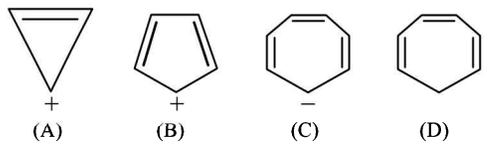
13 Hydrocarbons

Conceptual MCQs

1. $CH \equiv CH \xrightarrow[\text{Pressure}]{Ni(CN)_2} X$. Here X in the reaction is–

(a) Benzene (b) Ethane
(c) Cyclo Octatetraene (d) Cyclohexane

2. Which compound (s) out of the following is/are not aromatic?



(A) (B) (C) (D)

(a) (B), (C) and (D) (b) (C) and (D)
(c) (B) (d) (A) and (C)

3. Reactivity of hydrogen atoms attached to different carbon atoms in alkanes has the order:

(a) Tertiary > Primary > Secondary
(b) Primary > Secondary > Tertiary
(c) Tertiary > Secondary > Primary.
(d) Both (a) and (b)

4. Acetylene can be obtained by the reaction:

(a) $HCOOK \xrightarrow{\text{electrolysis}}$

(b) $CHI_3 + 6Ag + CHI_3 \xrightarrow{\Delta}$

(c) $CH_3CH_2OH \xrightarrow[443°C]{\text{Conc. } H_2SO_4}$

(d) $Be_2C + H_2O \longrightarrow$

5. When CH_3Cl and $AlCl_3$ are used in Friedel-Crafts reaction, the electrophile is:

(a) Cl^+ (b) $AlCl_4^-$ (c) CH_3^+ (d) $AlCl_2^+$

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

(a) $CH_3-CH=CH_2$

(b) $CH_3C \equiv C-CH_3$

(c) $CH_3-\underset{H}{\overset{|}{C}}=\underset{H}{\overset{|}{C}}-CH_3$

(d) CH_4

7. In commercial gasolines the type of hydrocarbons which are more desirable is:

(a) branched hydrocarbons
(b) straight-chain hydrocarbons
(c) aromatic hydrocarbons such as toluene
(d) linear unsaturated hydrocarbons

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

(a) bromine, CCl_4
(b) H_2, Lindlar catalyst
(c) dilute H_2SO_4, $HgSO_4$
(d) ammonical Cu_2Cl_2 solution

9. On mixing a certain alkane with chlorine and irradiating it with ultraviolet light, it forms only one monochloroalkane. This alkane could be:

(a) pentane (b) isopentane
(c) neopentane (d) propane

10. Which of these will not react with acetylene?

(a) NaOH (b) Ammonical $AgNO_3$
(c) Na (d) HCl.

11. Which of the following is oxidised by $KMnO_4$?

(a) Methane (b) Pentane
(c) Isobutane (d) Neopentane

12. In the reaction

$CH_3C \equiv C^-Na^+ + (CH_3)_2CH-Cl \longrightarrow ?$

the product formed is :

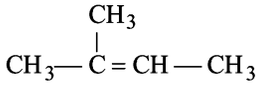
(a) propene (b) propyne
(c) propyne and propene (d) 4-methylpentyne-2

13. 1, 2-Dibromocyclohexane on dehydrobromination gives :

(a)  (b) 

(c)  (d) None of these

14. The following compound



on reaction with $NaIO_4$ in the presence of $KMnO_4$ gives:

(a) $CH_3CHO + CO_2$

(b) CH_3COCH_3

(c) $CH_3COCH_3 + CH_3COOH$

(d) $CH_3COCH_3 + CH_3CHO$

15. The addition of HBr is easiest with :

(a) $(CH_3)_2C = CH_2$

(b) $CH_3 - CH = CH_2$

(c) $ClCH = CHCl$

(d) $CH_2 = CH - Cl$

Application Based MCQs

16. In the given reactions:

(i) $CH_3Br \xrightarrow{\text{Na, ether}} X \xrightarrow[h\nu]{Br_2} Y \xrightarrow{\text{Na, ether}} Z$

