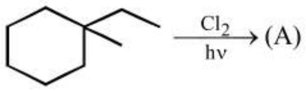
Hydrocarbons

1. 

Find the number of monochloro derivatives formed (excluding stereoisomers) in the above reaction.

2. Find the total number of trichloroderivatives of the compound  (excluding stereoisomers).

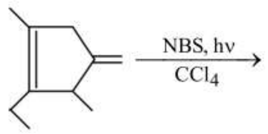
3. How many isomers (including geometrical and optical) are possible for bromochlorocyclobutane?

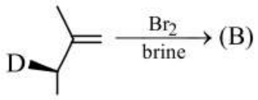
4. How many stereoisomers are possible for dichlorocyclobutane?

5. How many enantiomeric pairs are possible in bromochlorocyclopentane?

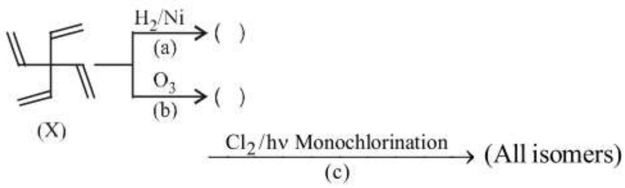
6. How many alkyl bromides would yield isopentane on reaction with Grignard reagent followed by treatment with water?

7. How many free radicals can be produced during following reaction (ignoring resonating structure) ?



8. 

Find the number of fractions obtained after fractional distillation of product mixture.

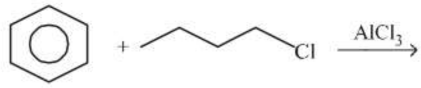
9. 

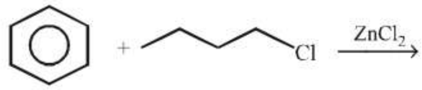
Calculate sum of number of products formed in the reaction a, b and c.

10. How many alkenes, alkynes, alkadienes can be hydrogenated to form isopentane (include all isomers)?

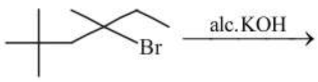
11. Find the total number of cyclic isomers possible for a hydrocarbon with the molecular formula C_4H_6.

12. Write total number of hydrogen atoms on all the carbon atoms which are connected directly by a single bond to benzylic carbon (carbon connected to benzene ring) in the product

(i) 

(ii) 

13. Number of monochloro derivatives (excluding stereoisomers), dichloro derivatives and trichloro derivatives of cyclopentane are n_1, n_2 and n_3. Find the value of $(n_1 + n_2)/n_3$.

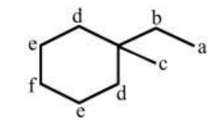
14. 

Find the number of alkenes produced in the reaction given.

15. Find the total no. of alkynes that on catalytic reduction gives 3-ethyl-4-methylheptane

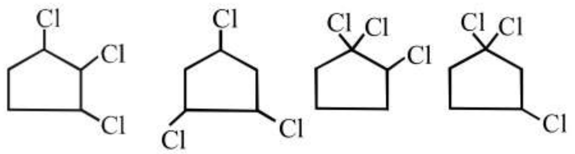
SOLUTIONS

1. **(6)**

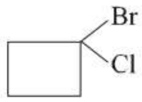


There are six positions in the given compound which will give monochloroderivatives.

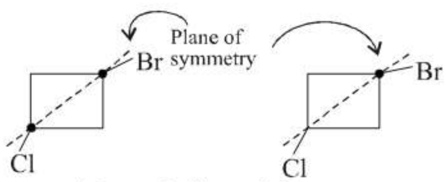
2. **(4)**



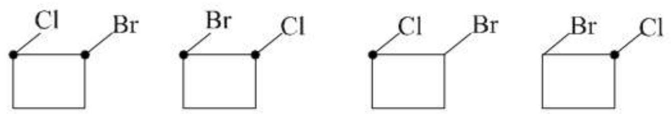
3. **(7)** Seven possible isomers are



1-Bromo-1-chlorocyclobutane
(Stereoisomerism not possible)



1-Bromo-3-chlorocyclobutane
(Both are optically inactive)

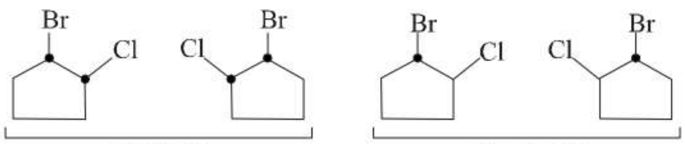


cis-(+), cis-(–)- trans-(+), trans-(–)-

1-Bromo-2-chlorocyclobutane

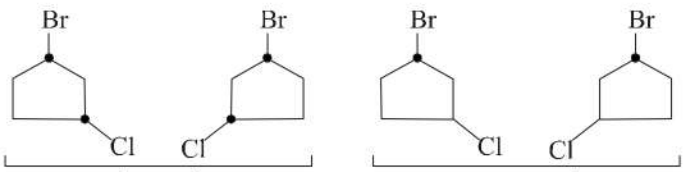
4. **(5)** 1, 3-Dichlorocyclobutane can exist in *cis* and *trans* forms. *trans*-1, 2-Dichlorocyclobutane can exist in (+) – and (–) – forms. However, *cis*-1, 2 Dichlorocyclobutane has a plane of symmetry and hence it can exist as *meso* isomer.

