12 Basic Concepts of Organic Chemistry

12.1 Introduction to organic chemistry and organic compounds

1. Define organic compounds with suitable examples. 2

12.2 Reasons for the separate study of organic compounds from inorganic compounds

2. List the differences between organic and inorganic compounds. 2/4
   Why are organic compounds studied as a separate branch from inorganic compounds? 2/4

12.3 Tetra-covalency and **Catenation** property of carbon

3. What is meant by the tetra-covalency of carbon? 1
4. What property accounts for millions of compounds formed by the element carbon? 1
5. What is the self-linking property of carbon called? 1
6. **What is catenation and why is it very pronounced in carbon? 2**
   Why does carbon exhibit catenation to a maximum extent? 1

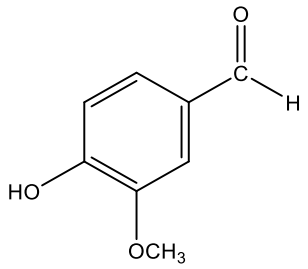
12.4 Classification of organic compounds

7. Write short notes on: Classification of hydrocarbons. 5
8. How are saturated hydrocarbons different from unsaturated hydrocarbons? 1
9. What are homocyclic compounds and heterocyclic compounds? Give an example of each. 2
10. The fact that, in the 19th century, most of the then-known carbon compounds were considered to have originated in living organisms led to the naming of such compounds as organic compounds. What is the modern definition of organic compounds? Explain their classification. 1+4

12.5 Alkyl groups, functional groups, and homologous series

11. Write a short note on: functional group. 4
    What is meant by a functional group? 1
12. Give any four functional groups containing oxygen atoms. 2
13. Write the functional group of i) alcohol ii) ester iii) acid anhydride iv) aldehyde. Mention an example of each compound containing these functional groups. 4
14. Name the following functional groups and an example of the compound containing these functional groups.
    i) -OH ii) -CHO iii) $-NH_2$ iv) $-NO_2$ 4

15. The flavouring agent of vanilla beans is the compound vanillin, which has the following structure.



Encircle and name the three functional groups present in this compound.
Define Functional group. 1.5+1

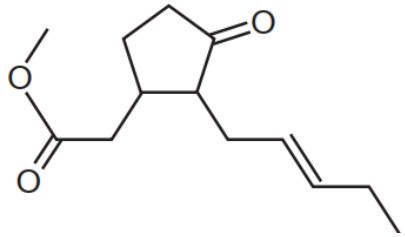
Homologous series

16. Define homologous series. 1
17. Write short notes on homologous series. 5
    Write short notes on characteristics of homologous series. 5
    What are the characteristics of a homologous series? 4
    Write short notes on homology. 5
    What are the characteristic features of a homologous series? 3
18. Write a homologous series containing –CHO as a functional group. 1
19. Give the IUPAC name of the first member of the ketone series.
20. A homologous series is a family or class of compounds obtained when compounds having the same functional group are arranged in the increasing order of their molecular weight.
    a. How do two adjacent members of the homologous series differ from each other?
    b. Write the other two characteristics of the homologous series.
    c. Write the structure and IUPAC names of the second member of the following homologous series i) alkanes ii) alkynes iii) ketones. 1+1+3
21. Write a homologous series containing –CHO as a functional group.
    What are the structural formulae and IUPAC names of:
    i) 4^{th} member of carboxylic acid
    ii) 1^{st} member of amide
    iii) 3^{rd} member of acid chloride 4
22. Write down the structural formulae of the third member of the following homologous series: i) Alkanamide ii) Alkanol iii) Alkyne iv) Alkanoic acid. 2
23. How do two adjacent members of the homologous series differ from each other? 1
24. Make a list of homologous series of alcohol and alkane (up to 6 carbon atoms). 4

12.6 Idea of structural formula, contracted formula and bond line structural formula

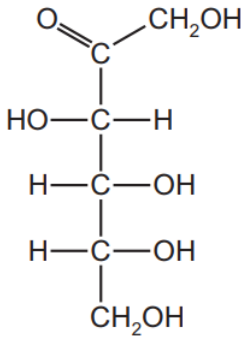
25. Name **all** the functional groups present in **V**. [1]

V



26. Determine the empirical formula of fructose. 1

fructose

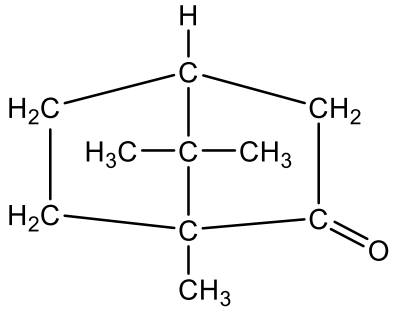


27. Define empirical formula and molecular formula. 2

12.7 Preliminary idea of cracking and reforming, quality of gasoline, Octane number, Cetane number and gasoline additives

28. What is cracking? Mention any one example of it. 2
    What is cracking of petroleum? 2
    Define cracking. 1
29. How can you differentiate cracking from reforming? 2
30. Which terminology is used to grade the quality of fuel? Define the terminology. 2
31. Define the term: Octane number. 1
32. A fuel has an octane number of 80. What does it mean? 2
    What is meant by the octane number of a fuel being 80? 1
33. Show your familiarity with the cetane number. 1
    Show your acquaintance with the cetane number 1
34. Define the term gasoline additive. 1
35. What do you understand by an anti-knocking agent? Give an example of it. 2
36. Define gasoline additive and give an example of a gasoline additive. 2
    What are anti-knocking agents? Name one important anti-knocking agent. 2
37. What is the function of Tetraethyl lead (TEL) in gasoline? 1
38. How does TEL bring about a pollution problem? 1

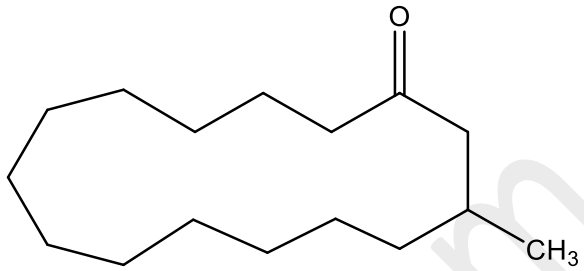
39. Camphor (Kapur in Nepali) is a highly flammable and volatile white solid with a strong aroma. Its structural formula is:



Camphor

a. What is the functional group in camphor?
b. Give the molecular formula of camphor? = $C_{10}H_{16}O$
c. Is the compound homocyclic or heterocyclic?

40. Muscone is valuable in perfumery. It is naturally obtained from the glandular secretion of the musk deer (Kasturi mriga), an endangered species. It is now synthesised in laboratories and industries. Its structure is



Muscone

a. What is the functional group in Muscone?
b. Write the molecular formula and empirical formula of Muscone.
c. Is this a homocyclic or heterocyclic compound?

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