



## CHEMISTRY

### BOOKS - PRADEEP CHEMISTRY (HINGLISH)

### HYDROCARBONS

#### SAMPLE PROBLEM

1. A hydrocarbon containing two double bonds gave on reductive ozonolysis ethanol, glyoxal and propanone. Predict the structure of the hydrocarbon and give its IUPAC name.

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2. Give the structures of the compounds which on reductive ozonolysis give :

(i)propane-1,3-dial

(ii)glyoxal and formaldehyde

(iii)acetaldehyde, formaldehyde and carbon dioxide.



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## CURIOSITY QUESTIONS

1. Acetylene is said to be acidic ? Does it mean that it turns blue litmus red ?



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2. Does acetylene react with Fehling's solution ?



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3. What would have been the shape of benzene molecule had there been no resonance ?

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4. Does resonance always lead to stabilization of cyclic conjugated systems ?

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## ADVANCED PROBLEMS FOR COMPETITION

1. An organic compound [A]  $C_6H_{10}$ , on reduction first gives [B]  $C_6H_{12}$ , and finally [C]  $C_6H_{14}$ . [A] on ozonolysis followed by hydrolysis gives two aldehydes [D]  $C_2H_4O$ , and [E]  $C_2H_2O$ . Oxidation of [B] with acidified  $KMnO_4$  gives acid [F]  $C_4H_8O_2$ . Determine the structures of the compounds [A] to [F] with proper reasoning.

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2. A conjugated alkydiene having molecular formula  $C_{13}H_{22}$  on ozonolysis yielded ethyl methyl ketone and cyclohexanecarbaldehyde. Identify the diene, write its structural formula and give its IUPAC name.

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3. A chloro compound with M.F  $C_3H_3Cl$  shows the following properties

(i) Decolourized bromine in  $CCl_4$ ,

(ii) Absorbed hydrogen catalytically,

(iii) Gave a precipitate with ammoniacal cuprous chloride solution.

Deduce the structure of the chloro compound.

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4. An unsaturated hydrocarbon (A),  $C_6H_{10}$ , readily gives (B) on treatment with  $NaNH_2$  in liquid  $NH_3$ . When (B) is allowed to react with 1-

chloropropane, a compound (C) is obtained. On partial hydrogenation in the presence of Lindlar's catalyst, (C) gives (D),  $C_9H_{18}$ . On ozonolysis, (D) gives 2, 2-dimethylpropanal and 1-butanal. Identify compounds A, B, C and D.

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5. Primary alkyl halide  $C_4H_9Br$  (a) reacted with alcoholic KOH to give compound (b). Compound (b) is reacted with HBr to give (c) which is an isomer of (a). When (a) is reacted with sodium metal it gives compound (d),  $C_8H_{18}$  which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of (a) and write the equations for all the reactions.

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**PROBLEMS FOR PRACTICE**

1. An alkene with molecular formula  $C_7H_{14}$  gives propanone and butanal on ozonolysis. Write down its structural formula.

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2. The reductive ozonolysis of an alkene gave butanone and propanal. Write the structure of alkene and its IUPAC name.

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3. An unknown alkene on reductive ozonolysis gives two isomeric carbonyl compounds of molecular formula,  $C_3H_6O$ . Write the structures of the alkene and the two isomeric carbonyl compounds.

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TEST YOUR GRIP (MULTIPLE CHOICE )

1. Isopropyl bromide on Wurtz reaction gives

A. Hexane

B. Propane

C. 2, 3-Dimethylbutane

D. Neohexane.

**Answer: C**



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2.  $(CH_3)_3CMgCl$  on reaction with  $D_2O$  produces

A.  $(CH_3)_3CD$

B.  $(CH_3)_3OD$

C.  $(CD_3)_3CD$

D.  $(CD_3)_3OD$

**Answer: A**

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3. Heatingure a mixture of sodium benzoate and soda lime gives

- A. Benzene
- B. Methane
- C. Sodium benzoate
- D. Calcium benzoate.

**Answer: A**

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4. Which of the following alkane has lowest boiling point and highest melting point ?

- A. n-Pentane
- B. Isopentane
- C. Neopentane
- D. n-Hexane

**Answer: C**

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5. On mixing certain alkane with chlorine and irradiating it with ultraviolet light, it forms only one monochloroalkane. The alkane is

- A. neopentane
- B. propane
- C. pentane
- D. isopentane

**Answer: A**

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6. Isomers which can be interconverted through rotation around a single bond are

- A. conformers
- B. diastereomers
- C. enantiomers
- D. positional isomers

**Answer: A**

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7. Which one of the following is applicable to the conformations of a hydrocarbon ?

- A. C- C distance changes



B. C-H distance changes

C. C-C-C and C-C-H bond angles change.

D. Only distance between non-bonded H-atoms changes

**Answer: D**

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**8. Which of the following compounds will exhibit geometrical isomerism?**

A. 1-Phenyl-2-butene

B. 3-Phenyl-1-butene

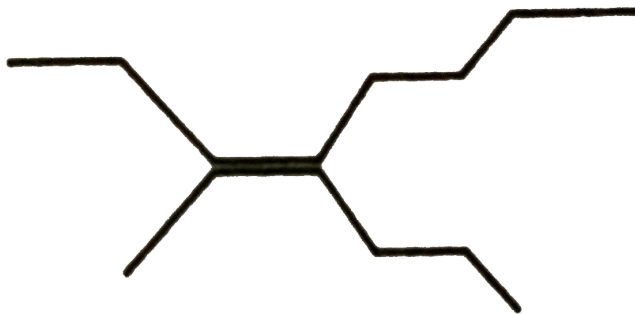
C. 2-Phenyl-1-butene

D. 1, 1-Diphenyl-1-propene

**Answer: A**

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9. Give the IUPAC name of the alkene



- A. Z-3-methyl-4-propyl-3-octene
- B. E-3-methyl-4-propyl-3-octene
- C. E-4-butyl-3-methyl-3-heptene
- D. E-2-ethyl-3-propyl-2-heptene

**Answer: A**

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10. Cis-2-butene and trans-2-butene are:

- A. conformational isomers
- B. structural isomers
- C. configurational isomers
- D. optical isomers

**Answer: C**

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**11.1** — Chlorobutane on reaction with alcoholic potash gives:

- A. 1-Butene
- B. 1-Butanol
- C. 2-Butene
- D. 2-Butanol.

**Answer: A**

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12. 1-Butene may be converted to butane by reaction with :

A.  $Pd/H_2$

B. Zn-HCl

C. Sn-HCl

D. Zn-Hg

**Answer: A**



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13. The compound that undergoes dehydration most readily is

A. Ethyl alcohol

B. 2-methylpropan-2-ol

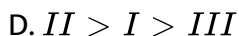
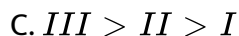
C. 3-methyl-2-butanol

D. Propyl alcohol

Answer: B

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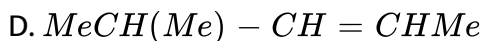
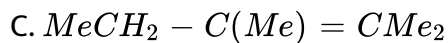
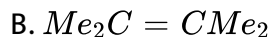
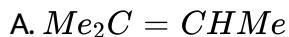
14. The order of reactivity of alkenes,  $(CH_3)_2C = CH_2$ ,  $CH_3CH = CH_2$ ,  $CH_2 = CH_2$  when subjected to acid catalyzed hydration is



Answer: A

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15. Which of the following gives on ozonolysis both aldehydes and ketones?

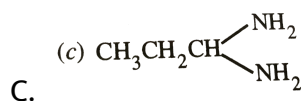
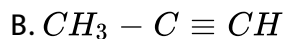
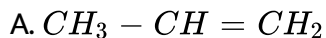


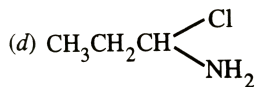
Answer: A



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16. When  $CH_3CH_2CHCl_2$  is treated with  $NaNH_2$ , the product formed is



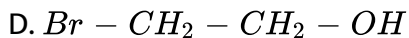
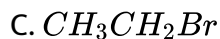
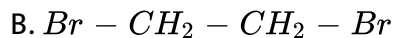
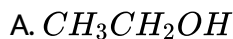


D.

**Answer: B**

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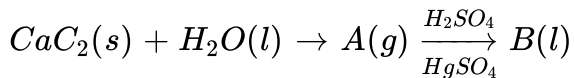
17. From which one of the following can both ethylene and acetylene be prepared in a single step reaction?



**Answer: B**

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18. Identify the compounds A and B in the following reaction sequence.

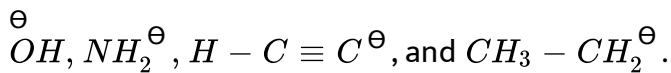


- A. A is ethylene, B is acetaldehyde
- B. A is acetylene, B is propionaldehyde
- C. A is ethane, B is ethanol
- D. A is acetylene, B is acetaldehyde.

**Answer: D**

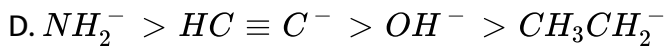
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19. What is the decreasing order of strengths of the following bases ?



- A.  $\text{CH}_3\text{CH}_2^- > \text{NH}_2^- > \text{HC} \equiv \text{C}^- > \text{OH}^-$
- B.  $\text{HC} \equiv \text{C}^- > \text{CH}_3\text{CH}_2^- > \text{NH}_2^- > \text{OH}^-$
- C.  $\text{OH}^- > \text{NH}_2^- > \text{HC} \equiv \text{C}^- > \text{CH}_3\text{CH}_2^-$

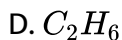
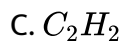
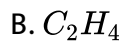




**Answer: A**

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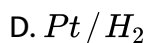
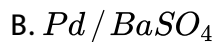
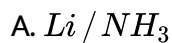
20. A gas decolourises alkaline  $KMnO_4$  solution but does not give precipitate with silver nitrate. It is:



**Answer: B**

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21. 2 – Hexyne gives trans – 2 – hexene on treatment with :

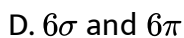
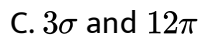
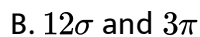


**Answer: A**



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22. Number of bonds in benzene is



**Answer: B**

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23. The enthalpy of hydrogenation of cyclohexene is  $-119.5 \text{ kJ mol}^{-1}$ . If resonance energy of benzene is  $-150.4 \text{ kJ mol}^{-1}$ , its enthalpy of hydrogenation would be :

A.  $-358.5 \text{ kJ mol}^{-1}$

B.  $-508.9 \text{ kJ mol}^{-1}$

C.  $-208.1 \text{ kJ mol}^{-1}$

D.  $-269.9 \text{ kJ mol}^{-1}$

**Answer: C**

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24. Phenyl magnesium bromide reacts with methanol to give :-

- A. a mixture of anisole and  $\text{Mg(OH)Br}$
- B. a mixture of benzene and  $\text{Mg(OMe)Br}$
- C. a mixture of phenol and  $\text{Mg(OMe)Br}$
- D. a mixture of toluene and  $\text{Mg(OH)Br}$

**Answer: B**

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25. The ortho/para directing group among the following is

- A.  $\text{COOH}$
- B.  $\text{CN}$
- C.  $\text{COCH}_3$
- D.  $\text{NHCOCH}_3$

**Answer: D**

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26. Arrange the following compounds in order of their decreasing reactivity with an electrophile,  $E^{(+)}$

i) Chlorobenzene

ii) 2,4- dinitrochlorobenzene

iii) *p*- nitrochlorobenzene

A. C gt B gt A

B. B gt C gt A

C. A gt C gt B

D. A gt B gt C

**Answer: C**



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**TEST YOUR GRIP (FILL IN THE BLANKS )**

1. In presence of UV light, benzene reacts with chlorine forming \_\_\_\_\_

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2. In chlorobenzene, chlorine is \_\_\_\_\_ but \_\_\_\_\_ directing.

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3. Addition of water to phenyl acetylene in presence of dil.  $H_2SO_4$  and  $HgSO_4$  give \_\_\_\_\_

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4. Out of three isomeric pentanes, \_\_\_\_\_ has the maximum bp. and \_\_\_\_\_ has the maximum m.p.

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5. The cyclopentadienyl cation is \_\_\_\_\_ while cyclopentadienyl anion is \_\_\_\_\_

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6. Reduction of 2-butyne with Lindlar's catalyst gives \_\_\_\_\_ while reduction with sodium in liquid ammonia gives \_\_\_\_\_

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7. Out of benzene, ethylene and acetylene, the carbon-carbon bond length is longest in \_\_\_\_\_

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8. The reactions of benzene with acetic anhydride in presence of anhydrous  $AlCl_3$  is called \_\_\_\_\_ reaction and yields \_\_\_\_\_

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9. Acidity of acetylene, water and ammonia decreases in the order \_\_\_\_\_

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10. In the reaction,  $C_2H_5Br \xrightarrow[(ii) CuI]{(i) Li} (X) \xrightarrow{CH_3Br} (Y)$ , the products X and Y are \_\_\_\_\_ and \_\_\_\_\_ respectively.

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11. In presence of peroxides, the addition of HBr to propene occurs according to \_\_\_\_\_ rule and gives \_\_\_\_\_ as the major product but in absence of peroxides, addition occurs according \_\_\_\_\_ rule and gives \_\_\_\_\_ as the major product.

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12. \_\_\_\_\_ on reductive ozonolysis gives ethanal, methanal and carbon dioxide.

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13. The dihedral angle between the hydrogen atoms of two methyl groups in staggered conformation of ethane is

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14. The most stable conformation of ethylene glycol is :

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15. The reaction between benzene and ICl in presence of anhyd.  $AlCl_3$  yields \_\_\_\_\_

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16. Kolbe's electrolysis of \_\_\_\_\_ produces n-hexane at anode .

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17. Intramolecular dehydration of alcohols is carried out with \_\_\_\_\_ to give \_\_\_

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18. To prepare p-bromonitrobenzene, the benzene is first subjected to \_\_\_ and then \_\_\_

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19. o-xylene on reductive ozonolysis gives

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20. Phenyl magnesium bromide reacts with methanol to give :-

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## CONCEPTUAL Questions

1. Devise a scheme for the synthesis of n-butane using  $CH_3I$  as the only carbon source. Can you employ the reactions in your scheme to synthesis propane in fairly pure state ? Explain

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2. How will you prepare a pure sample of propane ?

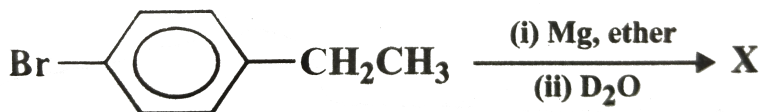
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3. What happens when butanoic acid is heated with soda-lime at 630 K ?

Is there any other acid which also gives the same product under similar conditions. Write its name and the reaction involved .

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4. Give structure of the product (*X*) in the following reaction :



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5. Which of the following has the highest boiling point ?

(i) 2-Methylpentane (ii) 2, 3-Dimethylbutane (iii) 2, 2-Dimethylbutane

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6. What effect the branching of an alkane has on its boiling point?

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7. An organic compound  $C_8H_{18}$  on monochlorination gives a single monochloride. Write the structure of the hydrocarbon.

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8. What are the main constituents of LPG ?

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9. a. Why are alkanes inert ?

b. Why the (C—C) bond rather than (C—H) bond breaks when alkanes are pyrolysed ?

c. Why the combustion of alkanes does not occur at moderate temperature, although it is an exothermic process ?

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10. Is it possible to isolate pure staggered ethane or pure eclipsed ethane at room temperature?

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11. Dehydration of alcohol to form an alkene is always carried out with concentrated  $H_2SO_4$  and not with concentrated  $HCl$  or  $HNO_3$ . Explain.

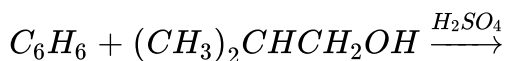
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12. Dehydration of 1-butanol or 2-butanol with conc.  $H_2SO_4$  always gives the same mixture of 2-butene (80 %) and 1-butene (20 %) but dehydrohalogenation of 1-bromobutane with alc. KOH gives 1-butene as

the major product while that of 2-bromobutane gives 2-butene as the major product . Explain why ?

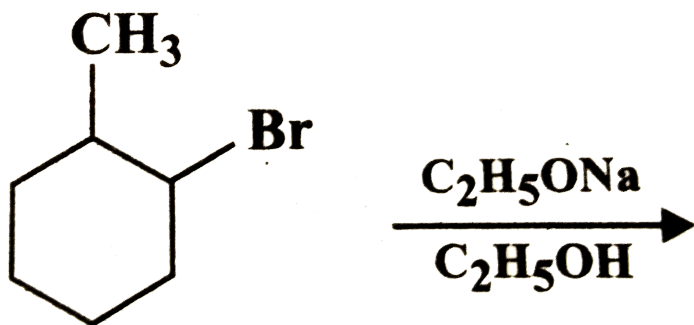
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13. Predict the major product of the following reaction:



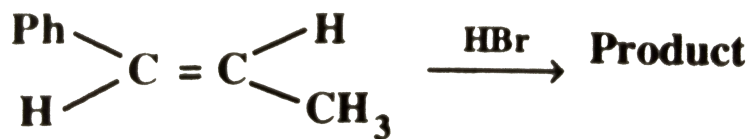
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14. Identify the organic products obtained in the following reaction :



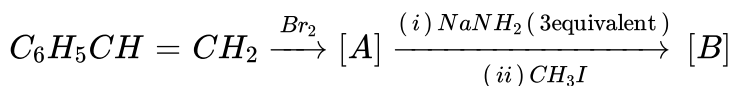
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15. Predict the products of the following reaction



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16. Complete the following reactions with appropriate structures of product/reagents :



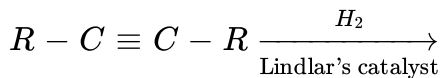
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17. How will you prepare 3-methylbut-1-yne by starting with ethyne ?

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18. Predict the major product in the following reaction :



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19. Identify the product in the reaction  $PhC \equiv CMe \xrightarrow{H_3O^+, Hg^{2+} ?}$

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20. How will you prepare (i) cis-pent-2-ene and trans-pent-2-ene by starting with ethyne ?

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21. Starting with ethyne, how will you prepare pentan-2-one ?

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22. How will you separate a mixture of ethane, ethylene and acetylene ?

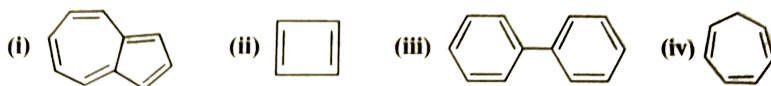
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23. Give reasons for the following:

$CH_2 = CH^\ominus$  is more basic than  $HC \equiv C^\ominus$

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24. Predict which of the following systems would be aromatic and why ?

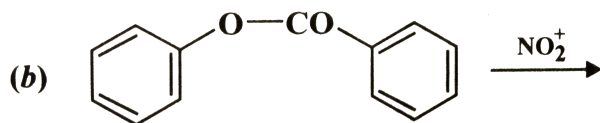
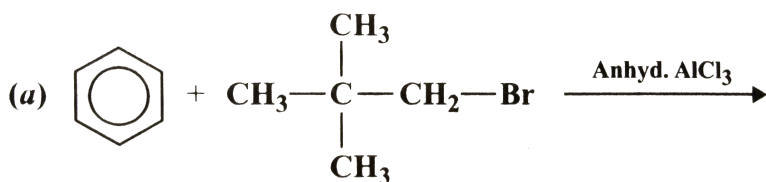


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25. Ozonolysis of mesitylene gives

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26. Write the major product in each case



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27. Tert-Butylbenzene does not benzoic acid on oxidation with acidic  $\text{KMnO}_4$ . Give reason.

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28. How will you explain the directive influence of

(i)  $-CH=CH_2$  and (ii)  $-CCl_3$  group when attached to the benzene ring?

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## NCERT QUESTION AND EXERCISES WITH ANSWERS

1. Write structure of different chain isomers of alkanes corresponding to the molecular formula  $C_6H_{14}$ . Also write IUPAC names.

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2. Write structures of different isomeric alkyl groups corresponding to the molecular formula  $C_5H_{11}$ . Write IUPAC names of the alcohols obtained by attachment of  $-OH$  group at different carbons of the chain.

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3. Write IUPAC names of the following compounds

(i)  $(CH_3)_3CCH_2C(CH_3)_3$  , (ii)  $(CH_3)_2C(C_2H_5)_2$  (iii) Terta-tert-butylmethane.

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4. Write structural formulas of the following compounds.

(i) 3,4,4,5-Tetramethylheptane , (ii) 2,5-Dimethylhexane.

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5. Write structures for each of the following compounds. Why are the given names incorrect? Write correct IUPAC names.

(i) 2-Ethylpentane

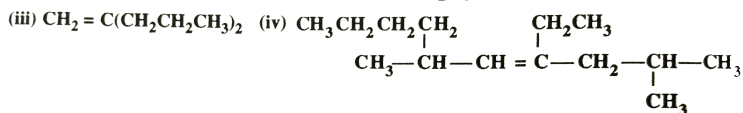
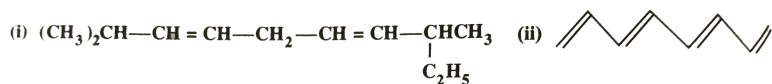
(ii) 5-Ethyl – 3-methylheptane

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6. Sodium salt of which acid will be needed for the preparation of propane ? Write chemical equation for the reaction.

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7. Write the IUPAC name of the following compounds.



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8. Calculate number of sigma ( $\sigma$ ) and pi ( $\pi$ ) bonds in the above structures (i-iv).

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9. Write the structural and IUPAC names of different structural isomers of alkenes corresponding to  $C_5H_{10}$ .

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10. Draw the structures of cis-and trans-isomers of the following compounds. Also write their IUPAC names. (i)  $CHCl=CHCl$  (ii)  $C_2H_5C(CH_3) = C(CH_3)C_2H_5$

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11. Write of the following compounds will show cis-trans isomerism ?

(i)  $(H_3C)_2C = CH - C_2H_5$ , (ii)  $H_2C = CBr_2$ , (iii)  $C_6H_5CH = CHCH_3$ , (iv)  $H_3C - CH = CCl(CH_3)$

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**12.** Write IUPAC names of the products obtained by addition reactions of HBr to hex-1-ene (i) in presence of peroxide and (ii) in the absence of peroxide.

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**13.** Write structures of different isomers corresponding to the 5th member of alkyne series. Also write IUPAC names of all the isomers. What type of isomerism is exhibited by different pairs of isomers ?

