CHEMISTRY COACHING CIRCLE

+1

GRAND TEST - 7

TEST - 31

TOPIC

ORGANIC CHEMISTRY

- **IUPAC Naming**
- **Nomenclature**
- **Isomerism**
- **General Organic Chemistry**
- **Hydrocarbon**

Test Date: 27.1.2018 (Saturday)
Time: 11:00 AM to 01:30 PM

Empowered By:

TEST SERIES

PCB QUANTUM Plus | **PCM** INTELLIQUEST

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Test Dated: 27.1.2018

Topic: (IUPAC NAMING, G.O.C., ISOMERISM & HYDROCARBON (Alkane, Alkene & Alkyl)

READ THE INSTRUCTIONS CAREFULLY

1. The test is of **2 hour 30 minutes** duration.
2. The maximum marks are **340. [240 Marks (Level – 1) & 100 Marks (Level-2)]**
3. This test consists of **81 questions**.
4. Keep Your **mobiles switched off** during Test in the Halls.

Level – 1

SECTION – A (Single Correct Choice Type) Negative Marking [-1]

This Section contains **60 multiple choice questions.** Each question has four choices A), B), C) and D) out of which **ONLY ONE** is correct. (Mark only One choice) **60 × 4 = 240 Marks**

1. Which of the following will not produce ethane?

a. Reduction of CH_3COOH with HI and Red Phosphorus
b. Reduction of CH_3COCH_3 with HI and Red Phosphorus
c. Soda lime decarboxylation of sodium propionate
d. Hydrogenation of ethene in the presence of Ni

B

Sol. It will produce propane

$$CH_3-\overset{\overset{O}{\|}}{C}-CH_3+4HI\xrightarrow[423\,K]{red\,P}CH_3CH_2CH_3+H_2O+2I_2$$

2. A metallic carbide of gp(II) on treatment with water gives a colourless gas which burns readily in air and gives a precipitate with ammonical silver nitrate. The gas is:

a. Methane b. Ethene c. Ethyne d. Propane

C

Sol. Hydrocarbon is terminal alkyne. Only terminal alkyne give white ppt. with $AgNO_3$ & metallic carbide is CaC_2.

3. When $CH_3[CH_2]_3\,C\equiv CH$ is oxidized with hot acidic $KMnO_4$ the product is:

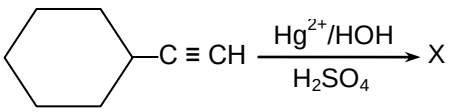
a. CH_3CH_2COOH
b. $CH_3CH_2CH_2COOH$
c. $CH_3CH_2CH_2COOH$ & CO_2
d. $CH_3CH_2CH_2CH_2COOH$ & CO_2

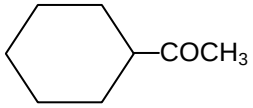
D

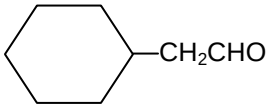
Sol. Alkyne give lower acid. HCOOH oxidised to give CO_2.

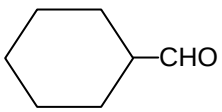
$$CH_3-CH_2-CH_2-CH_2-C\overset{\curlyvee}{\equiv}CH\xrightarrow{Oxidation}CH_3CH_2CH_2CH_2-COOH+HCOOH\longrightarrow CO_2+H_2O$$

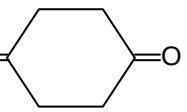
4. What is X in the following reaction?



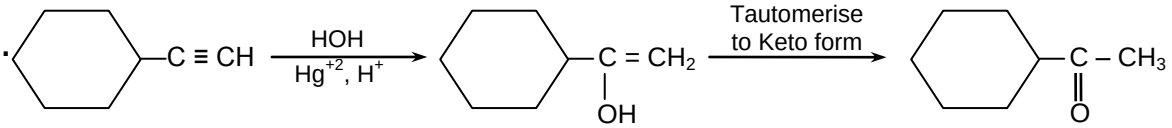
a. 

b. 

c. 

d. 

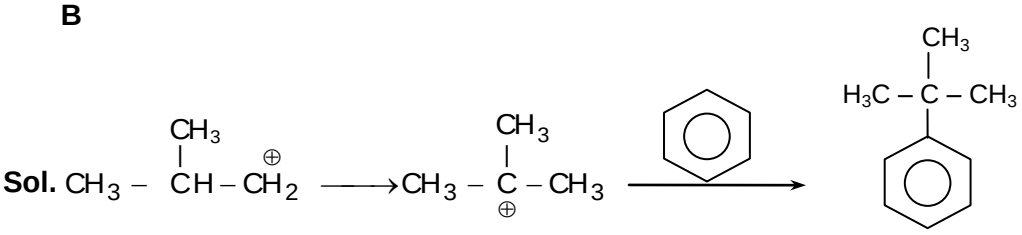
A

Sol. 

5. Friedal craft reaction of benzene with isobutyl chloride produces:

a. isobutylbenzene
b. tert–Butylbenzene
c. n–butylbenzene
d. sec–Butylbenzene

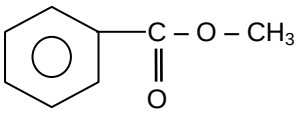
B

Sol. 

6. Which one of the following will undergo meta-substitution on monochlorination?

a. Ethoxybenzene
b. Chlorobenzene
c. Methyl benzoate
d. Phenol

C

Sol. It is meta directing 

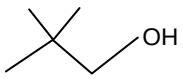
7. When $CH_3 - \underset{Cl}{CH} - \underset{Cl}{CH} - CH_3$ is treated with $NaNH_2$ the major product formed is:

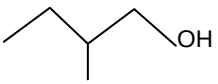
a. $CH_3\,CH = CH_2$
b. $CH_3 - C \equiv C - CH_3$
c. $CH_2 = C = CH - CH_3$
d. $CH_2 = CH - CH = CH_2$

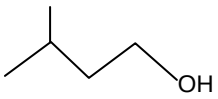
D

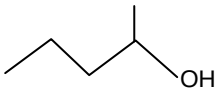
Sol. double dehydro halogenations of dihalide will form alkyne

8. Which of the following alcohols would be most likely to undergo dehydration with rearrangement by a process involving a methyl migration (methyl shift)?

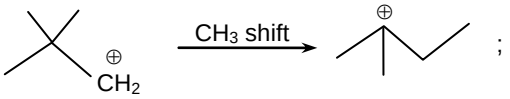
a. 

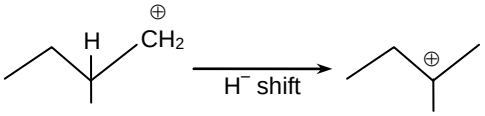
b. 

c. 

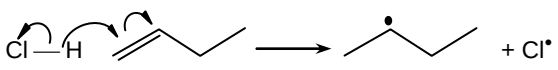
d. 

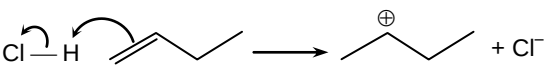
A

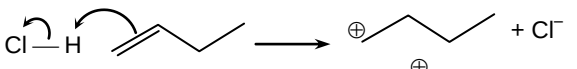
Sol. (A) = 

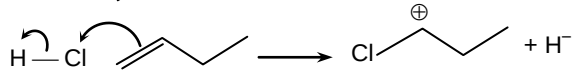
; (B) = 

9. Which of the following most accurately describes the first step in the reaction of hydrogen chloride with 1-butene?

a. 

b. 

c. 

d. 

