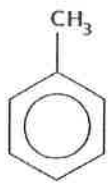
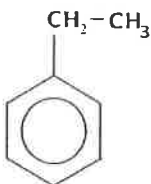


Aromatic Hydrocarbons – Practice Sheet for Naming and Drawing Rules

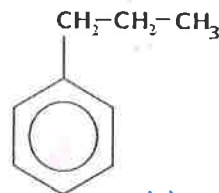
1. Name the following aromatic compounds.



methyl benzene



ethyl benzene

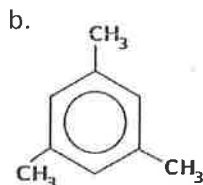


propyl benzene

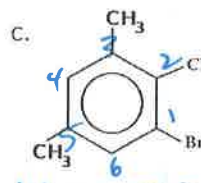
2. Name the following aromatic compounds.



5-methyl-1,3-dinitrobenzene

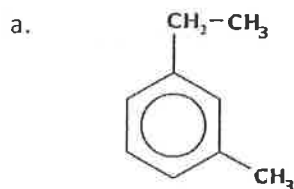


1,3,5-trimethylbenzene

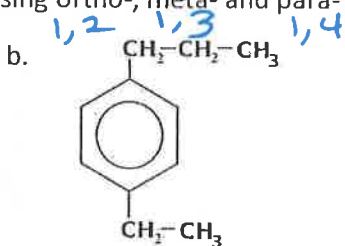


1-bromo-2-chloro-3,5-dimethylbenzene

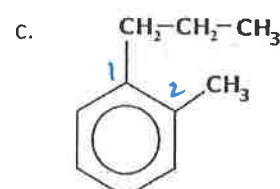
3. Name the following aromatic compounds using ortho-, meta- and para- prefixes.



meta-ethylmethylbenzene



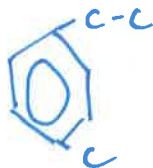
para-ethylpropylbenzene



ortho-methylpropylbenzene

4. Draw a structural diagram for each aromatic compound.

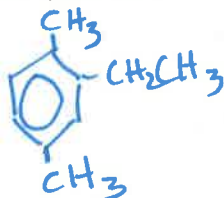
a. 1-ethyl-3-methylbenzene



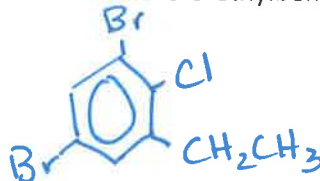
c. Para-dichlorobenzene



b. 2-ethyl-1,4-dimethylbenzene

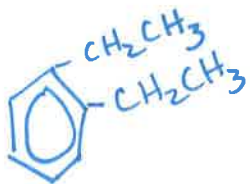


d. 1,5-dibromo-2-chloro-3-ethylbenzene

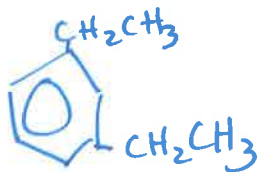


5. Draw and name three aromatic isomers with the molecular formula $C_{10}H_{14}$.

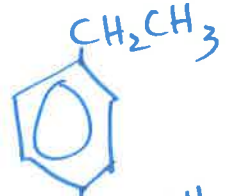
more possible



1,2-diethylbenzene



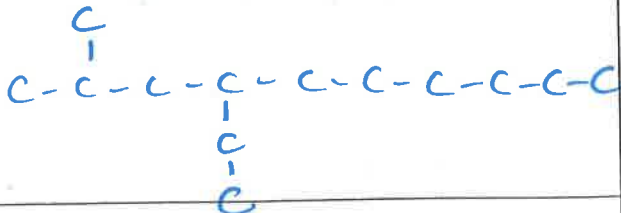
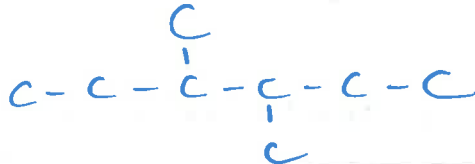
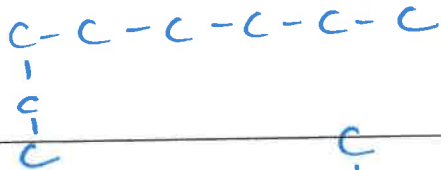
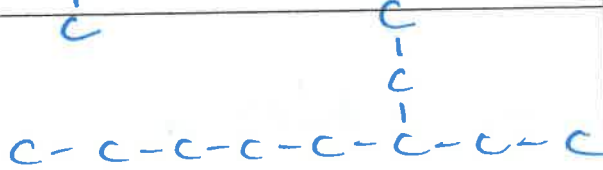
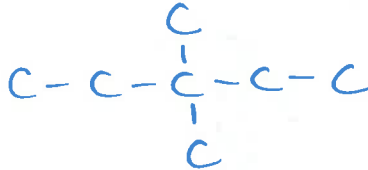
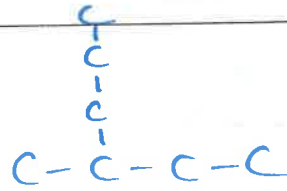
1,3-diethylbenzene