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**14.** How will you convert ethanoic acid into benzene?

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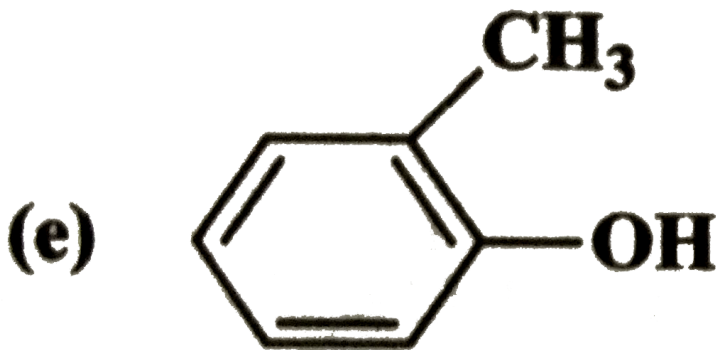
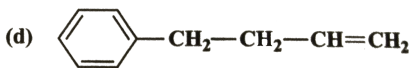


1. How do you account for formation of ethane during chlorination of methane ?

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2. Write IUPAC names of the following compounds :

(a)  $CH_3CH = C(CH_3)_2$  , (b)  $CH_2 = CH - C \equiv C - CH_3$  ,



(f)  $CH_3(CH_2)_4CH(CH_2)_3CH_3$  , (g)

$CH_3 - CH = CH - CH_2 - CH = CH - \underset{\substack{| \\ C_2H_5}}{CH} - CH_2 - CH = CH_2$

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3. For the following compounds, write structural formulas and IUPAC names for all possible isomers having the number of double or triple bond as indicated:

(a)  $C_4H_8$  (one double bond)

(b)  $C_5H_8$  (one triple bond)

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4. Write IUPAC names of the products obtained by the ozonolysis of the following compounds:

(i) Pent-2-ene (ii) 3,4-Dimethyl-hept-3-ene

(iii) 2-Ethylbut-1-ene (iv) 1-Phenylbut-1-ene

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5. An alkene 'A' on ozonolysis gives a mixture of ethanal and pentan-3-one.

Write structure and IUPAC name of 'A'.

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6. An alkene 'A' contains three C - C, eight C - H ( $\sigma$ ) bonds and one C - C ( $\pi$ ) bond. 'A' on ozonolysis gives two moles of an aldehyde of molar mass 44 u. Write IUPAC name of 'A'.

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7. Propanal and pentan-3-one are the ozonolysis products of an alkene?

What is the structural formula of the alkene?

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8. Write chemical equations for combustion reaction of the following hydrocarbons:

(i) Butane

(ii) Pentene

(iii) Hexyne

(iv) Toluene

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9. Draw the cis and trans structures of hex-2-ene. Which isomer will have higher b.p. and why?

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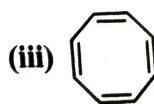
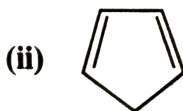
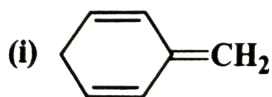
10. Why is benzene extra ordinarily stable though it contains three double bonds?

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11. What are the necessary conditions for any system to be aromatic?

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12. Explain why the following systems are not aromatic ?



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13. How will you convert benzene into

(i) p-nitrobromobenzene

(ii) m-nitrochlorobenzene

(iii) p-nitrotoluene

(iv) acetophenone

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14. In the alkane  $H_3C - CH_2 - C(CH_3)_2 - CH_2 - CH(CH_3)_2$ , identify  $1^\circ$ ,  $2^\circ$ ,  $3^\circ$ , carbon atoms and give the number of H atoms bonded to each one of these.

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15. What effect does branching of an alkane chain has on its boiling point?

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16. Addition of HBr to propene yields 2-bromopropane, while in the presence of benzoyl peroxide, the same reaction yields 1-bromopropane. Explain and give mechanism.

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17. Write down the products of ozonolysis of 1, 2-dimethylbenzene (o-xylene). How does the result support Kekulé structure for benzene?

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18. Arrange benzene, n-hexane and ethyne in decreasing order of acidic behaviour. Also give reason for this behaviour.

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19. Why does benzene undergo electrophilic substitution reactions easily and nucleophilic substitutions with difficulty?

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20. How would you convert the following compounds into benzene?

(i) Ethyne

(ii) Ethene

(iii) Hexane

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21. Write structures of all the alkenes which on hydrogenation give 2-methylbutane.

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22. Arrange the following set of compounds in order of their decreasing relative reactivity with an electrophile,  $E^+$

(a) Chlorobenzene, 2,4-dinitrochlorobenzene, p-nitrochlorobenzene

(b) Toluene,  $p - H_3C - C_6H_4 - NO_2$ ,  $p - O_2N - C_6H_4 - NO_2$ .

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23. Out of benzene, m-dinitrobenzene and toluene which will undergo nitration most easily and why?

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24. Suggest the name of a Lewis acid other than anhydrous aluminium chloride which can be used during ethylation of benzene.

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25. Why is Wurtz reaction not preferred for the preparation of alkanes containing odd number of carbon atoms? Illustrate your answer by taking one example.

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1. Arrange the following in decreasing order of their boiling points.

(A). N-butane

(B). 2-methylbutane

(C). N-pentane

(D). 2,2-dimethylpropane

A. A > B > C > D

B. B > C > D > A

C. D > C > B > A

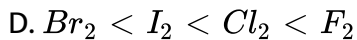
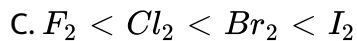
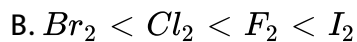
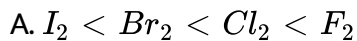
D. C > B > D > A

**Answer: D**



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2. Arrange the halogens  $F_2$ ,  $Cl_2$ ,  $Br_2$ ,  $I_2$ , in order of their increasing reactivity with alkanes.



**Answer: A**



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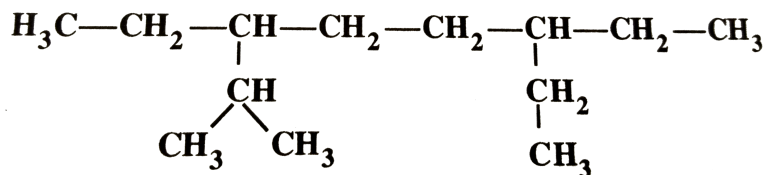
3. The increasing order of reduction of alkyl halides with zinc and dilute HCl is



**Answer: B**

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4. The correct IUPAC name of the following alkane is

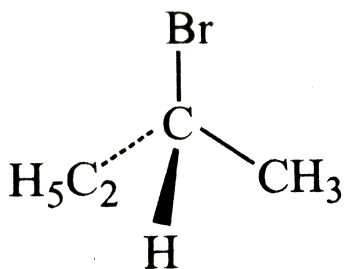


- A. 3,6-Diethyl-2-methyloctane
- B. 5-Isopropyl-3-ethyloctane
- C. 3-Ethyl-5-isopropyloctane
- D. 3-Isopropyl-6-ethyloctane

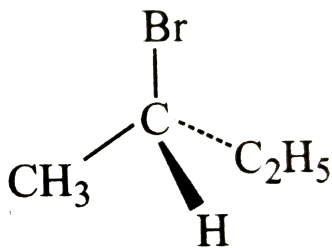
**Answer: A**

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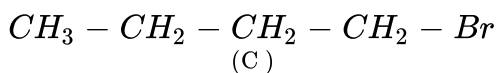
5. The addition of HBr to 1-butene gives a mixture of products A , B and C



(A)



(B)



The mixture consists of

- A. A and B as major and C as minor products
- B. B as major , A and C as minor products
- C. B is minor, A and C as major products
- D. A and B as minor and C as major products .

Answer: A

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6. Which of the following will not show geometrical isomerism ?

A.

B.

C.

D.

**Answer: D**



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7. Arrange the following hydrogen halides in order of their decreasing reactivity with propene.

A. HCl gt HBr gt HI

B. HBr gt HI gt HCl

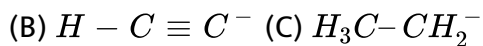
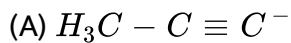
C. HI gt HBr gt HCl

D. HCl gt HI gt HBr

**Answer: C**

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**8.** Arrange the following carbanions in order of their decreasing stability.



A. A gt B gt C

B. B gt A gt C

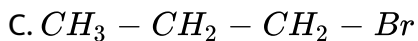
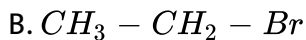
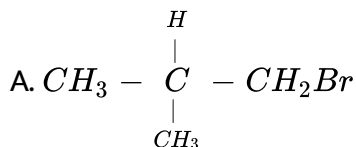
C. C gt Bgt A

D. C gt A gt B

**Answer: B**

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9. Arrange the following alkyl halides in decreasing order of the rate of  $\beta$ -elimination reaction with alcoholic KOH.



A. A > B > C

B. C > B > A

C. B > C > A

D. A > C > B

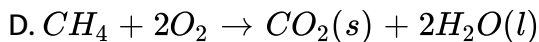
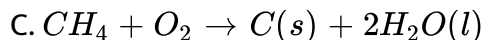
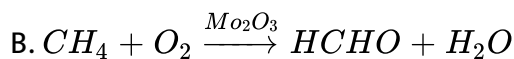
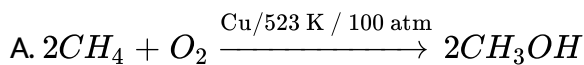
**Answer: D**



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10. Which of the following reactions of methane is incomplete combustion:



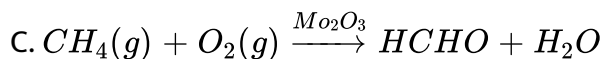
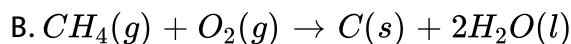
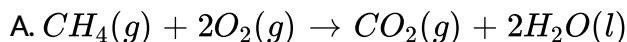


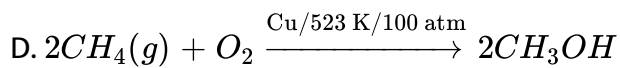
Answer: C

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## NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS (MULTIPLE CHOICE -II)

1. Some oxidation reactions of methane are given below. Which of them is/are controlled oxidation reactions?





**Answer: C::D**

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2. Which of the following alkenes on ozonolysis give a mixture of ketones only?

A.

B.

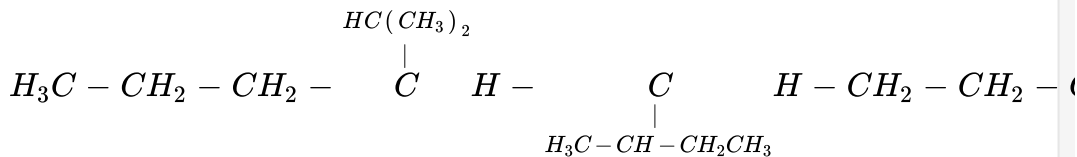
C.

D.

**Answer: C::D**

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3. Which are the correct IUPAC names of the following compound?

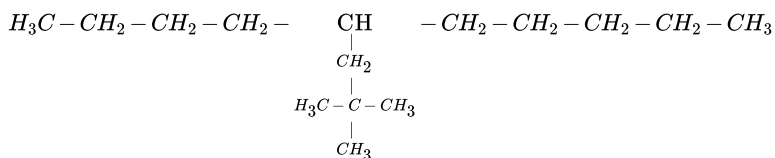


- A. 5-Butyl-4-isopropyldecane
- B. 5-Ethyl-4-propyldecane
- C. 5-sec-Butyl-4-isopropyldecane
- D. 4-(1-methylethyl)-5-(1-methylpropyl) decane

Answer: C::D

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4. Which are the correct IUPAC names of the following compounds ?



- A. 5-(2'-2'-Dimethylpropyl)decane

B. 4-Butyl-2,2-dimethylnonane

C. 2,2-Dimethyl-4-pentyloctane

D. 5-Neopentyldecane

**Answer: A::D**



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5. For an electrophilic substitution reaction , the presence of a halogen atom in the benzene ring .....

A. deactivates the ring by inductive effect

B. deactivates the ring by resonance

C. increases the charge density at ortho and para position relative to meta position by resonance

D. directs the incoming electrophile to meta position by increasing the charge density relative to ortho and para position.

**Answer: A::C**



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6. In an electrophilic substitution reaction of nitrobenzene, the presence of nitro group \_\_\_\_\_.

- A. deactivates the ring by inductive effect
- B. activates the ring by inductive effect
- C. decreases the charge density at ortho and para position of the ring relative to meta position by resonance
- D. increases the charge density at meta position relative to the ortho and para positions of the ring by resonance .

**Answer: A::C**



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7. Which of the following are correct ?

A.  $CH_3 - O - CH_2^{\oplus}$  is more stable than  $CH_3 - CH_2^{\oplus}$

B.  $(CH_3)_2CH^{\oplus}$  is less stable than  $CH_3 - CH_2 - CH_2^{\oplus}$

C.  $CH_2 = CH - CH_2^{\oplus}$  is more stable than  $CH_3 - CH_2 - CH_2^{\oplus}$

D.  $CH_2 = CH^{\oplus}$  is more stable than  $CH_3 - CH_2^{\oplus}$

Answer: A::C



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8. Four structures are given in options (a) to (d) . Examine them and select the aromatic structures.

A.

B.

C.

D.

**Answer: A::C**

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**9. The molecules having dipole moment are :**

- A. 2,2-Dimethylpropane
- B. trans-Pent-2-ene
- C. cis-Hex-3-ene
- D. 2,2,3,3-Tetramethylbutane

**Answer: B**

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**NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS  
(SHORT ANSWER QUESTIONS)**

1. Why do alkenes prefer to undergo electrophilic addition reaction while arenes prefer electrophilic substitution reactions ? Explain.

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2. Alkynes on reduction with sodium in liquid ammonia form trans alkenes. Will the butene thus formed on reduction of 2-butyne show the geometrical isomerism ?

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3. Rotation around carbon-carbon single bond of ethane is not completely free. Justify the statement

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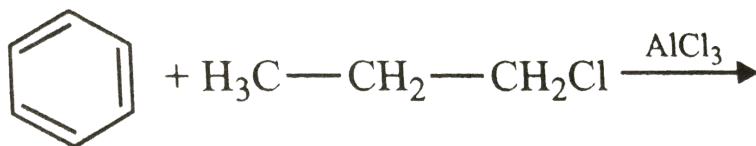
4. Draw Newman and sawhorse projections for the eclipsed and staggered conformations of ethane. Which of these conformations is more stable and why?

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5. The intermediate carbocation formed in the reactions of HI, HBr, and HCl with propene is the same and the bond energy of HCl, HBr, and HI is  $430.5 \text{ KJmol}^{-1}$ ,  $363.7 \text{ KJmol}^{-1}$  and  $296.8 \text{ KJmol}^{-1}$  respectively. What will be the order of reactivity of these halogen acids?

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6. What will be the product obtained as a result of the following reaction and why?





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7. How will you convert benzene into:

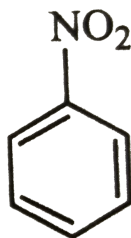
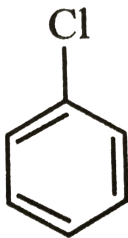
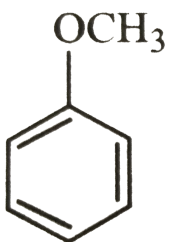
(i) p-nitrobromobenzene

(ii) m-nitrobromobenzene



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8. Arrange the following set of compounds in the order of their decreasing relative reactivity with on electrophile . Give reason .



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9. Despite their -I effect, halogens are o- and p- directing in haloarenes.

Explain .

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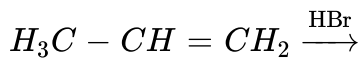
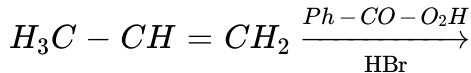
10. Why does presence of a nitro group make the benzene ring less reactive in comparison to the unsubstituted benzene ring . Explain .

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11. Suggest a route for the preparation of nitrobenzene starting from acetylene ?

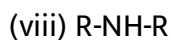
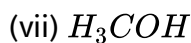
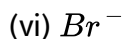
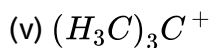
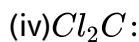
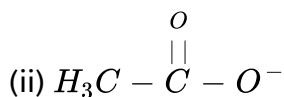
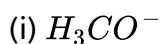
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12. Predict the major product(s) of the following reactions and explain their formation.



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**13.** Nucleophiles and electrophiles are reaction intermediates having electron rich and electron deficient centres respectively. Hence, they tend to attack electron deficient and electron rich centres respectively. Classify the following species as electrophiles and uncheophiles.



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14. The relative reactivity of  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  hydrogen's towards chlorination is 1: 3.8: 5. Calculate the percentages of all monochlorinated products obtained from 2-methylbutane.

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15. Write the structures and names of products obtained in the reactions of sodium with a mixture of 1-iodo-2-methylpropane and 2-iodopropane.

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16. Write hydrocarbon radicals that can be formed as intermediates during monochlorination of 2-methylpropane ? Which of them is more stable? Give reasons.

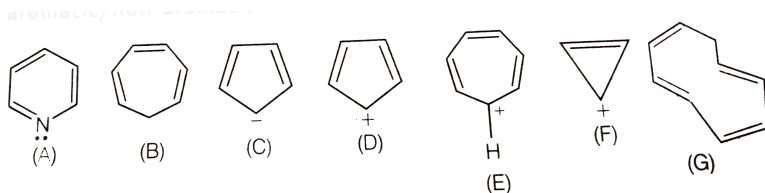
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17. An alkane  $C_8H_{18}$  is obtained as the only product on subjecting a primary alkyl halide to Wurtz reaction. On monobromination this alkane yields a single isomer of a tertiary bromide. Write the structure of alkane and the tertiary bromide.

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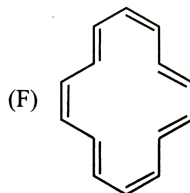
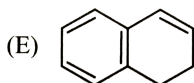
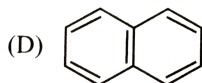
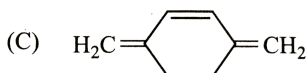
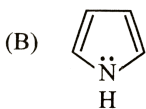
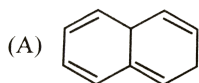
18. The ring systems having following characteristics are aromatic.

- (i) Planar ring containing conjugated  $\pi$  bonds .
- (ii) complete delocalisation of the  $\pi$  -electron in ring system i.e. , each atom in the ring has unhybridised p-orbital , and
- (iii) Presence of  $(4n + 2)\pi$ -electrons in the ring where n is an integer(n = 0, 1, 2, ..... ) [Huckel rule]. Using this information classify the following compounds as aromatic/non-aromatic.



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19. Which of the following compounds are aromatic according to Huckle's rule ?



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20. Suggest a route to prepare ethyl hydrogensulphate ( $CH_3 - CH_2 - OSO_2 - OH$ ) starting from ethanol ( $C_2H_5OH$ ).

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NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS  
(MATCHING TYPE QUESTIONS)

1. Match the reagent from Column I which on reaction with  $CH_3 - CH = CH_2$  gives some product given in Column II as per the codes given below

Column I	Column II
A. $O_3 / Zn + H_2O$	1. Acetic acid and $CO_2$
B. $KMnO_4 / H^+$	2. Propan-1-ol
C. $KMnO_4 / OH^-$	3. Propan-2-ol
D. $H_2O / H^+$	4. Acetaldehyde and formaldehyde
E. $B_2H_6 / NaOH^+$ and $H_2O_2$	5. Propane-1, 2-diol



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2. Match the hydrocarbons in Column I with the boiling points given in Column II.

Column I	Column II
(i) <i>n</i> -Pentane	(a) 282.5 K
(ii) Isopentane	(b) 309 K
(iii) Neopentane	(c) 301 K



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3. Match the following reactants in Column I with the corresponding reaction products in Column I

**Column I**

- (i) Benzene +  $\text{Cl}_2 \xrightarrow{\text{AlCl}_3}$
- (ii) Benzene +  $\text{CH}_3\text{Cl} \xrightarrow{\text{AlCl}_3}$
- (iii) Benzene +  $\text{CH}_3\text{COCl} \xrightarrow{\text{AlCl}_3}$
- (iv) Toluene  $\xrightarrow{\text{KMnO}_4 / \text{NaOH}}$

**Column II**

- (a) Benzoic acid
- (b) Methyl phenyl ketone
- (c) Toluene
- (d) Chlorobenzene
- (e) Benzene hexachloride

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4. Match the reactions given in Column I with the reaction types in Column II.

**Column I**

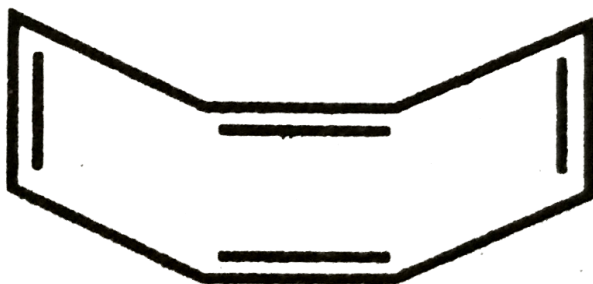
- (i)  $\text{CH}_2 = \text{CH}_2 + \text{H}_2\text{O} \xrightarrow{\text{H}^+} \text{CH}_3\text{CH}_2\text{OH}$
- (ii)  $\text{CH}_2 = \text{CH}_2 + \text{H}_2 \xrightarrow{\text{Pd}} \text{CH}_3-\text{CH}_3$
- (iii)  $\text{CH}_2 = \text{CH}_2 + \text{Cl}_2 \longrightarrow \text{Cl}-\text{CH}_2-\text{CH}_2-\text{Cl}$
- (iv)  $3 \text{CH} \equiv \text{CH} \xrightarrow[\text{Heat}]{\text{Cu tube}} \text{C}_6\text{H}_6$

**Column II**

- (a) Hydrogenation
- (b) Halogenation
- (c) Polymerisation
- (d) Hydration
- (e) Condensation

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1. Assertion (A): The compound cyclooctatetraene has the following structural formula :



It is cyclic and has conjugated 8  $\pi$ -electron system but it is not an aromatic compound.

Reason (R) :  $(4n+2)$   $\pi$ -electrons rule does not hold good and ring is not planar.

A. Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. Both Assertion and Reason are not correct

D. Assertion is not correct but Reason is correct.

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2. Assertion (A) Toluene on Friedal Crafts methylation gives o - and p-xylene.