B

10. Alkyl halides + Mg $\longrightarrow$ (G) $\xrightarrow[\text{Boil}]{H_2O}$ Pr opane

The alkyl halide is:

a. Ethyl bromide
b. n-Propyl iodide
c. Isopropyl iodide
d. Propyl and Isopropyl iodide

D

Sol.

$$CH_3-\underset{\underset{\text{Isopropyliodide}}{I}}{CH}-CH_3 \longrightarrow CH_3-\underset{MgI}{CH_2}-CH_3 \xrightarrow{HOH} CH_3-CH_2-CH_2$$

$$CH_3-CH_2-\underset{\underset{\text{Propyliodide}}{I}}{CH_2} \xrightarrow{Mg} CH_2CH_2CH_2-MgI \xrightarrow{HOH} CH_3-CH_2-CH_2$$

11. $C_3H_7I \xrightarrow{KOH\,(alc.)} A \xrightarrow[770\,K]{Cl_2\,(g)} X$; X can be

a. 1-chloropropene
b. 3-chloropropene
c. Propyl alcohol
d Propene

B

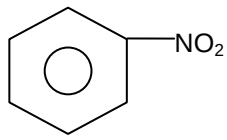
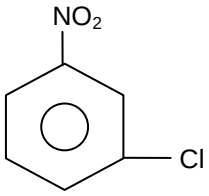
Sol. $C_3H_7I \xrightarrow{alc.KOH} CH_3-CH=CH_2 \xrightarrow[770\,K\ \ Allylic Chlorination]{Cl_2} \overset{Cl}{\overset{|}{C}}H_2-CH=CH_2$

12. $C_6H_6 \xrightarrow[H_2SO_4]{HNO_3} X \xrightarrow[FeCl_3]{Cl_2} Y$

In the above sequence Y can be

a. ortho or p-Chloronitrobenzene
b. 3-Nitrochlorobenzene
c. only 4-Nitrochlorobenzene
d. equal mixture of all the above products

B

Sol. x =  ; y =  ; NO_2 group is meta directing due to –M & –I effect

13. In the following sequence of the reactions:

$$CH_3CH_2CH_2I \xrightarrow{KOH\,(Alc.)} A \xrightarrow[(ii)\,NaNH_2]{(i)\,Br_2} B$$

The end product B is

a. Alkene
b. Alkanol
c. Alkyne
d. Alkyl amine

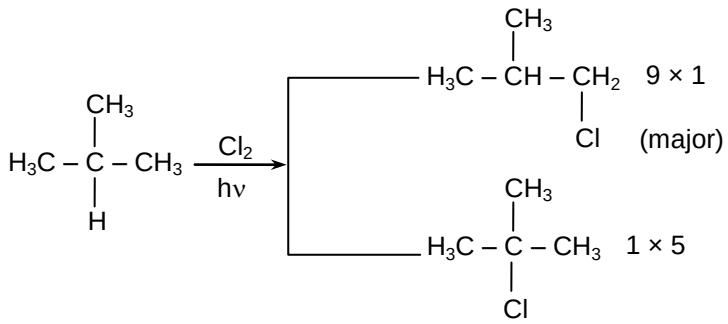
C

Sol. $A = CH_3-CH=CH_2 \xrightarrow{(i)} CH_3-\underset{Br}{\overset{|}{C}}H-\underset{Br}{\overset{|}{CH_2}} \xrightarrow[(ii)]{NaNH_2} \underset{(B)}{CH_3-C\equiv CH}$

14. The major product obtained when isotobutane is treated with chlorine in the presence of diffused sun light is

a. isobutylchloride
b. n-Butylchloride
c. tert-Butylchloride
d. sec-Butylchloride

A

Sol. 

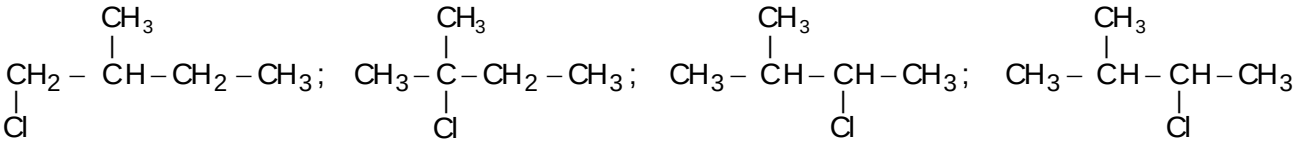
15. Which alkane (molecular mass 72) would yield three different monochloro derivatives? (excluding steroisomer)

a. n-Pentane b. Isopentane c. n-Hexane d. Isohexane

A

Sol. C_nH_{2n+2} = 72 n = 5; $CH_3CH_2CH_2CH_2CH_3$ give three mono chloropentane

1-Chloropentane + 2-chloropentane + 3 –chloropentane & isopentane give four isomer



16. In which of the following reactions Markownikov's rule is not observed

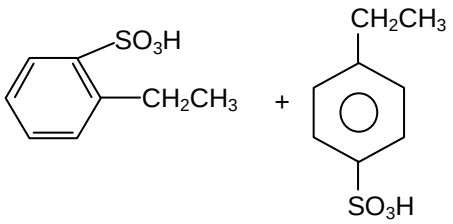
a. $CH_3CH = CH_2 + HCl \xrightarrow{\text{Organic peroxide}}$ b. $CH_3CH = CH_2 + HBr \xrightarrow{\text{Organic peroxide}}$

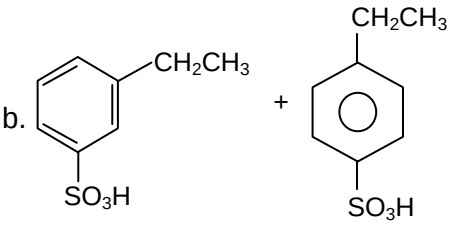
c. $CH_3CH = CH_2 + HI \xrightarrow{\text{Organic peroxide}}$ d. $CH_3CH = CH_2 + H_2SO_4 \longrightarrow$

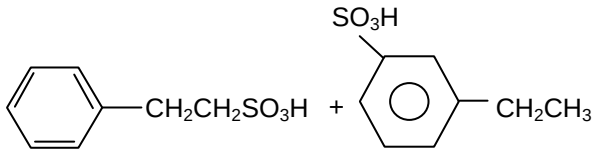
B

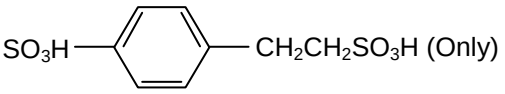
Sol. It is anti-markovnikoff's addition is presence of peroxide. No peroxide effect with HCl & HI

17. Ethylbenzene react with oleum ($H_2SO_4 + SO_3$) to form

a. 

b. 

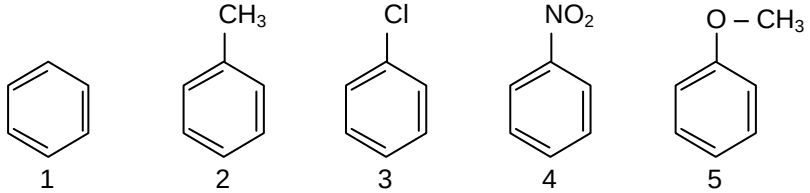
c. 

d. 

A

Sol. Ethyl group is o & p-directing; In presence of $FeBr_3$, reaction is electrophilic substitution.

