MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Are the numbers in each of the following statements measured or exact?

1) Compounds that have the same molecular formula but different arrangements of atoms are called

2) In the three-dimensional structure of methane, CH₄, the hydrogen atoms attached to a carbon atom are aligned
   A) at the corners of a tetrahedron. B) at the corners of a cube. C) in a straight line. D) at the corners of a rectangle. E) at the corners of a square.

3) The special feature that determines the family name and chemical reactivity of the organic compound it is found in is called a(n)

4) VSEPR theory predicts that simple carbon compounds will form bonds that are
   A) as far apart as possible. B) pointed to the corners of a triangle. C) arranged in a straight line. D) as close together as possible. E) pointed to the corners of a cube.

5) The bond angles of tetravalent carbon are all approximately
   A) 109.5° B) 60° C) 90° D) 45° E) 99.5°

6) Which of the following is NOT typical of most hydrocarbons?
   A) covalent bonding B) high melting point C) low boiling point D) poor solubility in water E) high flammability

7) The compound (CH₃CH₂)₂O is a(n)
8) Organic compounds that are poorly soluble in water behave that way because they are
A) moderately polar.
B) highly polar.
C) generally nonpolar.
D) covalently bonded.
E) ionically bonded.

9) The carbon atoms in saturated hydrocarbons
A) contain at least one triple bond.
B) contain a benzene ring.
C) contain at least one double bond.
D) have only single bonds.
E) contain both a double and a triple bond.

10) What is the name of this compound?
\[ \text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3 \]
A) butane  B) hexane  C) pentane  D) heptane  E) octane

11) What is the IUPAC name of this alkane?
\[ \begin{array}{l}
\text{CH}_3 \quad \text{CH}_2 - \text{CH}_2 - \text{CH}_3 \\
\quad \quad \mid \\
\text{CH}_3 - \text{CH} - \text{CH}_2 - \text{CH} \\
\quad \quad \mid \\
\quad \text{CH}_2 - \text{CH}_2 - \text{CH}_3 
\end{array} \]
A) 3-methyl-1,1-dipropylbutane
B) methylpropylheptane
C) 2-methyl-4-ethylheptane
D) 6-methyl-4-propylheptane
E) 2-methyl-4-propylheptane

12) Which of the following compounds could have the molecular formula C\textsubscript{7}H\textsubscript{16}?
A) pentane
B) 2-methylheptane
C) hexane
D) 2,3-dimethylpentane
E) 3-ethylhexane
13) Which of the following pairs of formulas represent structural isomers?

A) \[
\begin{align*}
\text{CH}_3 & \quad \text{CH}_3 \\
| & \quad | \\
\text{C}_2\text{H}_2 & \quad \text{C}_3 \\
| & \quad | \\
\text{CH}_3 & \quad \text{CH}_3
\end{align*}
\]
and
\[
\begin{align*}
\text{CH}_3 & \quad \text{CH}_2 - \text{C} - \text{CH}_3 \\
| & \quad | \\
\text{CH}_3 & \quad \text{CH}_3
\end{align*}
\]

B) \[
\begin{align*}
\text{CH}_3 - \text{CH}_2 & \quad \text{CH}_2 - \text{CH}_2 \\
| & \quad | \\
\text{CH}_3 & \quad \text{CH}_3
\end{align*}
\]

C) \[
\begin{align*}
\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3 & \quad \text{CH}_3 - \text{CH}_2 - \text{CH}_3
\end{align*}
\]

D) \[
\begin{align*}
\text{CH}_3 & \\
| & \\
\text{CH}_3 - \text{C} & \quad \text{CH}_3 \\
| & \quad | \\
\text{CH}_3 & \quad \text{CH}_3
\end{align*}
\]

E) \[
\begin{align*}
\text{CH}_3 & \quad \text{CH}_3 \\
| & \quad | \\
\text{CH}_3 - \text{C} - \text{CH} - \text{CH}_3 & \quad \text{CH}_3 - \text{CH}_2 - \text{C} - \text{CH}_3 \\
| & \quad | \\
\text{CH}_3 & \quad \text{CH}_3
\end{align*}
\]

14) Which of the following is the best name for this compound?

\[
\begin{align*}
\text{CH}_3 - \text{C}_7\text{H}_{11}
\end{align*}
\]

A) 3-cyclohexylethylmethylpropane
B) 2-ethyl-4-methyl-4-propylcyclohexane
C) 1-methyl-3-ethyl-5-propylhexane
D) ethylmethylpropylcyclohexane
E) 1-ethyl-3-methyl-5-propylcyclohexane
15) A compound that contains the ring structure of benzene is called a(n)
   A) alkyl group.
   B) hydrocarbon.
   C) cycloalkane.
   D) alkane.
   E) aromatic compound.

16) What is the name for a two-carbon saturated alkyl group?
   A) butyl  B) pentyl  C) methyl  D) ethyl  E) propyl

17) According to the IUPAC convention, alkyl substituents on a hydrocarbon chain should be listed in which order?
   A) alphabetical without considering prefixes
   B) in order with the substituent having the highest number of carbons first
   C) in order with the substituent having the highest total number of carbons first
   D) in order with the substituent having the lowest number of carbons first
   E) alphabetical including prefixes

18) The IUPAC name for CH₃CH₂C≡CCH₃ is
   A) 2-pentyne.
   B) pentyne.
   C) 2-propene.
   D) 1-methylbutyne.
   E) 3-pentyne.

19) The reaction of hydrogen (H₂) and propene using a platinum catalyst is called
   A) combustion.
   B) neutralization.
   C) addition.
   D) substitution.
   E) condensation.

20) The reaction of propene and Br₂ yields
   A) 2-bromopropane.
   B) 2,2-dibromopropane.
   C) 1,2-dibromopropane.
   D) 1,1-dibromopropane.
   E) 1-bromopropane.
21) Small molecules that make up the repeat unit in polymers are called
   A) monomers.
   B) alkynes.
   C) synthetic polymers.
   D) alkenes.
   E) minipolymers.

22) What is the starting monomer for the polymer Teflon®?

   F     F     F     F
   \_    \_    \_    \_
   - C - C - C - C -
   \_    \_    \_    \_
   F     F     F     F

   A) C \equiv F   B) F               C) F     F   D) F     E) F     F
   F - C - F     F - C = C - F     H - C - H     F - C - C - F
   \_    \_    \_    \_    \_    \_    \_
   F               F               F     F

23) When chlorine atoms are attached to carbon 1 and carbon 3 in benzene, the compound is named
   A) dichlorobenzene.
   B) \textit{j}–dichlorobenzene.
   C) \textit{p}–dichlorobenzene.
   D) \textit{o}–dichlorobenzene.
   E) \textit{m}–dichlorobenzene.

24) All of the carbon–carbon bonds in benzene are
   A) single bonds.
   B) composed of only two types, single and double.
   C) circular bonds.
   D) identical.
   E) double bonds.

25) Which of the following is(are) substitution reaction(s) on aromatic rings?
   A) nitration
   B) halogenation
   C) sulfonation
   D) All of the above.
   E) None of the above.
1) Answer: No Correct Answer Was Provided.
2) Answer: A
3) Answer: B
4) Answer: A
5) Answer: A
6) Answer: B
7) Answer: A
8) Answer: C
9) Answer: D
10) Answer: D
11) Answer: E
12) Answer: D
13) Answer: E
14) Answer: E
15) Answer: E
16) Answer: D
17) Answer: A
18) Answer: A
19) Answer: C
20) Answer: C
21) Answer: A
22) Answer: C
23) Answer: E
24) Answer: D
25) Answer: D