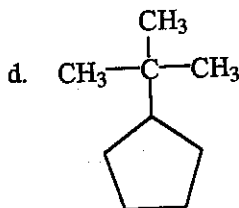
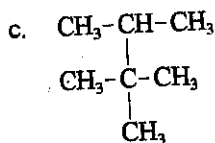
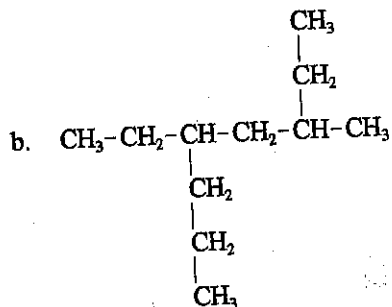
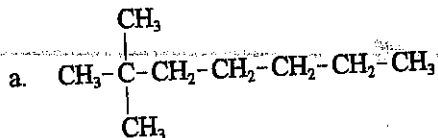


Exercises

1. Name the following compounds using IUPAC nomenclature.



2. Write structure for the following systematic names.

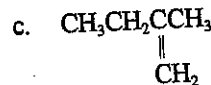
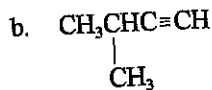
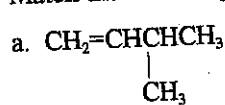
- 1-ethyl-3-propylcyclohexane
- 1,1,2-trichloroethane

3. Are saturated hydrocarbons (alkanes) soluble in water?

4. Explain why the chair conformation of cyclohexane is more stable than the boat form.

5. Which of these has the higher boiling point, n-octane or n-heptane? Which, if either, has a melting point above 25°C? Which, if either, is soluble in water?

6. Match the following structures with their correct systematic name.



1. 3-methyl-1-butyne

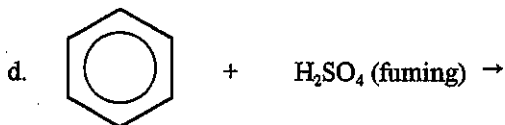
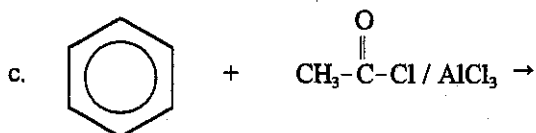
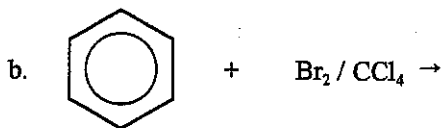
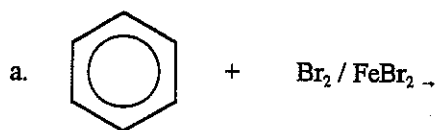
2. 3-methyl-1-butene

3. 2-methyl-1-butene

7. What products would form after hydrogenation of 2-methyl-1-butene? After halogenation (Cl₂)?

8. Why, in general, are alkenes more reactive in addition reactions than alkanes?

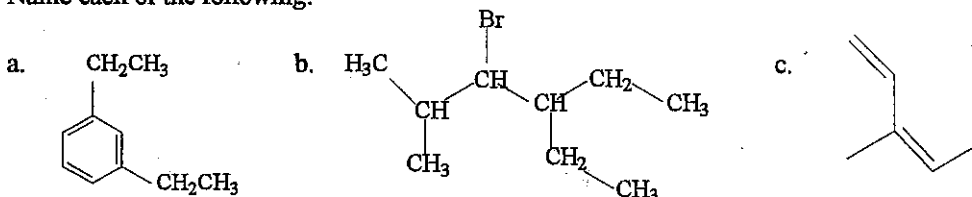
9. What are the products of the following reactions?



10. Draw these organic molecules:

- Para-dichlorobenzene
- 2,3,5-trifluoro-1-heptane

11. Name each of the following:



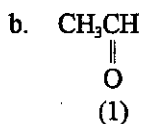
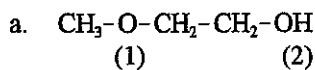
12. How many isomers are there of:

- Monochlorobenzene
- Dichlorobenzene
- Trichlorobenzene
- Tetrachlorobenzene
- Pentachlorobenzene