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

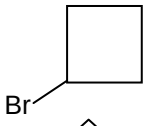


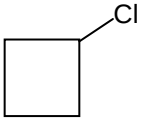
a. 1 > 2 > 3 > 4 > 5 b. 4 > 3 > 2 > 1 > 5

c. 5 > 2 > 1 > 3 > 4 d. 2 > 3 > 1 > 4 > 5

C

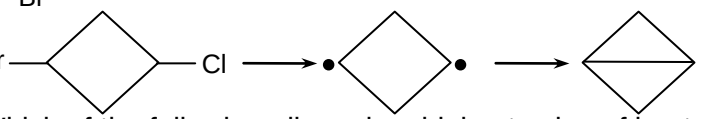
19. What would be the product formed when 1-Bromo-3-chlorocylobutane reacts with two equivalents of metallic sodium in ether?

a. 

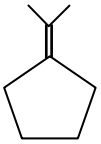
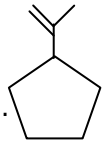
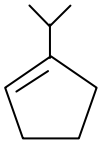
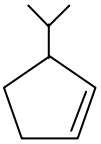
b. 

c. 
d. 

D

Sol. 

20. Which of the following alkene has highest value of heat of hydrogenation?

a. 
b. 
c. 
d. 

D

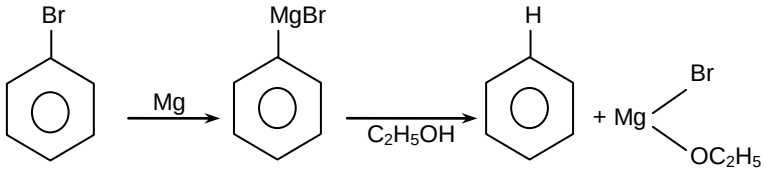
Sol. Compound (d) is least stable as it contain minimum no. of α - H.

$$\Delta H_{hydrogenation} \propto \frac{1}{\text{stability of alkene}}$$

21. Bromobenzene is treated with magnesium in dry ether to form compound 'X' which is then treated with ethanol to form compound 'Y'. The compound y is

a. Benzene b. Phenol c. Ethylbenzene d. ethyl phenyl ether

A

Sol. 

22. 2-Bromopentane $\xrightarrow{(CH_3)_3COK/(CH_3)_3COH}$ P

The major product (P) formed in the above reaction is

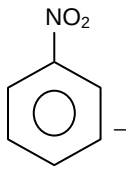
a. pent-1-ene
b. cis pent-2-ene
c. trans pent-2-ene
d. $CH_3-CH_2-CH_2-\underset{\displaystyle CH_3}{\underset{|}{CH}}-OC(CH_3)_3$

A

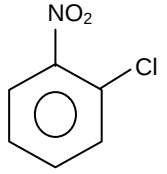
Sol. With Bulky base major product is

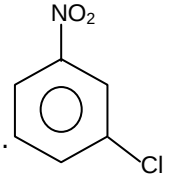
Hoffmann's product a less stable alkene. Bulky base will attack on less hindered side

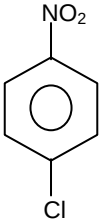
$$CH_3-\underset{\displaystyle Br}{\underset{|}{CH}}-CH_2-CH_2-CH_3 \xrightarrow{\text{Base Bulky}} CH_2=CH-CH_2-CH_2CH_3$$

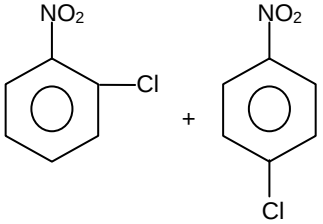
23. 

$\xrightarrow[FeCl_3]{Cl_2}$ X; X is

a. 

b. 

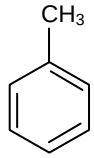
c. 

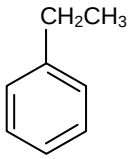
d. 

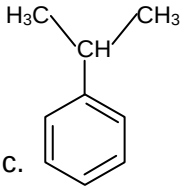
B

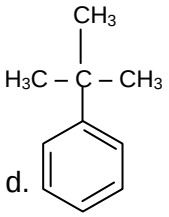
Sol. CCl_3 group is meta directing due to Reverse hyperconjugation

24. In which of the following benzene ring is most electron rich.

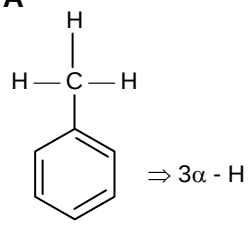
a. 

b. 

c. 

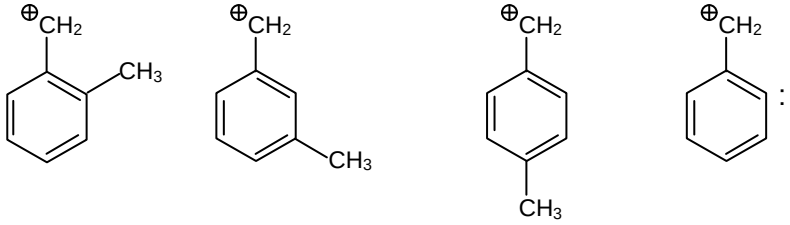
d. 

A

Sol. 

due to maximum hyperconjugation

$\Rightarrow 3\alpha$ - H

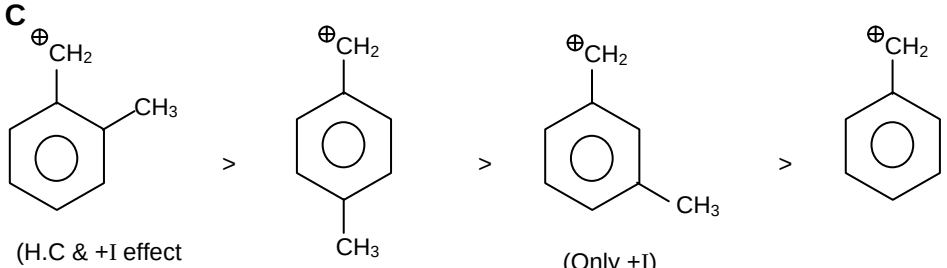
25. 

(P) **(Q)** **(R)** **(S)**

Which of the following is correct order of stability?

a. P > Q > R > S b. P > S > Q > R c. P > R > Q > S d. S > R > Q > P

C

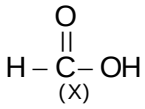
Sol. 

(H.C & +I effect maximum)

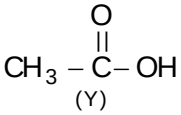
(H.C & less +I)

(Only +I)

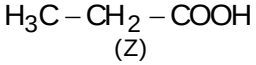
26. Which of the following is correct order of acidic strength.



(X)



(Y)

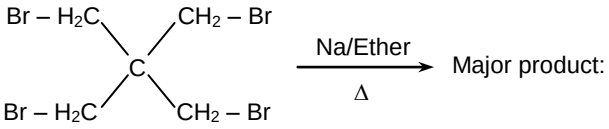


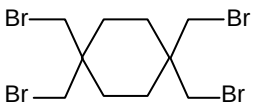
(Z)

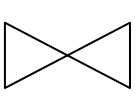
a. X > Z > Y b. X > Y > Z c. Z > X > Y d. Z > Y > X

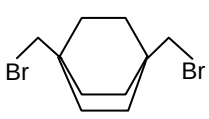
B

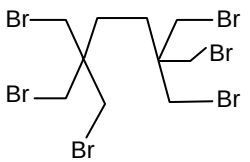
Sol. HCOOH is more acidic than CH_3COOH; All α-substituted Acid (having withdrawing gp) are more acidic than HCOOH.

27. 

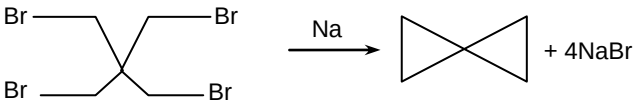
a. 

b. 

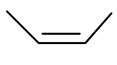
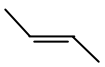
c. 

