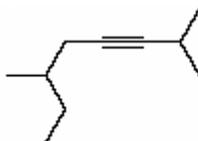


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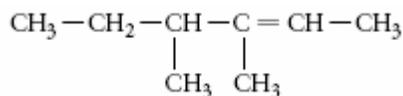
Multiple-Choice Questions

Circle the letter for the choice that best completes the statement or answers the question.

- In comparison to inorganic compounds, there are many organic compounds. Which of the following statements best explains why carbon forms the basis of so many compounds?
 - Carbon atoms have a high electronegativity.
 - Carbon atoms combine easily with hydrogen.
 - Carbon readily forms covalent bonds with other carbon atoms.
 - Carbon will readily form many strong ionic bonds with other carbon atoms.
- In comparison to inorganic compounds, which property is a general characteristic of organic compounds?
 - insoluble in non-polar solvents
 - soluble in polar solvents
 - lower melting points
 - higher boiling points
- Which of the following is the correct name for the compound shown below?
 - 6-ethyl-2-methylhept-3-yne
 - 2-ethyl-6-methylhept-4-yne
 - 3,7-dimethyloct-5-yne
 - 2,6-dimethyloct-3-yne



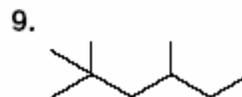
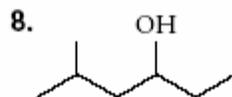
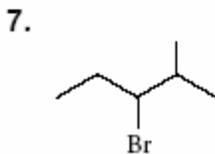
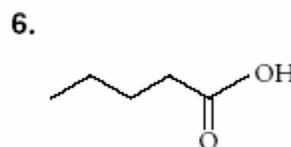
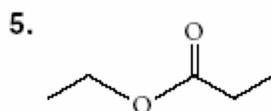
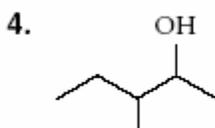
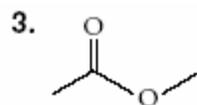
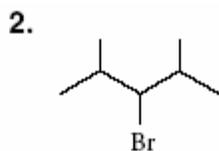
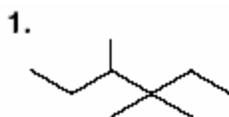
- What is the IUPAC name for the molecule shown below?
 - 2-ethyl-3-methylpent-1-ene
 - 3-methyl-2-ethylpent-1-ene
 - 3-methyl-4-methylhexane
 - 3,4-dimethylhex-2-ene



- Which of the following compounds is a carboxylic acid?
 - $\text{CH}_3\text{CH}_2\text{COOCH}_3$
 - $\text{CH}_3\text{CH}_2\text{COOH}$
 - $\text{CH}_3\text{CH}_2\text{OCH}_3$
 - $\text{CH}_3\text{CH}_2\text{OH}$

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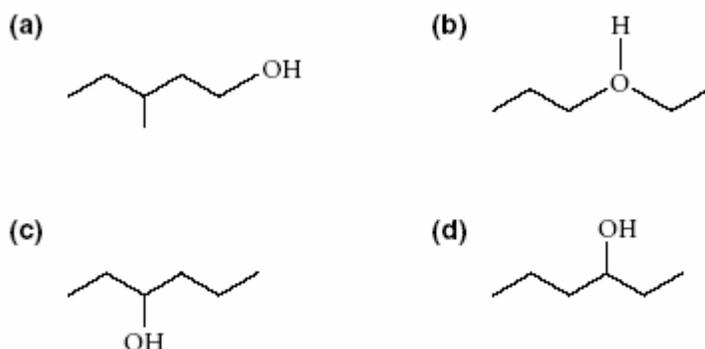
Use the following structures to answer questions 6, 7, and 8.



6. Which structures represent esters?
- 1 and 9
 - 2 and 7
 - 3 and 5
 - 4 and 8
7. Which structure represents the molecule 2,2,4-trimethylhexane?
- 1
 - 3
 - 5
 - 9
8. Which molecule will turn blue litmus red and react with sodium hydrogen carbonate to produce carbon dioxide gas?
- 3
 - 4
 - 6
 - 7

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12. Which of the following molecules is **not** an alcohol?



13. Organic compounds that are primarily non-polar and exhibit weak intermolecular forces have

- low boiling points
- low vapour pressure
- high conductivity
- high melting points

14. When comparing strengths of intermolecular bonds, hydrogen bonding is most noticeable in

- aromatics
- carboxylic acids
- esters
- alkanes

15. Which of the following represents a homologous series?

- C_2H_2 , C_2H_4 , C_2H_6
- C_2H_2 , C_2H_4 , C_4H_8
- C_2H_4 , C_2H_6 , C_3H_6
- C_2H_4 , C_3H_6 , C_4H_8

16. Which of the following is an isomer of CH_3CH_2OH ?

- $CH_3CH_2CH_3$
- CH_3OCH_3
- CH_3COOH
- CH_3COCH_3

17. What is the general formula for members of the alkane series?

- C_nH_{2n}
- C_nH_{2n-2}
- C_nH_{2n+2}
- C_nH_{2n-6}

18. What family of organic compounds has historically been used in the creation of perfumes?

- alkynes
- alkanes
- esters
- alkyl halides

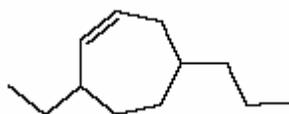
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19. The process in which large organic molecules are broken down into smaller molecules to increase the yield of gasoline from petroleum is called
- cracking
 - esterification
 - hydrogenation
 - polymerization
20. In the process of fractional distillation, a mixture of hydrocarbons is separated into its fractions according to their
- boiling points
 - melting points
 - fusion points
 - fraction points

Numerical Response Questions

Record the answer to each numerical response question as indicated.

