N.B.Navale

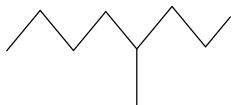
Date : 01.04.2025 **TEST ID: 75 Time**: 01:20:06 **CHEMISTRY**

Marks: 89

HYDROCARBONS

Single Correct Answer Type

The IUPAC name of compound

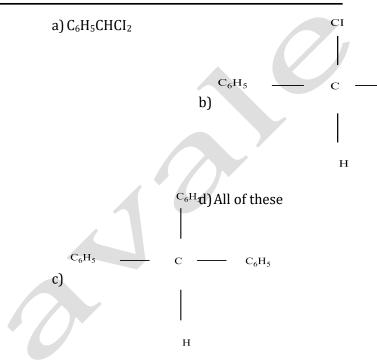


- a) 4-methyloctane
- b) 2-propylhexane
- c) 2-butylpentane
- d) None of these
- 2. Which one of the following has the smallest heat of hydrogenation per mole?
 - a) 1-butene
- b) Trans-but-2-ene
- c) C/s-but-2-ene
- d) Buta-1,3-diene
- $\text{CaC}_2 + \text{H}_2\text{O} \longrightarrow \text{A} \overset{\text{H}_2\text{SO}_4/\text{HgSO}_4}{\longrightarrow} \text{R}$

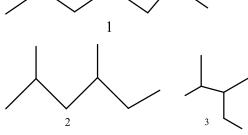
Identify A and B in the given reaction.

- a) C₂H₂ and CH₃CHO b) CH₄ and HCOOH
- c) C₂H₄ and CH₃COOH d) C₂H₂ and CH₃COOH
- The product(s) obtained via oxymercuration $(HgSO_4 + H_2SO_4)$ of but-1-yne would be
 - a) CH₃CH₂COCH₃
- b) CH₃CH₂CH₂CHO
- c) $\frac{\text{CH}_3\text{CH}_2\text{CHO}}{+\text{HCHO}}$
- d) + HCOOH

- Among the following, the compound that can be most readily sulphonated is
 - a) benzene
- b) nitrobenzene
- c) toluene
- d)chlorobenzene
- 6. Which of the following conformation has maximum energy?
 - a) Eclipsed
- b) Staggered
- c) Gauche
- d) Equal
- 7. Conversion of hexane into benzene involves the reaction of
 - a) hydration
- b) hydrolysis
- c) hydrogenation
- d) dehydrogenation
- 8. An activating group
 - a) activates only ortho b) deactivates meta and para positions position
 - c) activates ortho and d) deactivates meta para more than meta more than ortho and para
- A Friedel-Crafts reaction of benzene with chloroform produces



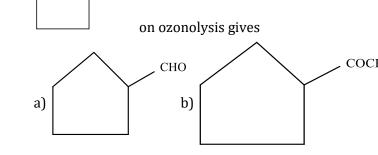
10. Rank the following substances in decreasing order of heat of combustion (most exothermic \rightarrow least exothermic).

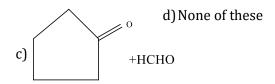


- a) 2 > 1 > 3
- b) 2 > 3 > 1
- c) 3 > 1 > 2

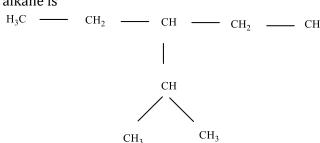
11.

d)3 > 2 > 1

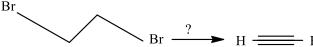




12. The correct IUPAC name of the following alkane is



- a) 3,6-diethyl-2methyloctane
- b) 5-isopropyl-3ethyloctane
- c) 3-ethyl-5isopropyloctane
- d)3,3-isopropyl-6ethyloctane
- 13. The reagents(s) for the following conversion,



is/are

- a) alcoholic KOH
- b) alcoholic KOH followed by NaNH₂
- c) aqueous KOH followed by NaNH₂
- d)Zn/CH₃OH
- 14. The reaction of toluene with chlorine in the presence of ferric chloride gives predominantly
 - a) benzoyl chloride
- b) m-chlorotoluene
- c) benzyl chloride
- d) o-chlorotoluene and p-chlorotoluene
- 15. The reaction conditions leading to the best yield of C₂H₅Cl are

b) $C_2H_6 + Cl_2 \xrightarrow{\text{hv}}$

 $C_2H_6 + Cl_2$ (excess) d) None of the above

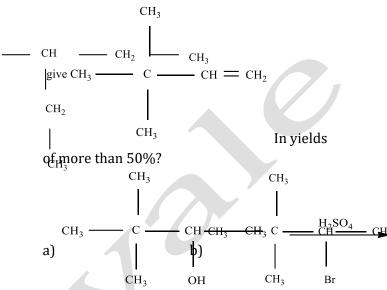
- 16. Which of the following alkane on mono chlorination produces racemic mixture?
 - a) neo-pentane
- b) n-butane
- c) 2, 3-dimethylbutane d) 2,2,3,3-

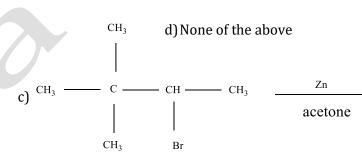
tetramethylbutane

- 17. An alkyl bromide, RBr of molecular weight 151 is the exclusive product of bromination of which hydrocarbon?
 - a) Dodecane
- b) 2, 2-

dimethylpropane c) 2, 2-dimethylhexane d) 2, 2, 3trimethylheptane

18. Which of the following reactions is not expected to





- 19. How many isomers are possible for an alkane having molecular formula C₅H₁₂?
 - a) 5

b)3

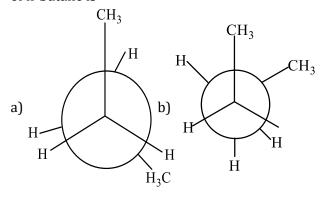
c) 4

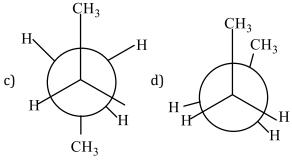
- d)2
- 20. Select the correct statement (s).
 - a) Staggered and eclipsed conformers cannot be physically separated because the energy difference between them is so small that they readily interconvert at room temperature