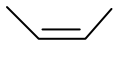
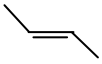
d. 

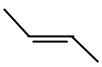
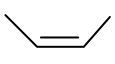
B

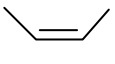
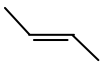
Sol. Wurtz reaction 

28. Which of the following is correct order of stability of alkene?

a. $CH_3 - CH = CH_2$ <  <  < 

b. $CH_3 - CH = CH_2$ <  <  < 

c.  <  <  < $CH_3 - CH = CH_2$

d.  < $CH_3 - CH = CH_2$ <  < 

B

Sol. As the number of α - H increases stability of alkene increases; Trans alkene is more stable than cis-alkene

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

a. Isopentane b. neopentane c. propane d. pentane

B

Sol. $CH_3 - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}} - CH_3$ (It has only one type of hydrogen) $\xrightarrow[h\nu]{Cl_2} CH_3 - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}} - CH_2 - Cl$

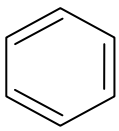
30. Hydroxylation of 2-butene with Baeyer's Reagent will form

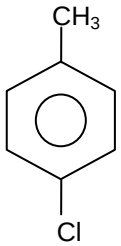
a. Butan-2-ol b. Butanone c. Butane-2, 3-diol d. Butane-2,3-dione

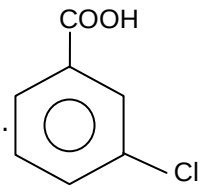
C

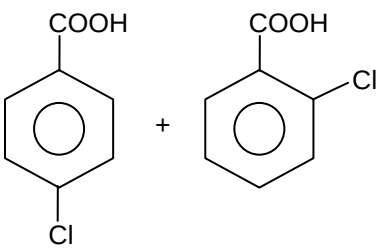
Sol. $CH_3 - CH = CH - CH_3 \xrightarrow[\text{Reagent}]{\text{Baeyer's}} CH_3 - \underset{OH}{\underset{|}{CH}} - \underset{OH}{\underset{|}{CH}} - CH_3$

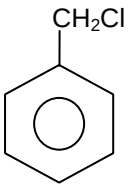
31. Which is the major product (P) in the following reaction:

 1. CH_3Cl, Anhyd. $AlCl_3$ → P
2. Oxidation
3. $Cl_2/FeCl_3$

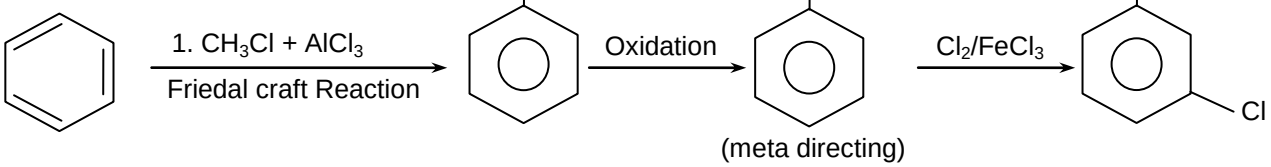
a. 

b. 

c. 

d. 

B

Sol. 

32. Reaction of 2-chloropropane with Na and dry ether give major product

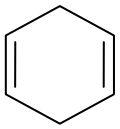
a. Propane b. Butane c. 2,3-Dimethyl butane d. Pentane

C

Sol. It is Wurtz Reaction. $CH_3-\underset{\underset{CH_3}{|}}{CH}-\boxed{Cl+2Na+Cl}-\underset{\underset{CH_3}{|}}{CH}-CH_3 \longrightarrow CH_3-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{CH_3}{|}}{CH}-CH_3$

33. An alkene on reaction with hot acidic $KMnO_4$ give two molecule of ethanoic acid and one molecule of oxalic acid. Alkene is-

a. $CH_3CH = CH - CH_2 - CH = CHCH_3$ b. $CH_3-CH=CH-CH=\underset{\underset{CH_3}{|}}{CH}$

c. $CH_3-\underset{\underset{CH_3}{|}}{C}=CH-CH=CH-CH_3$ d. 

B

Sol. $CH_3-CH\overset{\sim}{=}CH-CH\overset{\sim}{=}CH-CH_3 \xrightarrow[\Delta]{H^+/KMnO_4} 2CH_3COOH+\underset{\underset{COOH}{|}}{C}OOH$

34. Which of the following on ozonolysis will form two molecule of ethanal.

a. 1-Butene b. 2-Butene c. 2-Butyne d. Butane

B

Sol. $CH_3CH\overset{\sim}{=}CH-CH_3 \xrightarrow{oznolysis} CH_3CHO+OCH-CH_3$

35. Which of the following acid will form Ethane on decarboxylation and butane on electrolysis of aqueous solution of its sodium salt

a. CH_3COOH b. CH_3CH_2COOH

c. $CH_3-\underset{\underset{CH_3}{|}}{CH}-COOH$ d. $CH_3-CH_2-\underset{\underset{CH_2CH_3}{|}}{CH}-COOH$

B

Sol. $CH_3CH_2\boxed{COOH} \longrightarrow CH_3CH_3$

$\xrightarrow{NaOH} CH_3CH_2COO^-Na^+ \xrightarrow{Kolbe's\ electrolysis} CH_3CH_2CH_2CH_3$

36. Which of the following on hydrogenation will form 2,3-Dimethyl butane

a. $CH_3-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{CH_3}{|}}{C}=CH_2$ b. $CH_3-C\equiv C-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_3$

c. $CH_3-C\equiv C-CH_3$ d. $(CH_3)_2C=CHCH_3$

A

37. Which of the following Intermediate carbocation is most stable

a. $CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C^{\oplus}}}$ b. $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-\underset{\oplus}{CH_2}$

c. $CH_3-CH_2-\overset{\oplus}{C}H-CH_3$ d. $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-\underset{\oplus}{CH_2}$

A

Sol. A has maximum Hyperconjugation

38. In a mixture of Isooctane and n-heptane, the percentage of n-heptane is 60, the octane number of the fuel is:

a. 60 b. 40 c. 20 d. 4

B

Sol. Octane number is volume of Isoctane in a mixture of Isooctane & heptane, which have same knocking as that of sample petrol

39. What is the end product in the following reaction:

$$CaC_2 \xrightarrow{HOH} A \xrightarrow[\text{glass tube}]{\text{Red hot}} B$$

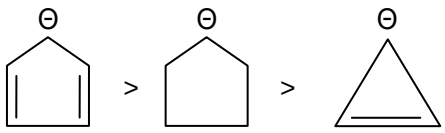
a. Cyclohexane b. Benzene c. Toluene d. 2-Butene

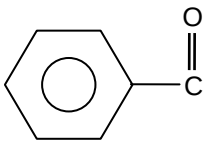
B

Sol. $CaC_2 \xrightarrow{HOH} HC \equiv CH \longrightarrow$ Benzene

40. Which of the following is not the correct order as indicated:

a. $CH_2 = CH - \dot{C}H_2 > CH_3 - \dot{C}H - CH_3 > CH_3 - \dot{C}H_2$ (Stability)

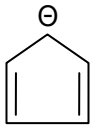
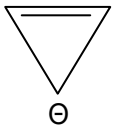
b.  (Stability)

c. $CH_3CH_2COOH >$  $> CH_3OH$ (Acidic strength)

d. $(CH_3)_2CH = CH_2 > CH_3 - CH = CH_2 > CH_2 = CH_2$ (Stability)