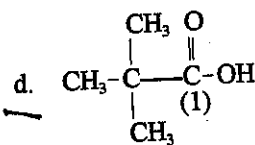
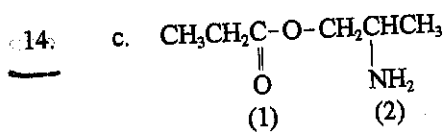
13. Arrange the molecules in order from lowest to highest boiling points:

benzene, ethane, isobutane, pentadecane

14. Name the functional group(s) in each of the following compounds:

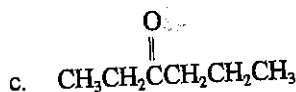
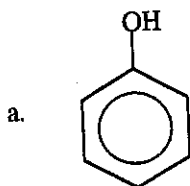


(then name the compound)

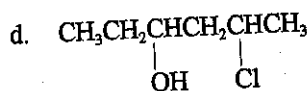


15. Write the structural formula for the following: isopropyl alcohol, methylamine, ethyl iodide, salicylic acid, acetone.

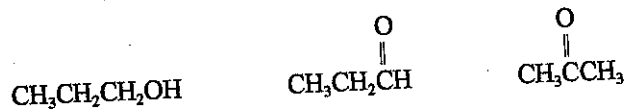
16. Name the following compounds or give their structure:



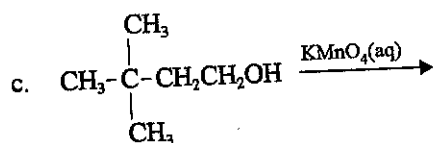
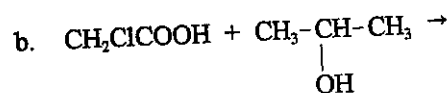
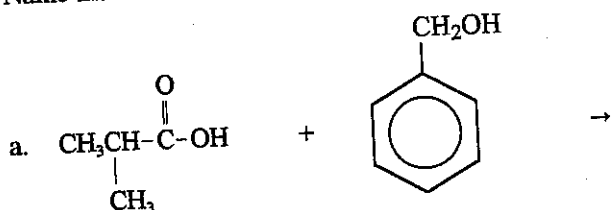
b. 3-chlorobenzaldehyde



17. Arrange the molecules in order from lowest to highest boiling point:



18. Name the reactants in each equation below. Give the structure of the products that would form.

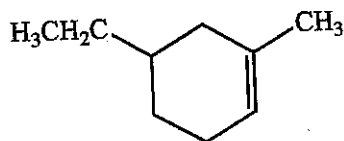


19. Label the following amines as 1° , 2° , or 3° .
- a. $N(CH_2CH_3)_3$ c. $CH_3CH_2NHCH_3$
- b. $(CH_3)_2NCH(CH_3)_2$ d. $NH_2CH_2CH(CH_3)_2$
20. Draw structural formulas for all possible isomers having the molecular formula $C_4H_{10}O$. Label all the alcohols as primary, secondary, or tertiary. Label all other compounds according to functional groups.
21. Define or explain the following terms:
- a. dimer c. copolymer e. polymer
b. free radical d. homopolymer
22. Distinguish between addition polymerization and condensation polymerization.
23. Write the cis- and trans- chair conformations of 1,2-dichlorocyclohexane.
24. Arrange the following alkenes from most stable to least stable. (Hint: stability is directly related to the substitution of the double bond.)
- a. $H \quad H$
 $| \quad |$
 $H-C=C-H$
- b. $CH_3 \quad H$
 $| \quad |$
 $H-C=C-H$
- c. $H \quad CH_2CH_2CH_3$
 $| \quad |$
 $CH_3CH_2-C=C-H$
- d. $CH_3 \quad CH_2CH_3$
 $| \quad |$
 $CH_3-C=C-CH_3$
25. Alcohols are capable of forming strong hydrogen bonds to each other making them polar. Why is ethyl alcohol greatly soluble in water while heptyl alcohol is almost insoluble in water?
26. Arrange the following amines from the highest to the lowest boiling point. Give an explanation of your answer.
- a. $(CH_3-CH_2)_2N-H$ b. $CH_3-CH_2-N(CH_3)_2$ c. $CH_3(CH_2)_3-NH_2$
27. Using the free radical mechanism in your textbook as a guide, draw a complete arrow-pushing mechanism for the formation of teflon.