Conformers are their existence to the tetrahedral nature of b) carbon bonding and the fact that the σ bond is cylindrically symmetrical

- c) Both (a) and (b) are d) None of the above correct
- 21. $CH_3CH_2CH_3 \stackrel{400-600^{\circ}C}{\longrightarrow} X + Y$ X and Y are
 - a) hydrogen, methane b) methane, ethylene
 - c) hydrogen, ethylene d) ethylene, ethane

22. In the following, the most stable conformation of n-butane is





- 23. Eclipsed form of ethane has higher energy due
 - a) torsional strain
- b) steric strain
- c) angle strain
- d) Both (a) and (b)
- 24. An unsaturated hydrocarbon 'A' adds two molecules of H₂ and on reductive ozonolysis gives butane - 1, 4- dial, ethanol and propanone. Give the IUPAC name of A.
 - a) 3-methylocta-2,6-
- b) 2-methylocta-2-5diene
- diene
- c) 2-methylocta-2-6diene
- d) 2-methylocta-3-5diene
- 25. On mixing a certain alkane with chlorine and irradiating it with UV light, it forms one monochloro alkane. The alkane could be
 - a) neo-pentane
- b) propane
- c) pentane
- d) iso-pentane
- 26. Which of the following annulenes is antiaromatic?
 - a) Benzene
- b) Cyclobutadiene
- c) Cyclodecapentene
- d) Cyclooctatetraene
- 27. Hydrocarbon which is liquid at room temperature is
 - a) pentane
- b) butane
- c) propane
- d) ethane
- 28. Nitrobenzene can be prepared from benzene by using a mixture of concentrated HNO₃ and concentrated H₂SO₄. In the nitrating mixture, HNO₃ acts as
 - a) base
- b) acid

- c) reducing agent d)catalyst
- 29. Arrange the following hydrogen halides in the order of their decreasing reactivity with propene.
 - a) HCl > HBr > HI
- b) HBr > HI > HCI
- c) HI > HBr > HCI
- d) HCI > HI > HBr
- 30. The final product in the following sequence of reaction is

 $\overset{NaNH_2}{\longrightarrow} A \overset{CH_3Br}{\longrightarrow}$ $CH \equiv CH \longrightarrow$

$$a) = CH_2 = CH - CH$$
$$= CH_2$$

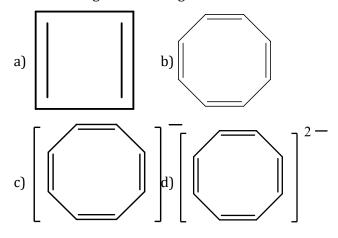
b)
$$HC \equiv C - CH_3$$

c) $CH_2 = CH - CH_3$

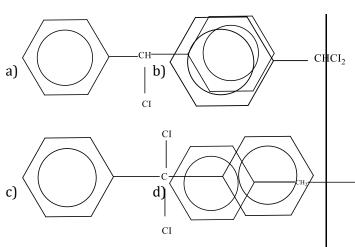
- d) $CH_3 CH_2 CH_3$
- 31. The addition of HCl to 3,3,3-trichloropropene gives
 - a) Cl₃CCH₂CH₂Cl
- b) Cl₃CCH₂CHCl₂
- c) Cl₂CHCH₂CHCl₂
- d) Cl₂CHCH(Cl)CH₂Cl
- 32. The compound with the highest boiling point is
 - a) n-hexane
- b) n-pentane
- c) 2, 2-
- d) 2-methylbutane

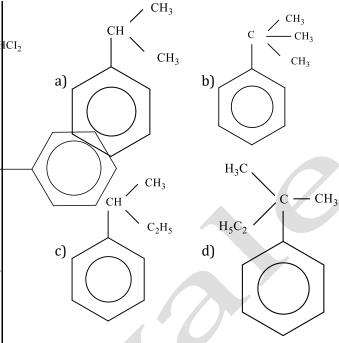
dimethylpropane

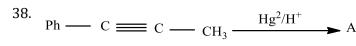
- 33. The alkene which on hydrogenation give 2methyl butane is
 - a) 2-methylbut-1-ene b) 2-methylbut-2-ene
 - c) 3-methylbut-1-ene d) All of these
- 34. The treatment of benzene with benzoyl chloride in the presence of AICI₃ gives
 - a) benzaldehyde
- b) benzophenone
- c) diphenyl
- d) cyclohexane
- 35. The best method to prepare cyclohexene from cyclohexanol is by using
 - a) conc. H C $l + ZnCl_2$ b) conc. H_3PO_4
 - c) HBr
- d) conc. HCl
- 36. Which among the following is aromatic?



37. When excess of C₆H₆ reacts with CH₂CI₂ in the presence of anhydrous AICI3, the following compound is obtained



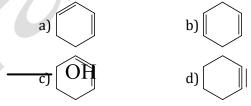




- a)
- Ph - CH . c) $H_{3}C$
- 39. Alkyne, C₇H₁₂, when reacted with alkaline KMnO₄ followed by acidification with HCI gives a mixture of (CH₃)₂ CHCOOH + CH₃CH₂COOH. The alkyne C₇H₁₂ is
 - a) 3-hexvne
- b) 2-methyl-2-hexene
- c) 2-methyl-3-hexyne d) 3-methyl-2-hexyne
- 40. Water can be added across a triple bond in the presence of
 - a) acidic medium
- b) alkaline medium
- c) neutral medium
- d) acid and HgSO4
- 41.