C

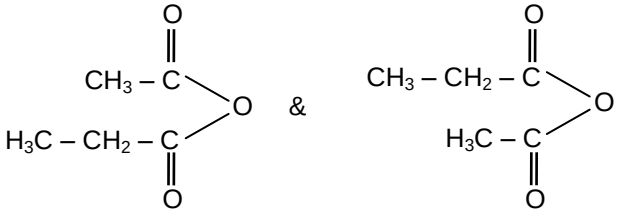
Sol. (a) = allylic free Radical is more stable than alkyl free Radical

(b) =  is aromatic and  is antiaromatic and least stable

(c) Benzoic acid is stronger acid than alkyl carboxylic acid

41. Which of the following is a correct match

a. $CH_3 - \overset{O}{\overset{\|}{C}} - CH_2 - CH_2 - CH_3$ & $H - \overset{O}{\overset{\|}{C}} - CH_2CH_2 - CH_2CH_3$ Functional Isomer

b.  Metamers

c. $CH_3 - CH_2 - COOCH_3$ & $CH_3COOC_2H_5$ Positional isomer

d. $CH_3 - CH_2 - CH = CH_2$ & $CH_3 - \underset{H}{\overset{|}{C}} = \underset{H}{\overset{|}{C}} - CH_3$ Stereoisomer

A

42. How many alkynes are possible for formula C_4H_6

a. 3 b. 4 c. 2 d. 9

C

Sol. $CH \equiv C - CH_2CH_3$; $CH_3 - C \equiv C - CH_3$

43. Which of the following Reagent can be used for following conversion.

$$CH_3 - C \equiv C - CH_3 \longrightarrow CH_3 - \underset{H}{\overset{}{C}} = \overset{H}{\overset{|}{C}} - CH_3$$

a. Pd + $BaSO_4$ + H_2 b. Nickel Boride + H_2 c. Ni + H_2 d. Na/liq NH_3, C_2H_5OH

D

44. The compound X produces methane when treated with water. The compound X is:

a. Calcium carbide b. Berylium carbide c. Magnesium carbide d. Aluminium nitride

B

Sol. $Be_2C + 4H_2O \longrightarrow 2Be(OH)_2 + CH_4$

45. What is X in the following sequence of reaction?

$$X \xrightarrow[-1/2\,H_2]{Na} Z \xrightarrow{NaOH/CaO} CH_4 \uparrow$$

a. Methane b. ethanoic acid c. propane d. Methylchloride

B

Sol. $\underset{(X)}{H_3C - COOH} \xrightarrow[-1/2\ H_2]{Na} \underset{(Z)}{H_3CCOONa} \xrightarrow[-Na_2CO_3]{NaOH/CaO} CH_4 \uparrow$

46. Alkene which upon acidic hydration produces 2-Methyl propan-2-ol is:

a. $CH_3CH_2CH = CH_2$ b. $CH_3CH = CHCH_3$ c. $(CH_3)_2C = CH_2$ d. $CH_3CH = CH_2$

C

Sol. $(CH_3)_2C = CH_2 \xrightarrow[H^+]{HOH} CH_3 - \overset{CH_3}{\overset{|}{\underset{OH}{\underset{|}{C}}}} - CH_3$ (Markovnikoff's addition of water)

47. Addition of HBr to 2 – methyl – prop-1-ene in the presence of hydrogen peroxide mainly forms :

a. 1 – Bromobutane b. 2 – Bromopropane
c. 2 – Bromo – 2 – Methylpropane d. 1 – Bromo – 2 – methylpropane

D

Sol. $CH_3 - \overset{CH_3}{\overset{|}{C}} = CH_2 \xrightarrow[HBr]{Peroxide} \underset{\text{Anti Markovnikoff's addition}}{CH_3 - \overset{CH_3}{\overset{|}{C}}H - CH_2Br}$

48. When but – 1 – yne is treated with excess of HBr, the expected product is:

a. 1, 2 – Dibromobutane b. 2, 2 – Dibromobutane
c. 1, 1 – Dibromobutane d. All the above

B

Sol. $C_2H_5 - C \equiv CH + HBr \longrightarrow C_2H_5 - \underset{Br}{\overset{}{C}} = CH_2 \longrightarrow CH_2 - \underset{Br}{\overset{CH_3}{\overset{|}{C}}} - CH_3$ (Br on the CH_2 group)

49. The reaction

$$H_3C - C \equiv CH + NaNH_2 \longrightarrow CH_3 - C \equiv \overset{\Theta\ +}{C}Na + NH_3$$

Shows that the hydrogen atom of terminal alkyne are:

a. Acidic b. Basic b. Neutral d. Amphoteric

A

Sol. $CH_3C \equiv CH + \underset{\text{Base}}{NaNH_2} \longrightarrow CH_3 - C \equiv C^-Na^+ + NH_3$ [Acid Base Reaction]

50. Iodination of alkane is carried out in the presence of :

a. Alcohol b. HIO_3 c. Any reducing agent d. Benzene

B

Sol. $R - H + I_2 \longrightarrow R - I + HI \xrightarrow{HIO_3} H_2O + I_2$

$\xrightarrow{HNO_3} NO_2 + I_2 + H_2O$

Any oxidising agent can be used to remove HI

51. $(CH_3)_2C = CHCH_3 \xrightarrow[\text{Heat}]{X} \text{Acetone} + CH_3COOH$

In the above reaction X is:

a. $KMnO_4/H_2SO_4$ b. $O_3/Zn + H_2O$ c. $C_6H_5\overset{\overset{O}{\|}}{C}OOH$ d. Bayer's Reagent

A

Sol. $\begin{matrix} CH_3 \\ \diagdown \\ H_3C \end{matrix}\!\!\diagup C \equiv CH - CH_3 \xrightarrow{\text{Hot } H^+ KMnO_4} \begin{matrix} CH_3 \\ \diagdown \\ H_3C \end{matrix}\!\!\diagup C = O + CH_3COOH$

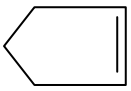
52. The reagent required to convert 1 – butyne to 2 – butanone is (are):

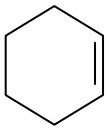
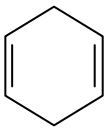
a. Dilute H_2SO_4 b. $ZnCl_2 + HCl$ c. $Hg^{2+} + H_2SO_4 + H_2O$ d. Alk. $KMnO_4$

C

Sol. It is addition of H_2O according to Markovnikoff's rule in presence of Hg^{+2} & Acid.

53. An alkene upon ozonolysis yield $CHO - CH_2 - CH_2 - CH_2 - CHO$ only. The alkene is:

a. $CH_2 = CH - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$ b. 

c.  d. 

B

54. Which of the following decolourise bromine water as well as Baeyer's reagent?

a. Propane b. Cyclohexane c. Propyne d. Benzene

C

Sol. Unsaturated hydrocarbon except Aromatic react with Bayer's reagent.

55. The hydrocarbon which does not decolourise alkaline $KMnO_4$ solution and also does not give any precipitate with $Cu_2Cl_2 + NH_4OH$ is:

a. Hexane b. Acetylene c. Propyne d. Butyne – 1

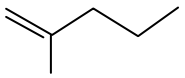
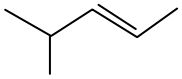
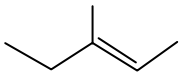
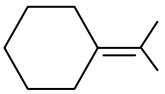
A

56. In the reaction of hydrogen bromide with an alkene (in the absence of peroxides), the first step of the reaction is the _____ to the alkene

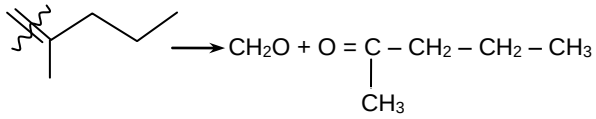
a. Fast addition of an electrophile b. Slow addition of an electrophile
c. Fast addition of a nucleophile d. Slow addition of a nucleophile

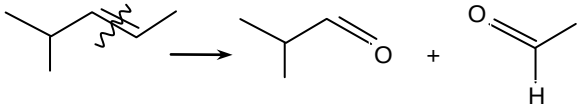
B

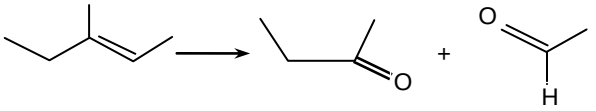
57. Which one of the following compounds gives acetone $(CH_3)_2C = O$ as one of the products of its ozonolysis?