1,4-diethylbenzene

Alkane Challenge

There is something wrong with each of the following IUPAC names. Identify the error, draw the correct structural formula and write the correct IUPAC name for each substance:

Incorrect Name Correct Name	Structural Formula
2-methyl-4-ethyldecane 4-ethyl-2-methyldecane	
3-methyl-4-methyl-hexane 3,4-dimethylhexane	
1-ethylhexane octane	
6-ethyloctane 3-ethyloctane	
3,3-methylpentane 3,3-dimethylpentane	
2-propylbutane 3-methylhexane	

Alkanes Worksheet

1. Identify each carbon as organic or inorganic, and give reason for your answer. If unsure whether a compound is organic or inorganic, put a question mark beside it.

- | | | |
|----------------------------|--------------------------------------|-----------------------------------|
| a) <u>CH₄</u> | e) <u>C₆H₆</u> | i) CCl ₄ |
| b) <u>CH₃OH</u> | f) NH ₄ SCN | j) <u>CH₂Cl</u> |
| c) CO ₂ | g) <u>CH₃COOH</u> | k) K ₂ SO ₄ |
| d) HCN | h) CaCO ₃ | |

2. Indicate whether each of the following statements is true or false.

- F** a) The number of organic compounds exceeds the number of inorganic compound by a factor of ~~about~~ ^{more than} 2.
- F** b) Chemists now believe that ^{no} a special "vital force" is needed to form an organic compound.
- T** c) Historically, the org- of the term organic was conceptually paired with the org- in the term living organism.
- T** d) Most but not all compounds found in living organism are organic compounds.
- T** e) Over 7 million organic compounds have been characterized.
- F** f) The number of organic compounds and the number of known inorganic compounds are ^{not} approximately the same.
- T** g) In essence, organic chemistry is the study of the compounds of one element. **(C)**
- T** h) Numerous organic compounds are known that do not occur in living organisms.

3. Identify the three properties of carbon that allow it to form such a great variety of compounds. (Why are there so many more organic compounds than inorganic compounds?)

4. Indicate whether each of the following situations meet or do not meet the bonding requirements for carbon atoms.

- | | |
|--|---|
| a) Two single bonds and a double bond. Yes | d) A double bond and a triple bond. No |
| b) A single bond and two double bonds. No | e) Two double bonds. Yes |
| c) Three single bonds and a triple bond. No | |

5. What is the difference between a hydrocarbon and a hydrocarbon derivative?

6. What is the difference between saturated and unsaturated hydrocarbons?

7. What is the structural feature present in an unsaturated hydrocarbon that is not present in a saturated hydrocarbon?

8. Compare the shape around a single-bonded carbon atom with the shape around a double-bonded and triple-bonded carbon atom. Use diagrams to illustrate your answer.

9. Draw the indicated type of formula for the following alkanes.

- The expanded structural formula for a straight-chain alkane with the formula C₅H₁₂.
- The expanded structural formula for CH₃—(CH₂)₆—CH₃.
- The condensed structural formula, using parentheses for the —(CH₂)— groups, for the straight-chain alkane C₁₀H₂₂.
- The molecular formula for the alkane CH₃—(CH₂)₆—CH₃.

10. What general condition must be met before two compounds can be isomers?

11. Explain why two alkanes with the molecular formulas C₅H₁₂ and C₆H₁₄ could not be isomers.

12. The molecular formula of C₆H₁₄ has five isomers. Draw the complete, condensed, and line structural diagrams for each of these isomers.