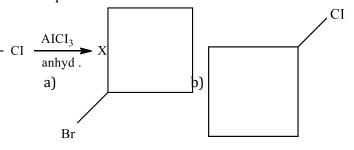
Identify the X in the above reaction.

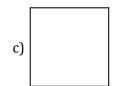
- Acetylene and HCHO reacts in the presence of copper acetylide catalyst to form
 - a) 1-butyne-1, 4-diiol b) 2-butyne-1, 2-diol
 - c) 2-butyne-1, 4-diol d) None of these
- 43. Which of the following compounds is the most stable?

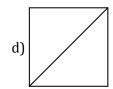


- 44. In the iodination of alkane, some HIO₃ is also added so that
 - a) reaction is made faster
- b) reaction is made reversible
- c) HI formed is oxidized to l₂
- d) reaction is selective
- 45. The reaction of propene with HOCl proceeds via the addition of
 - a) Cl⁺and OH⁻in a single step
- b) Cl⁺in the first step

- c) H⁺in the first step
- d)OH⁻in the first step
- 46. What would be the product formed when 1bromo-3-chloro cyclobutane reacts with two equivalents of metallic sodium in ether?





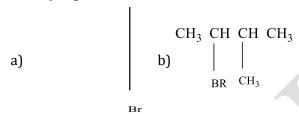


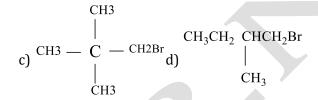
- 47. Ammoniacal silver nitrate form a white precipitate easily with
 - a) $CH_3C \equiv CH$
- b) $CH_3C \equiv C CH_2$
- c) $CH_3CH = CH_2$
- $d)CH_2 = CH_2$
- 48. An alkene, C_8H_{18} is obtained as the only product on subjecting a primary alkyl halide to Wurtz reaction. On monobromination this alkane yields a single isomer of a tertiary bromide. The primary alkyl halide is
 - a) 1-chloro butane
- b) iso-butyl halide
- c) iso pentyl halide
- d) neo- pentyl halide

49.

$$C_5 \underset{(A)}{H_{11}} \text{Br} \xrightarrow{\text{(i)Mg/ ether}} C_5 \underset{(B)}{H_{11}} D$$

Only one type of B is formed. Thus, A is $_{\rm CH_3CH_2}$ $_{\rm CH}$ $_{\rm CH_3CH_2}$





- 50. The addition of HBr to an alkene in the presence of peroxide is the example of
 - a) electrophilic
- b) nucleophile addition
- addition reaction
- reaction
- c) free radical addition d) the formation of reaction carbocation as an
 - intermediate
- 51. The treatment of $CH_3C = CHCH_3$ with $NalO_4$ or

CH₃

boiling KMnO₄ produces

- a) $^{\text{CH}_3\text{COCH}_3}_{+\text{CH}_3\text{COOH}}$
- b) $\frac{\text{CH}_3\text{COCH}_3}{\text{+ CH}_3\text{CHO}}$
- c) $CH_3CHO + CO_2$
- d) CH₃COCH₃ only
- 52. The increasing order of reduction of alkyl halides with zinc and dilute HCI is
 - a) R CI < R I < R Br b) R CI < R Br < R I
 - c) R I < R Br < R CId) R Br < R I < R CI

53. Arrange the following in the 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
- 54. Identify 'B' in the following reaction

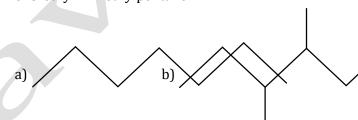
$$C_2H_6 \xrightarrow{Br_2} A \xrightarrow{CH_3COOAg} B$$
AIBr₃

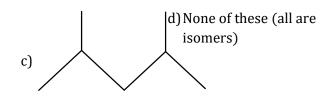
- a) $C_2H_5COOCH_3$
- b) CH₃COOC₂H₅
- c) C₂H₅COOC₂H₅
- d)CH₃COOCH₃
- 55. The number of possible alkynes with molecular formula C_5H_8 is
 - a)3

b)4

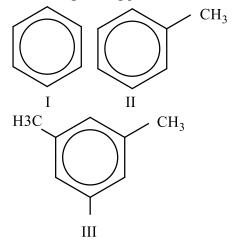
c) 5

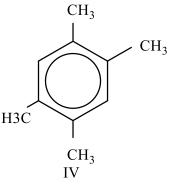
- d)6
- 56. Which of the following substances is an isomer of 3-ethyl-2-methylpentane?



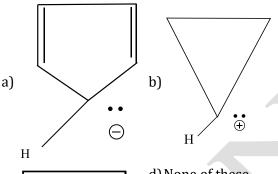


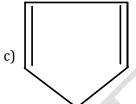
57. Arrange the following in the order of decreasing boiling point.





- a) I > II > III > IV
- b) IV > III > II > I
- c) I > III > IV > II
- d)II > III > I > IV
- 58. Arrange benzene, n-hexane and ethyne and in the decreasing order of acidic behaviour.
 - a) Ethyne > benzene > b) Hexane > benzene > hexane ethyne
 - c) Ethyne > hexane > d) Benzene > hexane > benzene ethyne
- 59. Which of the following species will be aromatic?





d) None of these

60. Choose the response that best describes the following compounds

- a) 1, 3 and 4 represent b) 1 and 3 are isomers the same compound of 2 and 4
- c) 1 and 4 are isomers d) All the structures of 2 and 3 represent the same compound
- 61. Which of the following form alkynide?

a)
$$C = C C$$
 $C = C C$
 $C = C$

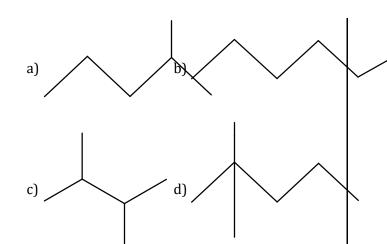
62. What will be the product obtained as a result of the following reaction and why?

