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

1) Which of the following is a tertiary amine?
   A) \[
   \begin{array}{c}
   \text{CH}_3 \\
   \text{CH}_3 - \text{C} - \text{CH}_3 \\
   \text{NH} - \text{CH}_3 \\
   \end{array}
   \]
   B) \[
   \begin{array}{c}
   \text{CH}_3 - \text{CH} - \text{CH} - \text{CH}_3 \\
   \text{CH}_3 \text{ NH}_2 \\
   \end{array}
   \]
   C) \[
   \begin{array}{c}
   \text{CH}_3 - \text{N} - \text{CH}_3 \\
   \text{CH}_3 \\
   \end{array}
   \]
   D) \[
   \begin{array}{c}
   \text{CH}_3 - \text{CH} - \text{CH}_2 - \text{NH}_2 \\
   \text{CH}_3 \\
   \end{array}
   \]
   E) \[
   \begin{array}{c}
   \text{CH}_3 \\
   \text{CH}_3 - \text{C} - \text{CH}_3 \\
   \text{NH}_2 \\
   \end{array}
   \]

2) There are 8 isomers that have the molecular formula C\textsubscript{5}H\textsubscript{11}Br. How many of these are tertiary alkyl bromides?
   A) 1   B) 8   C) 2   D) 3   E) 0

3) Which of the following is sec-butyl alcohol?
   A) CH\textsubscript{3}CH(OH)CH\textsubscript{2}CH\textsubscript{3}
   B) (CH\textsubscript{3})\textsubscript{2}CHCH\textsubscript{2}OH
   C) CH\textsubscript{3}CH\textsubscript{2}CH\textsubscript{2}CH\textsubscript{2}OH
   D) (CH\textsubscript{3})\textsubscript{2}CHOCH\textsubscript{3}
   E) (CH\textsubscript{3})\textsubscript{2}CHOH
4) What is the common name for the following structure?

A) Isopropylmethane
B) sec-Butane
C) t-Butane
D) Isobutane
E) n-Butane

5) Give the IUPAC name for the following structure:

A) 2-methyl-3-ethylheptane
B) 3-ethyl-2-methylheptane
C) 2-methyl-3-propylheptane
D) 4-Isopropyloctane
E) 5-Isopropylloctane

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

6) There is something wrong with the following name. Write the structure and correct the name: 2-ethylpropane.

7) Give structures for the three isomers with molecular formula C₅H₁₂ and provide the common name of each.

8) Provide an acceptable name for the alkane shown below.

CH₃CH₂CH₂CH₂CH₂CH₃

9) Provide an acceptable name for the alkane shown below.

CH₃—CH—CH₂CH₂CH(CH₃)₂

| CH₂CH₃
10) Provide an acceptable name for the alkane shown below.

11) Provide an acceptable name for the alkane shown below.

12) Provide an acceptable name for the alkane shown below.

13) Provide an acceptable name for the alkane shown below.

14) Draw an acceptable structure for 4-\(t\)-butyloctane.

15) Draw an acceptable structure for 3-ethyl-3-methylhexane.

16) Draw an acceptable structure for 4-isopropyl-2-methylheptane.

17) Draw an acceptable structure for 6-ethyl-2, 6, 7-trimethyl-5-propynonane.
18) Provide an acceptable name for the alkane shown below.

\[ \text{C (CH}_3\text{)}_3 \]
\[ \text{CH}_3 \quad \text{C} \quad \text{CH}_2\text{CH}_2\text{CH (CH}_3\text{)}_2 \]
\[ \text{H} \]

19) Provide an acceptable name for the alkane shown below.

\[ \text{H} \quad \text{CH}_2\text{CH}_2\text{CH (CH}_3\text{)}_2 \]
\[ \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\quad \text{C} \quad \text{C} \quad \text{CH}_2\text{CH}_2\text{CH}_3 \]
\[ \text{CH}_3\text{CH}_2 \quad \text{H} \]

20) Give the systematic name of the alkane shown below.

![Alkane Structure](image)

21) Give the systematic name of the alkane shown below.

![Alkane Structure](image)

22) Give the systematic name of the cycloalkane shown below.

![Cycloalkane Structure](image)

23) Draw an acceptable structure for sec-butylcyclopentane.
24) Provide the systematic name of the compound shown.

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

25) What is the common name for the following structure?

A) Neobutyl bromide
B) sec-Butyl bromide
C) t-Butyl bromide
D) Isopropyl methyl bromide
E) Isobutyl bromide

26) Give the IUPAC name for the following compound:

A) 1, 2-chloromethylcyclohexane
B) 1-methyl-2-chlorocyclohexane
C) 1-chloro-2-methylcyclohexane
D) 1-chloro-5-methylcyclohexane
E) 1-methyl-5-chlorocyclohexane
27) Which of the following is diisopropyl ether?
   A) \( \text{CH}_3\text{CH}_2\text{O} - \text{CH}_2\text{CH}_2\text{CH}_3 \)
   B) \( \text{CH}_3\text{CH}_2\text{CH}_2\text{O} - \text{CH}_2\text{CH}_2\text{CH}_3 \)
   C) \( \text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}((\text{CH}_3)_2 \)
   D) \( (\text{CH}_3)_2\text{CH}((\text{CH}_3)_2 \)
   E) \( (\text{CH}_3)_3\text{COCH}((\text{CH}_3)_2 \)

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

28) Draw all ethers with molecular formula \( \text{C}_4\text{H}_{10}\text{O} \).