Reason ( R )  $CH_3$ -group bonded to benzene ring increases density at o - and p- position.

A. Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. Both Assertion and Reason are not correct

D. Assertion is not correct but Reason is correct.



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3. S-I: Nitration of benzene with nitric acid requires the use of concentrated sulphuric acid

S-II: The mixture of concentrated sulphuric acid and concentrated nitric acid produces the electrophile, nitronium ion.

- A. Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
- B. Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
- C. Both Assertion and Reason are not correct
- D. Assertion is not correct but Reason is correct.



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4. Assertion (A) : Among isomeric pentanes, 2, 2- dimethylpentane has highest boiling point.

Reason (R) : Branching does not affect the boiling point.

- A. Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
- B. Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
- C. Both Assertion and Reason are not correct
- D. Assertion is not correct but Reason is correct.



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**NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS (LONG ANSWER QUESTIONS )**

1. An alkyl halide  $C_5H_{11}$  (A) reacts with ethanolic KOH to give an alkene 'B' which reacts with  $Br_2$  to give a compound 'C' which on dehydrobromination gives an alkyne 'D'. On treatment with sodium metal in liquid ammonia one mole of 'D' gives one mole of the sodium salt of 'D' and half a mole of hydrogen gas. Complete hydrogenation of 'D' yields a straight chain alkane. Identify A, B, C and D. Give the reactions involved.

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2. 448mL of a hydrocarbon (A) having C (87.80%), H (12.19%) weight 1.64g at NTP. On hydrogenation it gives 2 methyl pentane. Treatment of (A) with acidic  $HgSO_4$  gives a new compound (B) of molecular weight  $C_6H_{12}O$ . Compound (A) does not react with ammoniacal  $AgNO_3$ . What is the structure of (A)?

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3. An unsaturated hydrocarbon 'A' adds two molecules of  $H_2$  and on reductive ozonolysis gives butane-1, 4-dial, ethanal and propanone. Give the structure of 'A' , write its IUPAC name and explain the reactions involved.

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4. In the presence of peroxide addition of HBr to propene takes place according to anti Markownikoff's rule but peroxide effect is not seen in the case of HCl and HI. Explain.

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### ADDITIONAL QUESTIONS (VERY SHORT ANSWER TYPE QUESTIONS )

1. Indicate the primary , secondary , tertiary and quaternary carbon atoms in the following : (i) 3-Ethyl-2-methylhexane , (ii) 2,2,4-Trimethylpentane .



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2. Which isomer of hexane has only two different sets of structurally equivalent hydrogen atoms?



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3. What is a Grignard reagent ? How is propane prepared from a Grignard reagent ?



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4. n-Propylmagnesium bromide on hydrolysis gives propane. Is there another Grignard reagent which also gives propane ? If so, give its name , structure and equation for the reaction.



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5. How will you convert 2-bromopropane to 2-deuteriopropene ?

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6. How many monobromo derivatives are obtained when 2-methylbutane is subjected to photobromination ?

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7. What does LPG stands for?

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8. Arrange the following in increasing order of their release of energy on combustion.



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## 9. CRACKING

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10. Which of the following shows geometrical isomerism ?

(i)  $\text{CHCl}=\text{CHCl}$  , (ii)  $\text{CH}_2 = \text{CCl}_2$  , (iii)  $\text{CCl}_2 = \text{CHCl}$

Give structures of its cis- and trans-forms.

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11. Write the structural formula of all the possible isomers of  $\text{C}_2\text{H}_2\text{Cl}_2$

and indicate which of these is non polar?

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12. Use markownikov's rule and predict the products of the following reaction:

(i). HCl with  $CH_3C \equiv CH_2$

(ii). HCl with  $CH_3CH = C(CH_3)_2$ .

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13. Give the structures of the alkene ( $C_4H_8$ ) which adds on HBr in the presence and in the absence of peroxide to give the same product ,  $C_4H_9Br$

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14. An alkyl halide ( $X$ ) of the formula  $C_6H_{13}Cl$  on treatment with potassium tertiary butoxide gives two isomeric alkenes ( $Y$ ) and ( $Z$ ) ( $C_6H_{12}$ ). Both the alkenes on hydrogenation give 2,3 – dimethyl butane. Predict the structures of ( $X$ ), ( $Y$ ), and ( $Z$ )

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15. The hydrocarbon [A] adds one mole of hydrogen in the presence of a platinum catalyst to form n-hexane. When [A] is oxidised vigorously with  $KMnO_4$ , a single carboxylic acid containing three carbon atoms is isolated. Give the structure of [A] and explain the reactions.

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16. Write the structural isomers of an alkene having M.F.  $C_4H_8$ . How can you distinguish between them ?

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17. Write the structure of the alkene which on reductive ozonolysis gives butanone and ethanal.

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18. Which of the following compounds is the most reactive towards electrophilic addition reactions?

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19. Which is most reactive towards nucleophilic addition reactions?

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20. Out of benzene , ethylene and acetylene, the carbon-carbon bond length is longest in \_\_\_\_\_

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21. Name two reagents which can be used to distinguish between ethene and ethyne.

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22. What is Lindlar's Catalyst

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23. Birch reduction is observed in

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24. The presence of unsaturation in an organic compound can be tested with-

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25. How would you separate propene from propyne ?

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26. How will you distinguish between but-1-yne and but-2-yne ?

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27. Arrange the following in the increasing order of C-C bond length :

$C_2H_6$ ,  $C_2H_4$ ,  $C_2H_2$ ,  $C_6H_6$

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28. Give reason for the following in one or two sentences:

'Although benzene is highly unsaturated, normally it does not undergo addition reaction'.

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29. How will you demonstrate that double bonds of benzene are somewhat different from those of olefins ?

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30. Predict product formed when benzene is treated with iodine chloride in presence of anhydrous aluminium chloride.

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### ADDITIONAL QUESTIONS (SHORT ANSWER QUESTIONS)

1. What are alkanes ? Why are they called paraffins ?

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2. Draw the structure of 2,2,4-trimethylhexane and indicate how many each of the  $1^\circ$ ,  $2^\circ$ ,  $3^\circ$  and  $4^\circ$  carbons does it contain ?

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3. Comment upon three-dimensional structures of alkanes and their planar representations

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4. Write the structural isomers of  $C_5H_{12}$  and give their IUPAC names

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5. An alkane has a molecular mass of 72 Give all the possible structural isomers along with their IUPAC names.

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6. How can alkanes be prepared from (i) an alkene, (ii) an alkyl halide, and (iii) a carboxylic acid ?

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7. How can the following reactions be used to prepare alkanes. (i) Wurtz reaction, (ii) Kolbe's electrolytic method, and (iii) Sabatier and Senderen's reaction ?

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8. Give two methods for the preparation of alkanes from carboxylic acids.

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9. Starting from ethanoic acid, how will you prepare (i) methane (ii) ethane?

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10. Wurtz reaction is used to prepare

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11. Wurtz reaction is a good method for the preparation of alkanes containing even number of carbon atoms but not for alkanes containing odd number of carbon atoms. Comment



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12. What is an Octet rule? What are its limitations?



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13. What is Corey House reaction? In what way, it is superior to Wurtz reaction ?



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**14.** Which of the statement is correct ?

I. Melting point of alkane increases with increase of C atoms and with increase in branching.

II. Boiling point of alkane increases with increase of C atoms but with decrease in branching.

III. Cycloalkanes have lower boiling point than normal alkane with same number of C atoms.

IV. Alkenes have lower boiling point than same number of C atoms in alkanes.



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**15.** Discuss briefly the mechanism of halogenation of methane



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**16.** Write short notes on : (i) Oxidation reactions of alkanes. ,  
(ii) Isomerization of alkanes



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17. Why is rotation about carbon-carbon single bond not free? What type of isomerism does it lead to ?



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18. Draw Newman and sawhorse projections for the eclipsed and staggered conformations of ethane. Which of these conformations is more stable and why ?



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19. What is the cause of geometrical isomerism in alkenes ?



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20. A hydrocarbon has the molecular mass 70. Write all the possible structural isomers and give their IUPAC names

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21. What is the cause of geometrical isomerism in alkenes ?

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22. Which of the following alkenes will show geometrical isomerism ?

(i) Propene, (ii) But-2-ene , (iii) But-1-ene , (iv) 2, 3-Dimethylbut-2-ene

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23. How can alkenes be prepared from (i) alcohol, and (ii) an alkyl halide ?

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24. How is bromoethane prepared from (i) ethanol (ii) ethane?

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25. Intermolecular dehydration of alcohols gives

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26. Chloroethane is treated with alcoholic caustic potash ? Give another method by which the hydrocarbon obtained in the above reaction be prepared

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27. Explain the following with one example: (a) Dehydrohalogenation (b) Dehydration

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**28.** Explain the mechanism of electrophilic addition reactions of alkenes.

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**29.** How will you test the presence of double bond in an alkene ? Give chemical equations for the reactions involved.

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**30.** What is peroxide effect ? Why is it applicable only in case of HBr and not in case of HCl or HI?

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**31.** Melting point of cis - But - 2 - ene is lower than that of trans - But - 2 - ene. Give reason .

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**32. (a)** What is ozonolysis ? How can ozonolysis be used to determine the position of a double bond in an unknown alkene ?

(b) Give the name of the alkene which on ozonolysis gives only propanone.

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**33.** Write brief notes on:

(i) Markovnikov's rule (ii) Peroxide effect.

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**34.** Discuss briefly the structure of CsCl.

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35. Which of the following isomerism is absent in alkynes?

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36. Alkynes contain two  $\pi$ -bonds but still do not show geometrical isomerism whereas alkenes contain only one  $\pi$ -bond but show geometrical isomerism. Comment

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37. What happens when calcium carbide is treated with water? Give chemical equation for the reaction.

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38. Describe with a labelled diagram the laboratory method of preparation of acetylene. How can it be converted into 1-butyne and 2-

butyne ?

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39. Write the equation for preparation of propyne.

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40. Why a benzaldehyde less reactive than acetaldehyde towards nucleophilic addition reactions?

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41. Comment upon acidic character of terminal alkynes

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42. Account for the order of acidity:

Acetylene > Benzene > Hexane

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43. Why do alkynes undergo addition reactions while simple alkenes do not?

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44. Discuss the stereochemistry of the reduction products obtained when but-2-yne is reduced with (i) Lindlar's catalyst (ii) Na in liquid  $NH_3$

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45. Sketch the mechanism of addition of water to alkynes.

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**46.** Reactions of Alkynes

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**47.** isomerism of alkenes

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**48.** discuss the orbital structure of ethene

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**49.** Benzene contains three double bonds yet it behaves like a saturated compound. Explain

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**50.** Why is that the carbon-carbon bond distance in benzene is intermediate between carbon-carbon single bond and a carbon-carbon double bond

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**51.** Define substitution reactions. Why do arenes undergo substitution reactions even though they contain double bonds ?

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**52.** What is meant by

(i) delocalization

(ii) resonance energy ?

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**53.** The resonance energy of benzene is



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54. Explain the term aromaticity ? How can Huckel rule be used to determine the aromaticity of a compound .



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55. What are the necessary conditions for any system to be aromatic?



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56. Benzene is treated with methyl chloride in presence of anhydrous  $AlCl_3$  and the product treated with excess of chlorine in presence of UV light. The final product is:



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57. Which of the following undergoes electrophilic substitution reactions faster than benzene?

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58. Write down the products and give the mechanism of the following reactions

(i)  $C_6H_5OH + H_2SO_4$  (conc.) , (ii)  $C_6H_5CH_3 + HNO_3$  and  $H_2SO_4$  (conc.)

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59. Explain the directive influence of substituents on benzene and their effect on reactivity,

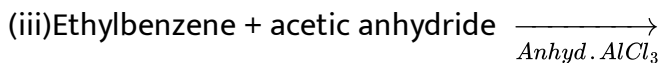
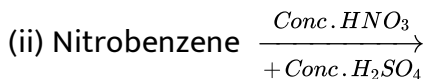
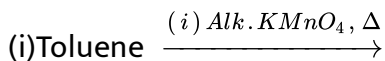
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60. Which of the following group (s) is/are *o* – and *p*-directing ?

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61. Predict the products of the following reactions :



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62. Comment upon the toxicity of polynuclear hydrocarbons

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**ADDITIONAL QUESTIONS (LONG ANSWER QUESTIONS)**

1. What are aliphatic hydrocarbons ? How are they classified ?

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2. Discuss briefly the structure of alkanes. What are the various methods used for their preparation?

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3. Draw all the structural isomers with the molecular formula,  $C_6H_{14}$ . Name each one of them by the IUPAC system. Also indicate primary, secondary, tertiary and quaternary carbons in each one of them.

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4. Discuss briefly the various physical properties and chemical reactions of alkanes.

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5. reactions of alkenes

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6. How is methane prepared in the laboratory ?

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7. Give the physical properties and chemical composition of urine.

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8. What are arenes ? How are they classified ? Discuss briefly the isomerism and nomenclature of arenes.

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9. Discuss the structure of benzene with an emphasis on resonance and orbital pictures.

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10. Justify the statement: Benzene is a highly unsaturated compound but behaves like a saturated compound.

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11. Explain the directive influence of substituents on benzene and their effect on reactivity,

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## 1. v\_display\_options

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## 2. n-Butane prepared by Wurtz reaction of ethyl

bromide is always contaminated by

some ethane and ethene . From where do

ethane and ethene come in ? Explain.

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## 3. Methyl chloride prepared by chlorination of methane is always

contaminated with some ethane What is the source of ethane ? Explain.

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4. tert-Butyl chloride on treatment with  $LiAlH_4$  gives 2-methylpropene but with  $NaBH_4$  it gives 2-methylpropane . Why so ? Explain.

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5. Hydrocarbon (A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon atoms. A is

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6. Four aromatic carboxylic acids on heating with soda-lime at 630 K, give toluene as the only product. Write the structures of the four aromatic carboxylic acid.

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7. Generally the melting points of isomeric alkanes decreases with branching but among isomeric pentanes, neopentane with two branches has the highest melting point . Why is it so ? Explain.

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8. Addition of HBr to 2-butene

gives two products while that of HBr to 1-butene

gives three products . Explain why ?

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9. Explain why the addition of HI to 3,3-dimethylbut-1-ene gives 2-iodo-2,3-dimethylbutane as the major product and not the 2-iodo-3,3-dimethylbutane.

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10. Addition of  $H_2$  to 2-butyne in presence of Lindlar's catalyst . Gives cis-2-butene while with Na/in liq.  $NH_3$  gives trans-2-butene. Why so ? Explain.

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11. Which of the two : trans-but-2-ene-or trans- pent-2- ene is non polar ?

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12. Why HF forms H-bonding with ethyne even though it is non-polar in nature ?

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13. Which of the following has higher dipole moment and why?

But -1- ene or But -1- yne

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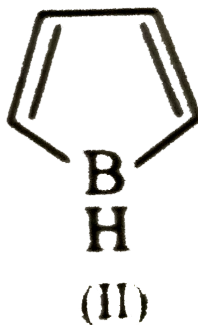
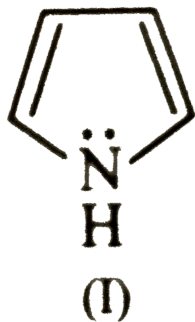
14. A and B are two salts. A reacts both with dil  $H_2SO_4$  and conc.  $H_2SO_4$  to give reddish brown vapours. However, B reacts only with conc.  $H_2SO_4$  to give similar vapours. Hence A and B are respectively

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15. Benzenesulphonic acid when heated with steam gives benzene but nitrobenzene does not. Why so ?

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16. Consider the following molecules :



Compound (I) is aromatic while compound (II) is not. Why so ?

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## ANALYTICAL QUESTIONS AND PROBLEMS WITH ANSWERS/SOLUTIONS (PROBLEMS)

1. Two isomeric compounds X and Y have the molecular formula  $C_7H_7OH$ . X gives purple colour with  $FeCl_3$  while Y does not. What are X and Y ?

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2. 7-bromo-1,3,5-cycloheptatriene exists as ionic species in aqueous solution while 5-bromo-1,3-cyclopentadiene doesn't ionise even in presence of  $Ag^+(aq)$ , Explain.

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## Competition Focus (JEE(main and advanced)/Medical Entrance) I. MULTIPLE CHOICE QUESTIONS

1. Pick out the alkane which differs from the other members of the group.

A. 2,2-dimethylpropane

B. pentane

C. 3-methylbutane

D. 2,2-dimethylbutane

**Answer: D**

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2. The number of structural isomers for  $C_6H_{14}$  is :

- A. 3
- B. 4
- C. 5
- D. 6

**Answer: C**



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3. An alkyl halide by formation of its Grignard reagent and heating with water gives propane. What is the original alkyl halide

- A. methyl iodide
- B. ethyl iodide
- C. ethyl bromide

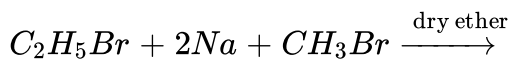
D. propyl bromide

**Answer: D**



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4. The product /s of the following reaction is (are)



A. ethane

B. propane

C. butane

D. ethane, propane and butane

**Answer: D**



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5. The products expected to be formed in the Wurtz reaction of a mixture of neopentyl bromide and isobutyl bromide are :

- (i) 2,2,4-trimethylpentane
- (ii) 2,2,5,5-tetramethylhexane
- (iii) 2,2,4,4- tetramethylhexane
- (iv) 2,5-dimethylhexane
- (v) 2,2,5-trimethylhexane

A. (ii),(iii) and (v)

B. (ii), (iv) and (v)

C. (i),(iv) and (v)

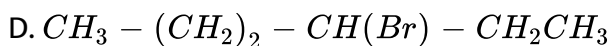
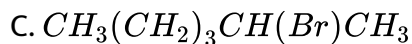
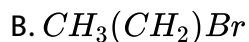
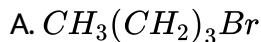
D. (i) , (iii) and (v)

**Answer: B**



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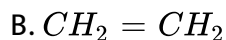
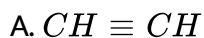
6. An alkyl bromide (X) reacts with sodium in ether to form 4,5-diethyloctane. The compound 'X' is



**Answer: D**

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7. Hydrocarbon (A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon atoms. A is



C.  $CH_3 - CH_3$

D.  $CH_4$

**Answer: D**

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8. Cycloalkane formed when 1,4-dibromopentane is heated with sodium is:

A. methylcyclobutane

B. cyclopentane

C. cyclobutane

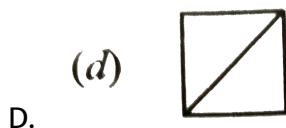
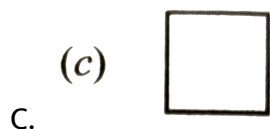
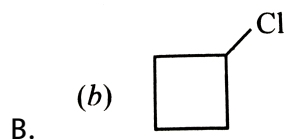
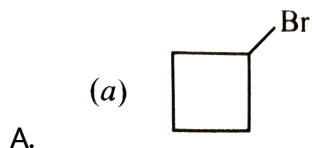
D. methylcyclopentane

**Answer: A**

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9. What would be the product formed when 1-bromo-3 chlorocyclobutane reacts with two equivalents of metallic sodium in ether ? .



Answer: D

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10. An alkane  $C_7H_{16}$  is produced by the reaction of lithium di (3 – Pentyl) cuprate with ethyl bromide. The alkane produced is

- A. 3-ethylpentane
- B. 2-methylpentane
- C. 3-methylhexane
- D. 2-methylhexane

**Answer: A**

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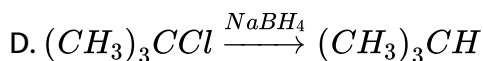
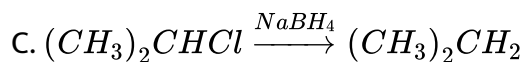
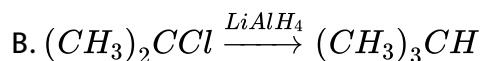
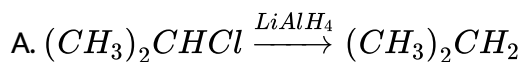
11. The best method for the preparation of 2,2-dimethylbutane is via the reaction of

- A.  $Me_3CBr$  and  $MeCH_2Br$  in Na/ether
- B.  $(Me_3C)_2CuLi$  and  $MeCH_2Br$
- C.  $(MeCH_2)_2CuLi$  and  $Me_3CBr$
- D.  $Me_3CMgI$  and  $MeCH_2I$

**Answer: B**

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12. Which of the following reactions is not correct for preparation of alkanes ?

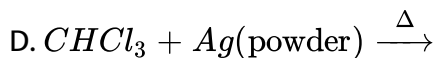
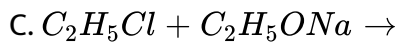
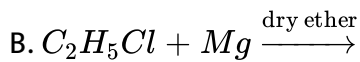


**Answer: B**

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13. Wurtz reaction of methyl iodide yields an organic compound X. Which one of the following reactions also yields X?

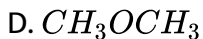
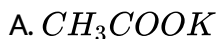




**Answer: A**

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14. Electrolysis of a concentrated aqueous solution of a compound gave  $C_2H_6$  on anode. The compound is



**Answer: A**

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15. For preparing an alkane, a concentrated aqueous solution of sodium or potassium salt of saturated carboxylic acid is subjected to

- A. hydrogenation
- B. oxidation
- C. electrolysis
- D. hydrolysis

**Answer: C**



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16. The correct order of boiling points of 2, 2-dimethylpropane, 2-methylbutane and n-pentane is

- A. n-pentane > 2,2-dimethylpropane > 2-methyl-butane
- B. n-pentane > 2-methylbutane > 2,2-dimethyl-propane

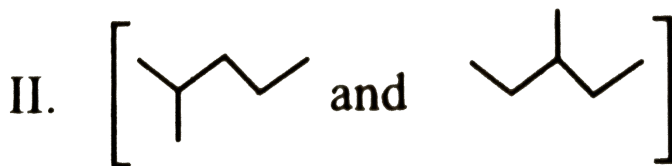
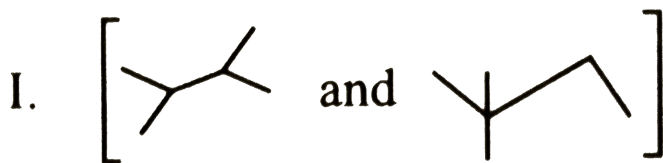
C. 2-methylbutane gt n-pentane gt 2,2-dimethyl-propane

D. 2-methylbutane gt 2,2-dimethylpropane gt n-pentane

**Answer: B**

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17. Isomers of hexane, based on their branching, can be divided into three distinct classes as shown in the figure.