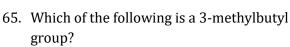
$$C(CH_3)_3$$
 C_2H_5

63.
$$\underbrace{ \begin{array}{c} \text{(i)BH}_3, \text{THF} \\ \text{(ii)H}_2 \text{O}_2, \text{OH} \end{array} }_{} \text{CH}_3 \text{C} = \text{CH} \underbrace{ \begin{array}{c} \text{HgSO}_4 \\ \text{H}_2 \text{SO}_4 \end{array} }_{} \text{B}$$

Identify A and B.

- a) CH₃CHO, CH₃COCH₃ b) CH₃CH₂CHO, CH₃COC
- c) CH₃CH₂CHO, CH₃COCd) HCHO, CH₃COCH₃
- 64. Which of the following has maximum boiling point?





a)
$$^{\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2}_{-}$$
 b) $^{\text{CH}_3\text{CHCH}_2\text{CH}_2}_{-}$

- c) $(CH_3CH_2)_2CH d)(CH_3)_3CCH_2 -$
- 66. C_8H_{18} with two quaternary carbon atoms will have
 - a) one-CH₂ and six-CH₃ b) one-CH₂ and five-CH₃ groups
 - c) two-CH $_2$ and four- d) six CH $_3$ groups CH $_3$ groups
- 67. Among the following statements on the nitration of aromatic compounds, the false one is
 - a) the rate of nitration b) the rate of nitration of benzene is almost the same as that of hexadeuterobenzene b) the rate of nitration of toluene is greater than that of benzene
 - c) the rate of nitration d) nitration is an of benzene is greater electrophilic than that of substitution reaction hexadeuterobenzene
- 68. $A(C_4H_6) \xrightarrow{H_2,Ni} B(C_4H_8) \xrightarrow{O_3/H_2O/Zn} CH_3CHO$. Thus, A and B are

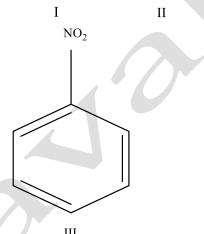


$$CH_3CH_2C$$
 $CH_2 = CH - CH$
 $C) \equiv CH, CH_3CH$ $d) = CH_2, CH_3CH$
 $= CHCH_3$ $= CH - CH_3$

- 69. Of the five isomeric hexanes, the isomer which can give two monochlorinated compounds is a) 2-methylpentane b) 2, 2-dimethylbutane c) 2, 3-dimethylbutane d) n-hexane
- 70. Arrange the following set of compounds in the order of their decreasing relative reactivity

OCH₃ CI

with an electrophile.

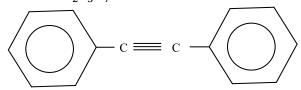


- a) I > II > III b) I > III > II
 c) II > I III d) II > III > I
- 71. The reduction of 4 -octyne with H₂ in the presence of Pd/CaCO₃ quinoline givesa) trans-4-octeneb) cis-4-octene
 - c) a mixture of cis-and trans-4-octene d) a completely reduced product C₈H₁₈
- 72. Propyne and propene can be distinguished by a) conc. H_2SO_4 b) Br_2 in CCI_4 c) alk. $KMnO_4$ d) $AgNO_3$ in NH_3
- 73. On mixing a certain alkane with chlorine and irradiating it with ultraviolet light, it forms only one monochloroalkane. This alkane would be
 - a) propane b) pentane c) iso-pentane d) neo pentane
- 74. What is the range of number of carbon atoms in alkanes found in paraffin wax?
 - a) C_{21} to C_{30} b) C_{19} to C_{20} c) C_6 to C_8 d) C_{17} to C_{18}
- 75. Propanal and pentan-3-one are ozonolysis product of an alkene. What is the structural formula of the alkene?

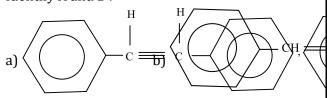
 $c) = CH_3CH_2CH$ $= CHCH_2C_3H_7$

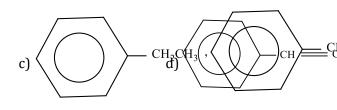
d) $CH_3CH_2CH = C <$

76.

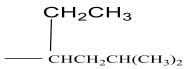


Identify A and B.





77. What is the correct IUPAC name of the alkyl group shown?



- a) 1-ethyl-3methylbutyl
- b) 1-ethyl-3,3-dlmethyl propyl
- c) 4-ethyl-2methylbutyl
- d)5-methylhexyl
- 78. Consider the following statements:
 - I . In a group of isomeric acyclic compounds, normal compound always has the highest boiling and melting point.
 - II . Greater the branching in alkanes, lower is the boiling point.
 - III . Melting point of alkanes depend upon the packing of molecules in the crystalline lattice. Select the correct statement (s).
 - a) Both I and II
- b) Both II and III
- c) Both I and III
- d) All of these
- 79. Arrange the following set of compounds in the order of their decreasing relative reactivity with an electrophile, E+
 - I. chlorobenzene
 - II. 2,4-dinitrochlorobenzene
 - III. p-nitrochlorobenzene
 - IV. toluene
 - $V. p-H_3C C_6H_4 NO_2$,
 - a) I > II > III > IV > V b) IV > V > I > III > II
 - c) V > IV > III > II > I d) I > III > II > V > IV

80. Arenes on treatment with chlorine in presence of ferric chloride as a catalyst undergoes what type of reaction?

a) Electrophilic₄
Pd/CaCO₃, substitution
quinoline c) Electrophilic

- b) Nucleophilic substitution
- Electrophilic d) Nucleophilic addition addition
- 81. Which of the following alkanes can be easily sulphonated?