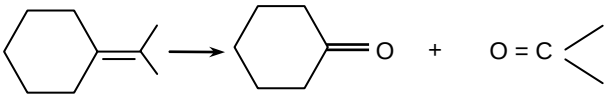
a.  b.  c.  d. 

D

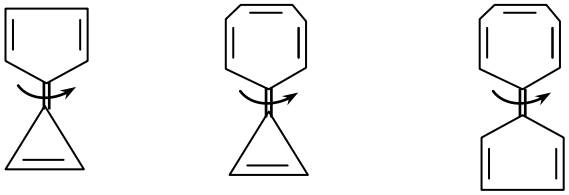
Sol. a = 

b = 

c = 

d = 

58. The barrier for rotation about indicated bonds will be maximum in which of these compounds?

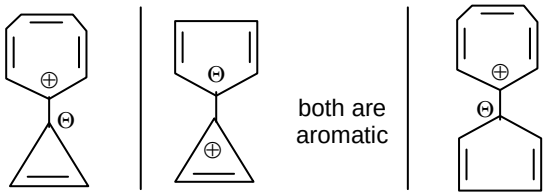


(X) (Y) (Z)

a. X b. Y c. Z d. Same in all

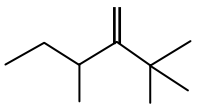
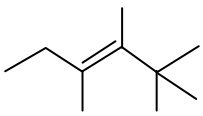
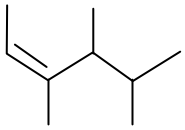
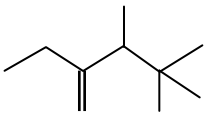
B

Sol. One ring becomes antiaromatic in y.

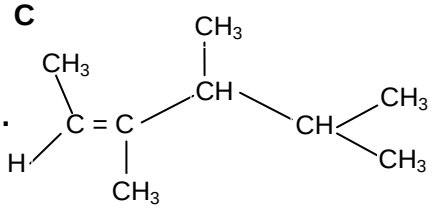


(y) (x) (z)

59. Which one of the alkenes shown below has the Z configuration of its double bond?

a.  b.  c.  d. 

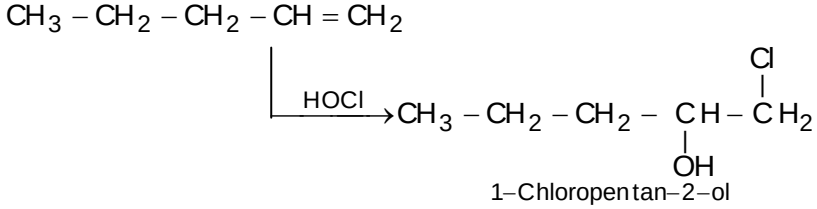
C

Sol.  (Z)

60. The major product from the reaction of 1-pentene with Cl_2 in H_2O is:

a. 1-Chloro-2-pentanol b. 2-Chloro-2-pentanol
c. 1-Chloro-1-pentanol d. 2-Chloro-1-pentanol

A

Sol. 

1–Chloropentan–2–ol

LEVEL – 2

SECTION – C (Paragraph Type) Negative Marking [-1]

This Section contains **1 paragraph.** Each of these questions has four choices A), B), C) and D) out of which **ONLY ONE** is correct. **5 × 4 = 20 Marks**

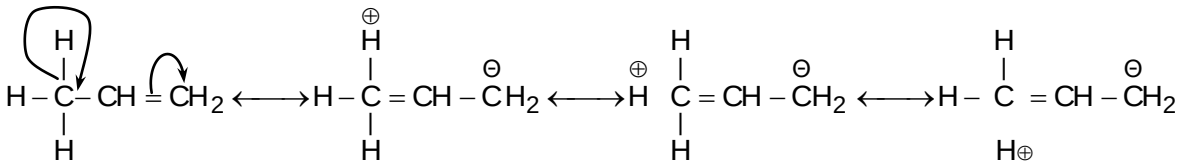
Passage 1

When (C – H) sigma electrons are in conjugation with pi bond, this conjugation is knwon as σ (C – H) π conjugation, excess conjugation or hyperconjugation.

(i) Compound should have at least one sp^2-hybrid carbon of either alkene, alkyl carbocation or alkyl free radical.

(ii) α-carbon with respect to sp^2 hybrid carbon should have at least one hydrogen.

(iii) Resonating structures due to hyperconjugation may be written involving "no bond" between the alpha carbon and hydrogen atoms



In the above resonating structures there is no covalent bond between carbon and hydrogen, and from this pooint of view, hyperconjugation may be regarded as "no bond resonance". Actually the hydrogen atom is not free from the carbon. These resonating structures only suggest that: (a) there is some ionic character between C – H bond and (b) carbon-carbon double bond acquires some single bond character.

We can explain the stability of alkene, carbocation and carbon free radical on the basis of hyperconjugation.

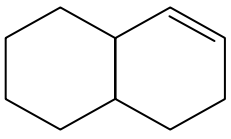
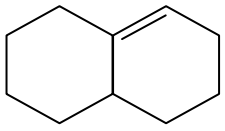
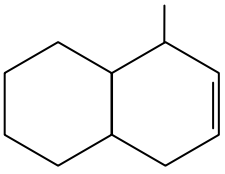
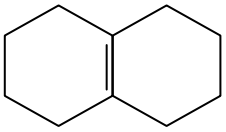
$$\text{Stability of alkene} \propto \text{number of } \alpha\text{-H} \propto \frac{1}{\text{Heat of hydrogenation}}$$

1. Which of the following statements are correct for $C_6H_5 – CCl_3$?

(a) CCl_3 group is electron withdrawing due to the –I effect and reverse hyerpconjugation.
(b) CCl_3 group is meta directing due to the – M effect.
(c) CCl_3 group is o, p-directing because it is +R group.
(d) CCl_3 group can exert +M effect.

A

2. Which of the following has the lowest heat of hydrogenation?

(a)  (b)  (c)  (d) 

D

Sol. Maximum Hyperconjugation. Means least stable alkene

3. Carbon-carbon double bond length will be maximum in which of the following compounds?

(a) $CH_3 – CH = CH_2$

(b) $CH_3 – CH = CH – CH_3$

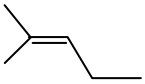
(c) $CH_3 – \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\underset{|}{\overset{|}{C}}}} = C – CH_3$

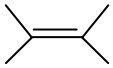
(d) $CH_2 = CH_2$

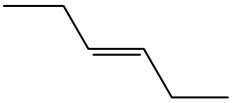
C

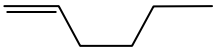
Sol. Maximum hyperconjugation will make – C = C –; a single bond

4. The heats of combustion for the four C_6H_{12} isomers shown are (not necessarily in order): 955.3, 953.6, 950.6, and 949.7 (all in kilocalories per mole). Which of these values is most likely the heat of combustion of isomer 1?