The correct order of their boiling point is

A. I gt II gt III

B. III gt II gt I

C. II gt III gt I

D. III gt I gt II

**Answer: B**

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**18.** In which of the following, homolytic bond fission takes place :

A. Free radical chlorination of methane

B. Alkaline hydrolysis of ethyl chloride

C. Addition of HBr to double bond

D. Nitration of benzene

**Answer: A**

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19. Methane can be converted into ethane by the reactions

- A. chlorination followed by the reaction with alcoholic KOH
- B. chlorination followed by the reaction with aqueous KOH
- C. chlorination followed by Wurtz reaction
- D. chlorination followed by decarboxylation

**Answer: C**



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20. The total number of monohalogenated products formed by halogenation of 2,2,4-trimethylhexane is

- A. 5
- B. 7
- C. 6



D. 8

**Answer: C**

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21. Which branched chain isomer of the hydrocarbon with molecular mass  $72\mu$  gives only one isomer of mono substituted alky halide ?

A. Neopentane

B. Isohexane

C. Neohexane

D. Tertiary butyl chloride

**Answer: A**

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22. Of the five isomeric hexanes, the isomer which can give two monochlorinated compounds is

- A. n-hexane
- B. 2,3-dimethylbutane
- C. 2,2-dimethylbutane
- D. 2-methylpentane

**Answer: B**

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23. Of the isomeric haexanes, the isomers that give the minimum and maximum number of monochloro derivatives are, respectively,

- A. 3-methylpentane and 2,3-dimethylbutane
- B. 2,3-dimethylbutane and n-hexane
- C. 2,2-dimethylbutane and 2-methylpentane

D. 2,3-dimethylbutane and 2-methylpentane

**Answer: D**

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24. Which of the following isomeric heptanes can yield seven different monochlorinated products upon free radical chlorination ?

A. 3-Methylhexane

B. 2,2-Dimethylpentane

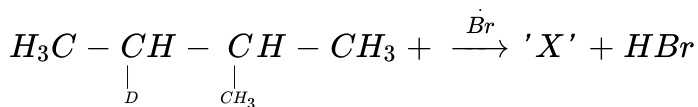
C. 2-Methylhexane

D. 2,3-Dimethylpentane

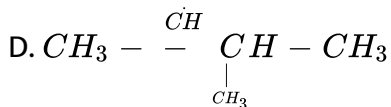
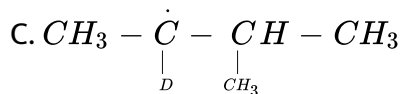
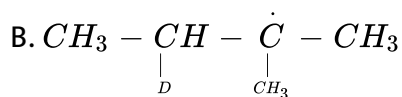
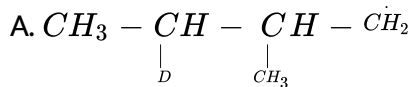
**Answer: A**

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25. Consider the following reaction ,



Identify the structure of the major product 'X'



Answer: B

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26. 2 – Methylbutane on reacting with bromine in the presence of sunlight gives mainly

A. 1-bromo-2-methylbutane

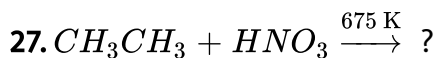
B. 2-bromo-2-methylbutane

C. 2-bromo-3-methylbutane

D. 1-bromo-3-methylbutane

**Answer: B**

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A.  $CH_3CH_2NO_2$

B.  $CH_3CH_2NO_2 + CH_3NO_2$

C.  $2CH_3NO_2$

D.  $CH_2 = CH_2$

**Answer: B**

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28. When n-hexane is heated with anhydrous  $AlCl_3$  and HCl gas, the major product obtained is

- A. 1-chlorohexane
- B. 2-chlorohexane
- C. 3-chlorohexane
- D. mixture of 2-methylpentane and 3-methylpentane

**Answer: D**



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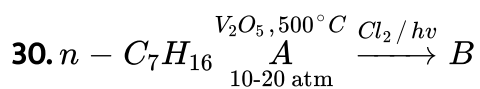
29. n-Hexane on heating to 773 K at 10-20 atmospheric pressure in the presence of oxides of vanadium supported over alumina, yields

- A. 1-hexene
- B. 2-hexene
- C. benzene

D. 2-methylpentane

Answer: C

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What is B in the above reaction ?

- A. Benzyl chloride
- B. Benzal chloride
- C. Hexachlorobenzene
- D. Benzene hexachloride

Answer: A

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31. n-Octane when heated to 773 K under a pressure of 10-20 atm and in presence of a mixture of  $Cr_2O_3$ ,  $V_2O_5$  and  $Mo_2O_3$  supported over  $Al_2O_3$  as catalyst, gives

- A. o-xylene
- B. m-xylene
- C. p-xylene
- D. all the three

**Answer: D**



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32. Liquid hydrocarbon can be converted to a mixture of gasous hydrocarbon by

- A. hydolysis
- B. oxidation



C. cracking

D. distillation under reduced pressure

**Answer: C**

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**33.** With respect to the conformers of ethane, which of the following statements is true ?

A. Bond angle changes but bond length remains same

B. Both bond angle and bond length change

C. Both bond angle and bond length remain same

D. Bond angle remains same but bond length changes

**Answer: C**

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34. At room temperature, the eclipsed and staggered forms of ethane can not be isolated because

- A. they interconvert rapidly
- B. both the conformers are equally stable
- C. the energy difference between the conformers is large
- D. there is a large energy barrier of rotation about the  $\sigma$ -bond

**Answer: A**



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35. The dihedral angle between two C-H bonds the staggered conformation of ethane is

- A.  $180^\circ$
- B.  $0^\circ$
- C.  $120^\circ$

D.  $60^\circ$

**Answer: D**

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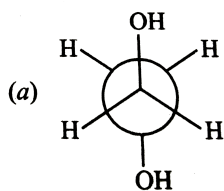
**36.** Increasing order of stability among the three main conformation ( i.e. Eclipse, Anti, Gauche ) of 2-fluoroethanol is :

- A. eclipse, anti, gauche
- B. anti, gauche, eclipse
- C. eclipse, gauche , anti
- D. gauche, eclipse , anti

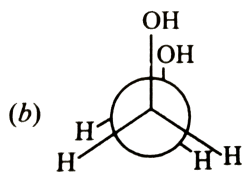
**Answer: A**

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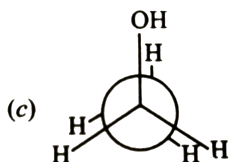
37. Which of the following conformers for ethylene glycol is most stable?



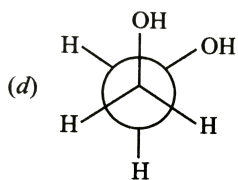
A.



B.



C.



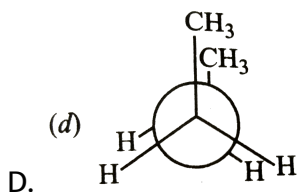
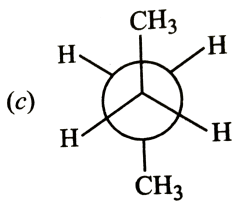
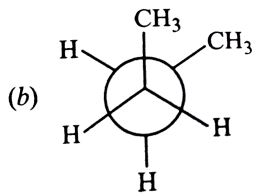
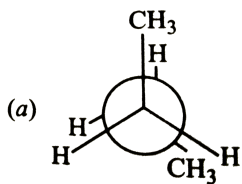
D.

Answer: D



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38. Among the following , the most stable conformation of n-butane is

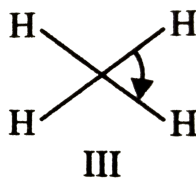
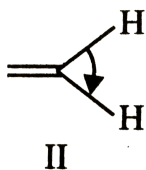
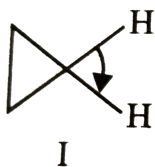


Answer: C



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39. The correct order of decreasing H-C-H angle in the following molecule is



A. I gt II gt III

B. II gt I gt III

C. III gt II gt I

D. I gt III gt II

**Answer: B**

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40. Which of the following compounds will exhibit geometrical isomerism?

- A. 2-Phenyl-1-butene
- B. 1,1-Diphenyl-1-propene
- C. 1-Phenyl-2-butene
- D. 3-Phenyl-1-butene

**Answer: C**

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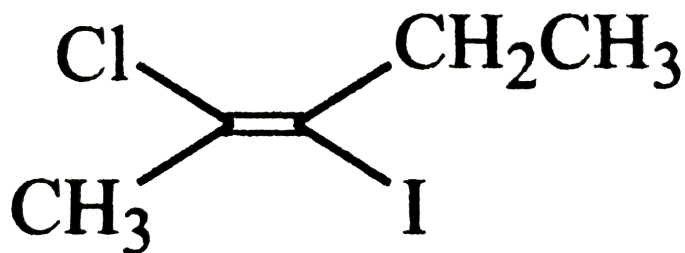
**41. Which of the following exhibits geometrical isomerism ?**

- A. 1,2-Dibromopropene
- B. 2,3-Dimethylbut-2-ene
- C. 2,3-Dibromobut-2-ene
- D. 2-Methylbut-2-ene

**Answer: A**

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42. The IUPAC name of the following compound is



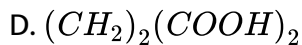
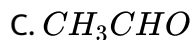
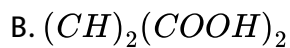
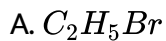
- A. trans-2-chloro-3-iodo-2-pentene
- B. cis-3-iodo-4-chloro-3-pentene
- C. trans-3-iodo-4-chloro-3-pentene
- D. cis-2-chloro-3-iodo-2-pentene

Answer: A

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43. Which of the following compounds exhibits geometrical isomerism ?





**Answer: B**

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**44.** Geometrical isomerism is not possible in

A. 2,4-hexadiene

B. benzaldoxime

C. but-2-ene

D. benzophenone oxime

**Answer: D**

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45. The number of isomers for the compound with molecular formula  $C_2BrClFI$  is

A. 3

B. 4

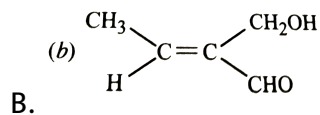
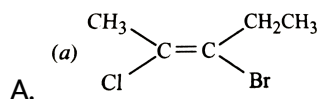
C. 5

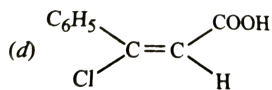
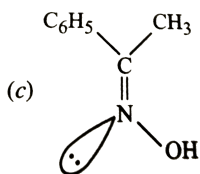
D. 6

Answer: D

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46. The Z-isomer among the following is





**Answer: A**

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47. The major product formed when 2-bromo-2-methylbutane is refluxed with ethanolic KOH is:

- A. 2-methylbut-2-ene
- B. 2-methylbutan-1-ol
- C. 3-methylbutan-2-ol
- D. 2-methylbutan-2-ol

**Answer: A**



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48. Which of the following organohalogen compound when heated with alcoholic KOH does not undergo dehydrohalogenation reaction :

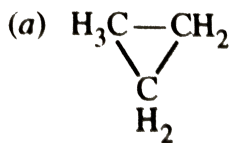
- A. Secondary butyl chloride
- B. Isopropyl chloride
- C. Neopentyl chloride
- D. Isobutyl chloride

**Answer: C**

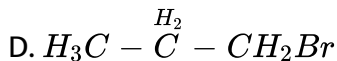
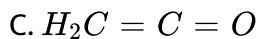
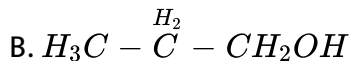


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49. Which of the following compounds shall not produce propene by reaction with HBr followed by elimination reaction ?

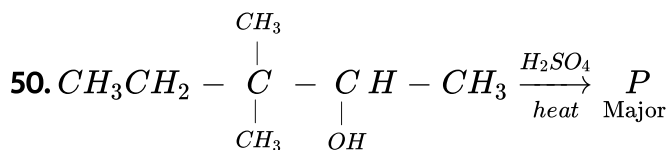


A.

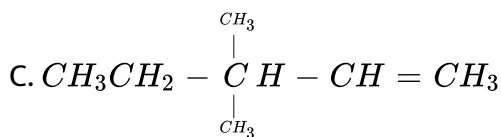
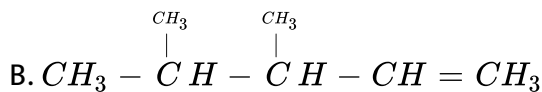
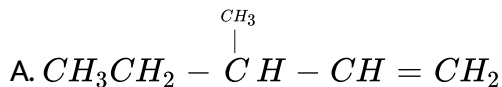


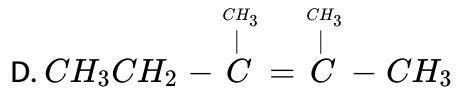
Answer: C

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What is the major product P in the above reactions?

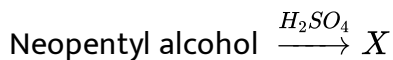




**Answer: D**

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51. In the reaction below,  $X$  is

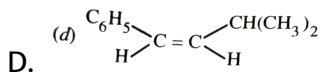
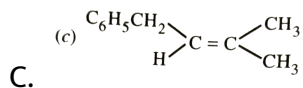
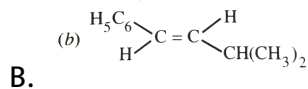
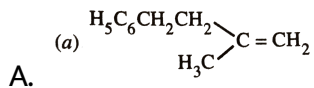


- A. 2-methylpentane
- B. 2-methylpent-2-ene
- C. 2-methylbut-2-ene
- D. neopentane

**Answer: C**

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52. The main product of the following reaction is

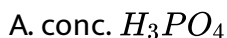


Answer: B



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53. Cyclohexene is best prepared from cyclohexanol by which of the following



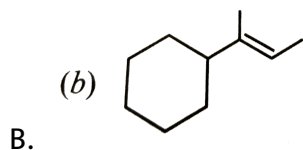
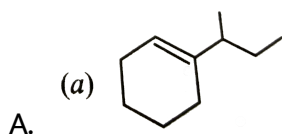
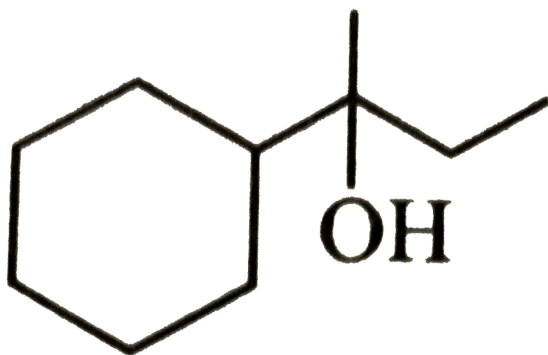
C. conc. HCl

D. conc. HBr

**Answer: A**

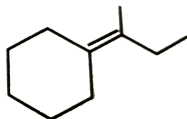
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54. Which of the following is not the product of dehydration of



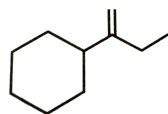


(c)



C.

(d)



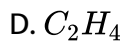
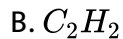
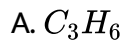
D.

**Answer: A**



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55. The compound that will react most readily with gaseous bromine has the formula



**Answer: A**



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56. 3-Phenylpropene on reaction with  $HBr$  gives (as major product)

- A.  $C_6H_5CH_2CH(Br)CH_3$
- B.  $C_6H_5CH(Br)CH_2CH_3$
- C.  $C_6H_5CH_2CH_2CH_2Br$
- D.  $C_6H_5CH(Br)CH = CH_2$

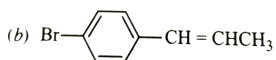
Answer: B



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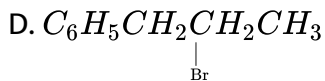
57. The reaction of  $C_6H_5CH = CHCH_3$  with  $HBr$  produces

- A.  $C_6H_5CH_2CH_2CH_2Br$



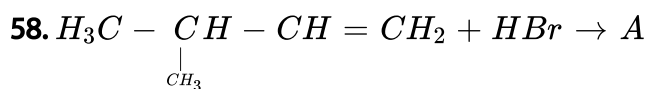
B.

- C.  $C_6H_5\underset{\text{Br}}{\text{C}}HCH_2CH_3$

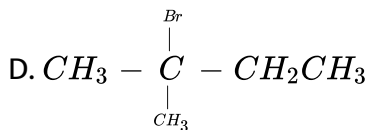
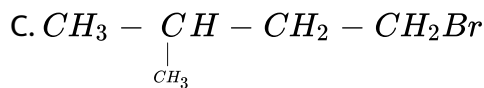
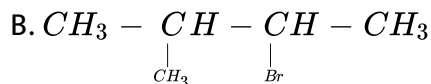
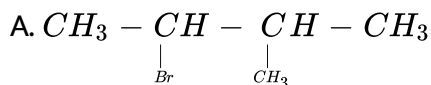


Answer: C

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A (predominantly) is



Answer: D

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59. HBr reacts with  $CH_2 = CH - OCH_3$  under anhydrous conditions at room temperature to give

- A.  $CH_3CHO$  and  $CH_3Br$
- B.  $BrCH_2CHO$  and  $CH_3OH$
- C.  $BrCH_2 - CH_2 - OCH_3$
- D.  $H_3C - CHBr - OCH_3$

Answer: D



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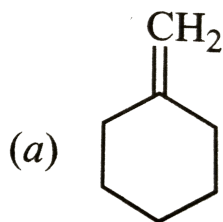
60. The addition of HBr to 2-pentene gives

- A. 2-bromopentane only
- B. 3-bromopentane only
- C. 2-bromopentane and 3-bromopentane
- D. 1-bromopentane and 3-bromopentane

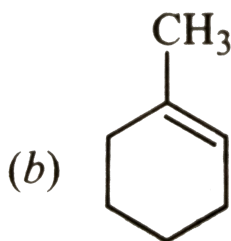
Answer: C

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61. In the reaction with HCl, an alkene reacts in accordance with Markownikoff's rule to give a product 1-chloro-1-methylcyclohexane. The possible alkene is:



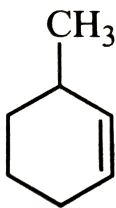
A.



B.

C. (A) and (B)

(b)

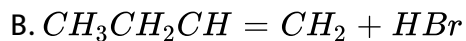
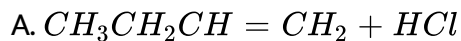


D.

Answer: C

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62. In which of the following can peroxide effect operate ?



Answer: B

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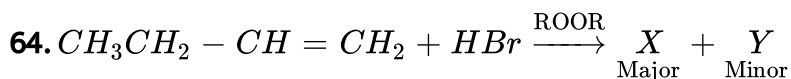
63. The alkene that will give the same product with HBr in the presence as well as in the presence of peroxide is

- A. but-2-ene
- B. but-1-ene
- C. propene
- D. hexane

Answer: A

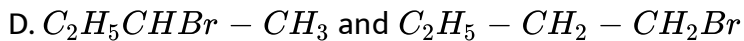


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[X] and [Y] respectively are

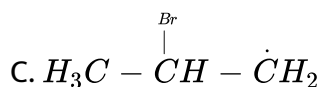
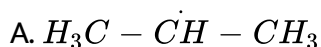
- A.  $BrCH_2CH_2CH = CH_2$  and  $C_2H_5 - CHBr - CH_3$
- B.  $C_2H_5 - CH_2CH_2 - Br$  and  $Br - CH_2CH_2 - CH = CH_2$
- C.  $C_2H_5 - CH_2 - CH_2Br$  and  $C_2H_5 - CHBr - CH_3$



Answer: C

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65. The reaction of propene with HBr in presence of peroxide proceeds through the intermediate:



Answer: B

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66. When 3-phenylpropene reacts with HBr in the presence of peroxide, the major product formula is:

- A. 2-bromo-1-phenylpropane
- B. 1,2-dibromo-3-phenylpropane
- C. 3-(o-bromophenyl)propane
- D. 1-bromo-3-phenylpropane

**Answer: D**



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67. The major product obtained by the addition reaction of HBr to 4-methylpent-1-ene in the presence of peroxide is:

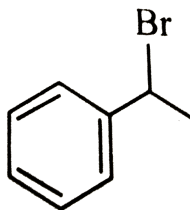
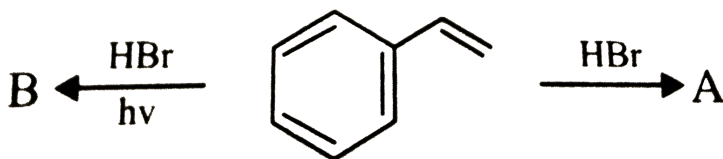
- A. 1-bromo-4-methylpentane
- B. 4-bromo-2-methylpentane
- C. 3-bromo-2-methylpentane

## D. 2-bromo-2-methylpentane

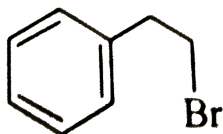
Answer: A

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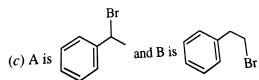
68. Observe the following reactions and predict the nature of A and B



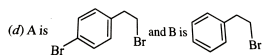
A.



B.



C.



D.

**Answer: C**

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**69.** In presence of peroxide, hydrogen chloride and hydrogen iodide do not give anti-Markovnikov's addition to alkenes because

- A. both are highly ionic
- B. one is oxidising and the other is reducing
- C. one of the steps is endothermic in both the cases
- D. all the steps are exothermic in both reactions

**Answer: C**

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**70.** Acid catalysed hydration of alkene is an example for

- A. free radical substitution
- B. nucleophilic substitution
- C. nucleophilic addition
- D. electrophilic addition

**Answer: D**

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71. 2, 3 – Dimethyl– 2 – butene can be prepared by heating which of the following compounds with a strong acid ?