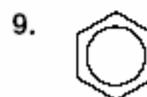
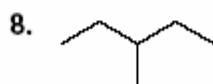
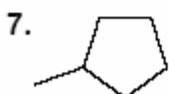
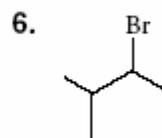
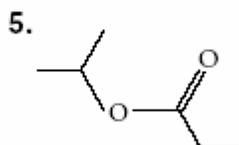
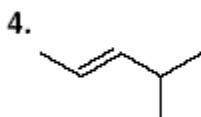
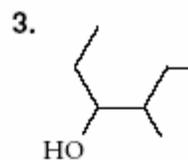
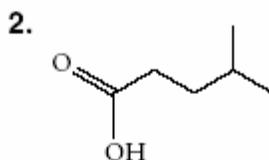
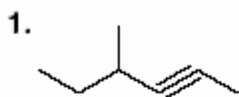
21. For the molecule shown below, the empirical molecular formula may be written in the form C_aH_c , where **a**, **b**, **c**, and **d** are numbers from 0 to 9. The correct numerical sequence of **a**, **b**, **c**, **d** for this molecule is _____, _____, _____, _____.



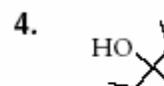
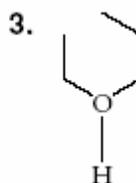
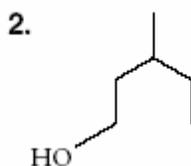
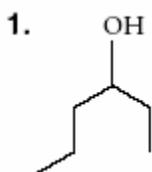
Use the structural formulas on the next page to answer questions 22, 23, 24, and 25.

On the next page are line structural formulas for molecules that represent nine different classes of organic compounds. When answering questions 22–25, identify each molecule by its number, from 1 through 9.

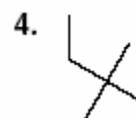
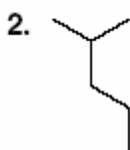
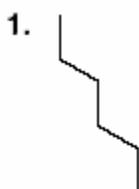
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22. When the molecules are put in the order of aromatic, alkyne, carboxylic acid, and ester the numerical sequence that would correspond is ____, ____, ____, ____.
23. Identify the four aliphatic hydrocarbons: ____, ____, ____, ____.
24. Identify two molecules most likely to be soluble in water: ____, ____.
25. Bromine water is added to each of the compounds in solution. The reddish-brown bromine colour is observed to disappear for two of those compounds. Those compounds are ____, ____.
26. When the numbered structural diagrams below are placed in the order of the following names or descriptions: (a) 3-methylpentan-1-ol, (b) does not exist, (c) 3-methylpentan-3-ol, (d) hexan-3-ol, the number sequence is ____, ____, ____, ____.



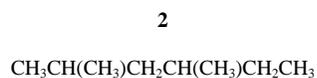
27. Four 6-carbon organic compounds are represented by the numbered diagrams below.



When the compounds are arranged in order of increasing boiling point, the corresponding number sequence is ____, ____, ____, ____.

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28. Circle the number(s) of the following substances that have carbon-carbon multiple bonds.



29. The empirical formulas for four members of a homologous series are indicated below.



When those members are arranged from higher boiling points to lower boiling points, the correct order will be _____, _____, _____, _____.

30. Descriptions of four processes involved in the refining of crude oil to form petroleum are given below.

1. Hydrocarbons are heated under pressure, in the absence of air, to break carbon-carbon bonds.
2. Hydrocarbons undergo successive heating, evaporation, cooling, and condensation.
3. Short-chain molecules are combined with an acid catalyst, under controlled heat and pressure, to form larger molecules.
4. Hydrocarbons are mixed with catalysts and heated, under very high pressure, to convert straight-chain molecules to branched, cyclic, or aromatic molecules.

Match the numbered descriptions with the names of those processes below.

_____ Fractional Distillation

_____ Cracking

_____ Reforming

_____ Alkylation

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Written Response Questions

Answer each question in the space provided. Use complete sentences and diagrams when necessary.

31. Define the term “functional group” as it is used in organic chemistry. Include reasons why chemists are interested in knowing what functional groups are included in a molecule.

32. Provide the names for the two isomers shown below. Describe three physical tests or properties that could be used to distinguish between the two isomers.



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33. Bitumen from Alberta's oil sands is processed to form crude oil and subsequently into various useful hydrocarbons. Explain the mechanisms involved in each of the following processes.

a) Fractional distillation

b) Cracking and reforming