a) n-butane

- —b) iso-butane
- n-pentage,
- d)n-hexaneooH
- Renzylehloride (C₀H₅CH₂CI) can be prepared from toluene by chlorination with
- a) SO₂CI₂
- b) SOCI₂

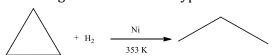
/ c) CI₂\

- d) NaOCI
- 3. The order of stability for the conformations of n-butane among these is CHO

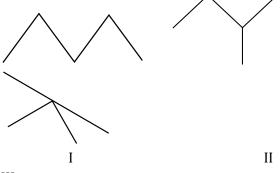
I . anti/ III. eclipsed (part II . gauche

III. eclipsed (partial)
(full)

- IV . eclipsed
- a) I > II > III > IV
- b) IV > III > II > I
- c) III > II > I > IV
- d)II > III > I > IV
- 84. Arrange the halogens F_2 , CI_2 , Br_2 , I_2 . in order of their increasing reactivity with alkanes .
 - a) $I_2 < Br_2 < Cl_2 < F_2$ b) $Br_2 < Cl_2 < F_2 < I_2$
 - c) $F_2 < Cl_2 < Br_2 < I_2$ d) $Br_2 < I_2 < Cl_2 < F_2$
- 85. Following reaction is of the type



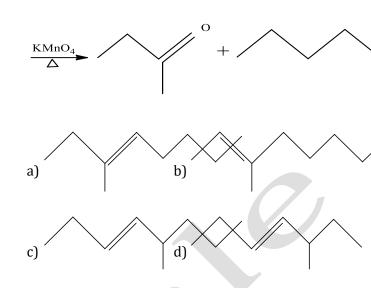
- a) nucleophilic addition
- b) nucleophilic substitution
- c) electrophilic addition
- d) electrophilic substitution
- 86. Which has maximum boiling point and melting point out of



- III
- a) I in both case
- b) Both I and II
- c) Both I and III
- d) Both II and I
- 87. The major product of the reaction between n-butane and bromine at $130^{\circ}\,\text{C}$

$$\begin{array}{c|c} & CH_3CH_2 & CHBr \\ a)\,CH_3CH_2CH_2CH_2Br & b) & & \\ & CH_2Br \\ CH_3 & \longrightarrow CH_2CH_2Br & CH_3CH_2 & \longrightarrow CHBr \\ c) & & & \\ & CH_2Br & & & \\ \end{array}$$

- 88. The highest boiling point is expected for a) iso-octane b) n-octane c) 2, 2, 3, 3-tetramethyl d) n-butane butane
- 89. Alkene(A)



N.B.Navale

 Date
 : 01.04.2025

 Time
 : 01:20:06

 TEST ID: 75

 CHEMISTRY

Marks: 89

HYDROCARBONS

: ANSWER KEY:														
1)	a	2)	d	3)	a	4)	a 49)	С	50)	С	51)	a	52)	b
5)	c	6)	a	7)	d	8)	c 53)	d	54)	b	55)	a	56)	b
9)	c	10)	a	11)	c	12)	a 57)	a	58)	a	59)	a	60)	a
13)	b	14)	d	15)	a	16)	b 61)	b	62)	b	63)	b	64)	b
17)	b	18)	a	19)	b	20)	a 65)	b	66)	d	67)	a	68)	d
21)	b	22)	c	23)	d	24)	c 69)	c	70)	a	71)	b	72)	d
25)	a	26)	b	27)	a	28)	a 73)	d	74)	a	75)	a	76)	b
29)	c	30)	b	31)	a	32)	a 77)	a	78)	d	79)	b	80)	a
33)	d	34)	b	35)	b	36)	d 81)	d	82)	c	83)	a	84)	a
37)	d	38)	a	39)	c	40)	d 85)	c	86)	c	87)	d	88)	b
41)	b	42)	c	43)	a	44)	c 89)	a						
45)	b	46)	d	47)	a	48)	b							

N.B.Navale

 Date
 : 01.04.2025

 Time
 : 01:20:06

 Time
 : 01:20:06

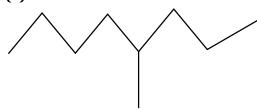
Marks: 89

HYDROCARBONS

: HINTS AND SOLUTIONS :

Single Correct Answer Type

1 (a)



IUPAC name: 4 - methyloctane

2 **(d)**

Heat of hydrogenation $\propto \frac{1}{\text{stability}}$

Among the given, buta-1,3-diene is resonance stabilized,

i.e. more stable, thus it has the lowest heat of hydrogenation.

3 (a)

$$CaC_2 + 2H_2O \rightarrow C_2H_2 + Ca(OH)_2$$

CH
$$\parallel \quad \frac{\text{Dil}, \text{H}_2\text{SO}_4/\text{HgSO}_4}{\text{CH}}$$
CH

Acetylene (A)

 CH_2

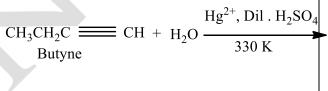
II CHOH

vinyl alcohol (Unstable)

CH₃CH₂

4 (a)

In the presence of dil. H_2SO_4 and mercury salts, alkynes add a molecule of H_2O to form aldehydes or ketones.



5 **(c)**

Reactivity towards electrophilic substitution increases as the electron density in the benzene

ring increases.

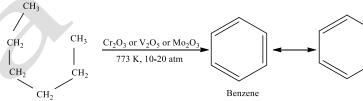
Since, CH_3 is a strong electron donating group thus toluene ($C_6H_5CH_3$) can be most readily sulphonated.

6 **(a)**

Eclipsed conformation has maximum energy.