- A.  $(CH_3)_3C - CH = CH_2$
- B.  $(CH_3)_2C = CH - CH_2CH_3$
- C.  $(CH_3)_2CH - CH_2 - CH = CH_2$
- D.  $(CH_3)_2CH - \underset{\substack{| \\ CH_3}}{CH} - CH = CH_2$

**Answer: A**



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72. Acid catalysed hydration of alkenes except ethene leads to the formation of

- A. primary alcohol
- B. secondary or tertiary alcohols
- C. mixture of primary and secondary alcohols
- D. mixture of secondary and tertiary alcohols

**Answer: B**



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73. 2 – Phenyl propene on acidic hydration gives ,

- A. 2-phenyl-2-propanol
- B. 2-phenyl-1-propanol

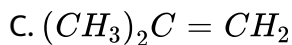
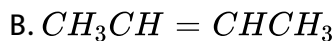
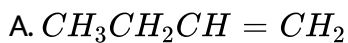
C. 3-phenyl-1-propanol

D. 1-phenyl-2-propanol

**Answer: A**

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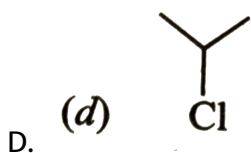
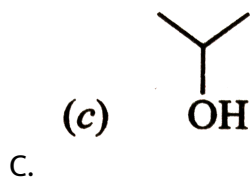
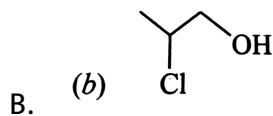
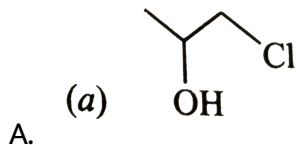
74. Among the alkenes, which one produces tertiary butyl alcohol on acid hydration?



**Answer: C**

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75. Propene on reaction with chlorine water gives



Answer: A



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76. On ozonolysis, one mole of a hydrocarbon produces two molecules of ethanal and one molecule of ethanedial. The hydrocarbon could be

A. 1,3-hexadiene

B. 1,4-cyclohexadiene

C. 1,4-hexadiene

D. 2,4-hexadiene

**Answer: D**

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77. An alkene on reductive ozonolysis gives two molecules of  $CH_2(CHO)_2$ . The alkene is:

A. 2,4-hexadiene

B. 1,3-cyclohexadiene

C. 1,4-cyclohexadiene

D. 1-methyl-1,3-cyclopentadiene

**Answer: C**



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78. Which of the compounds with molecular formula  $C_5H_{10}$  yields acetone on ozonolysis ?

- A. 2-Methyl-1-butene
- B. 2-Methyl-2-butene
- C. 3-Methyl-1-butene
- D. Cyclopentane

**Answer: B**

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79. One mole of alkene on ozonolysis gives of butanone. The alkene is

- A. 3,4-dimethylhex-2-ene
- B. 2,3-dimethylhex-3-ene

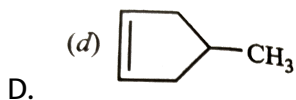
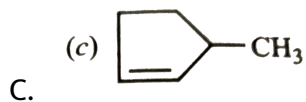
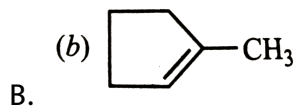
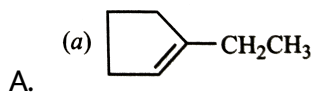
C. 3,4-dimethylhex-3-ene

D. 2,3-dimethylhex-2-ene

**Answer: C**

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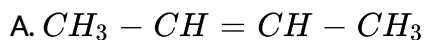
80. 5-oxohexanal is obtained by ozonolysis of:



**Answer: B**

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81. Ozonolysis of an alkene produces only one dicarbonyl compound. The structure of the alkene is



B.



C.



Answer: B



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82. The major products obtained during ozonolysis of 2,3-dimethyl-1-butene and subsequent reductions with Zn and  $H_2O$  are

A. methanoic acid and 2-methyl-2-butanone

B. methanal and 3-methyl-2-butanone

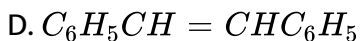
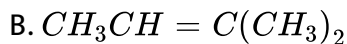
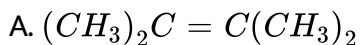
C. methanol and 2,3-dimethyl-3-butanone

D. methanoic acid and 2-methyl-3-butanone

**Answer: B**

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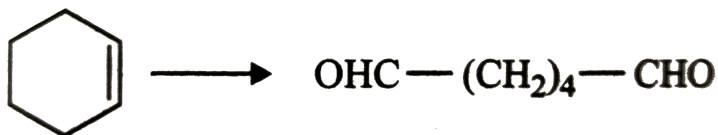
83. Oxidation of an alkene ( $X$ ) gives a diol. Further oxidation gives a diketone. Which one of the following could be  $X$ ?



**Answer: D**

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84. Select the reagent for the following reaction,



A.  $\text{SeO}_2$

B.  $\text{O}_3, \text{Zn} / \text{H}_2\text{O}$

C.  $\text{O}_3, \text{H}_2\text{O}_2 - \text{CH}_3\text{COOH}$

D. PCC

Answer: B

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85. Among the following, the alkene on ozonolysis giving rise to only one aldehyde as the product, is

A. 1-butene

B. propene

C. 2-butene

D. 2-methylprop-1-ene

**Answer: C**

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86. Products of the following reaction  $Me_2C = CHCH_3 \xrightarrow[\text{(ii) } (CH_3)_2S]{\text{(i) } O_3} ?$

Are

A.  $CH_3CHO + CH_3COOH$

B.  $Me_2CO + CH_3CHO$

C.  $Me_2CO + CH_3COOH$

D.  $2Me_2CO$

**Answer: B**



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87. One mole of a symmetrical alkene on ozonolysis gives two moles of an aldehyde having a molecular mass of 44u. The alkene is:

- A. ethene
- B. propene
- C. 1-butene
- D. 2-butene

**Answer: D**



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88. Ozonolysis of an organic compound gives formaldehyde as one of the products. This confirms the presence of

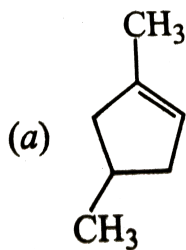
- A. a vinyl group

- B. an isopropyl group
- C. an acetylene triple bond
- D. two ethlenic double bonds

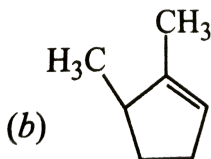
Answer: A

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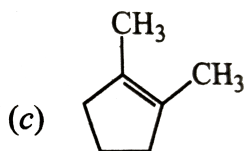
89. Which compound would give 5-keto-2-methylhexanal on ozonolysis ?



A.



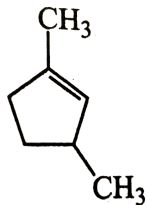
B.



C.



(d)

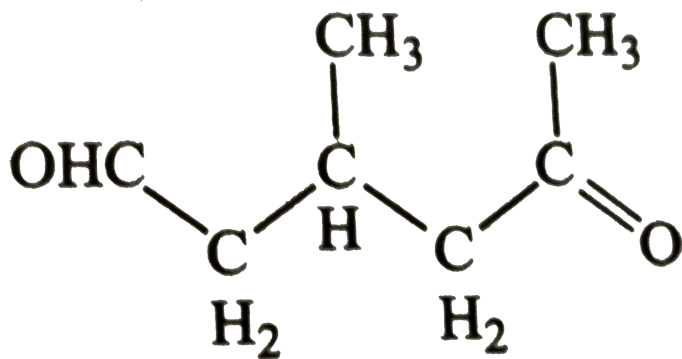


D.

Answer: D

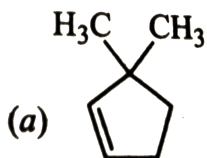
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90. A single compound of the structure.

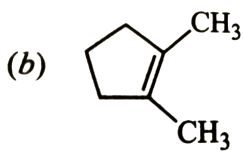


is obtainable

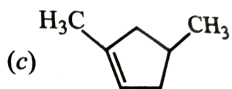
from ozonolysis of which of the following cyclic compounds ?



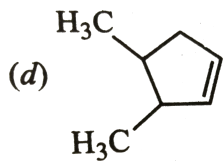
A.



B.



C.



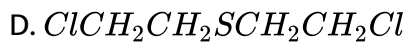
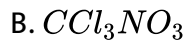
D.

Answer: C



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91. Mustard gas is:



**Answer: D**

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**92.** Which one is incorrect name ?

- A. Propyne
- B. But-2-yne
- C. Pent-3-yne
- D. But-1-yne

**Answer: C**

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**93.** Which of the following is not an isomer of 3-methylbut-1-yne ?

- A. Pent-1-yne

B. Buta-1,3-diene

C. Pent-2-yne

D. Penta-1,3-diene

**Answer: B**

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94. Number of possible alkynes with formula  $C_5H_8$  is

A. 3

B. 5

C. 2

D. 4

**Answer: A**

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95. The major organic compound formed by the reaction of 1,1,1-trichloroethane with silver powder is .

A. 2-butene

B. acetylene

C. ethene

D. 2-butyne

**Answer: D**



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96. The number and type of bonds between two carbon atoms in calcium carbide are

A. one sigma , two pi

B. one sigma, one pi

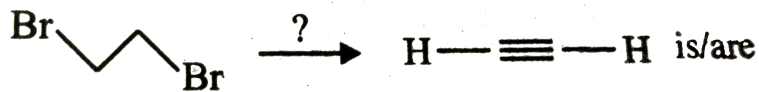
C. two sigma , one pi

D. two sigma, two pi

Answer: A

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97. The reagents for the following conversion

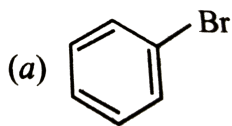


- A. alcoholic KOH
- B. alcoholic KOH followed by  $\text{NaNH}_2$
- C. aqueous KOH followed by  $\text{NaNH}_2$
- D.  $\text{Zn}/\text{CH}_3\text{OH}$

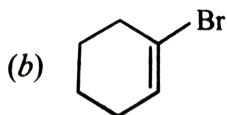
Answer: B

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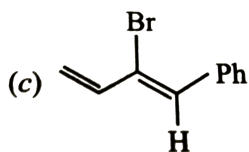
98. Which of the following will most readily give the dehydrohalogenation product ?



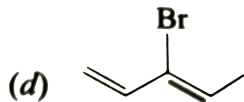
A.



B.



C.



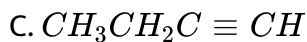
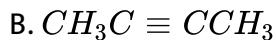
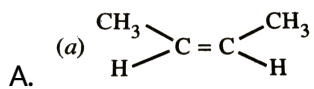
D.

Answer: C



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99. Which of the following hydrocarbons has the lowest dipole moment ?



**Answer: B**

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**100.** The number of structural and configurational isomers of a bromo compound,  $\text{C}_5\text{H}_9\text{Br}$ , formed by the addition of  $\text{HBr}$  to 2-pentyne respectively, is:

A. 1 and 2

B. 2 and 4

C. 4 and 2

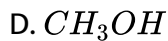
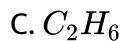
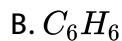
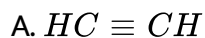
D. 2 and 1



**Answer: B**

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**101.** Among the following compounds, the strongest acid is :



**Answer: D**

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**102.** Which of these will not react with acetylene?



B. ammoniacal  $AgNO_3$

C. Na

D. HCl

**Answer: A**

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103. Base strength of  $H_3C - \overset{\theta}{C}H_3$ ,  $H_2C = \overset{\theta}{C}H$  and  $H - C \equiv C^{\theta}$  is in

the order of

A. (i) > (iii) > (ii)

B. (i) > (ii) > (iii)

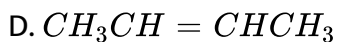
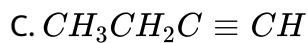
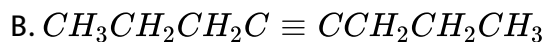
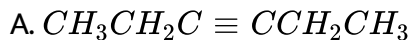
C. (ii) > (i) > (iii)

D. (iii) > (ii) > (i)

**Answer: B**

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104. The hydrocarbon which can react with sodium in liquid ammonia is

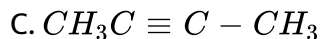
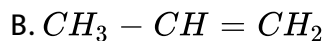


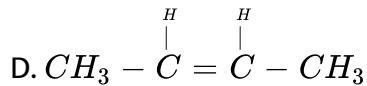
Answer: C



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105. The treatment of  $CH_3MgX$  with  $CH_3C \equiv C - H$  produces :

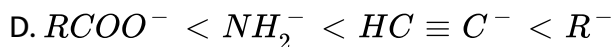
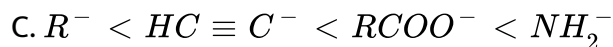
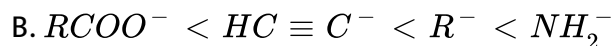
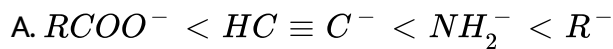




Answer: A

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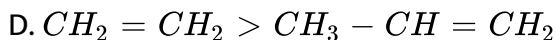
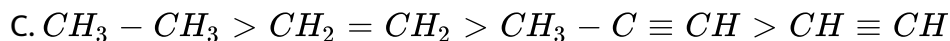
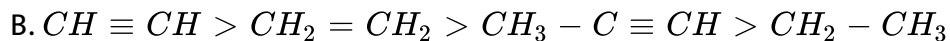
106. The correct order of increasing basicity of the given conjugate bases ( $R = CH_3$ ) is



Answer: A

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107. Which one is the correct order of acidity ?

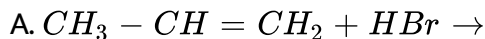


Answer: A



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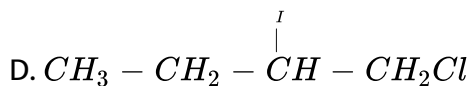
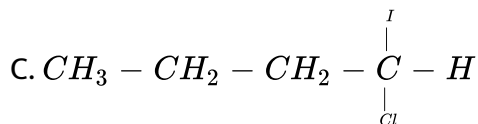
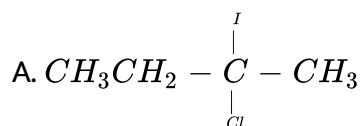
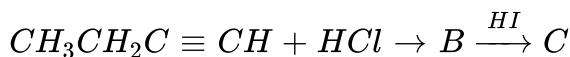
108. Which of the following reactions will yield 2,2-dibromopropane



Answer: B

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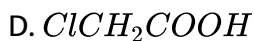
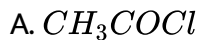
109. Predict the product C obtained in the following reaction of butyne-1.



Answer: A

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110. What is the product formed when acetylene reacts with hypochlorous acid.

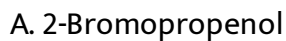


Answer: C



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111. What would be the expected product of the reaction of propyne with  $Br_2/H_2O$  if the mechanism of this reaction is analogous to that of propene?



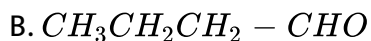
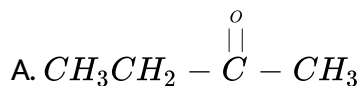
C. 2-Bromo-2-propanol

D. Bromoprophenol

**Answer: B**

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112. The product(s) obtained via oxymercuration ( $HgSO_4 + H_2SO_4$ ) of 1-butyne would be:

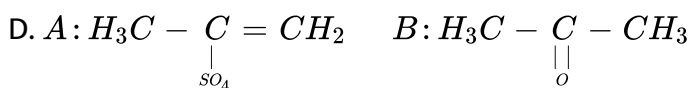
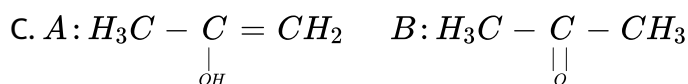
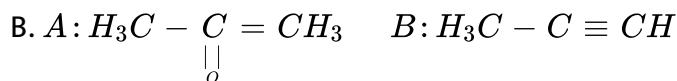
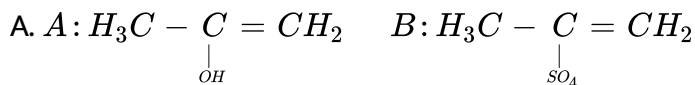
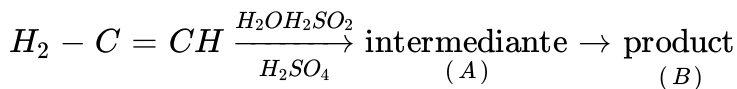


**Answer: A**

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113. Predict the correct intermediate and product in the following reaction.



Answer: C

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114. Which 2-butyne is treated with dil.  $H_2SO_4/HgSO_4$  (4), the product formed is

A. butanol-1

B. butanol-2

C. 2-butanone

D. butanal

**Answer: C**

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115. Identify the product in the reaction  $PhC \equiv CMe \xrightarrow{H_3O^+, Hg^{2+}, ?}$

A.  $PhCH_2CH_2CHO$

B.  $PhCOCH_2CH_3$

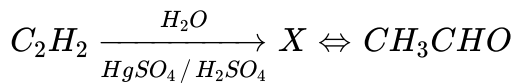
C.  $PhCH_2COCH_3$

D.  $PhCOCOMe$

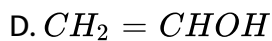
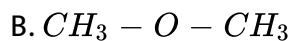
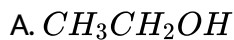
**Answer: B**

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116. In the following reaction :



What is X ?

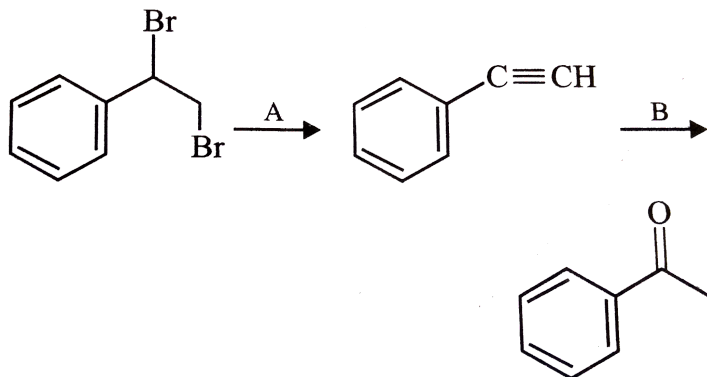


Answer: D



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117. Identify the reagents in the following transformations :



A. Alc. KOH and  $\text{H}_2\text{O}$ ,  $\text{HgSO}_4$ ,  $\text{H}_2\text{SO}_4$

B. Alc. KOH and  $\text{KMnO}_4 / \text{H}^+$

C.  $\text{NaNH}_2$  and  $\text{H}_2\text{O}$ ,  $\text{HgSO}_4$ ,  $\text{H}_2\text{SO}_4$

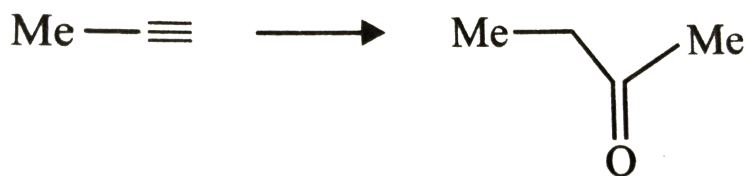
D.  $\text{NaNH}_2$  and  $\text{KMnO}_4 / \text{H}^+$

**Answer: C**



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118. The reagents to carry out the following conversion are



A.  $\text{HgSO}_4$ , dil.  $\text{H}_2\text{SO}_4$

B.  $\text{BH}_3$ ,  $\text{H}_2\text{O}_2$  /  $\text{NaOH}$

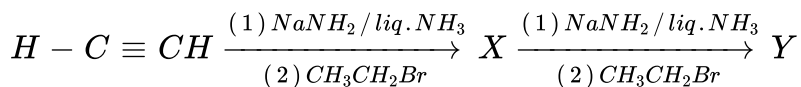
C.  $\text{OsO}_4$ ,  $\text{HIO}_4$

D.  $\text{NaNH}_2$  /  $\text{CH}_3\text{I}$ ,  $\text{HgSO}_4$  / dil.  $\text{H}_2\text{SO}_4$

Answer: D

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119. In the reaction



X and Y are

A. X=2-butyne, Y=2-hexyne

B. X=1-butyne, Y=2-hexyne

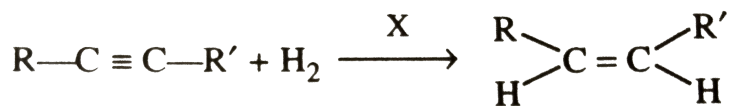
C. X=1-butyne, Y=3-hexyne

D. X=2-butyne, Y=3-hexyne

Answer: C

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120. The reagent 'X' used for the following reaction is



A. Ni

B. Pd/C

C.  $\text{LiAlH}_4$

D.  $\text{Na} / \text{liquid NH}_3$

**Answer: B**

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**121.** The trans-alkenes are formed by the reduction of alkynes with

A.  $H_2, Pd/C, BaSO_4$

B.  $NaBH_4$

C.  $Na/liq. NH_3$

D.  $Sn/HCl$

**Answer: C**

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**122.** 2 – Hexyne gives trans – 2 – hexene on treatment with :

A.  $Li/NH_3$

B.  $Pd / BaSO_4$

C.  $LiAlH_4$

D.  $Pt / H_2$

**Answer: A**

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**123.** The isomerism of 2-butyne to 1-butyne can be achieved by treatment with:

A. hydrochloric acid

B. ammoniacal silver nitrate

C. ammoniacal cuprous chloride

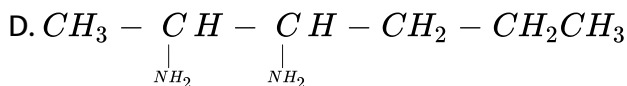
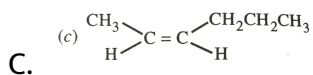
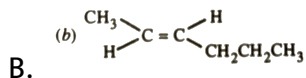
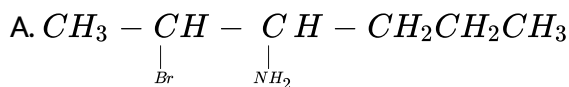
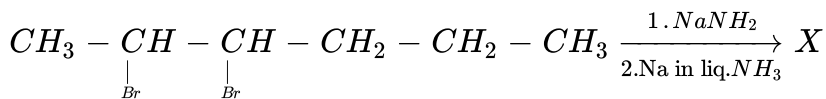
D. ethanolic potassium hydroxide

**Answer: D**

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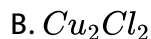
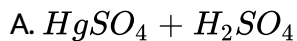
124. Identify X in the following sequence of reactions :

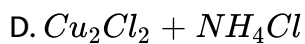
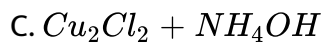


Answer: B

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125. Catalyst used in dimerisation of acetylene to prepare chloroprene is

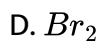
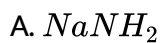




**Answer: D**

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**126.** Which of the following reagents will be able to distinguish between 1 – butyne and 2 – butyne ?



