**18. **Ans. (6)**19. **Ans. (3)**20. **Ans. (5)**

II, III, V, VII, VIII has presence of alpha hydrogen. So, will show tautomerism.