1


2


3

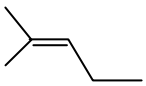

4

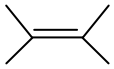
a. 955.3 kcal/mol b. 950.6 kcal/mol c. 953.6 kcal/mole d. 949.7 kcal/mol

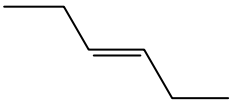
B

Sol. Stable alkene have lowest heat of Hydrogenation. Stability order is 2 > 1 > 3 > 4; order of heat relased 4 > 3 > 1 > 2

5. The heats of combustion for the four C_6H_{12} isomers shown are (not necessarily in order): 955.3, 953.6, 950.6, and 949.7 (all in kilocalories per mole). What can be said about isomers 3 and 4?


1


2


3


4

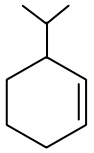
a. 3 is more stable by 1.7 kcal/mol. b. 3 more stable by 3.0 kcal/mol.
c. 4 is more stable by 1.7 kcal/mol. d. 3 is more stable by 0.9 kcal/mol.

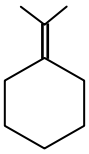
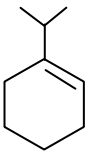
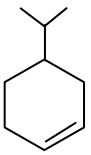
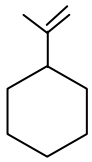
A

Sol. 950.6 (3) ; 949.7 (4) ; difference is 1.7 kcal/mol. Isomer 3 is more stable by 1.7.

SECTION – D (More than One Answer) No Negative Marking

This Section contains **8 questions.** Each question has four choices A), B), C) and D) out of which **ONE OR MORE** may be correct. **(8 × 5 = 40 Marks)**

1. Which of the following alkenes are more stable than  ?

a.  b.  c.  d. 

A,B,C,D

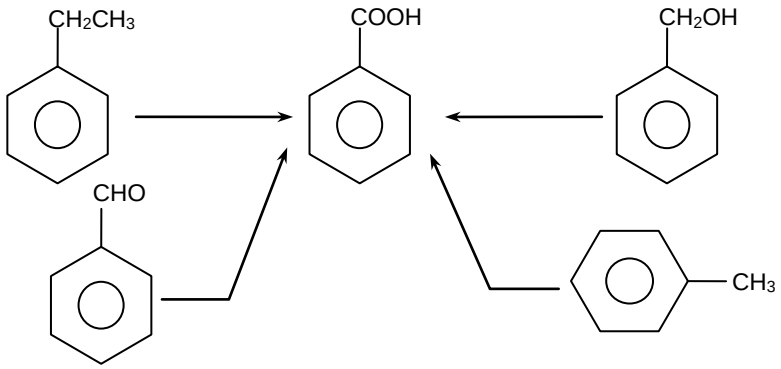
Sol. A = 10 CH; B = 5 – CH; C = 4CH; D = 4 – CH; given compound have – 3CH

2. Which of the following compound on oxidation with acidic $KMnO_4$ will give Benzoic acid?

a. Ethylbenzene b. Benzaldehyde c. Phenylmethanol d. Toluene

A,B,C,D

Sol.



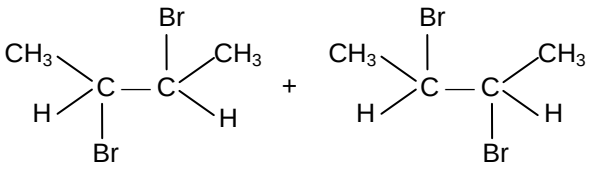
3. $CH_3-\underset{H}{\overset{|}{C}}=\underset{H}{\overset{|}{C}}-CH_3 \xrightarrow{Br_2} (X)$;
(cis)

The product (X) is:

a. formed by anti addition of Br_2 b. racemic mixture of 'd' and 'ℓ' form

c. $CH_3CHBrCHBrCH_3$ d. formed by syn addition of Br_2

A,B,C

Sol. $CH_3-\underset{H}{\overset{|}{C}}=\underset{H}{\overset{|}{C}}-CH_3 \xrightarrow{Br_2,\ \text{Antiaddition}}$  +

4. Which of the following compound on Reaction with Red P + HI will give 2-Methyl propane

a. 2-Methylpropan-2-ol b. 2-methylbutanoic acid

c. Isobutyl iodide d. 2-methyl propanal

A,C,D

Sol. (A) $H_3C-\underset{OH}{\overset{CH_3}{\overset{|}{\underset{|}{C}}}}-CH_3 \xrightarrow{Red\,P+HI} CH_3-\underset{CH_3}{\overset{|}{CH}}-CH_3$

(B) $H_3C-\underset{CH_3}{\overset{|}{CH}}-CH_2COOH \xrightarrow{Red\,P+HI} CH_3-\underset{CH_3}{\overset{|}{CH}}-CH_2-CH_3$
2–Methylbutane

(C) $CH_3-\underset{CH_3}{\overset{|}{CH}}-CH_2-I \xrightarrow{Red\,P+HI} CH_3-\underset{CH_3}{\overset{|}{CH}}-CH_3$

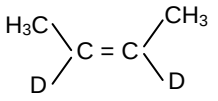
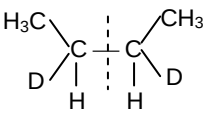
(D) $CH_3-\underset{CH_3}{\overset{|}{CH}}-CHO \xrightarrow{Red\,P+HI} CH_3-\underset{CH_3}{\overset{|}{CH}}-CH_3$

5. $\underset{D}{\overset{H_3C}{}}\!\!>C=C<\!\!\underset{D}{\overset{CH_3}{}}$ $\xrightarrow{H_2/Ni}$

Product of above reaction will be:

a. racemic mixture b. optically inactive c. meso d. constitutional isomers

B,C

Sol.  $\xrightarrow{H_2/Ni}$ 

Syn addition

Meso (Plane of symmetry)

6. Which of the following alkane cannot be prepared by hydrogenation of alkene by Ni + H_2.

a. $CH_3-\underset{CH_3}{\overset{|}{CH}}-CH_3$ b. $CH_3-\underset{CH_3}{\overset{CH_3}{\overset{|}{\underset{|}{C}}}}-CH_3$ c. CH_4 d. $CH_3-\underset{CH_3}{\overset{|}{CH}}-CH_2-CH_3$

B,C

7. $CH_3I \longrightarrow CH_4$

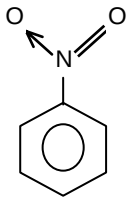
Above conversion can be achieved by:

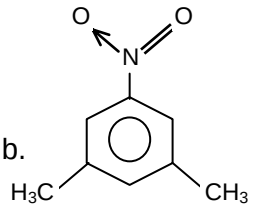
a. Zn/H^+ b. Red P + HI c. Mg (ether) then H_2O d. Na + dryether

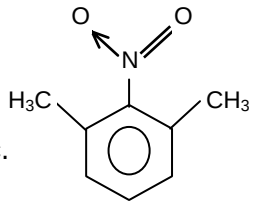
A,B,C

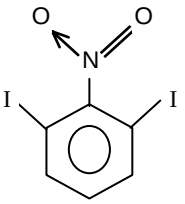
Sol. $CH_3 - Cl \xrightarrow{Mg} CH_3MgBr \xrightarrow{H_2O} CH_4$; $CH_3I \xrightarrow{Na} CH_3 - CH_3$

8. In which of the following molecules — NO_2 group is not coplanar with phenyl ring?

a. 

b. 

c. 

d. 

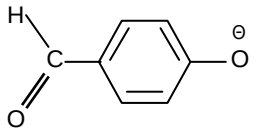
C,D

Sol. Steric hindrance due to larger size of $-CH_3$ and – I.