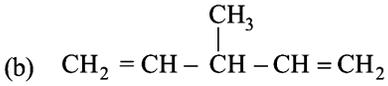
(ii) $CH_3COOH \xrightarrow{NaOH} X \xrightarrow[CaO]{NaOH} Y \xrightarrow[h\nu]{Br_2} Z$

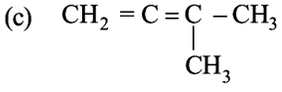
Identify X, Y and Z.

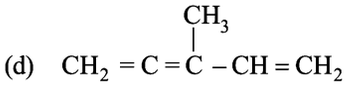
		X	Y	Z
(a)	(i)	CH_4	CH_3Br	CH_3CH_3
	(ii)	CH_3COONa	CH_3CH_3	CH_3CH_2Br
(b)	(i)	CH_3CH_3	CH_4	CH_3Br
	(ii)	CH_3COONa	CH_4	$CH_3CH_2CH_3$
(c)	(i)	CH_3CH_2Br	CH_3CH_3	$CH_3CH_2CH_3$
	(ii)	CH_3COONa	CH_4	CH_3Br
(d)	(i)	CH_3CH_3	CH_3CH_2Br	$CH_3CH_2CH_2CH_3$
	(ii)	CH_3COONa	CH_4	CH_3Br

17. An alkene gives two moles of HCHO, one mole of CO_2 and one mole of CH_3COCHO on ozonolysis. What is its structure?

(a) $CH_2 = C = CH - CH_2 - CH_3$

(b) 

(c) 

(d) 

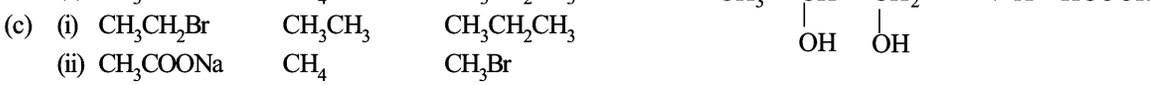
18. Which one of the following reactions is expected to readily give a hydrocarbon product in good yields ?

(a) $RCOOK \xrightarrow[\text{oxidation}]{\text{Electrolytic}}$ (b) $RCOO^-Ag^+ \xrightarrow{Br_2}$

(c) $CH_3CH_3 \xrightarrow[h\nu]{Cl_2}$ (d) $(CH_3)_3CCl \xrightarrow{C_2H_5OH}$

19. In the reaction

$$CH_3CH = CH_2 + H_2O + [O] \xrightarrow[\text{Acid}]{KMnO_4}$$



X is–

(a) CH_3CH_2COOH (b) CH_3COOH

(c) CH_3CH_2CHO (d) CH_3CH_2OH

20. 2-Methylbutane on reacting with bromine in the presence of sunlight gives mainly:

(a) 1-bromo-3-methylbutane

(b) 2-bromo-3-methylbutane

(c) 2-bromo-2-methylbutane

(d) 1-bromo-2-methylbutane

21. Ozonolysis of 2,3-dimethyl but-1-ene followed by reduction with zinc and water gives:

(a) methanal and hexanoic acid

(b) methanoic acid and butanone

(c) methanal and 3-methylbutan-2-one

(d) butanoic acid and 2,3-dimethylbutanoic acid.

22. At 130 °C, normal butane reacts with bromine, the product will be :

(a) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{Br}{|}}{C}}-CH_3$

(b) $CH_3CH_2CH_2CH_2-Br$

(c) $CH_3-CH_2-\underset{|}{\overset{Br}{CH}}-CH_3$

(d) All of the above

23. What is the end product of the following sequences of operations $CaC_2 \xrightarrow{H_2O} A \xrightarrow[Hg^{2+}]{dil.H_2SO_4} B \xrightarrow[H_2]{Ni} C$?

