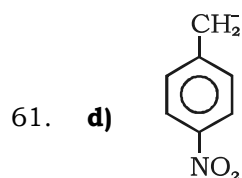


PART B - CHEMISTRY

46. **d) A lone pair of electrons**
47. **c) A reagent which attacks an electron-deficient site in a molecule**
Electrophiles attack electron-rich and not electron deficient site in a molecule.
48. **b) NH_3 , CN^- , CH_3OH**
 NH_3 , CN^- and CH_3OH all have at least one lone pair of electrons and hence act as nucleophiles
49. **b) $\text{COO}^- > \text{O}^- > \text{CR}_3$**
The + I-effect of these substituents decreases in the order : $\text{O}^- > \text{COO}^- > \text{CR}_3$.
50. **b) Ethers**
Since simple ethers, do not contain a multiple bond, therefore, they do not show electromeric effect.
51. **d) Resonance**
Due to resonance, all C-C bond distances in benzene are equal.
52. **a) Contributing structures contribute to the resonance hybrid in proportion of their relative energies**
Contributing structures contribute to the resonance energy inversely in proportion of their relative energies, i.e., structures with high energy contribute less while those with low energy contribute more. Therefore, option (a) is wrong.
53. **c) $-\text{NH}_2$**
 $-\text{NH}_2$ group has + R-effect while all others have -R-effect.
54. **b) $\text{C}_6\text{H}_5\overset{+}{\text{N}}\text{H}_3$**
In $\text{C}_6\text{H}_5\overset{+}{\text{N}}\text{H}_3$, there is no lone pair of electrons on the N-atom and hence it cannot exert its resonance effect.
55. **d) $(\text{CH}_3)_2\text{C} = \text{C}(\text{CH}_3)_2$**
Greater the number of hyperconjugation structures, more stable in the alkene $\text{CH}_3\text{CH} = \text{CHCH}_3$ has six, $(\text{CH}_3)_2\text{C} = \text{CH}_2$ has six, $(\text{CH}_3)_2\text{C} = \text{CHCH}_3$ has nine, while $(\text{CH}_3)_2\text{C} = \text{C}(\text{CH}_3)_2$ has twelve hyperconjugation structures.
56. **b) $\text{C}_6\text{H}_5\dot{\text{C}}\text{HCH}_3$**
 $\text{C}_6\text{H}_5\dot{\text{C}}\text{HCH}_3$ is stabilized both by + I-effect and the hyperconjugative effect of the CH_3 group as well as by resonance due to delocalization of the radical over the phenyl group.
57. **a) $\text{CH}_3 - \text{CH} = \text{CH} - \overset{\text{O}}{\parallel}{\text{C}} - \text{CH}_3$**
- $\text{CH}_3 - \text{CH} = \text{CH} - \overset{\text{O}}{\parallel}{\text{C}} - \text{CH}_3$
 Inductive as well as hyperconjugation effect Mesomeric effect
58. **a) I and IV**
Both structures (I and IV) are stabilized by resonance.
59. **d) $\text{HC} \equiv \text{C}^- > \text{CH}_2 = \text{CHCH}_2^- > \text{CH}_2 = \text{CH}^- > \text{CH}_3\text{CH}_2^-$**
Lower the pKa value, stronger is the acid and hence more stable is the carbanion. Now the pKa values (w.r.t. H_2O) increase in the order :
 $\text{HC} \equiv \text{CH}$ (25) $\text{CH}_3 - \text{C} \equiv \text{CH}$ (34), $\text{CH}_2 = \text{CH}_2$ (35), $\text{CH}_3 - \text{CH}_3$ (40), therefore, the stability of the carbanions decrease in the reverse order, i.e.,
 $\text{HC} \equiv \text{C}^- > \text{HC} \equiv \text{C} - \text{CH}_2^- > \text{CH}_2 = \text{CH}^- > \text{CH}_3\text{CH}_2^-$

60. **d)** $(\text{CH}_3)_3\text{C} - \text{CH}_2^+$
 $(\text{CH}_3)_3\text{C} - \text{CH}_2^+$ does not contain α -hydrogens and hence does not exhibit hyperconjugation.



$p\text{-NO}_2 - \text{C}_6\text{H}_4 - \text{CH}_2^-$ is the most stable carbanion since electron-withdrawing $-\text{NO}_2$ group stabilizes the carbanion by dispersal of the $-ve$ charge.