- C₅H₁₂ (4 isomers)
- C₇H₁₆ (9 isomers)

13. Heptane has 7 carbon atoms. What is the chemical formula of heptane?

14. Nonane has 9 carbon atoms. What is its chemical formula?

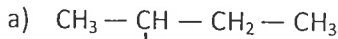
15. An alkane has 4 carbon atoms. How many hydrogen atoms does it have?

16. Candle wax contains an alkane with 52 hydrogen atoms. How many carbon atoms does this alkane have?

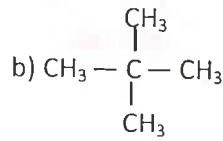
$$2n+2=52 \quad C_nH_{2n+2} \rightarrow C=25$$

$$2n=50 \quad n=25$$

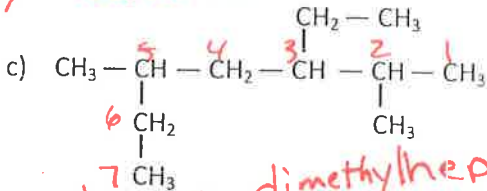
17. Name each compound:



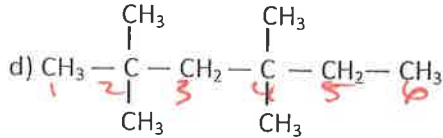
methylbutane



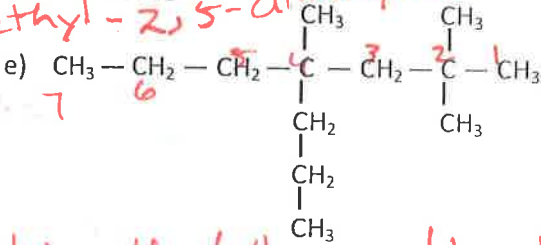
dimethylpropane



3-ethyl-2,5-dimethylheptane



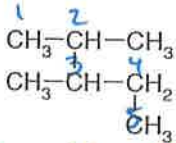
2,2,4,4-tetramethylhexane



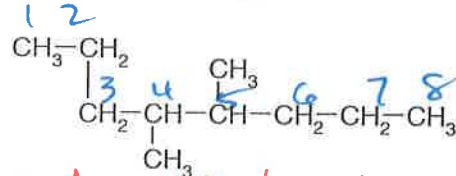
heptane

2,2,4-trimethyl-4-propylheptane

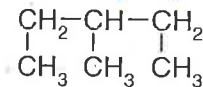
18. Give the correct IUPAC name for the following alkanes:



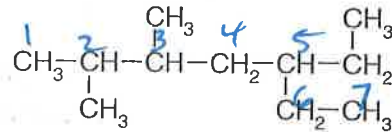
2,3-dimethylpentane



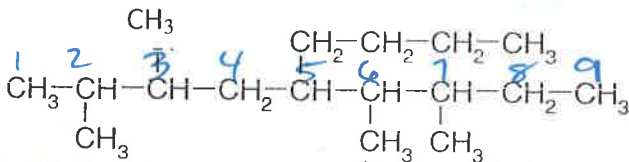
4,5-dimethyloctane



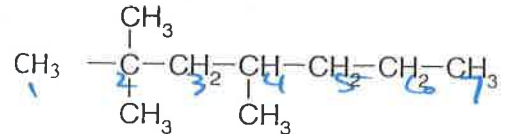
3-methylpentane



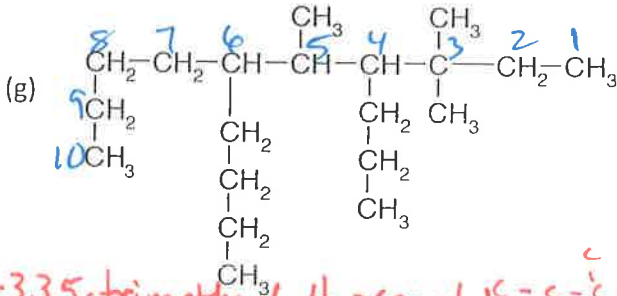
5-ethyl-2,3-dimethylheptane



5-butyl-2,3,6,7-tetramethylnonane



2,2,4-trimethylheptane



6-butyl-3,3,5-trimethyl-4-propyldecane

5-ethyl-3-methylnonane

19. Name all compounds from question number 12.

20. Identify any errors in the name of each hydrocarbon.

a) 2,2,3-dimethylbutane

2,2,3-trimethylbutane

b) 2,4-diethyloctane

c) 3-methyl-4,5-diethylnonane