**Answer: A**

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127. Propyne and propene can be distinguished by :

A. conc.  $H_2SO_4$

B.  $Br_2$  in  $CCl_4$

C. alk.  $KMnO_4$

D.  $AgNO_3$  in  $NH_3$

Answer: D



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128. Ethylene can be separated from acetylene by passing the mixture through

A. fuming  $H_2SO_4$

B. pyrogallol

C. ammoniacal  $Cu_2Cl_2$

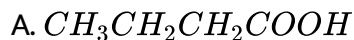
D. charcoal powder

Answer: C



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129. 1-Butyne reacts with cold alkaline  $KMnO_4$  to produce

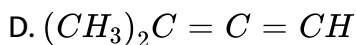
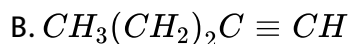


Answer: C



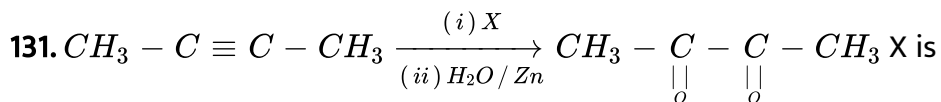
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130. A compound X ( $C_5H_8$ ) reacts with ammoniacal  $AgNO_3$  to give a white precipitate, and on oxidation with hot alkaline  $KMnO_4$  gives the acid,  $(CH_3)_2CHCOOH$ . Therefore, X is



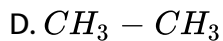
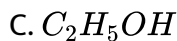
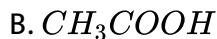
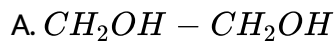
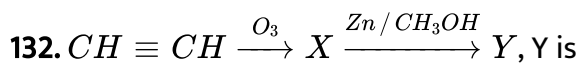
Answer: C

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Answer: C

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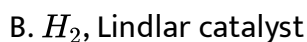


Answer: A



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133. Identify a reagent from the following list which can easily distinguish between 1-butyne and 2-butyne.



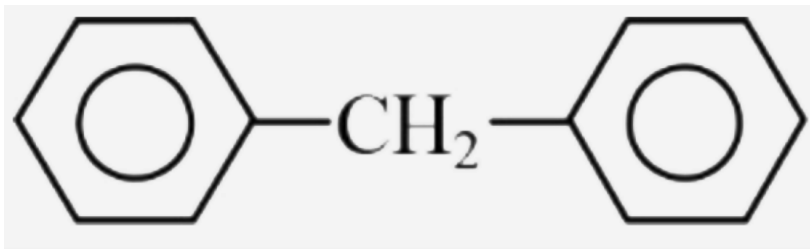
C. dilute  $H_2SO_4$ ,  $HgSO_4$

D. ammoniacal  $Cu_2Cl_2$  solution

**Answer: D**

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134. The molecular formula of diphenylmethane ,



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

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

A. 4

B. 8

C. 7

D. 18

**Answer: A**



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**135.** The hydrocarbon which does not decolourise alkaline  $KMnO_4$  solution and also does not give any precipitate with ammoniacal silver nitrate is

- A. benzene
- B. acetylene
- C. propyne
- D. butyne-1

**Answer: A**



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**136.** The correct statement is :



- A. cyclohexadiene and cyclohexane cannot be isolated with ease during controlled hydrogenation of benzene
- B. one mole each of benzene and hydrogen when reacted gives  $1/3$  mole of cyclohexane and  $2/3$  mole of unreacted hydrogen
- C. hydrogenation of benzene to cyclohexane is an endothermic process
- D. it is easier to hydrogenate benzene when compared to cyclohexene.

**Answer: A**

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**137.** Which one of the following is an aromatic compound ?

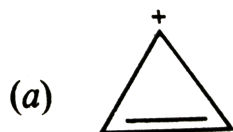
- A. Cyclopentadienyl cation
- B. Cycloheptatrienyl cation
- C. Cycloheptatrienyl anion

D. Cycloheptatriene

Answer: B

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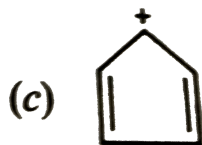
138. Which of the following compounds is not aromatic ?



A.

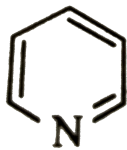


B.



C.

(d)



D.

Answer: C



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139. From the following compounds choose the one which is not aromatic

?

(a)



A.

(b)



B.

(c)



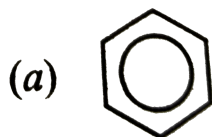
C.



Answer: B

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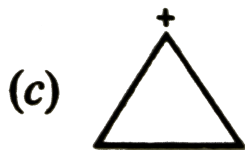
140. The chemical system that is non — aromatic is



A.



B.



C.



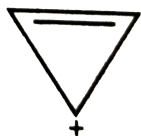
D.

Answer: C

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141. Among the following the aromatic compound is

(a)



A.

(b)



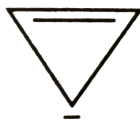
B.

(c)



C.

(d)

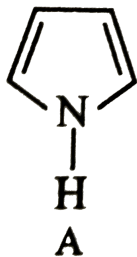


D.

Answer: A

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142. Which of the following compounds are aromatic ?



A. A,B

B. A,B,C

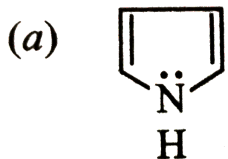
C. B,C

D. B,C,D

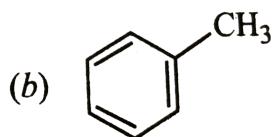
Answer: A

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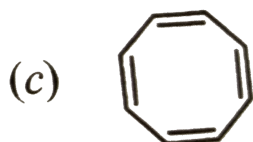
143. Which is a non-aromatic compound



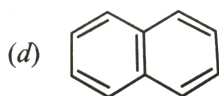
A.



B.



C.

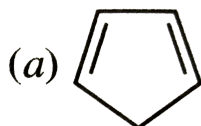


D.

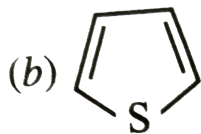
**Answer: C**

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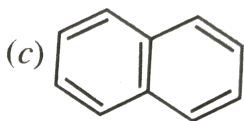
**144.** The non aromatic compound among the following is -



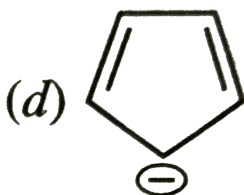
A.



B.



C.

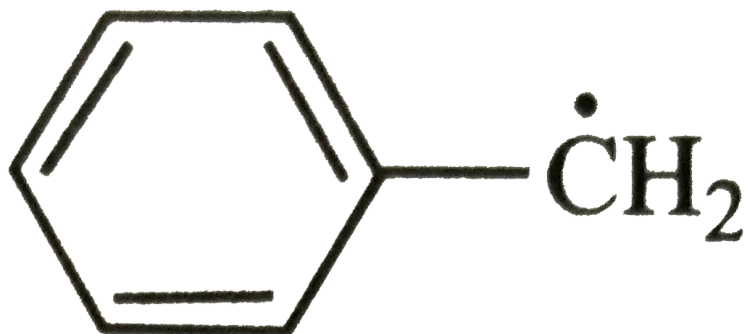


D.

Answer: A

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145. The radical is aromatic



is aromatic



because it has

- A. 7 p-orbitals and seven unpaired electrons
- B. 6 p-orbitals and 7 unpaired electrons
- C. 6 p-orbitals and 6 unpaired electrons
- D. 7 p-orbitals and 7 unpaired electrons

**Answer: C**



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**146.** Which of the following is not aromatic

- A. Cyclopentadienyl anion
- B. Cycloheptatrienyl cation
- C. Cyclooctatetraene
- D. Thiophene

**Answer: C**



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147. Cycloheptatrienyl cation is :

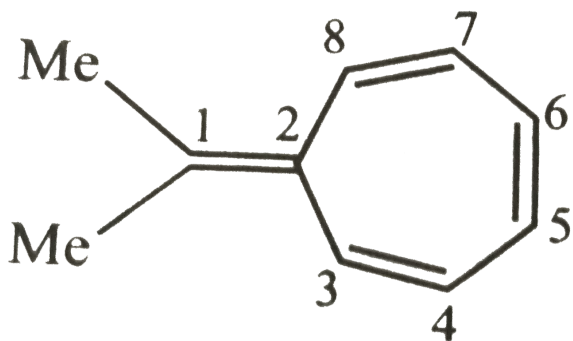
- A. non-benzenoid and non-aromatic
- B. non-benzenoid and aromatic
- C. benzenoid and non-aromatic
- D. non-benzenoid and antiaromatic

**Answer: B**



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148. The most likely protonation site in the following molecule is



A. C-1

B. C-2

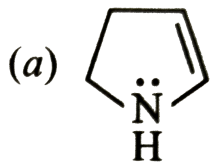
C. C-3

D. C-6

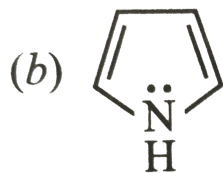
**Answer: A**

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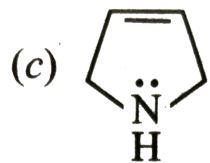
149. Which one of the following is an aromatic compound ?



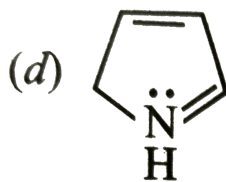
A.



B.



C.



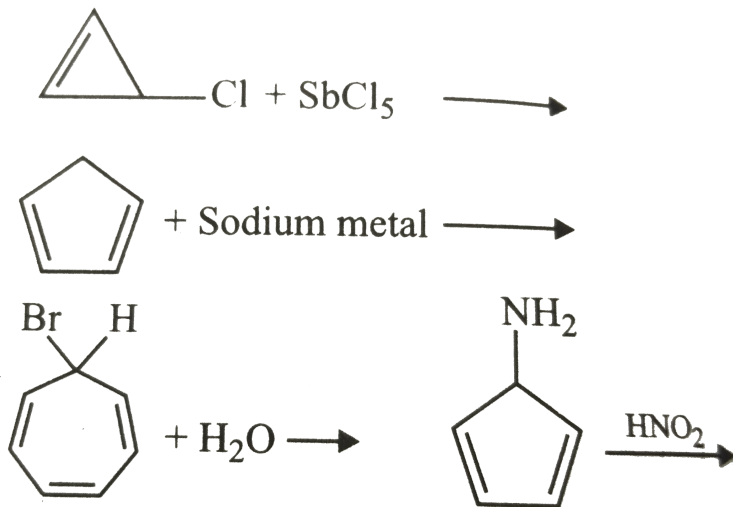
D.

**Answer: B**



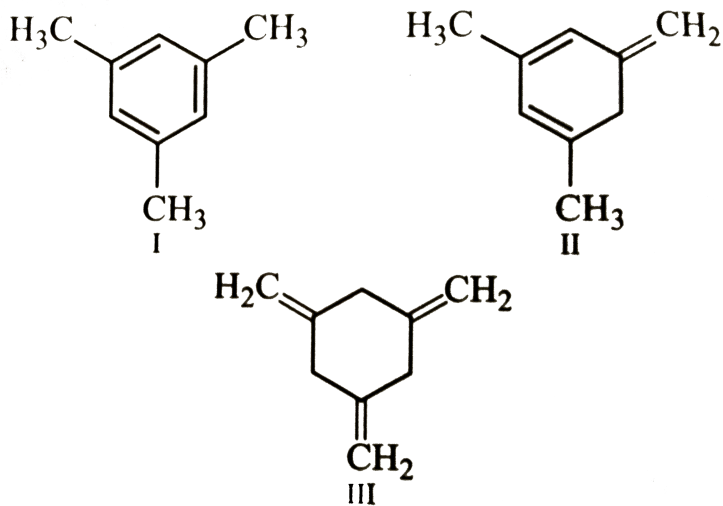
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150. The total number of aromatic species genetic the following reactions is



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151. Given :



The enthalpy of hydrogenation of these compounds will be in the order is

A. II gt III gt I

B. II gt I gt III

C. I gt II gt III

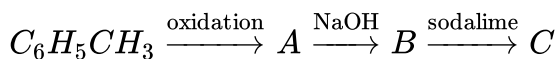
D. III gt II gt I

**Answer: D**



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**152.** In reaction

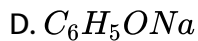


Then C is

A.  $C_6H_5OH$

B.  $C_6H_6$

C.  $C_6H_5COONa$



**Answer: B**

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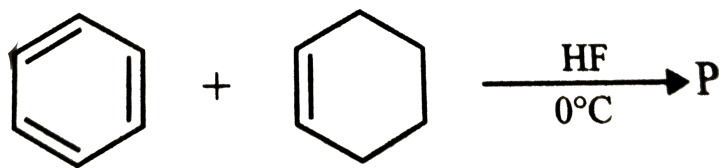
**153.** What is the electrophile when  $RCl + AlCl_3$  are used in Friedel-Crafts reaction ?



**Answer: C**

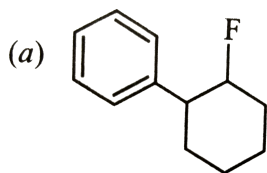
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154. In the given reaction,

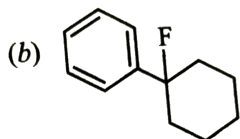


the product P

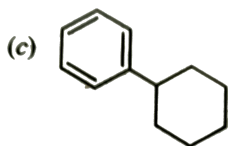
is



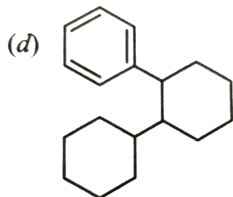
A.



B.



C.



D.



**Answer: C**

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**155.** The treatment of benzene with isobutene in the presence of sulphuric acid gives

- A. isobutylbenzene
- B. tert-butylbenzene
- C. n-butylbenzene
- D. no reaction

**Answer: B**

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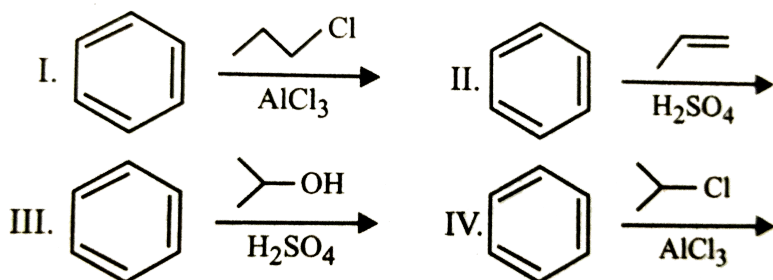
**156.** When Friedel-Crafts alkylation of benzene is carried out with n-propyl bromide, the major product is

- A. n-propylbenzene
- B. isopropylbenzene
- C. 2-ethylbenzene
- D. none of the above

Answer: B

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157. Which of the following reactions would give isopropylbenzene as the major product ?



- A. I and IV only
- B. II and III only

C. II, III , IV only

D. All of the above

**Answer: D**

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**158.** Conversion of benzene to acetophenone can be brought by :

A. Wurtz reaction

B. Wurtz-Fitting reaction

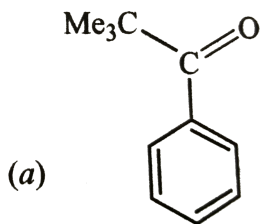
C. Friedel-Crafts alkylation

D. Friedel-Crafts acylation

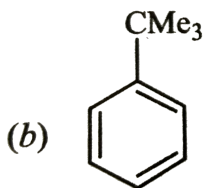
**Answer: D**

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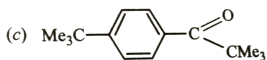
159. Reaction of benzene with  $Me_3COCl$  in the presence of anhydrous  $AlCl_3$  gives



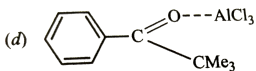
A.



B.



C.



D.

Answer: B

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160. Which of the following compounds will not undergo Friedel – Crafts reaction easily ?

- A. Nitrobenzene
- B. Toluene
- C. Cumene
- D. Xylene

**Answer: A**



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161. The electrophile that participates in nitration of benzene is

- A.  $NO^+$
- B.  $NO_2^+$
- C. NO
- D.  $NO_3^-$

**Answer: B**



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**162.** Nitrobenzenen can be prepared from benzene by using a mixture of conc  $HNO_3$  and conc.  $H_2SO_4$  in the nitrating mixture. Nitric acid acts as

a

A. base

B. acid

C. reducing agent

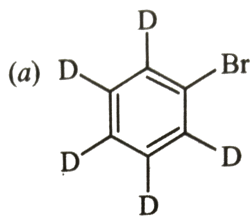
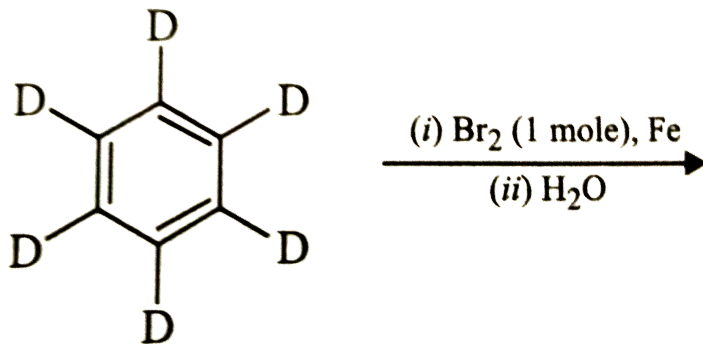
D. catalyst

**Answer: A**

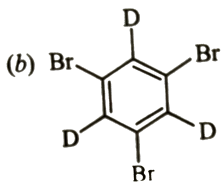


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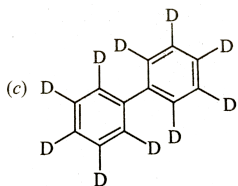
163. The major product(s) obtained from the following reaction of 1 mole of hexadeuteriobenzene is/are



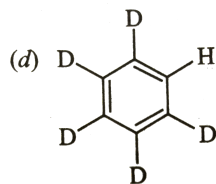
A.



B.



C.



D.

**Answer: A**

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**164.** Benzene reacts with  $I_2$  in presence of which of the following to give iodobenzene

A.  $HNO_3$

B. HI

C.  $SO_2$

D.  $H_2O$

**Answer: A**

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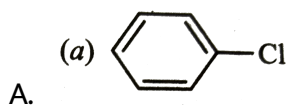
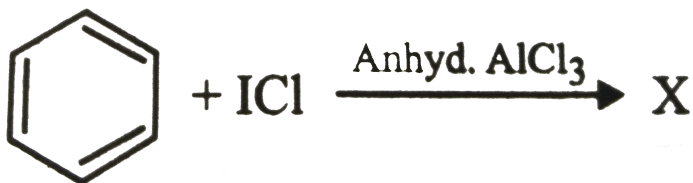
165. Aromatic electrophilic substitution reaction that is reversible is

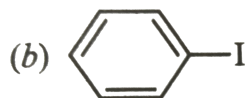
- A. nitration
- B. chlorination
- C. sulphonation
- D. alkylation

Answer: C

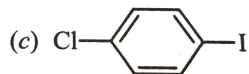
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166. The compound X in the reaction

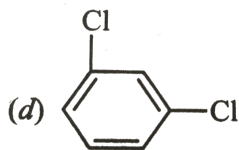




B.



C.



D.

**Answer: B**



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167. Which of the following undergoes nitration most easily?

A. Acetophenone

B. Benzonitrile

C. Benzaldehyde

D. benzene

**Answer: D**



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**168.** Among the following compounds the one that is most reactive towards electrophilic nitration is

- A. benzoic acid
- B. nitrobenzene
- C. toluene
- D. benzene

**Answer: C**



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**169.** Which of the following has the highest point ?

- A. o-xylene
- B. m-xylene

C. p-xylene

D. Toluene

**Answer: C**

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**170.** Chlorobenzene on treatment with sodium in dry ether gives diphenyl.

The name of the reaction is

A. Fittig reaction

B. Wurtz-Fitting reaction

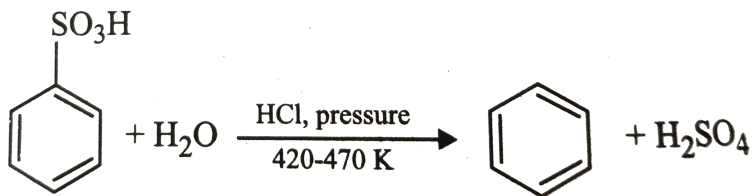
C. Sandmeyer reaction

D. Gatterman reaction

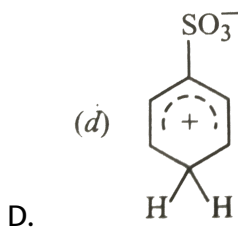
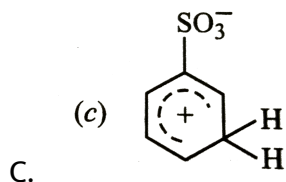
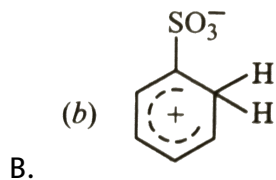
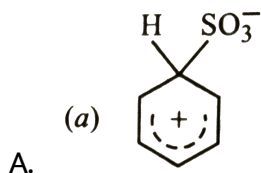
**Answer: A**

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171. The following desulphonation reaction,

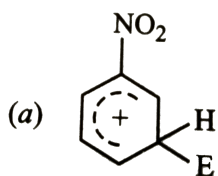


takes place through intermediate formation of

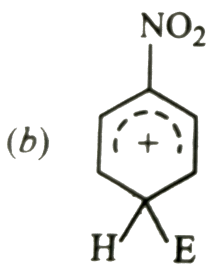


Answer: A

172. The electrophile,  $E^{\oplus}$  attacks the benzene ring to generate the intermediate  $\sigma$ -complex. Of the following, which  $\sigma$ -complex is of lowest energy?



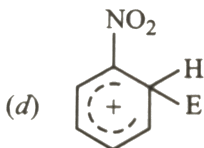
A.



B.



C.



D.