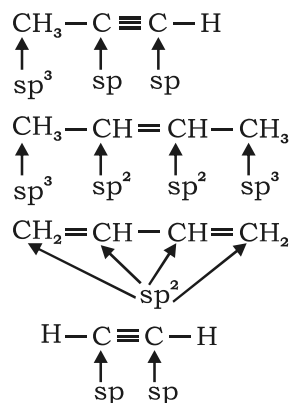
62. **a)** **1, 3-Hexadiene**
 Since the heat of hydrogenation i.e., 230 kJ mol^{-1} is less than the heat of hydrogenation of two isolated double bonds, i.e., $126 \times 2 = 252 \text{ kJ mol}^{-1}$, therefore, the diene must be conjugated i.e., $\text{CH}_3\text{CH}_2\text{CH} = \text{CH} - \text{CH} = \text{CH}_2$ (1, 3-Hexadiene)

63. **b)** $\sigma - p$
 $\sigma - p$ - conjugation

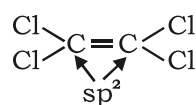
64. **b)** **I > III > II > IV**
 In structures (I and III), each atom has an octet of electrons but in structure (II), C has a sextet of electrons while in structure (IV), N has a sextet of electrons. Thus, structures I and III are more stable than structures II and IV. Among structures I and III, structure (I) has a negative charge on the more electronegative N atom while structure (III) has a negative charge on the less electronegative C atom. Therefore, structure (I) is more stable than structure (III). Among structures (II and IV), structure (IV) carries a +ve charge on the more electronegative N atom while structure (II) has a +ve charge on the less electronegative C atom. Therefore,

structure (II) is more stable than structure (IV). Thus, the overall stability decreases in the order : I > III > II > IV, i.e., option (b) is correct.

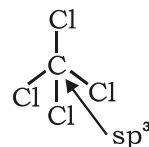
65. **a)** **$\text{CH}_3 - \text{C} \equiv \text{C} - \text{H}$**



66. **a)** **120° and 109.5°**

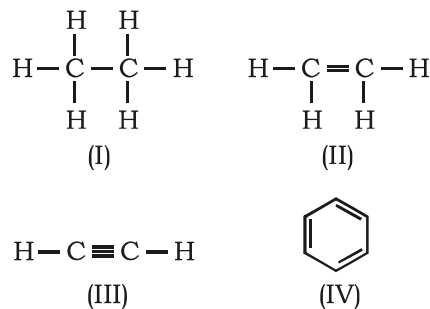


$\text{Cl} - \text{C} - \text{Cl}$ bond angle is 120° and



Bond angle is 109.5° .

67. **c)** **I > IV > II > III**



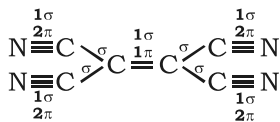
I > IV > II > III

pure single bond C is sp^3 resonance with double bond is pure double bond C sp^2 pure triple bond with (sp) single bond

68. a) I

As the hybridisation of C changes from sp^3 to sp^2 to sp , the percentage s-character increases. More s-character means more electronegativity of the carbon atom. Carbon (I) is sp hybridised while carbon (III) and (II) are sp^3 hybridised. Most electronegative carbon is (I)

69. a) 9σ and 9π



It consists of 9π and 9σ bonds

70. c) **Cyclohexane**

Benzene, cyclohexane and furan all three are cyclic compounds. But benzene and furan are called aromatic cyclic compounds while cyclohexane is called alicyclic compound. The answer is (c)



Benzene



Furan

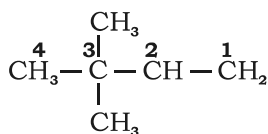


Cyclohexane

71. b) C_4H_8

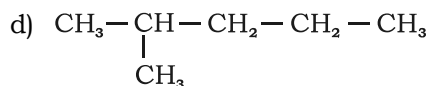
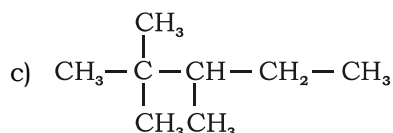
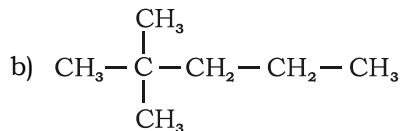
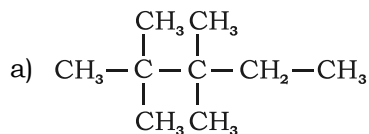
C_4H_8 is an unsaturated hydrocarbon, satisfying the molecular formula C_nH_{2n} .