Multiple Choice Questions

28. Which one of the following hydrocarbons is saturated?
- A. $CH_3CH_2CH_2CCH$ C. $CH_3CH_2CH_2CH_2CH_3$
B. $CH_3CH_2CHCHCH_3$ D. CH_3CHCH_2
29. What is the number of possible isomers for C_4H_8 ?
- A. 6 B. 3 C. 5 D. 2
30. How many carbons are in the longest chain of 4-chloro-5-ethyl-2,2-dimethyldecane?
- A. 10 B. 6 C. 7 D. 9

1. How many total carbons are in 4-chloro-5-ethyl-2,2-dimethyldecane?
 A. 10. B. 14. C. 15 D. 13
32. 1,1,2-trimethylcyclopentane is an isomer of which one of the following compounds?
 A. nonane B. isoheptane C. 2-isopropyl-pentane D. isohexane
33. How many total hydrogens are there in 3,3,6-triethyl-6-methyldecane?
 A. 38 B. 36 C. 17 D. 54
34. Which one of the following compounds can react with chlorine gas to produce 1,2-dichlorocyclohexane?
 A. hexane B. cyclohexene C. 3-methylcyclohexane D. 2-methylhexane
35. Which one of the following cyclic compounds do you expect to be most stable based on bond angle?
 A. cyclopropane B. cyclobutane C. cyclopentane D. cycloheptane
36. When ethane is converted to ethylene (CH_2CH_2), the carbon atoms:
 A. are oxidized B. are reduced C. act as oxidizers D. are unchanged
37. Butadiene is a hydrocarbon that can be described by which one of the following terms?
 A. a four carbon ring C. a five carbon chain
 B. a six carbon ring D. unsaturated hydrocarbon
38. What is the bond angle between H-C-C in acetylene?
 A. 180° B. 90° C. 109° D. 120°
39. What is the proper name of the following compound?



- A. 4-ethyl-2-methylcyclohexene C. 4-ethyl-2-methylcyclohex-1-ene
 B. 5-ethyl-1-methyl-cyclohexene D. 2-methyl-5-ethylcyclohex-1-ene
40. What is the proper name of the following compound?
-
- A. cis-1,2-dichlorobutene C. trans-1,2-dichloroethane
 B. trans-1,2-dichlorobutane D. cis-1,2-dichloroethane
41. With what would you react 2,2,3-trichloro-nonadiene, in order to convert it to 2,2,3-trichlorononane?
 A. oxygen B. hydrogen gas C. chlorine gas D. water
42. When hydrogen reacts with butadiene to produce butane, hydrogen acts as:
 A. reducing agent B. oxidizing agent C. dehydrating agent D. base

43. A benzene compound with bromine in the 1 and 3 positions has the common name of:
A. o-dibromobenzene B. p-dibromobenzene C. m-dibromobenzene D. dibromobenzene
44. Nitrobenzene can be produced by reacting benzene with which one of the following compounds?
A. nitric acid B. nitrogen dioxide C. nitrogen oxide D. nitrogen
45. 3-chlorotoluene can be produced by reacting which of the following reagents?
A. benzene with chlorine gas and methane C. benzene with HCl and methane
B. benzene with methyl chloride and HCl D. benzene with chlorine gas and methyl chloride
46. Which one of the following statements is not true about catalytic cracking?
A. It is a process that breaks down large molecules by breaking carbon-carbon bonds.
B. It is conducted at high temperatures.
C. It is easier to control than pyrolysis.
D. It can also include hydrocracking.
47. The process by which hexane is converted into methylcyclopentane is known as:
A. esterification B. pyrolysis C. catalytic reforming D. isomerization
48. Which one of the following process is not used to increase octane rating?
A. polymerization B. alkylation C. isomerization D. esterification
49. Which one of the following compounds is a secondary alcohol?
A. 2-butanol B. butanol C. neopentyl alcohol D. hexanol
50. Which one of the following alcohols would you expect to have the highest boiling point?
A. methanol B. propanol C. decanol D. hexanol
51. How many different ketones are possible in a six carbon straight chain?
A. 1 B. 2 C. 4 D. 6
52. Oxidation of which one of the following compounds would lead to an aldehyde?
A. cyclohexanol B. 2-Butanol C. methanol D. phenol
53. What functional group(s) are present in the this compound: $\text{CH}_3\text{CHOHCOOH}$?
A. acid B. alcohol, acid C. ketone, acid D. ether, acid
54. The following compound can be prepared by reacting which one of the following pairs of reagents?
$$\text{CH}_3\text{CH}_2\text{CH}_2\text{COOCH}_2\text{CH}_3$$

A. butyric acid with ethanol C. ethanoic acid with butyrate
B. butyraldehyde with ethanoic acid D. 2-butanone with acetaldehyde
55. Which one of the following amines is a primary amine?
A. diethylamine B. 1-aminohexane C. trimethylamine D. diphenylamine