

ANSWERS

I. Multiple Choice Questions (Type-I)

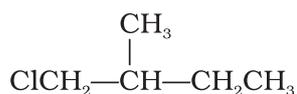
1. (iv) 2. (i) 3. (ii) 4. (i) 5. (i) 6. (iv)
7. (iii) 8. (ii) 9. (iv) 10. (iii)

II. Multiple Choice Questions (Type-II)

11. (iii), (iv) 12. (iii), (iv) 13. (iii), (iv)
14. (i), (iv) 15. (i), (iii) 16. (i), (iii)
17. (i), (iii) 18. (i), (iii) 19. (ii), (iii)

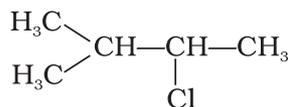
III. Short Answer Type

20. Both alkenes and arenes are electron-rich. Therefore undergo electrophilic reactions. Olefins undergo addition reactions because addition of a reagent to an olefin gives a more stable product as sp^2 hybridisation changes to sp^3 hybridisation. Addition to the double bond of an arene would give a product with less or no resonance stability hence addition is difficult arenes. On the other hand in substitution reaction resonance stabilisation is retained therefore, arenes undergo substitution reaction.
21. 2-Butene is capable of showing geometrical isomerism.
22. The rotation about C—C bond is restricted because of repulsion between electron cloud of C—H bonds on either carbon atoms.
24. Bond dissociation energy is least for HI and maximum for HCl therefore, order of reactivity will be $HI > HBr > HCl$.
25. Propyl chloride forms less stable $CH_3-CH_2-CH_2^\oplus$ carbocation with anhydrous $AlCl_3$ which rearranges to a more stable $CH_3-\overset{\oplus}{C}H-CH_3$ carbocation and gives isopropylbenzene as the product of the reaction.
27. The +R effect of $-OCH_3 > -Cl$ and $-NO_2$ has a -R effect. Relative reactivity of the substituted benzene rings is as follows :
- $$C_6H_5-OCH_3 > C_6H_5-Cl > C_6H_5-NO_2$$
28. Halogens attached to benzene rings exert -I and +R effect. +R effect dominates -I effect and increases the electron density at ortho and para positions of the benzene ring with respect to halogens.
33. 2-Methyl butane is $CH_3-\overset{\overset{CH_3}{|}}{CH}-CH_2-CH_3$. Possible compounds are A, B and C given below :



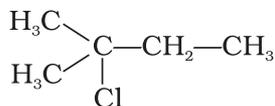
A (1°)

Nine possibilities for compound 'A' because nine methyl hydrogens are present in 2-methylbutane.



B (2°)

Two possibilities for 'B' compound because two CH hydrogens are present in 2-methylbutane.



C (3°)

Only one possibility for 'C' compound because one CH hydrogen is present in 2-methylbutane.

Relative amounts of A, B and C compounds = number of hydrogen × relative reactivity

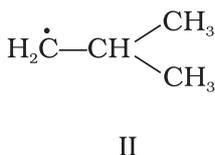
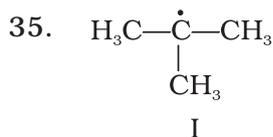
	A (1°)	B (2°)	C (3°)
Relative amount	9 × 1 = 9	2 × 3.8 = 7.6	1 × 5 = 5

Total Amount of monohalogenated compounds = 9 + 7.6 + 5 = 21.6

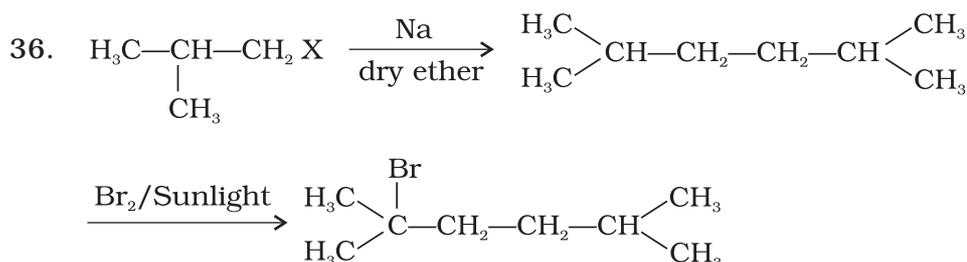
$$\text{Percentage of A} = \frac{9}{21.6} \times 100 = 41.7\%$$

$$\text{Percentage of B} = \frac{7.6}{21.6} \times 100 = 35.2\%$$

$$\text{Percentage of C} = \frac{5}{21.6} \times 100 = 23.1\%$$



Radical I is tertiary where as radical II is primary. Radical I is more stable due to hyperconjugation.