Answer: C



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173. 1, 4-Dimethyl benzene on heating with anhydrous  $AlCl_3$  and  $HCl$  produces :

- A. 1,2-dimethylbenzene
- B. 1,3-dimethylbenzene
- C. 1,2,3-trimethylbenzene
- D. ethylbenzene

**Answer: B**



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174. The reaction of toluene with  $Cl_2$  in presence of  $FeCl_3$  gives predominantly :

- A. Benzyl chloride

B. o- and p-chlorotoluene

C. m-chlorotoluene

D. benzoyl chloride

**Answer: B**

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175. Toluene react with a halogen in the presence of iron (III) chloride giving ortho and para halo compounds. The reactions is

A. free radical addition reaction

B. electrophilic elimination reaction

C. nucleophilic substitution reaction

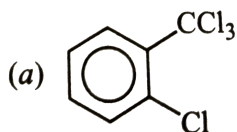
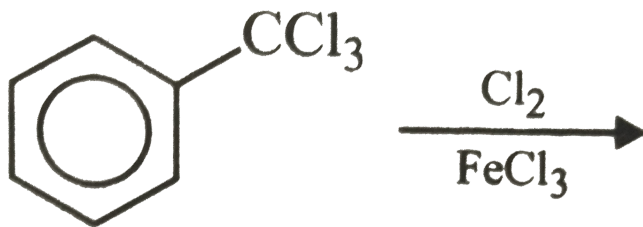
D. electrophilic substitution reaction

**Answer: D**

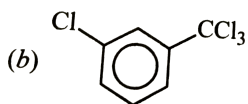
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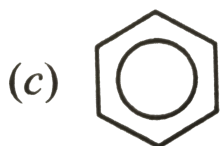
176. Find the major product in the following reaction



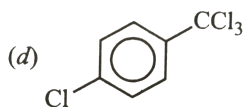
A.



B.



C.



D.

Answer: B



177. Presence of a nitro group in a benzene ring.

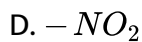
- A. deactivates the ring towards electrophilic substitution
- B. activates the ring towards electrophilic substitution
- C. renders the ring basic
- D. deactivates the ring towards nucleophilic substitution

**Answer: A**

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178. Which of the following substituents deactivates the benzene ring towards electrophilic substitution?

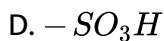
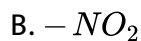
- A.  $-CHO$
- B.  $-NR_2$



**Answer: B**

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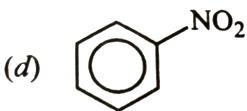
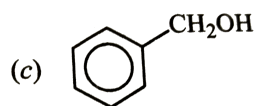
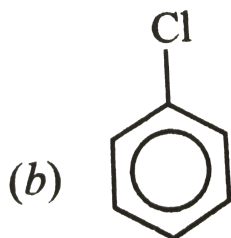
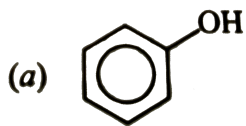
**179.** Some meta-directing substituents in aromatic substitution are given which one is the most deactivating?



**Answer: B**

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180. Which one of the following is most reactive towards electrophilic attack?



Answer: A

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181. The compound with molecular formula  $C_8H_{10}$  which will give only two isomers on electrophilic substitution with  $Cl_2/FeCl_3$  or with  $HNO_3/H_2SO_4$  is

A. p-dimethylbenzene

B. m-dimethylbenzene

C. o-dimethylbenzene

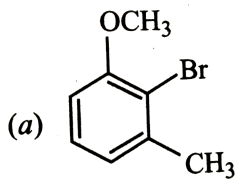
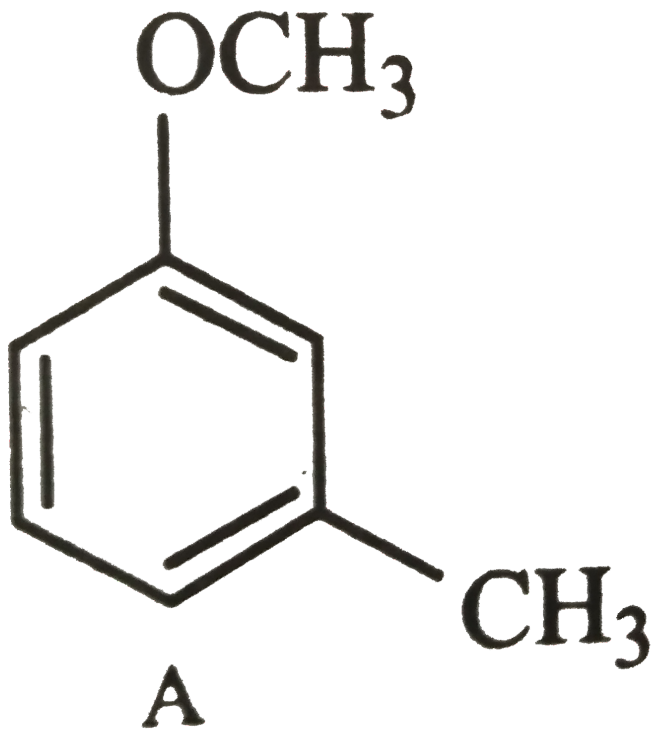
D. ethylbenzene

Answer: C

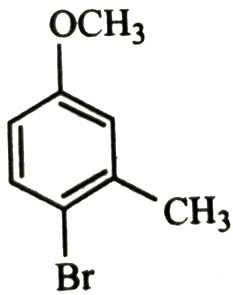


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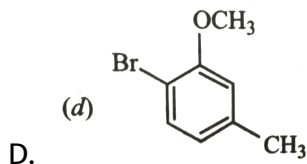
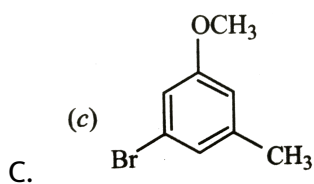
182. The major product obtained on monobromination ( $Br_2/FeBr_2$ ) of the following compound A is



A.



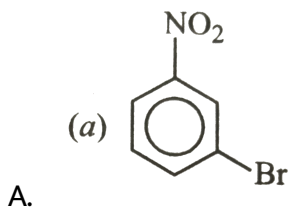
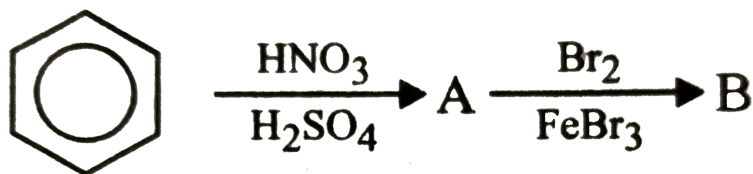
B.

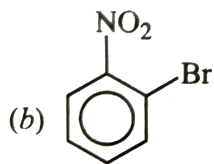


Answer: B

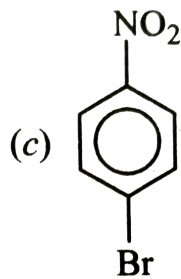
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183. Match the following columns

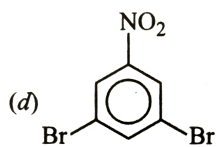




B.



C.



D.

**Answer: A**

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**184.** Among the following compounds, the decreasing order of reactivity towards electrophilic substitution is





A. III gt I gt II gt IV

B. IV gt I gt II gt III

C. I gt II gt III gt IV

D. II gt I gt III gt IV

**Answer: A**



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**185.** The order of decreasing reactivity towards an electrophilic reagent for the following,

(i). Benzene

(ii). Toluene.

(iii). Chlorobenzoic acid.

(iv). Phenol. Would.

A. (iv) gt (ii) gt (i) gt (iii)

B. (i) gt (ii) gt (iii) gt (iv)

C. (ii) gt (iv) gt (i) gt (iii)

D. (iv) gt (iii) gt (ii) gt (i)

**Answer: A**



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**186.** Which of the following is most reactive towards electrophilic substitution reaction ?

A. Aniline

B. nitrobenzene

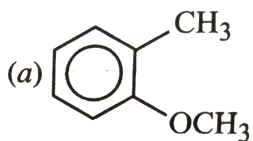
C. Benzoic acid

D. Acetanilide

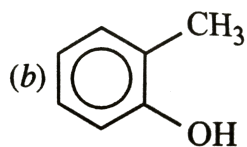
Answer: A

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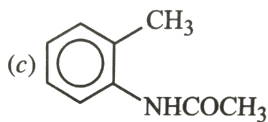
187. Which one of the following is most reactive towards electrophilic reagent ?



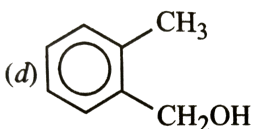
A.



B.



C.

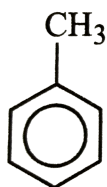


D.

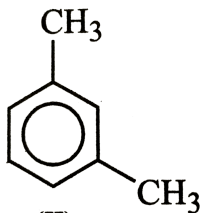
Answer: B

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188. The ease of nitration of the following three hydrocarbons follows the order



(I)



(II)



(III)

A.  $\text{II} = \text{III} = \text{I}$

B.  $\text{II} > \text{III} > \text{I}$

C.  $\text{III} > \text{II} > \text{I}$

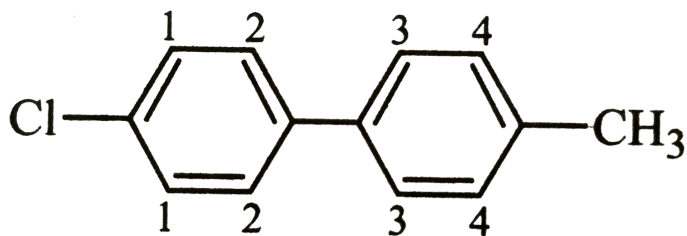
D.  $\text{I} \equiv \text{III} > \text{II}$

Answer: B

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189. Electrophilic substitution of compound A will be fastest at position

.....



A. 1

B. 2

C. 3

D. 4

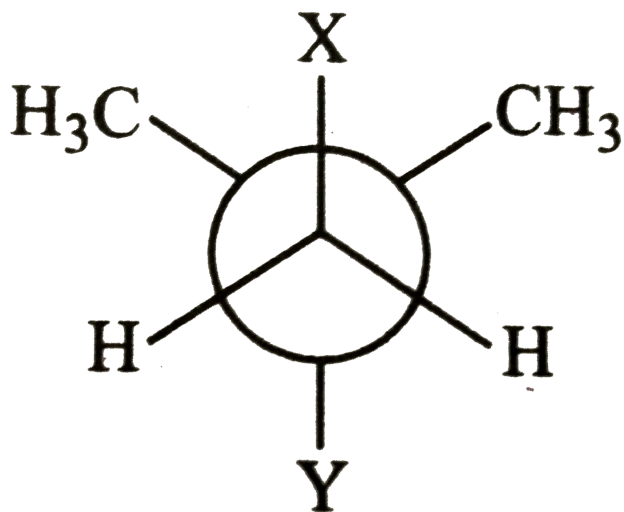
**Answer: D**



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Competition Focus (JEE(main and advanced)/Medical Entrance) II. MULTIPLE CHOICE

1. In the Newman projection for 2,2-dimethylbutane



X and Y can respectively be

- A. H and H
- B. H and  $C_2H_5$
- C.  $C_2H_5$  and H
- D.  $CH_3$  and  $CH_3$

**Answer: B::D**



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2. Which of the following compounds have finite dipole moments ?

A. trans-2-Pentene

B. cis-2-Pentene

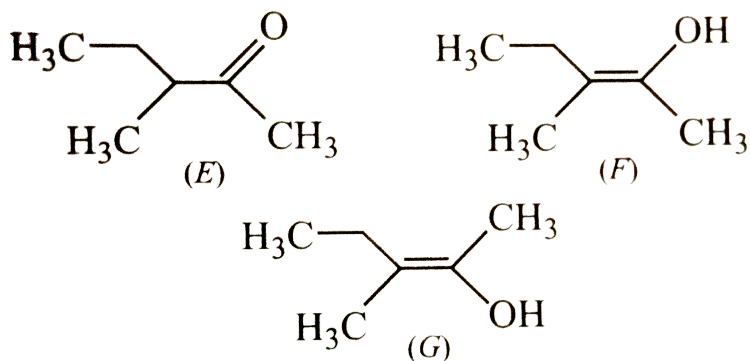
C. 1-Butyne

D. 2-Butyne

Answer: A::B::C

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3. The correct statement concerning the structures E,F and G is(are )



A. E,F and G are resonance structures

B. E, F and E, G are tautomers

C. F and G are geometrical isomers

D. F and G are diastereomers

**Answer: B::C::D**

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4. Which of the following alkenes on treatment with HBr in presence or absence of peroxide give the same product ?

A. Cyclohexene

B. But-2-ene

C. Hex-3-ene

D. Ethene

**Answer: A::B::C::D**

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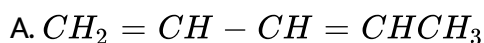
5. Dehydration of which one of the following alcohols produces an alkene exhibiting cis-trans isomerism ?

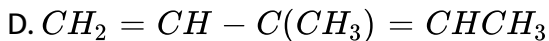
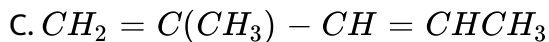
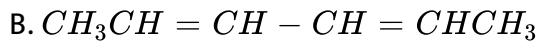
- A. Isopropyl alcohol
- B. Tertiary butyl alcohol
- C. Secondary butyl alcohol
- D. 3-Pentanol

**Answer: C**

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6. An unsaturated hydrocarbon on ozonolysis gives one mole each of methanal, ethanal and 2-ketopropanal. The structure of the hydrocarbon is

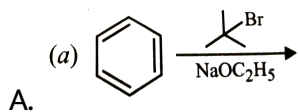




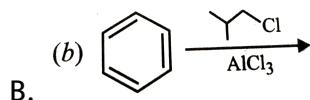
Answer: C::D

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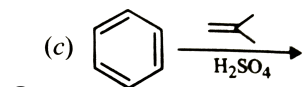
7. Among the following reactions (s), which gives (give) tert-butyl benzene as the major product?



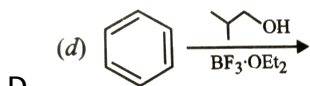
A.



B.



C.

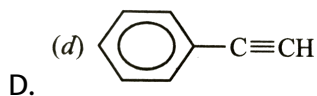
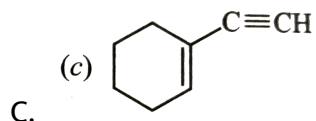
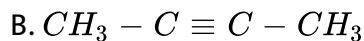
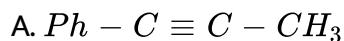


D.

Answer: B::C::D

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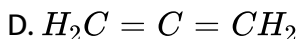
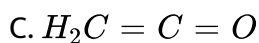
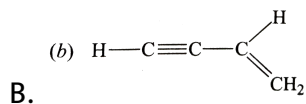
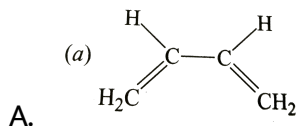
8. Which of the following on treatment with warm dil.  $H_2SO_4$  in presence of  $HgSO_4$  will give a methyl ketone.



Answer: B::C::D

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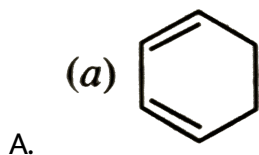
9. Amongst the given option, the compound(s) in which all the atoms are in one plane in all the possible conformations (if any), is/are



Answer: B::C

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10. Which of the following molecules, in pure form, is /are stable at room temperature?

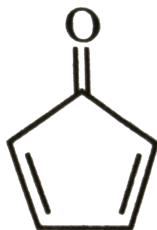


(b)



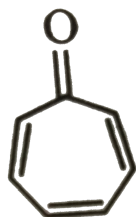
B.

(c)



C.

(d)



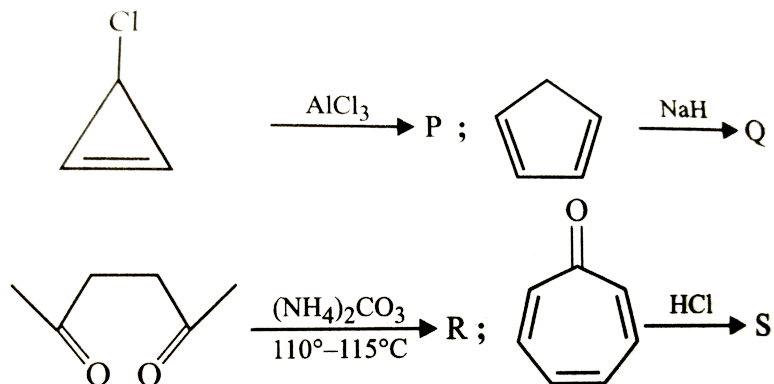
D.

Answer: B::C



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11. Among P,Q,R and S, the aromatic compound is (are )



A. P

B. Q

C. R

D. Sn/HCl

Answer: A::B::C::D



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12. Which of the following compounds on decarboxylation with soda-lime will give toluene ?

- A. Phenylacetic acid
- B. o-Toluic acid
- C. m-Toluic acid
- D. p-Toluic acid

**Answer: A::B::C::D**



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13. Which of the following undergoes electrophilic substitution reactions faster than benzene?

- A. Phenol
- B. Aniline
- C. toluene

D. Chlorobenzene

**Answer: A::B::C**

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**14.** Which of the following on reductive ozonolysis will give only glyoxal?

A. ethene

B. Benzene

C. toluene

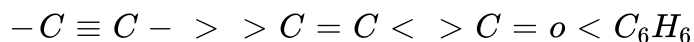
D. Ethyne

**Answer: B::D**

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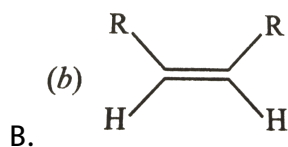
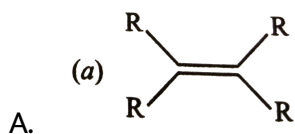


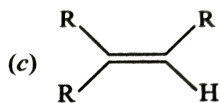
1. Catalytic hydrogenation involves addition of hydrogen to a  $C=C$  or  $C\equiv C$  bond in presence of a metal catalyst such as Ni, Pt, Pd, etc. These are called heterogeneous catalysts. Both  $H_2$  and alkene/alkyne get adsorbed on the surface of the metal, and syn-addition of hydrogen atoms takes place. The relative rates of hydrogenation follows the order:



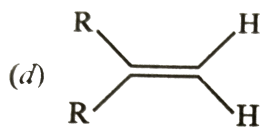
If sodium or lithium in liquid ammonia is used, anti-addition of H-atoms occurs across  $C\equiv C$  bond. These reducing agents can also be used to reduce double bonds of benzene rings and conjugated dienes but not of isolated dienes.

Which of the following alkenes will react most readily with  $H_2$  under catalytic hydrogenation conditions ?





C.

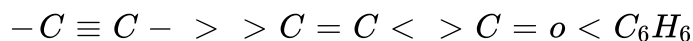


D.

**Answer: B**

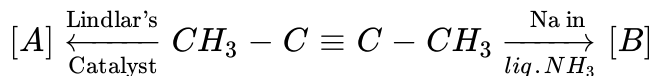
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2. Catalytic hydrogenation involves addition of hydrogen to a  $C = C$  or  $-C \equiv C-$  bond in presence of a metal catalyst such as Ni, Pt, Pd, etc. These are called heterogeneous catalysts. Both  $H_2$  and alkene/alkyne get adsorbed on the surface of the metal, and syn-addition of hydrogen atoms takes place. The relative rates of hydrogenation follows the order:



If sodium or lithium in liquid ammonia is used, anti-addition of H-atoms occurs across  $-C \equiv C-$  bond. These reducing agents can also be used

to reduce double bonds of benzene rings and conjugated dienes but not of isolated dienes.



[A] and [B] are respectively

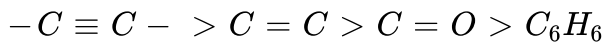
- A. cis, trans-2-butene
- B. both trans-2-butene
- C. trans,cis-2-butene
- D. both cis-2-butene

**Answer: A**

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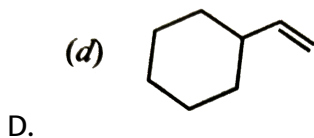
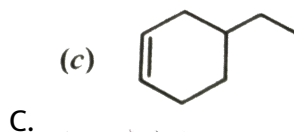
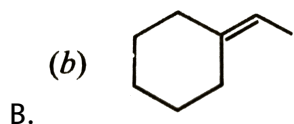
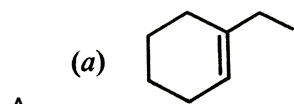
3. Catalytic hydrogenation involves addition of hydrogen to a  $\text{C} = \text{C}$  or  $-\text{C} \equiv \text{C}-$  bond in presence of a metal catalyst such as Ni, Pt, Pd, etc. These are called heterogeneous catalysts. Both  $\text{H}_2$  and alkene/alkyne get adsorbed on the surface of the metal, and syn-addition of hydrogen atoms takes place. The relative rates of hydrogenation

follows the order:



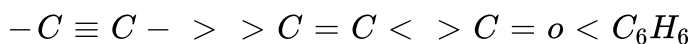
If sodium or lithium in liquid ammonia is used, anti-addition of H-atoms occurs across  $-C \equiv C -$  bond. These reducing agents can also be used to reduce double bonds of benzene rings and conjugated dienes but not of isolated dienes.

The catalytic hydrogenation of which of the following alkenes is most exothermic ?



**Answer: D**

4. Catalytic hydrogenation involves addition of hydrogen to a  $C=C$  or  $C\equiv C$  bond in presence of a metal catalyst such as Ni, Pt, Pd, etc. These are called heterogeneous catalysts. Both  $H_2$  and alkene/alkyne get adsorbed on the surface of the metal, and syn-addition of hydrogen atoms takes place. The relative rates of hydrogenation follows the order:



If sodium or lithium in liquid ammonia is used, anti-addition of H-atoms occurs across  $C\equiv C$  bond. These reducing agents can also be used to reduce double bonds of benzene rings and conjugated dienes but not of isolated dienes.

Which of the following functional groups is most easily reduced.

A.  $C=O$

B.  $C=C$

C.  $C\equiv C$

D.  $C_6H_6$

**Answer: C**



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5. Aromatic hydrocarbons are highly unsaturated molecules but behave like saturated hydrocarbons. Those which contain a benzene ring are called benzenoids but those which contain some highly unsaturated ring other than benzene are called non-benzenoids. Their aromatic character can be ascertained through Hückel rule. Aromatic hydrocarbons are, however, more reactive than alkanes but are less reactive than alkenes and alkynes. The lower reactivity of arenes is because of the extra stability associated with these molecules due to delocalization of  $\pi$ -electrons. Their stability is measured in terms of resonance energy which can be estimated from either heat of combustion or heat of hydrogenation data. They normally undergo electrophilic substitution reactions. In presence of a Lewis acid catalyst, nuclear halogenation occurs but in absence of Lewis acid catalyst and in presence of light, halogens add to the benzene ring. If an aromatic hydrocarbon contains an alkyl side chain, then in presence of heat/light side chain halogenation occurs in preference to

addition of halogens to the benzene ring. The reactivity of aromatic hydrocarbons towards electrophilic substitution reactions depends upon the electron density in the benzene ring. Electron-donating groups favour while electron-withdrawing groups retard these reactions. Orientation of electrophilic substitution reactions is governed by the nature of the substituent already present in the ring. Although aromatic hydrocarbons are resistant to oxidising agents ( $KMnO_4$ ,  $K_2Cr_2O_7$ , etc.) they do undergo ozonolysis.