(a) Methyl alcohol (b) Acetaldehyde

(c) C_2H_5OH (d) C_2H_4

24. Sample of 2, 3-dibromo-3-methylpentane is heated with zinc dust. The resulting product is isolated and heated with HI in the presence of phosphorus. Indicate which structure will represent the final organic product formed in the reaction?

(a) $CH_3-CH_2-\underset{|}{\overset{}{CH}}-CH_2-CH_3$ (CH_3 below CH)

(b) $CH_2=CH-\underset{|}{\overset{CH_3}{CH}}-CH_2-CH_3$

(c) $CH_3-CHI-\underset{|}{\overset{}{CH}}-CH_2-CH_3$ (CH_3 below CH)

(d) $CH_2=CH-\underset{|}{\overset{}{C(I)}}-CH_2-CH_3$ (CH_3 below C(I))

25. $\underset{\underset{CH}{|||}}{\overset{CH}{}} \xrightarrow{O_3/NaOH} X \xrightarrow{Zn/CH_3COOH} Y$.

'Y' is:

(a) $\underset{CH_2OH}{\overset{CH_2OH}{|}}$ (b) CH_3CH_2OH

(c) CH_3COOH (d) CH_3OH

26. The decreasing order of boiling points is:

(a) *n*-pentane > *iso*-pentane > *neo*-pentane

(b) *iso*-pentane > *n*-pentane > *neo*-pentane

(c) *neo*-pentane > *iso*-pentane > *n*-pentane

(d) *n*-pentane > *neo*-pentane > *iso*-pentane

27. $[A] \xleftarrow[\text{catalyst}]{\text{Lindlar's}} CH_3-C\equiv C-CH_3 \xrightarrow[\text{liq. } NH_3]{\text{Na in}} [B]$

[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

28. Which of the following does not give alkane?

(a) Reaction of CH_3I with Na in ether.

(b) Reaction of sodium acetate with sodalime.

(c) Electrolysis of concentrated sodium acetate solution.

(d) Reaction of ethyl chloride with alc. KOH.

29. What is the main product of this reaction?

$CH_3-C\equiv CH \xrightarrow[\text{Excess}]{HCl(g)} ?$

(a) $CH_3-\underset{\underset{CH_2}{\|}}{\overset{\overset{Cl}{|}}{C}}$

(b) $CH_3-\underset{\underset{Cl}{|}}{\overset{\overset{Cl}{|}}{CH}}-CH_2$

(c) $CH_3-CH_2-CH\begin{matrix}\diagup Cl\\ \diagdown Cl\end{matrix}$

(d) $CH_3-\underset{\underset{Cl}{|}}{\overset{\overset{Cl}{|}}{C}}-CH_3$

30. Match the column I with column II to identify the products of oxidation of alkanes and mark the appropriate choice.

Column I	Column II
(A) $CH_4 + 2O_2 \xrightarrow[[O]]{KMnO_4}$	(p) $HCOOH + H_2O$
(B) $2CH_4 + O_2 \xrightarrow[100\ atm]{Cu/523\ K}$	(q) $CO_2 + 2H_2O$
(C) $CH_4 + O_2 \xrightarrow[\Delta]{Mo_2O_3}$	(r) $2CH_3OH$
(D) $CH_4 + \frac{3}{2}O_2 \xrightarrow{(CH_3COO)_2Mn}$	(s) $HCHO + H_2O$

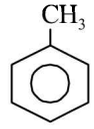
(a) (A) → (p), (B) → (q), (C) → (r), (D) → (s)

(b) (A) → (q), (B) → (r), (C) → (s), (D) → (p)

(c) (A) → (s), (B) → (q), (C) → (r), (D) → (p)

(d) (A) → (r), (B) → (p), (C) → (q), (D) → (s)

31. Which of the following will be easily nitrated?

(a) 

(b) 

