Organic Chemistry Some Basic Principles & Technique

Short Answer Type Questions

Note : Consider structures I to VII and answer the questions 23–26.

I. $CH_3—CH_2—CH_2—CH_2—OH$

II. $CH_3—CH_2—\underset{\displaystyle OH}{\underset{|}{CH}}—CH_3$

III. $CH_3—\overset{\displaystyle CH_3}{\overset{|}{\underset{\displaystyle OH}{\underset{|}{C}}}}—CH_3$

IV. $CH_3—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_2—OH$

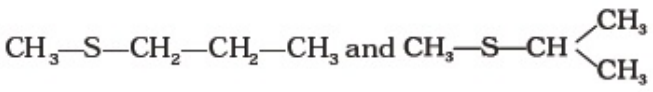
V. $CH_3—CH_2—O—CH_2—CH_3$

VI. $CH_3—O—CH_2—CH_2—CH_3$

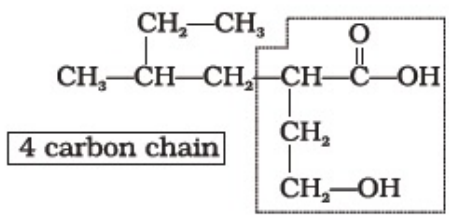
VII. $CH_3—O—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_3$

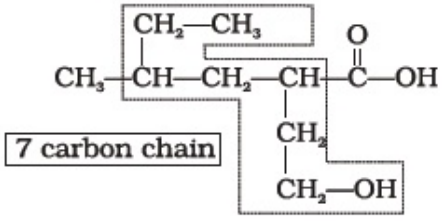
1. Which of the above compounds form pairs of metamers?
2. Identify the pairs of compounds which are functional group isomers.
3. Identify the pairs of compounds that represents position isomerism.
4. Identify the pairs of compounds that represents chain isomerism.
5. For testing halogens in an organic compound with $AgNO_3$ solution, sodium extract (Lassaigne's test) is acidified with dilute HNO_3. What will happen if a student acidifies the extract with dilute H_2SO_4 in place of dilute HNO_3?
6. What is the hybridisation of each carbon in $H_2C = C = CH_2$.
7. Explain, how is the electronegativity of carbon atoms related to their state of hybridisation in an organic compound?

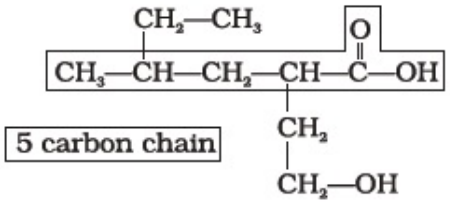
8. Show the polarisation of carbon-magnesium bond in the following structure.
   $CH_3—CH_2—CH_2—CH_2—Mg—X$
9. Compounds with same molecular formula but differing in their structures are said to be structural isomers. What type of structural isomerism is shown by

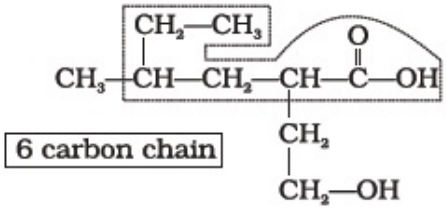


10. Which of the following selected chains is correct to name the given compound according to IUPAC system.







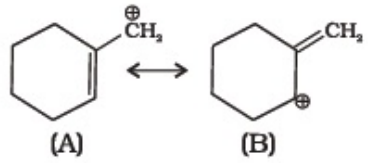


11. In DNA and RNA, nitrogen atom is present in the ring system. Can Kjeldahl method be used for the estimation of nitrogen present in these? Give reasons.
12. If a liquid compound decomposes at its boiling point, which method (s) can you choose for its purification. It is known that the compound is stable at low pressure, steam volatile and insoluble in water.

Note : Answer the questions 35 to 38 on the basis of information given below:
"Stability of carbocations depends upon the electron releasing inductive effect of groups adjacent to positively charged carbon atom involvement of neighbouring groups in hyperconjugation and resonance."

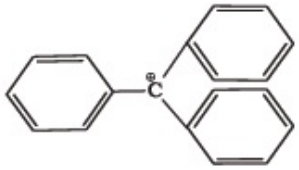
13. **Draw the possible resonance structures for $CH_3-\ddot{O}-\overset{+}{C}H_2$ and predict which of the structures is more stable. Give reason for your answer.**

14. Which of the following ions is more stable? Use resonance to explain your answer.

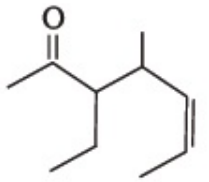


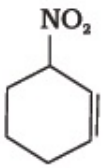
(A) (B)

15. The structure of triphenylmethyl cation is given below. This is very stable and some of its salts can be stored for months. Explain the cause of high stability of this cation.