7 (d

Hexane when heated to 773 K at 10-20 atm pressure in the presence of Cr_2O_3 , V_2O_5 or Mo_2O_3 supported over alumina gel undergoes dehydrogenation. (i.e. loss of hydrogen) and cyclized to give benzene and its homologous.



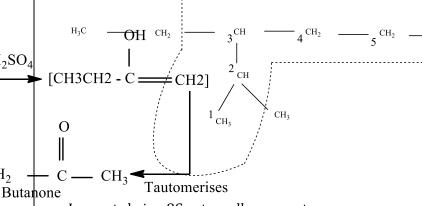
CH₃CHO

n-hexane

The embedded ecreasing order of heats of combustion is 2 > 1 > 3.

12 **(a)**

The correct IUPAC name is



Longest chain - 8C - atom alkane = octane Branch on 2, 3, 6 follows lowest sum rule. Branch of 2C -methyl; 3, 6 C-atom- ethyl. Ethyl comes alphabetically before methyl. Hence, the IUPAC name 3, 6- diethyl-2-methyloctane

15 **(a)**

For monosubstitution reaction, reactant should be in excess.

16 **(b)**

n-butane on monochlorination produces racemic mixture.

19 **(b)**

There can be 3 possible isomers for an alkane having formula C_5H_{12} . These are as follows:

20 **(a)**

Statement I is correct.

21 **(b)**

The thermal decomposition of alkanes is known as cracking. It leads to the formation of lower alkanes, alkenes and hydrogen.

$$CH_3CH_2CH_3 \xrightarrow{400-600^{0}C} CH_2 = CH_2$$
Propane
$$CH_2 = CH_2$$
Ethylene
(X)

22 **(c)**

is the most stable conformation of n-butane.

23 **(d)**

Eclipsed form of ethane has higher energy due to torsional and steric strain.

24 **(c)**

OHC — CH_2 — CH_2 — CHO, Butane-1,4-dial

Hence, the structure of compound A is

Neo-pentane

25 **(a)**

All H-atoms in neo-pentane are equivalent thus, it will yield monochloro product.

26 **(b)**

Cyclodecapentene and cyclooctatetraene both are non-aromatic. Cyclobutadiene is anti-aromatic while benzene having 6π -electrons is aromatic.

27 (a) $^{\text{CH4}}$ Pentane is liquid at room temperature.

28 $(\mathbf{a})_{(Y)}^{\text{Metha}}$

In the laboratory, nitrobenzene is prepared by nitration of benzene with the mixture of nitric acid and sulphuric acid at temperature below 60° C in which HNO₃ acts as a base.

29 **(c)**

Reactivity of halogen acids toward addition reactions increases with increase in the size of halogen atoms as this reaction involves dissociation of H - X bond.

31 **(a)**

$$CI_3 C$$
— $CH = CH_2 \xrightarrow{\text{anti-Markownikoff's rule}} CI_3 C$ — $CI_3 C$

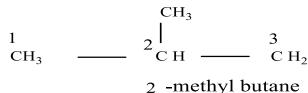
(∴ CCI₃ Is highly electron attracting group.)

32 **(a)**

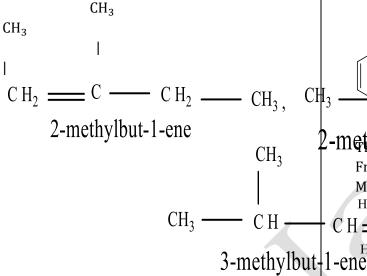
n-hexane has highest boiling point due to more number of C-atom in linear chain.

33 **(d)**

Structure of 2- methylbutane is



The structure of given alkenes are as:



Thus, all give 2-methyl butane on hydrogenation.

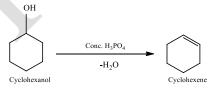
34 (b)

Benzophenone (diphenyl ketone) can be prepared by the Friedel-Crafts condensation between benzoyl chloride and benzene.

$$C_6H_6$$
 + C_6H_5COCI \longrightarrow

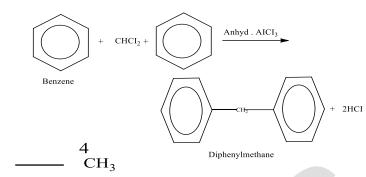
35 **(b)**

The best method to prepare cyclohexene from cyclohexanol is by using conc. H_3PO_4 because among given options dehydrating agent is only conc. H_3PO_4 .



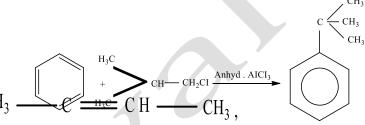
37 **(d)**

When excess of benzene reacts with CH_2CI_2 in the presence of anhyd . AICI $_3$, diphenylmethane is obtained.



This reaction is an example of Friedel- Crafts reaction.

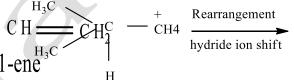
41 **(b)**



2-methylbut-2_{is}enexample of

Friedel - Crafts reaction.

Mechanism



- H₃C + C
- 43 **(a)**Conjugate dienes are more stable than other
- dienes.

 44 (c)

 In the indination of alkane, some HIO₂ is also

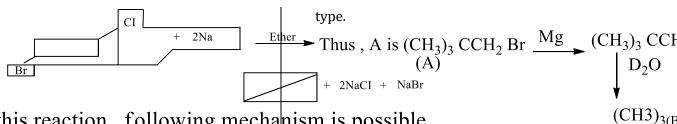
In the iodination of alkane, some HIO_3 is also added so that HI formed is oxidized to I_2 .

 $^{45}_{COC_6H}$ $^{(b)}_{OCI}$ $^{+}_{h0CI}$ has $^{CI^+}$ and $^{OH^-}$ ions.