(c) CH_3NO_2 (d) $C_6H_5NO_2$

32. In reaction sequence

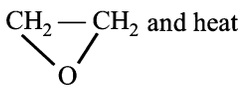
$$CH_2 = CH_2 \xrightarrow[\text{acid}]{\text{Hypochlorous}} M \xrightarrow{R} \begin{matrix} CH_2OH \\ | \\ CH_2OH \end{matrix}$$

molecule 'M' and reagent 'R' respectively are:

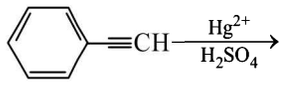
(a) CH_3CH_2Cl and NaOH

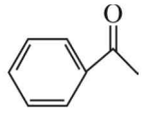
(b) CH_3CH_2OH and H_2SO_4

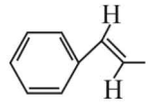
(c) $\begin{matrix} CH_2Cl \\ | \\ CH_2OH \end{matrix}$ and aqueous $NaHCO_3$

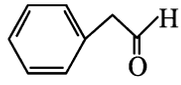
(d)  and heat

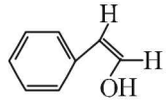
33. What is the major organic product of the following reaction?



(a) 

(b) 

(c) 

(d) 

34. A compound (X) on ozonolysis followed by reduction gives an aldehyde, C_2H_4O and 2-butanone, compound (X) is:

(a) 3-methylpent-2-ene (b) 3-methylpent-1-ene

(c) 3-methylhex-3-ene (d) 3-ethylpent-3-ene

35. The order of reactivity of alkenes,

$(CH_3)_2C = CH_2$, $CH_3CH = CH_2$, $CH_2 = CH_2$

(I) (II) (III)

when subjected to acid catalysed hydration is:

(a) I > II > III (b) I > III > II

(c) III > II > I (d) II > I > III

36. The reaction of toluene with Cl_2 in presence of $FeCl_3$ gives X and reaction in presence of light gives Y. Thus, X and Y are:

(a) X = Benzyl chloride,
Y = *m*-chlorotoluene

(b) X = Benzyl chloride,
Y = *o*-chlorotoluene

(c) X = *m*-chlorotoluene,
Y = *p*-chlorotoluene

(d) X = *o*- and *p*-chlorotoluene,
Y = Trichloromethyl benzene

37. In the following reaction

$$CH_3 - CH_2 - CH_2 - CH_3 \xrightarrow[475\ K]{H_2SO_4}$$

(a) $CH_3CH = CHCH_3$ predominates

(b) $CH_2 = CHCH_2CH_3$ predominates

(c) Both are formed in equal amounts

(d) The amount of production depends on the nature of catalyst

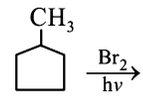
38. Identify the product P in the following reaction :

$$CH_3 - CH = CH_2 + NOCl \longrightarrow P$$

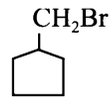
(a) $\begin{matrix} CH_3 - CH - CH_2 \\ \quad | \quad\ | \\ \quad NO \ \ Cl \end{matrix}$ (b) $\begin{matrix} CH_3 - CH - CH_2 \\ \quad | \quad\ | \\ \quad Cl \ \ NO \end{matrix}$

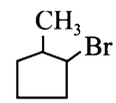
(c) $\begin{matrix} CH_2 - CH_2 - CH_2 \\ | \qquad\quad | \\ NO \qquad\ Cl \end{matrix}$ (d) $\begin{matrix} \quad\quad NO \\ \quad\quad | \\ CH_3 - CH_2 - CH \\ \quad\quad\quad\ | \\ \quad\quad\quad Cl \end{matrix}$

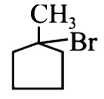
39. In the following reaction,

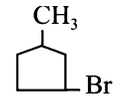


the major product obtained is:

(a) 

(b) 

(c) 

(d) 