SECTION – E (Matrix Type) No Negative Marking

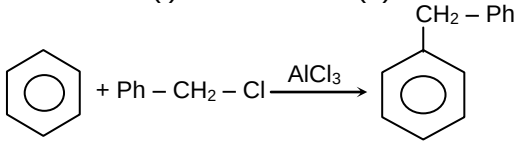
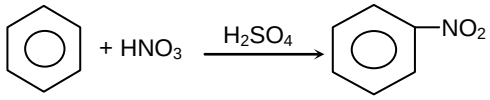
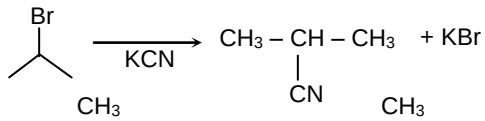
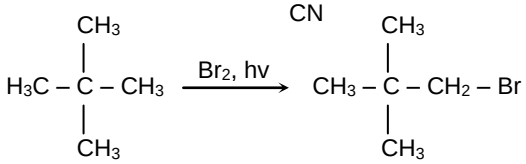
This Section contains **2 questions.** Each question has four choices (A, B, C and D) given in **Column I** and five statements (p, q, r, and s) in **Column II.** **(2 × 8 = 16 Marks)**

1. Match the column – I with Column – II.

Column (I) Intermediate	**Column (II) (Type of effects)**
(a) $H_3C - \overset{\oplus}{C}H_2$	(p) Mesomeric effect
(b) $H_3C - \overset{\bullet}{C}H_2$	(q) Hyperconjugation
(c) $Cl - \overset{\ominus}{C}(Cl)Cl$	(r) Inductive effect
(d) 	(s) p_π - d_π overlapping

Sol. A → Q, R; B → Q, R; C → R, S; D → P, R

2. Match Column (I) with Column (II)

(a) 		(p) Nucleophilic substitution
(b) 		(q) Electrophilic substitution
(c) 		(r) Cation intermediate
(d) 		(s) Free radical substitution

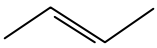
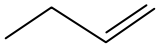
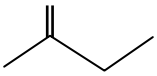
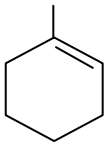
Sol. A – (q), (r); B – (q), (r) ; C – (p); D – (s)

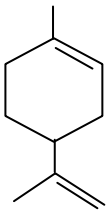
SECTION – F (Integer Type) No Negative Marking

This Section contains **6 Questions**. The answer to each question is a **Single Digit Integer** ranging from 0 to 10. The correct digit below the question number in the OMR is to be bubbled.

6 × 4 = 24 Marks

1. Examine the structural formulas of following compounds and find how many compounds will produce CO_2 with hot acidic $KMnO_4$

(a)  , (b)  , (c)  , (d) 

(e)  , (f) $H_3C - C \equiv CH$, (g) $Ph - CH = CH_2$

Sol. 5 (b); (c); (e); (f); (g) (terminal alkene & alkyne

2. From the following compounds/ ions:

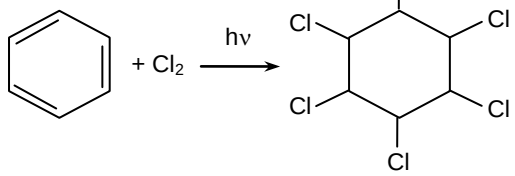
(a) $\overset{\oplus}{C}H_3$ (b) $\overset{\oplus}{N}H_4$ (c) BF_3 (d) NH_3 (e) $AlCl_3$ (f) F^- (g) $:CCl_2$ (h) $CH_2 = CH_2$

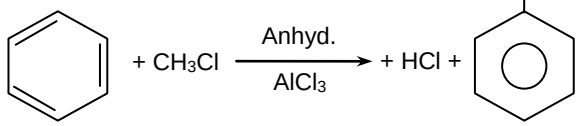
Identify value of ″X″. Where ″X″ is the total number of electrophiles.

Sol.4 (a, c, g, e)

3. How many of following reactions are electrophilic addition

(a) $CH_3 - CH = CH_2 \xrightarrow[H^+]{HOH} CH_3 - \underset{OH}{CH} - CH_3$ (b) $CH_3 - \underset{CH_3}{\overset{CH_3}{C}} - H \xrightarrow[H^+]{KMnO_4} CH_3 - \underset{CH_3}{\overset{CH_3}{C}} - OH$

(c) 

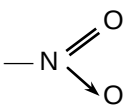
(d) 

(e) $CH_3 - \underset{}{\overset{CH_3}{C}} = CH_2 \xrightarrow{HCl} CH_3 - \underset{Cl}{\overset{CH_3}{C}} - CH_3$ (f) $CH_3 - C \equiv C - CH_3 \xrightarrow{Ozonolysis} CH_3 - \overset{O}{\overset{\|}{C}} - \overset{O}{\overset{\|}{C}} - CH_3$

Ans. 2

(a, e) (B = oxidation (free Radical); C = free Radical addition; D = electrophilic subsitution

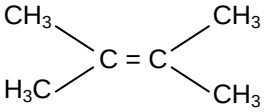
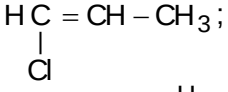
4. Which of the following groups on Benzene ring will make it meta directing:

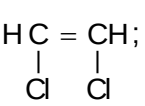
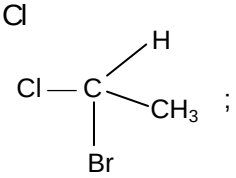
$-C \equiv N$;  ; $-\underset{CH_3}{\overset{CH_3}{C}} - CH_3$; $-\ddot{O}H$; $-\overset{O}{\overset{\|}{C}} - \ddot{N}H_2$; $-\ddot{N}H_2$; $-\overset{O}{\overset{\|}{C}} - H$;

$-\overset{O}{\overset{\|}{C}} - Cl$; $-Cl$;

Sol.6; CN, NO_2, $-C(CH_3)_3$; $-\overset{O}{\overset{\|}{C}} - NH_2$; $-\overset{O}{\overset{\|}{C}} - H$; $-\overset{O}{\overset{\|}{C}} - Cl$

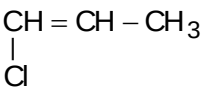
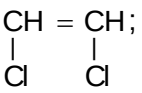
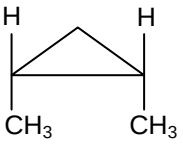
5. How many of the following will show Geometrical Isomerism.

$CH_2 = CH_2$;  ; $CH_3 - CH = CH - CH_3$;  ;

 1,2,-dimethyl cyclopropane; $CH_3 - CH_2 - CH_3$;  ;

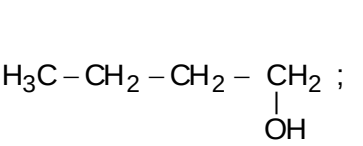
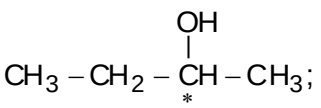
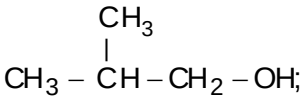
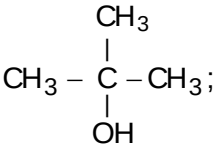
$CH_3 - CH = CH_2$

Sol. 4

$CH_3 - CH = CH - CH_3$;  ;  

6. How many total number of isomers are possible for formula $C_4H_{10}O$? (excluding stereoisomers)

Sol. 7

 ;  ;  

$CH_3 - CH_2 - O - CH_2 - CH_3$; $H_3C - O - CH_2 - CH_2 - CH_3$;