37. A = Planar ring, all atoms of the ring sp^2 hybridised, has six delocalised π electrons, follows Huckel rule. It is aromatic.
- B = Has six π electrons, but the delocalisation stops at sp^3 hybridised CH_2 - carbon. Hence, not aromatic.
- C = Six delocalised π -electrons (4 π electrons + 2 unshared electrons on negatively charged carbon) in a planar ring, follows Huckel's rule. It is aromatic.
- D = Has only four delocalised π -electrons. It is non aromatic.
- E = Six delocalised π -electrons follows Huckel's rule. π electrons are in sp^2 hybridised orbitals, conjugation all over the ring because of positively charged carbon. The ring is planar hence is aromatic.
- F = Follows Huckel's rule, has 2 π electrons i.e. $(4n+2)$ π -electrons where $(n=0)$, delocalised π -electrons. It is aromatic.
- G = 8π electrons, does not follow Huckel's rule i.e., $(4n+2)$ π -electrons rule. It is not aromatic.
38. A = Has 8π electrons, does not follow Huckel rule. Orbitals of one carbon atom are not in conjugation. It is not aromatic.
- B = Has 6π delocalised electrons. Hence, is aromatic.
- C = Has 6π electrons in conjugation but not in the ring. Non aromatic.
- D = 10π electrons in planar rings, aromatic.
- E = Out of 8π electrons it has delocalised 6π electrons in one six membered planar ring, which follows Huckel's rule due to which it will be aromatic.
- F = 14π electrons are in conjugation and are present in a ring. Huckel's rule is being followed. Compound will be aromatic if ring is planar.

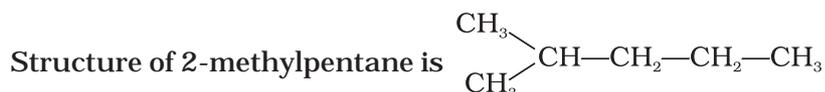
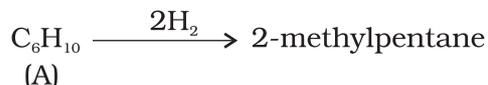
IV. Matching Type

40. (i) \rightarrow (d) (ii) \rightarrow (a) (iii) \rightarrow (e) (iv) \rightarrow (c)
 (v) \rightarrow (b)
41. (i) \rightarrow (b) (ii) \rightarrow (c) (iii) \rightarrow (a)
42. (i) \rightarrow (d) (ii) \rightarrow (c) (iii) \rightarrow (b) (iv) \rightarrow (a)
43. (i) \rightarrow (d) (ii) \rightarrow (a) (iii) \rightarrow (b) (iv) \rightarrow (c)

⇒ Molecular mass is double of the empirical formula mass.

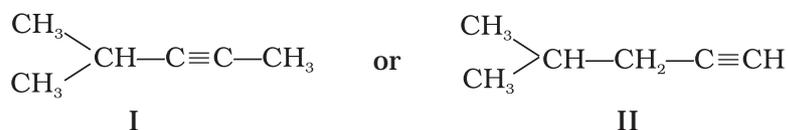
∴ Molecular Formula is C₆H₁₀

Step III

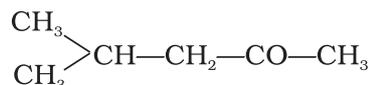


Hence, the molecule has a five carbon chain with a methyl group at the second carbon atom.

'A' adds a molecule of H₂O in the presence of Hg²⁺ and H⁺, it should be an alkyne. Two possible structures for 'A' are :



Since the ketone (B) gives a positive iodoform test, it should contain a —COCH₃ group. Hence the structure of ketone is as follows :



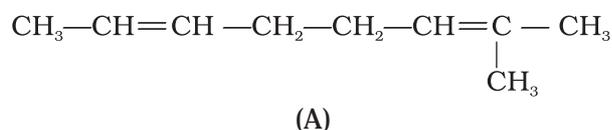
Therefore structure of alkyne is II.

50. Two molecules of hydrogen add on 'A' this shows that 'A' is either an alkadiene or an alkyne.

On reductive ozonolysis 'A' gives three fragments, one of which is dialdehyde. Hence, the molecule has broken down at two sites. Therefore, 'A' has two double bonds. It gives the following three fragments :



Hence, its structure as deduced from the three fragments must be



Reactions