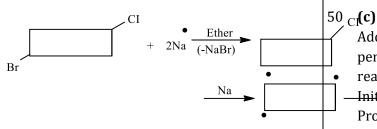
CH₃ —

46 **(d)**

This reaction is Wurtz's type reaction.



In this reaction, following mechanism is possible.



(Order of removal of halogen I > Br > CI).

47 (a)

C2H2 and all 1- alkynes give white precipitate with ammoniacal silver nitrate.

Propyne-1 ($CH_3 C = CH$) will give white precipitate with ammoniacal silver nitrate.

$$CH_3C \equiv CH + NH_4OH + AgNO_3$$

Propyne - 1

48 (b)

Since, alkane C₈H₁₈ on monobromination yields a single isomer of a tertiary bromide, therefore alkane must contain tertiary hydrogen. This is possible, if primary alkyl halide (which undergoes Wurtz reaction) has a tertiary hydrogen.

Wurtz reaction) has a tertiary hydrogen.

$$CH_3$$
 CH_3
 CH_3
 CH_3
 CH_4
 CH_5
 CH_5
 CH_5
 CH_5
 CH_5
 CH_5
 CH_6
 CH_7
 C

 (30^0 bromide)

49 (c) If one type of B is formed, it means A is also of one Addition of HBr to an alkene in the presence of peroxide is the example of free radical addition reaction.

Initiation R
$$0-0-R \rightarrow 2R-0^{\circ}$$
Propagation R $-0^{\circ}+HBr \rightarrow R-OH+Br^{\circ}$
R $-CH=CH_2+Br^* \rightarrow R-\dot{C}H-CH_2Br$
R $-CH-CH_2Br \xrightarrow{HBr} RCH_2CH_2Br+Br^{\circ}$
Termination $Br^{\circ}+Br^{\circ} \rightarrow Br_2$

52 (b)

The reactivity of halogens with alkane is $F_2 > CI_2 > Br_2 > I_2$. Hence reduction of alkyl halide with Zn and dilute HCI follows reverse

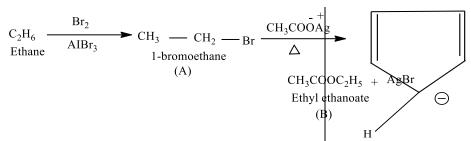
R - I > RWBit > plot. CI. Further, the reactivity of this reduction increases as the strength of C - X bond decreases + H₂O

53 (d)

As the number of carbon atom increases, boiling point increases. Boiling point decreases with branching

oes
$$CH_3$$
 H_3C CH_3 H_3C CH_2 CH_2 CH_2 CH_2 CH_3 CH_3 CH_4 CH_5 CH_6 CH_7 CH_8 CH_8 CH_9 $CH_$

 $\begin{array}{c|c} & & \\ \hline - & \\ - & \\ \hline \end{array} \begin{array}{c} & \\ - & \\ \end{array} \begin{array}{c} & \\$ AIBr₃ it gives 1- bromoethane (A) and then it reacts with CH₃COOAg gives ethyl ethanoate 2-bromo-2.5-dimethylhexane ($CH_3COOC_2H_5$)(B) and silver bromide (AgBr) ppt. is formed as byproduct in this reaction.

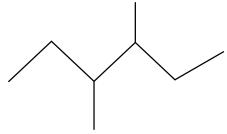


55 **(a)**

 C_5H_8 has three possible alkynes. These are :

56 **(b)**

An isomer of 3-ethyl-2-methylpentane is



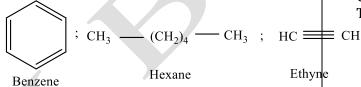
3, 4-dimethylhexane.

57 **(a**)

As the number of - CH_3 group increases, boiling point decreases.

58 **(a)**

The hybridization state of carbon in the given compound is



Type of hybridization sp^2 sp^3 sp

S - character 33.33%

25% 50%

Acidic character increases with increase in scharacter of the orbital. Hence, decreasing order of acidic behaviour of benzene, n-hexane and ethyne is as follows:

Ethyne > Benzene > Hexane

59 **(a)**

Cyclopentadienyl anion

 π -electrons = 4 + 2 = 6

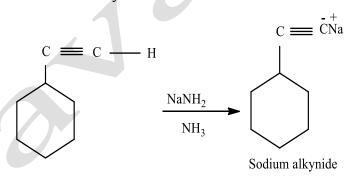
__A&it obeys Huckel rule, it is aromatic.

(a)

Structure 1, 3 and 4 represent the same compound.

6**€**H**(b)**− CH — C ≡ CH

Only terminal alkynes when heated with 3-methylbut-1-yne sodamide (NaNH $_2$ in liq. NH $_3$) result in the formation of alkynide.



64 **(b)**

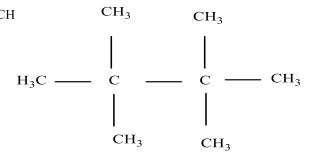
Branching decreases boiling point. Hence, hexane (C_6H_{14}) has the maximum boiling point.

65 **(b**)

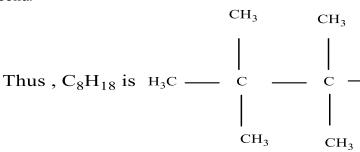
 $(CH_3)_2$ CHCH₂CH₂ - is a 3- methylbutyl group.

66 **(d)**

Two quaternary carbons can be at terminal



By structure two $(CH_3)_3$ C - are joined by C - C bond.



It has six methyl groups.