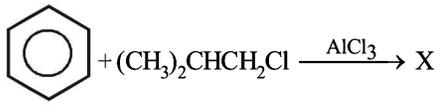
40. $(CH_3)_2C = \underset{\displaystyle CH_3}{\underset{|}{CH}} \xrightarrow[H_2]{\text{Catalyst}} [P]$

No. of optical isomers given by the product formed are:

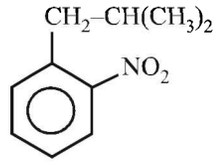
(a) 2 (b) 4 (c) Zero (d) 3

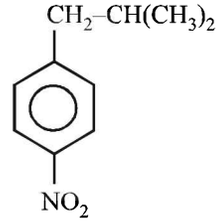
Skill Based MCQs

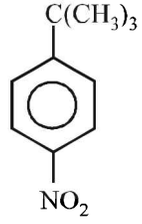
41. Identify the end product Y –

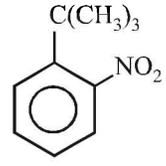


$$+(CH_3)_2CHCH_2Cl \xrightarrow{AlCl_3} X \xrightarrow[330K]{HNO_3/H_2SO_4} Y$$

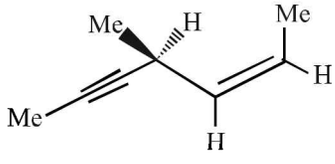
(a) 

(b) 

(c) 

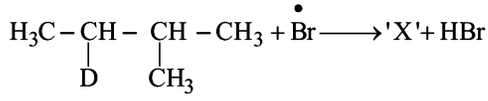
(d) 

42. Hydrogenation of the given compound in the presence of poisoned palladium catalyst gives:



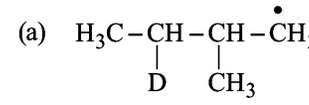
(a) an optically active compound.
(b) an optically inactive compound.
(c) a racemic mixture.
(d) a diastereomeric mixture.

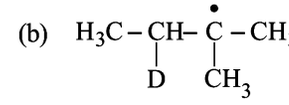
43. Consider the following reaction

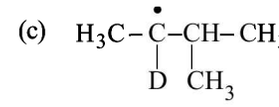


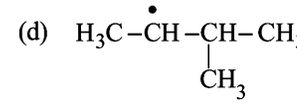
$$H_3C-\underset{D}{CH}-\underset{CH_3}{CH}-CH_3 + \dot{B}r \longrightarrow 'X' + HBr$$

Identify the structure of the major product 'X'.

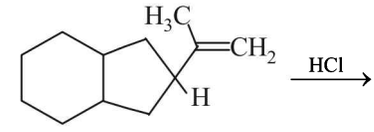
(a) 

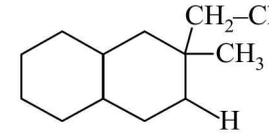
(b) 

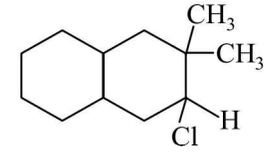
(c) 

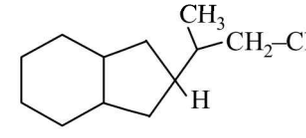
(d) 

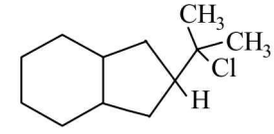
44. The major product of the following reaction is :



(a) 

(b) 

(c) 

(d) 

45. The major product of the following reaction is :

$$CH_3CH_2\underset{\underset{Br}{|}}{CH}-\underset{\underset{Br}{|}}{CH_2} \xrightarrow[(ii)\ NaNH_2 \text{ in liq. } NH_3]{(i)\ KOH\ alc}$$

(a) $CH_3CH=C=CH_2$

(b) $CH_3CH_2\underset{\underset{NH_2}{|}}{CH}-\underset{\underset{NH_2}{|}}{CH_2}$