16. Write structures of various carbocations that can be obtained from 2-methylbutane. Arrange these carbocations in order of increasing stability.
17. Three students, Manish, Ramesh and Rajni were determining the extra elements present in an organic compound given by their teacher. They prepared the Lassaigne's extract (L.E.) independently by the fusion of the compound with sodium metal. Then they added solid $FeSO_4$ and dilute sulphuric acid to a part of Lassaigne's extract. Manish and Rajni obtained prussian blue colour but Ramesh got red colour. Ramesh repeated the test with the same Lassaigne's extract, but again got red colour only. They were surprised and went to their teacher and told him about their observation. Teacher asked them to think over the reason for this. Can you help them by giving the reason for this observation. Also, write the chemical equations to explain the formation of compounds of different colours.
18. Name the compounds whose line formulae are given below :

(i) 

(ii) 

19. Write structural formulae for compounds named as-
    - (a) 1-Bromoheptane
    - (b) 5-Bromoheptanoic acid

20. Draw the resonance structures of the following compounds;

    (i) $CH_2 = CH—\ddot{\underset{\cdot\cdot}{C}}l:$

    (ii) $CH_2 = CH—CH = CH_2$

    (iii) $CH_2 = CH—\underset{\underset{H}{|}}{C} = O$

21. Identify the most stable species in the following set of ions giving reasons :

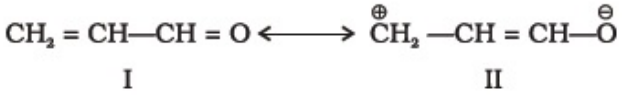
    (i) $\overset{+}{C}H_3$, $\overset{+}{C}H_2Br$, $\overset{+}{C}HBr_2$, $\overset{+}{C}Br_3$

    (ii) $\overset{\ominus}{C}H_3$, $\overset{\ominus}{C}H_2Cl$, $\overset{\ominus}{C}HCl_2$, $\overset{\ominus}{C}Cl_3$

22. Give three points of differences between inductive effect and resonance effect.
23. Which of the following compounds will not exist as resonance hybrid. Give reason for your answer :
    - (i) CH_3 OH
    - (ii) R—$CONH_2$
    - (iii) $CH_3CH = CHCH_2NH_2$

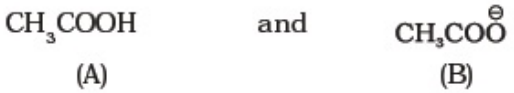
24. Why does SO_3 act as an electrophile?
25. Resonance structures of propenal are given below. Which of these resonating structures is

more stable? Give reason for your answer.



I II

26. By mistake, an alcohol (boiling point 97°C) was mixed with a hydrocarbon (boiling point 68°C). Suggest a suitable method to separate the two compounds. Explain the reason for your choice.
27. Which of the two structures (A) and (B) given below is more stabilised by resonance? Explain.



(A) and (B)

Long Answer Type Questions

1. What is meant by hybridisation? Compound $CH_2 = C = CH_2$ contains sp or sp^2 hybridised carbon atoms. Will it be a planar molecule?
2. Benzoic acid is a organic compound. Its crude sample can be purified by crystallisation from hot water. What characteristic differences in the properties of benzoic acid and the impurity make this process of purification suitable?
3. Two liquids (A) and (B) can be separated by the method of fractional distillation. The boiling point of liquid (A) is less than boiling point of liquid (B). Which of the liquids do you expect to come out first in the distillate? Explain.
4. You have a mixture of three liquids A, B and C. There is a large difference in the boiling points of A and rest of the two liquids i.e., B and C. Boiling point of liquids B and C are quite close. Liquid A boils at a higher temperature than B and C and boiling point of B is lower than C. How will you separate the components of the mixture. Draw a diagram showing set up of the apparatus for the process.
5. Draw a diagram of bubble plate type fractionating column. When do we require such type of a column for separating two liquids. Explain the principle involved in the separation of components of a mixture of liquids by using fractionating column. What industrial applications does this process have?
6. A liquid with high boiling point decomposes on simple distillation but it can be steam distilled for its purification. Explain how is it possible?