The enthalpy of hydrogenation of cyclohexene is  $-119.5\text{kJ mol}^{-1}$ . If resonance energy of benzene is  $-150.4\text{kJ mol}^{-1}$ , its enthalpy of hydrogenation would be

- A.  $-208.1\text{kJ mol}^{-1}$
- B.  $-269.9\text{kJ mol}^{-1}$
- C.  $-358.5\text{kJ mol}^{-1}$
- D.  $-508.9\text{kJ mol}^{-1}$

**Answer: A**



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6. Aromatic hydrocarbons are highly unsaturated molecules but behave like saturated hydrocarbons. Those which contain a benzene ring are called benzenoids but those which contain some highly unsaturated ring other than benzene are called non-benzenoids. Their aromatic character can be ascertained through Hückel rule. Aromatic hydrocarbons are, however, more reactive than alkanes but are less reactive than alkenes and alkynes. The lower reactivity of arenes is because of the extra stability associated with these molecules due to delocalization of  $\pi$ -electrons. Their stability is measured in terms of resonance energy which can be estimated from either heat of combustion or heat of hydrogenation data. They normally undergo electrophilic substitution reactions. In presence of a Lewis acid catalyst, nuclear halogenation occurs but in absence of Lewis acid catalyst and in presence of light, halogens add to the benzene ring. If an aromatic hydrocarbon contains an alkyl side chain, then in presence of heat/light side chain halogenation occurs in preference to addition of halogens to the benzene ring. The reactivity of aromatic hydrocarbons towards electrophilic substitution reactions depends upon the electron density in the benzene ring. Electron-donating groups favour



while electron-withdrawing groups retard these reactions. Orientation of electrophilic substitution reactions is governed by the nature of the substituent already present in the ring. Although aromatic hydrocarbons are resistant to oxidising agents ( $KMnO_4$ ,  $K_2Cr_2O_7$ , etc.) they do undergo ozonolysis.

Which of the following is not a non-benzenoid aromatic compound ?

- A. Tropylium cation
- B. Azulene
- C. Tropolone
- D. Diphenyl

**Answer: D**



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7. Aromatic hydrocarbons are highly unsaturated molecules but behave like saturated hydrocarbons. Those which contain a benzene ring are called benzenoids but those which contain some highly unsaturated ring

other than benzene are called non-benzenoids. Their aromatic character can be ascertained through Hückel rule. Aromatic hydrocarbons are, however, more reactive than alkanes but are less reactive than alkenes and alkynes. The lower reactivity of arenes is because of the extra stability associated with these molecules due to delocalization of  $\pi$ -electrons. Their stability is measured in terms of resonance energy which can be estimated from either heat of combustion or heat of hydrogenation data. They normally undergo electrophilic substitution reactions. In presence of a Lewis acid catalyst, nuclear halogenation occurs but in absence of Lewis acid catalyst and in presence of light, halogens add to the benzene ring. If an aromatic hydrocarbon contains an alkyl side chain, then in presence of heat/light side chain halogenation occurs in preference to addition of halogens to the benzene ring. The reactivity of aromatic hydrocarbons towards electrophilic substitution reactions depends upon the electron density in the benzene ring. Electron-donating groups favour while electron-withdrawing groups retard these reactions. Orientation of electrophilic substitution reactions is governed by the nature of the substituent already present in the ring. Although aromatic hydrocarbons are resistant to oxidising agents ( $KMnO_4$ ,  $K_2Cr_2O_7$ , etc.) they do

undergo ozonolysis.

Reaction of benzene with excess of  $Cl_2$  in presence of light and in presence of anhydrous  $AlCl_3$  and in dark give respectively

- A. hexachlorobenzene and benzene hexachloride
- B. benzene hexachloride and hexachlorobenzene
- C. both give benzene hexachloride
- D. none of the above

**Answer: B**



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**8.** Aromatic hydrocarbons are highly unsaturated molecules but behave like saturated hydrocarbons. Those which contain a benzene ring are called benzenoids but those which contain some highly unsaturated ring other than benzene are called non-benzenoids. Their aromatic character can be ascertained through Hückel rule. Aromatic hydrocarbons are, however, more reactive than alkanes but are less reactive than alkenes

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In the reaction of  $C_6H_5Y$ , the major product (gt 60%) is m-isomer, so the group Y is

A.  $-COOH$

B.  $-Cl$

C.  $-OH$

D.  $-NH_2$

**Answer: A**

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9. Which of the following is not aromatic ?

A. Benzene

B. Cyclooctatetraenyl dianion

C. Tropylium cation

D. Cyclopentadienyl cation

**Answer: D**

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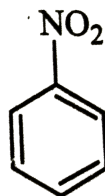
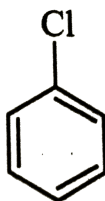
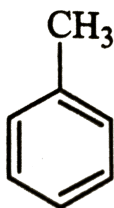
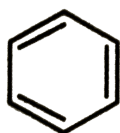
10. Which one of these is not compatible with arenes

- A. Greater stability
- B. Delocalization of  $\pi$ -electrons
- C. Electrophilic addition
- D. Resonance

Answer: C

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11. Identify the correct order of reactivity in electrophilic substitution reactions of the following compounds :



A. 1 gt 2 gt 3 gt 4

B. 4gt3gt 2gt1

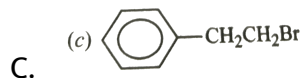
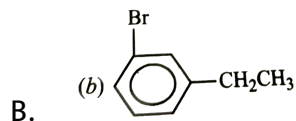
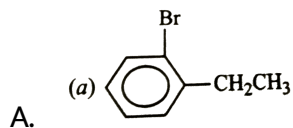
C. 2gt1gt3gt4

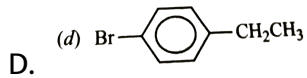
D. 2gt3gt1gt4

Answer: C

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12. Ethylbenzene with bromine in the presence of  $FeBr_3$  predominantly gives

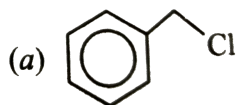
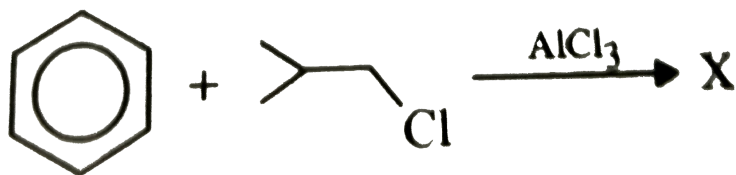




Answer: D

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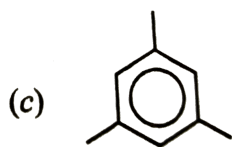
13. Match the following columns



A.

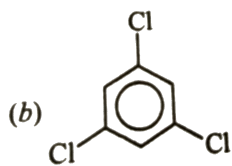


B.



C.

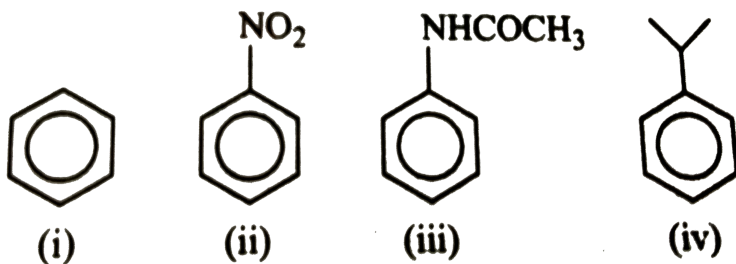




D.

Answer: B

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14.

The correct order towards electrophilic substitution is

A. ivgt iiigtii gti

B. igtiigtiiigtiv

C. iiigtiiigtiv

D. iiigtivgtigtii

Answer: D

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Competition Focus (JEE(main and advanced)/Medical Entrance) IV.  
MATCHING TYPE QUESTIONS

1. Match the following columns

**Column I**

- (A) Corey House reaction
- (B) Fittig reaction
- (C) Friedel-Crafts acylation
- (D) Dehydrohalogenation

**Column II**

- (p) Alkenes
- (q) Alkyl aryl or diaryl ketones
- (r) Alkanes
- (s) Diaryls

A. A-s, B-q, C-p, D-r

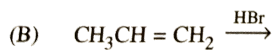
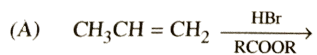
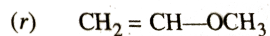
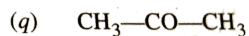
B. A-q, B-p, C-r, D-s

C. A-p, B-r, C-s, D-q

D. A-r, B-s, C-q, D-p

Answer: D

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**Column I****Column II**

2.

A. A-r, B-s, C-p, D-q

B. A-p, B-s, C-q, D-r

C. A-s, B-p, C-q, D-r

D. A-q, B-s, C-p, D-r

**Answer: B**



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**Column I****Column II**

- (A) Sodium benzoate when heated with soda-lime gives benzene.
- (B) Treatment of ethanol with conc.  $\text{H}_2\text{SO}_4$  at 433-443 K gives ethene.
- (C) Phenylmagnesium bromide on treatment with  $\text{D}_2\text{O}$  gives deuterated benzene.
- (D) Benzene on nitration with a mixture of conc.  $\text{HNO}_3$  + conc.  $\text{H}_2\text{SO}_4$  gives nitrobenzene.
- (p) Electrophilic substitution
- (q) Nucleophilic substitution
- (r) Dehydration
- (s) Decarboxylation
- 3.

A. A-s, B-r, C-q, D-p

B. A-r, B-s, C-p, D-q

C. A-p, B-s, C-r, D-s

D. A-q, B-p, C-s, D-r

**Answer: A**



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Competition Focus (JEE(main and advanced)/Medical Entrance) V. MATRIX-MATCH TYPE QUESTIONS

**Column I**

- (A)  $-\text{Cl}$
- (B)  $-\text{CH}=\text{CH}_2$
- (C)  $-\text{OH}$
- (D)  $-\text{NO}_2$

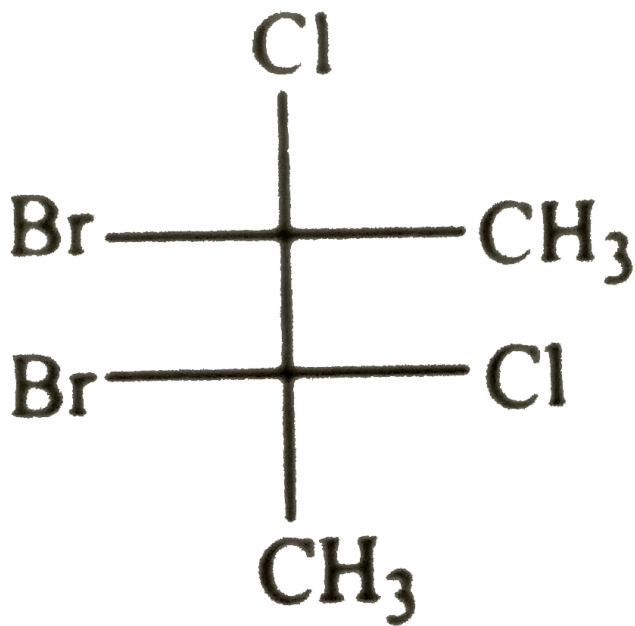
**Column II**

- (p) Activating
- (q) Deactivating
- (r) *ortho/para*-directing
- (s) *meta*-directing

1.

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TYPE QUESTIONS**

1. The total number of stable conformers with non-zero dipole moment for the following compound is



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2. How many number of cis-trans isomer with molecular formula  $C_2BrClFI$  are?

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3. Amongst the following the maximum number of alkenes which shows geometrical isomers are 1-pentene, 2-butene, 2-pentene, 1-butene, propene, 2,3-dimethyl-2-butene, 3-hexene, 1-hexene

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4. Which of the following molecules have zero dipole moment ?

cis-1,2-dichloroethene, trans-1,2-dichloroethene, 1,1-dichloroethene, trans-2-pentene, cis-2-pentene, 1-butyne, 2-butyne, trans-2-butene, cis-2-butene.

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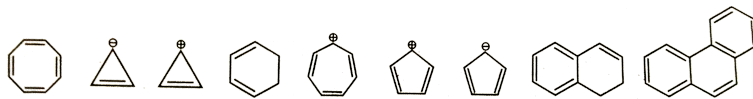
5. How many of the following on reductive ozonolysis will give only glyoxal? Ethylene, acetylene, 1,3-butadiene, benzene, o-xylene, m-xylene, p-xylene, cyclobutadiene, cyclooctatetrene.

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6. how many of the following species are aromatic in nature  
cyclopentadienyl cation, cyclopentadienyl anion, tropylium cation,  
azulene, cyclopropenyl cation, tetrahydrofuran, cyclooctatetraene, furan ,  
cycloheptatriene

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7. Among the following, the number of aromatic compounds is



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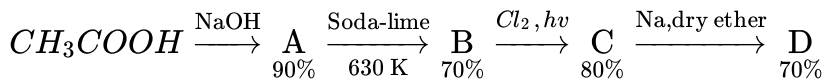
Competition Focus (JEE(main and advanced)/Medical Entrance)

## VII.NUMERICAL VALUE TYPE QUESTIONS

1. In the following reaction sequence, the amount of D (in g) formed formed from 10 moles of acetic acid is .... (The yield (%) corresponding to



the product in each step is given in the parenthesis)



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## Competition Focus (JEE(main and advanced)/Medical Entrance) VIII. ASSERTION - REASON TYPE QUESTIONS

1. Statement-1. The gauche conformation of ethylene glycol is more stable than its anti conformation

Statement-2. The gauche conformation is stabilized by H-bonding.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True , Statement-2 is not a correct explanation for Statement-1

C. Statement- 1 is True, Statement-2 is False

D. Statement-1 is False, Statement -2 is True

**Answer: A**

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2. Statement-1. Propene reacts with HBr in presence of organic peroxide to give 1-bromopropane

Statement-2. The reaction occurs through carbocation intermediate

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1
- B. Statement-1 is True, Statement-2 is True , Statement-2 is not a correct explanation for Statement-1
- C. Statement- 1 is True, Statement-2 is False
- D. Statement-1 is False, Statement -2 is True

**Answer: C**

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3. Assertion : Dimethyl sulphide is commonly used for the reduction of an ozonide of compound.

Reason: It reduces the ozonide giving water soluble dimethyl sulphoxide and excess of it evaporates.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True , Statement-2 is not a correct explanation for Statement-1

C. Statement- 1 is True, Statement-2 is False

D. Statement-1 is False, Statement -2 is True

**Answer: A**



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4. Statement-1. Acetylene is more reactive than ethylene towards electrophilic addition reactions

Statement-2. Acetylene contains two  $\pi$ -bonds

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True , Statement-2 is not a correct explanation for Statement-1

C. Statement- 1 is True, Statement-2 is False

D. Statement-1 is False, Statement -2 is True

**Answer: D**



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5. Statement-1: Bromobenzene upon reaction with  $Br_2/Fe$  gives 1,4-dibromobenzene as the major product.

Statement-2: In bromobenzene the inductive effect of the bromo group is more dominant than the mesomeric effect in directing the incoming electrophile.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1
- B. Statement-1 is True, Statement-2 is True , Statement-2 is not a correct explanation for Statement-1
- C. Statement- 1 is True, Statement-2 is False
- D. Statement-1 is False, Statement -2 is True

**Answer: C**



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6. Statement-1. The reaction of conc.  $HNO_3$  and conc.  $H_2SO_4$  on nitrobenzene gives m- dinitrobenzene.

Statement-2. The nitro group in benzene ring decreases the electron density in the benzene ring.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1
- B. Statement-1 is True, Statement-2 is True , Statement-2 is not a correct explanation for Statement-1
- C. Statement- 1 is True, Statement-2 is False
- D. Statement-1 is False, Statement -2 is True

**Answer: B**



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7. Statement-1. Toluene on sulphonation gives m-toluenesulfonic acid.

Statement-2. Sulphonation is a reversible reaction.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1
- B. Statement-1 is True, Statement-2 is True , Statement-2 is not a correct explanation for Statement-1
- C. Statement- 1 is True, Statement-2 is False
- D. Statement-1 is False, Statement -2 is True

**Answer: D**



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8. Assertion. Melting point of neopentane is higher than that of n-pentane but the boiling point of n-pentane is higher than that of neopentane.

Reason. Melting point depends upon packing of molecules in the crystal lattice while boiling point depends upon surface area of the molecule

- A. If both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: A**



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**9. Assertion.** Conformers are impractical to separate

**Reason.** Conformers have negligibly small difference in their potential energy

- A. If both assertion and reason are true, and reason is the true explanation of the assertion.



B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

**Answer: A**

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**10.** Assertion : Boiling points of cis-isomers are higher than trans - isomers.

Reason : Dipole moments of cis - isomers are higher than trans - isomers.

A. If both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

**Answer: A**



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**11.** Assertion. Propene is more reactive than ethene towards electrophilic addition reactions

Reason. Hyperconjugation effect of the  $CH_3$  group increases the electron density in the double bond

- A. If both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: A**

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12. Assertion. Addition of HI to vinyl chloride produces -chloro-1-todoethane

Reason. HI adds to vinyl chloride against Markovnikov's rule

- A. If both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: C**

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13. Assertion. Propene reacts with hydrogen chloride in presence of organic peroxide to give 1-chloropropane

Reason. Addition of HCl follows Kharasch effect

A. If both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

**Answer: D**



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14. Assertion. C-H bond in ethyne is shorter than C-H bonds in ethene.

Reason. Carbon atom in ethene is  $sp$  hybridised while it is  $sp^3$  in ethyne.

- A. If both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: C**



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**15.** Assertion. Calcium carbide on hydrolysis gives ethylene

Reason. Calcium carbide contains  $C^{4-}$  anions

- A. If both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

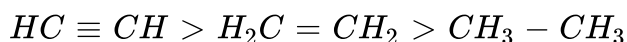
C. If assertion is true, but reason is false.

D. If both assertion and reason are false

**Answer: D**

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**16.** Assertion. Acidity of the C-H bond decreases in the order:



Reason. Acidity of the C-H bond increases as the electronegativity of the carbon to which it is attached increases

A. If both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

**Answer: A**



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17. Assertion. Acetylene reacts with sodamide to evolve  $H_2$  gas

Reason. Acetylene is a weaker acid than ammonia

A. If both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

**Answer: D**

18. Assertion : Acetylene on reacting with sodamide gives sodium acetylide and ammoniac.

Reason:  $sp$  – hybridised carbon atoms of acetylene are considerably electronegative.

- A. If both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: B**



19. Assertion. Addition of  $H_2O$  to acetylene occurs in presence of dil.  $H_2SO_4$  and  $HgSO_4$  to give acetaldehyde

Reason It is an example of electrophilic addition reaction

- A. If both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: A**



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20. Assertion. But 1-yne and but-2-yne can be distinguished by ammoniacal silver nitration solution

Reason. 1-Butyne forms white ppt. with ammoniacal silver nitrate but 2-butyne does not

- A. If both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: A**

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**21. Assertion.** Alkynes are more reactive towards nucleophilic addition reaction as compared to alkenes

Reason. Alkynes contain two pi bonds, while alkenes have only one pi bond

- A. If both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: C**

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**22.** Assertion : 2-butyne on controlled hydrogenation with  $\text{Pd}/\text{CaCO}_3$  in presence of  $\text{PbO}$  gives cis-2-butene.

Reason : Hydrogenation occur at the surfaces of metal containing adsorbed hydrogen

- A. If both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

**Answer: A**

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**23.** Assertion. But-2-yne on reduction with  $Na/NH_3(l)$  gives trans-2-butene

Reason. To minimise interelectronic repulsions, the addition of electrons occurs on the opposite faces of the triple bond.

A. If both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

**Answer: A**



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**24.** Assertion. Benzene does not decolourize  $Br_2$ - water

Reason. Benzene is stabilized by resonance due to delocalization of  $\pi$ -electrons.

A. If both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

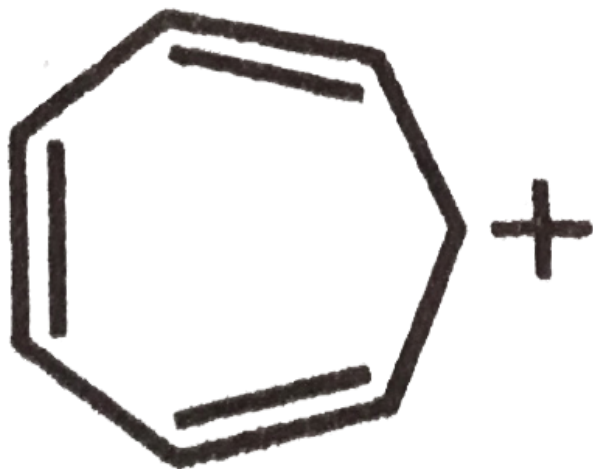
C. If assertion is true, but reason is false.

D. If both assertion and reason are false

Answer: A

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25. Assertion. Tropylium cation is aromatic in nature



Reason. The only property that determines its aromatic behaviour is its planar structure

A. If both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

**Answer: C**

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**26.** Assertion : Cyclopentadienyl anion is much more stable than allyl anion.

Reason : Cyclopentadienyl anion is aromatic in character.

A. If both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

**Answer: A**

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**27.** Assertion: Friedel – Crafts reaction is used to introduce an alkyl or acyl group in benzene nucleus

Reason: Benzene is a solvent for the Friedel – Crafts alkylation of bromobenzene.

A. If both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false



**Answer: C**

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**28.** Assertion (A) Friedel - Crafts reaction benzene with n - propyl chloride on heating produce isopropyl benzene

Reason (R ) Benzene undergoes electrophilic substitution easily.

- A. If both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: B**

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29. Assertion : Alkyl benzene is not prepared by Friedel – Crafts alkylation of benzene.

Reason : Alkyl halides are more reactive than acyl halides.

A. If both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

**Answer: B**



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30. Assertion : Oxidation of toluene as well as ethyl benzene with  $KMnO_4$  gives benzoic acid.

Reason : Both toluene and ethyl benzene are more reactive than benzene towards electrophilic substitution reactions.

- A. If both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: B**



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31. (A) Rate of nitration of benzene and hexadeuterobenzene are different.

(R) C-H bond is stronger than C-D bond.

- A. If both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: D**



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