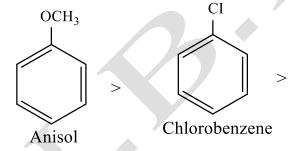
69

- (a) 2-methyl pentane $\stackrel{\text{Cl}_2}{\longrightarrow}$ five types of monochlorinated compounds
- (b) 2,2 -dimethylbutane $\stackrel{\text{Cl}_2}{\longrightarrow}$ three types of monochlorinated compounds
- (c) 2,3 -dimethylbutane $\stackrel{\text{Cl}_2}{\longrightarrow}$ two types of monochlorinated compounds
- (d) n-hexane $\stackrel{\text{Cl}_2}{\longrightarrow}$ three types of monochlorinated compounds

70 (a)

-OCH₃ (methoxy group) is an electron releasing group. It increases electron density at benzene nucleus due to resonance effect(+ R effect). Hence, makes anisole more reactive than benzene towards electrophiles.

In case of aryl halides, halogens are moderately deactivating because of their strong - I effect and +R effect thus, overall electron density on benzene ring decreases. It makes further substitution difficult. - NO₂ group is electron withdrawing group. It decreases the electron density in benzene nucleus due to strong -I- effect. Hence, makes nitrobenzene less reactive. Therefore, overall reactivity of these three compounds towards electrophiles decreases in the following order:



71 **(b)**

Reaction of 4-octyne and H₂ can be arrested at the alkene stage only by using palladium partially inactivated with trace of quinolone. The product is cis-alkene.

72 **(d)**

The two compounds should react differently with the reagent used to distinguish them.

- \therefore Propyne (CH₃ C = CH) and propene (CH₃CH = CH₂) both are unsaturated compounds.
- ∴ Both of them decolourise alk. KMnO₄ and Br₂ in CCI₄ and both of them give addition reaction with

conc. H₂SO₄.

∴ Propyne reacts with AgNO₃ in NH₃ to give white ppt. of silver acetylide and propene does not react with it. (only terminal alkynes react with AgNO₃ in NH₃).

$$CH_3 - CH = CH_2 + AgNO_3 + NH_3 \rightarrow No reaction$$

73 (d)

In neo-pentane, all H are equivalent.

$$CH_{3} \longrightarrow CH_{3}$$

$$CH_{3} \longrightarrow CH_{3}$$

$$CH_{3} \longrightarrow CH_{3}$$

$$CH_{3} \longrightarrow CH_{2}$$

$$CH_{3} \longrightarrow CH_{2}$$

$$CH_{3} \longrightarrow CH_{3}$$

$$CH_{3} \longrightarrow CH_{2}$$

$$CH_{3} \longrightarrow CH_{3}$$

74 (a)

Carbon twenty (C_{20}) to carbon thirty (C_{30}) range of carbon atoms in alkanes found in paraffin wax. It is a soft colourless solid derived from petroleum, coal or shale oil that consists of a mixture of hydrocarbon molecules. It is used in candles, wax paper, polishes, cosmetics and electrical insulators.

77 (a)

has 1- ethyl-3-methylbutyl as the correct IUPAC NO₂ NO₃ NO₄ NO₂ NO₃ NO₃ NO₄ NO₅ NO₅

Statement I, II and III are correct.

Presence of electron releasing group (or activating group) increases the electron density at benzene nucleus. Therefore, electrophile will

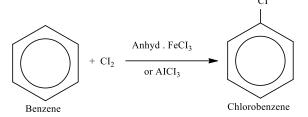
Nitrobettach enzene nucleus easily. But the presence of electron withdrawing group like - NO₂ decreases the electron density at benzene ring. Therefore, electrophile will attack benzene nucleus with difficulty.

> The order of reactivity towards electrophile, E+ in the order of their decreasing relative reactivity is Toluene > p-CH₃ - C₆H₄ - NO₂ > chlorobenzene >p-nitrochlorobenzene > 2, 4dinitrochlorobenzene

80 (a)

Arenes on treatment with chlorine in presence of Lewis acid catalyst, ferric chloride or aluminium chloride and in the absence of light undergoes

halogenation. It involves electrophilic substitution reaction.



Mechanism of electrophilic substitution is as

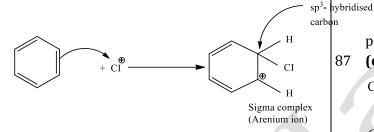
Step I Generation of an electrophile.

CI — CI + AICI₃ — CI⁺ + CI
$$\stackrel{\delta^+}{=}$$
 AI $\stackrel{\delta^-}{=}$ CI₃

— CI + [AICI₄]

Chloronium 86

Step II Formation of carbocation (arenium ion)



The arenium ion gets stabilized by resonance

$$\begin{bmatrix} H \\ CI \\ H \\ CI \end{bmatrix} = \begin{bmatrix} H \\ CI \\ H \\ CI \end{bmatrix}$$

Step III Removal of proton.

81

n-hexane can be easily sulphonated.

83

The order of stability for the conformations of nbutane is

Ш

anti > gauche > eclipsed (partial) > eclipsed (full)

- I П

IV

84 (a)

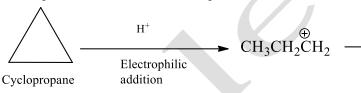
Rate of reaction of alkanes with halogens is $F_2 > CI_2 > Br_2 > I_2$

Alkane react with F2 vigorously and with I2 the

reaction is too slow that it requires a catalyst. It is because of high electronegativity of fluorine. Reactivity decreases with decrease in electronegativity and electronegativity decreases down the group.

85 (c)

To minimize strain, there is opening of ring (bond angle changes from 600 to 1090 28') and electrophilic addition of H+ takes place.



has maximum boiling

(c)

point and has maximum melting point.

87 (d) $-CH_2$ $-CH_3$ $-CH_3$ $-CH_3$

$$CH_3$$
 — CH_2 — CH_3 — CH_3 — CH_2 — CH_3 — C

H As 20 free radical is more stable than 10 free radical.

88 (b)

`CI

Only n-octane has the longest chain of eight ¬carbon atoms and hence, has the highest boiling point.