(c) $CH_3CH=CHCH_2NH_2$

(d) $CH_3CH_2C\equiv CH$

46. The addition of Br_2 to (E)-but-2-ene gives:

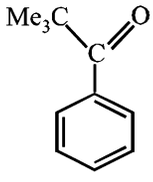
(a) (R, R)-2,3-dibromobutane

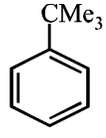
(b) (S, S)-2,3-dibromobutane

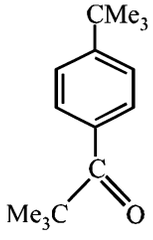
(c) (R, S)-2,3-dibromobutane

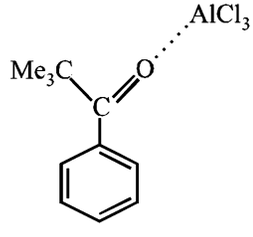
(d) A mixture of (R, R) and (S, S)-2,3-dibromobutane

47. Reaction of benzene with Me_3CCOCl in the presence of anhydrous $AlCl_3$ gives:

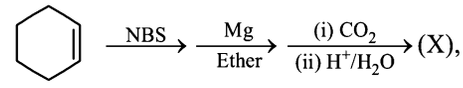
(a) 

(b) 

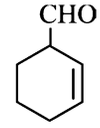
(c) 

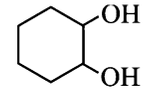
(d) 

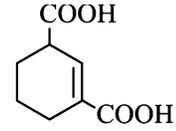
48. In the given reaction

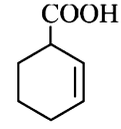


(X) will be :

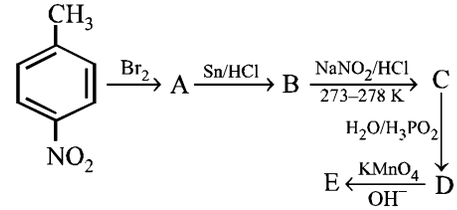
(a) 

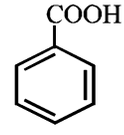
(b) 

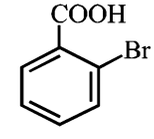
(c) 

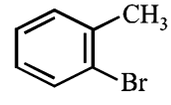
(d) 

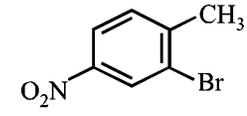
49. Identify the product (E) in the following sequence of reactions.



(a) 

(b) 

(c) 

(d) 

50. $CH\equiv CH \xrightarrow[H_2SO_4]{HgSO_4} \xrightarrow[H_2O]{CH_3MgBr} \xrightarrow{P/Br_2}$

(a) $CH_3CH(Br)CH_3$ (b) $CH_3CH_2CH_2Br$

(c) $CH_2=CH-Br$ (d) $BrCH=CH-CH_3$

ANSWER KEY																		
Conceptual MCQs																		
1	(c)	**3**	(c)	**5**	(c)	**7**	(a)	**9**	(c)	**11**	(c)	**13**	(b)	**15**	(a)			
2	(a)	**4**	(b)	**6**	(d)	**8**	(d)	**10**	(a)	**12**	(c)	**14**	(c)					
Application Based MCQs																		
16	(d)	**19**	(b)	**22**	(c)	**25**	(a)	**28**	(d)	**31**	(a)	**34**	(a)	**37**	(a)	**40**	(c)	
17	(d)	**20**	(c)	**23**	(c)	**26**	(a)	**29**	(d)	**32**	(c)	**35**	(a)	**38**	(b)			
18	(a)	**21**	(c)	**24**	(a)	**27**	(a)	**30**	(b)	**33**	(a)	**36**	(d)	**39**	(c)			
Skill Based MCQs																		
41	(c)	**42**	(b)	**43**	(b)	**44**	(d)	**45**	(d)	**46**	(c)	**47**	(b)	**48**	(d)	**49**	(b)	**50**	(a)