5. **(4)**



cis, racemic trans, racemic

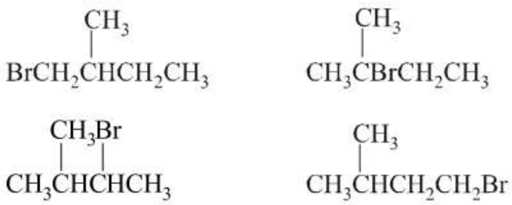
1-Bromo-2-cyclopentane



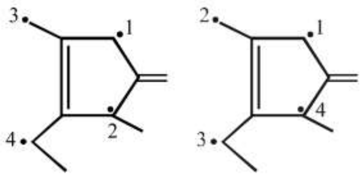
cis, racemic trans, racemic

1-Bromo-3-cyclopentane

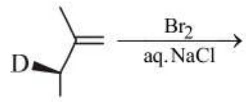
6. **(4)** All alkyl bromides having carbon skeleton of isopentane (2-methylbutane $(CH_3)_2CHCH_2CH_3$) will give isopentane via Grignard reagent.

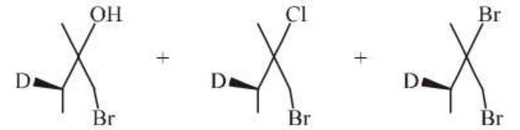


7. **(4)**



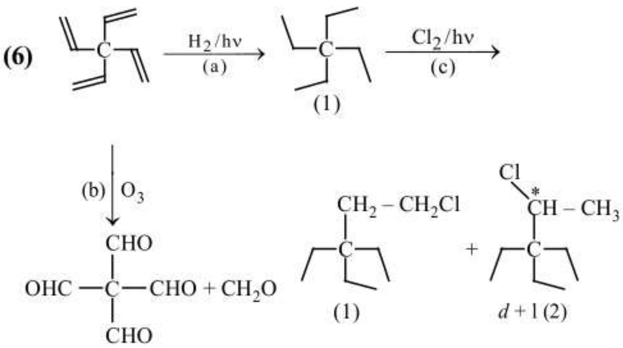
8. **(6)**





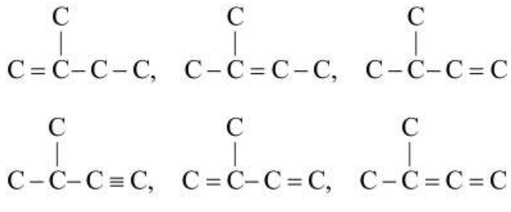
Diastereomeric pair + Diastereomeric pair + Diastereomeric pair

9. **(6)**

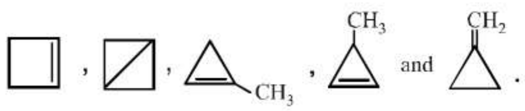


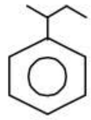
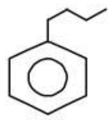
a = 1; b = 2; c = 3 Sum = 1 + 2 + 3 = 6

10. **(6)**



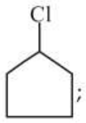
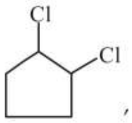
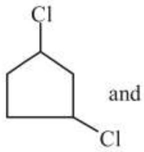
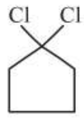
11. **(5)** The number of cyclic isomers for a hydrocarbon with molecular formula C_4H_6 is 5.
The structures are



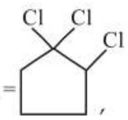
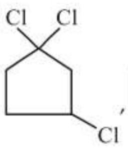
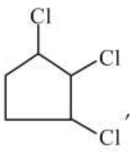
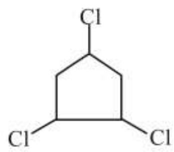
12. **(7)** (i)  (ii) 

5 H 2 H

13. **(1)** **2**

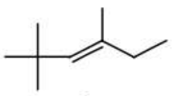
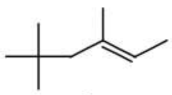
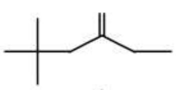
$n_1 =$  ; $n_2 =$  ,  and 

and

$n_3 =$  ,  ,  , 

$$\therefore \frac{n_1 + n_2}{n_3} = \frac{1+3}{4} = \frac{4}{4} = 1$$

14. **(5)**

2 2 1

[Five]

15. **(3)** $CH_3 - CH_2 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - \underset{\displaystyle CH_2 - CH_3}{\underset{|}{CH}} - CH_2 - CH_3$

3-Ethyl-4-methylheptane

(i) $CH \equiv C - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - \underset{\displaystyle CH_2CH_3}{\underset{|}{CH}} - CH_2 - CH_3$

(ii) $CH_3 - CH_2 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - \underset{\displaystyle C \equiv CH}{\underset{|}{CH}} - CH_2CH_3$

(iii) $CH_3 - C \equiv C - \underset{\displaystyle CH_3}{\underset{|}{CH}} - \underset{\displaystyle CH_2CH_3}{\underset{|}{CH}} - CH_2CH_3$

Alkynes (i), (ii) and (iii)
produces 3-ethyl-4-methyl heptane on catalytic reduction.