72. c) **3, 3-dimethyl-1-butene**



3, 3-Dimethyl but 1-ene

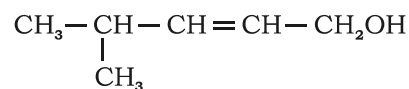
73. d) **2-methylpentane**



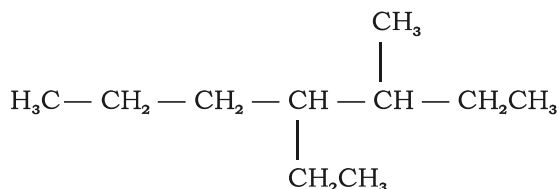
isopropyl group

74. c) **$(CH_3)_2CHCH=CHCH_2OH$**

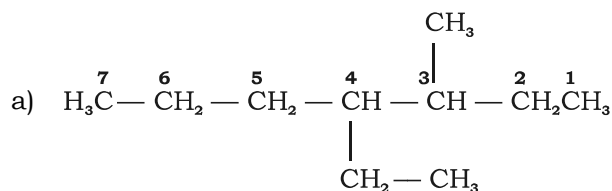
4 - Methyl - 2 - penten - 1 - ol is



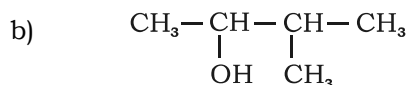
75. a)



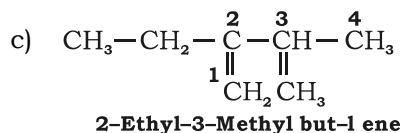
3-methyl-4-ethyl heptane



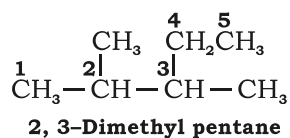
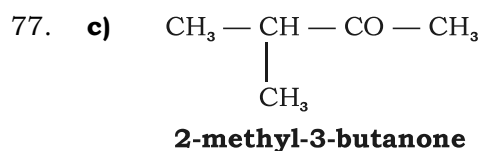
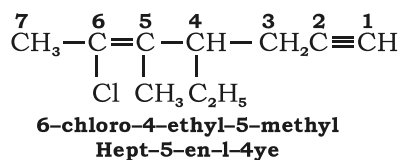
4-E thyl-3-Methyl heptane



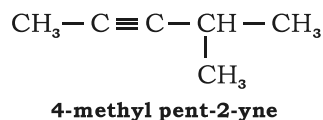
3-Methyl Butan-2-ol



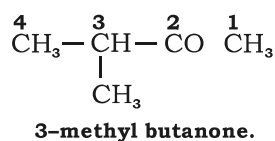
76. a) **6-chloro-4-ethyl-5-methylhept-5-en-1-yne**



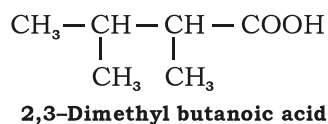
a) is correct



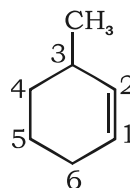
b) is also correct



3-methyl butanone. The name given in (c) is incorrect

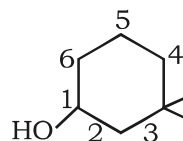


78. a) **3-methylcyclohexene**



3-methyl cyclohexene

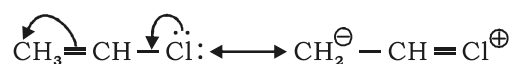
79. d) **3,3-dimethyl-1-cyclohexanol**



3, 3-Dimethyl cyclohexanol

80. a) **$-\text{NR}_2 < -\text{OR} < -\text{F}$**
 As the electronegativity increases, -I effect increases,

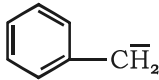
81. b) **Resonance stabilization**
 The less reactivity of chlorine is due to partial double bond character of C - Cl bond due to resonance.

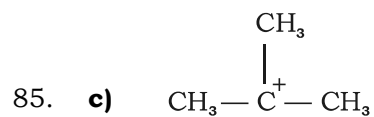


82. a) **Temporary effect**
 Electromeric effect is the polarization of bond in the presence of external reagent. Hence, it is a temporary effect

83. c) **$3^{\circ} > 2^{\circ} > 1^{\circ}$**
 As the number of R groups at positively charge carbon increase, +I effect increases.

84. b) **$\text{IV} > \text{III} > \text{II} > \text{I}$**
 As the number of e^- donating R groups increase, the stability of the carbanion decreases. Therefore,
 $\text{CH}_3\text{CH}_2^- > (\text{CH}_3)_2\text{CH}^- > (\text{CH}_3)_3\text{C}^-$

But in , the negative charge gets stabilized via resonance, Hence, the correct order is one given in answer (b)



The most stable carbocation is given in answer (c) as it is 3° and there are 9 hydrogens which can participate in hyper-conjugation.

86. **b)** **solubility of their hydroxides**

87. **b)** **Be > Mg > Ca**

88. **a)** HCO_3^-

89. **b)** **Na_2O_2**

90. **d)** **heated aluminium oxide**