29) Draw all possible constitutional isomers for \( \text{C}_2\text{H}_6\text{O} \) and give common names for each structure.

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

30) Give the IUPAC name for the following structure:

   A) 2-methyl-5-chlorocyclohexanol
   B) 3-chloro-2-methylcyclohexanol
   C) 1-chloro-4-methylcyclohexanol
   D) 2-methyl-3-chlorocyclohexanol
   E) 5-chloro-2-methylcyclohexanol

31) Which of the following compounds does not have the molecular formula \( \text{C}_6\text{H}_{14}\text{O} \)?

   A) 3-methyl-2-pentanol
   B) 1-hexanol
   C) cyclohexanol
   D) 2-hexanol
   E) 3-methyl-3-pentanol

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

32) Give the structure of isopentyl alcohol.
33) Provide the systematic name of the compound shown.

34) Draw the structure of 3-chloro-N-ethyl-2-hexanamine.

35) Give the structure of tetramethylammonium chloride.

36) Draw the structure of N-ethyl-5-methyl-3-hexanamine.

37) Fluorine is more electronegative than chlorine yet the carbon-fluorine bond in CH$_3$-F is shorter than CH$_3$-Cl. Explain.

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

38) Which of the following will have the lowest boiling point?
   A) CH$_4$   B) CH$_2$Cl$_2$   C) CCl$_4$   D) CH$_3$Cl   E) CHCl$_3$

39) Which of the compounds below will form hydrogen bonds between its molecules?
   A) CH$_3$CH$_2$CH$_2$CH$_3$
   B) (CH$_3$)$_3$N
   C) CH$_3$CH$_2$OCH$_3$
   D) CH$_3$CH$_2$CH$_2$F
   E) CH$_3$NHCH$_2$CH$_3$
40) Which of the following has the **greatest** van der Waal’s interaction between molecules of the same kind?
A)  
\[ \text{CH}_3 \]
\[ \text{CH}_3 \text{--C--CH}_3 \]
\[ \text{--CH}_3 \]
B)  
\[ \text{CH}_3 \text{--CH--CH}_3 \]
\[ \text{--CH}_3 \]
C) \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3
D) \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3
E) \text{CH}_3\text{--CH--CH}_2\text{CH}_3
\[ \text{--CH}_3 \]

41) Which of the following has the **lowest** boiling point?
A)  
\[ \text{CH}_3\text{CH}_2\text{CH}_2\text{CHCH}_3 \]
\[ \text{--CH}_3 \]
B)  
\[ \text{CH}_3 \]
\[ \text{CH}_3\text{CHCHCH}_3 \]
\[ \text{--CH}_3 \]
C) \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3
D) \text{CH}_3\text{CH}_2\text{CHCH}_2\text{CH}_3
E) \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3
\[ \text{--CH}_3 \]

42) Which of the following has the **greatest** solubility in \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3? 
A) \text{(CH}_3)_3\text{CH}
B) \text{CH}_3\text{OH}
C) \text{CH}_3\text{NH}_2
D) \text{CH}_3\text{OCH}_3
E) \text{CH}_3\text{O}^- \text{Na}^+$
43) Which of the following is the most soluble in H₂O?
A) CH₃CHO
B) CH₃CH₂Cl
C) CH₃CH₂CH₃
D) CH₃CH₂OH
E) CH₃OCH₃

44) Which of the following would have the highest boiling point?
A) CH₃CH₂O–CH₂CH₂–O–CH₃
B) CH₃CH₂O–CH₂–O–CH₂CH₃
C) CH₃–O–CH₂CH₂CH₂–O–CH₃
D) CH₃–O–CH₂CH₂–O–CH₃
E) HO–CH₂CH₂CH₂CH₂–OH

45) Consider the three isomeric alkanes n-hexane, 2,3-dimethylbutane, and 2-methylpentane. Which of the following correctly lists these compounds in order of increasing boiling point?
A) n-hexane < 2,3-dimethylbutane < 2-methylpentane
B) 2,3-dimethylbutane < 2-methylpentane < n-hexane
C) 2-methylpentane < n-hexane < 2,3-dimethylbutane
D) 2-methylpentane < 2,3-dimethylbutane < n-hexane
E) n-hexane < 2-methylpentane < 2,3-dimethylbutane

46) What is the strongest intermolecular force present in liquid ethanol?
A) ion–dipole
B) dipole–dipole, but not hydrogen bonding
C) dipole–dipole, specifically hydrogen bonding
D) ion–ion
E) induced dipole–induced dipole

47) Assuming roughly equivalent molecular weights, which of the following would have the highest boiling point?
A) an alcohol
B) a quaternary ammonium salt
C) an alkyl chloride
D) an ether
E) a tertiary amine

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

48) Explain why CH₃CH₂CH₂CH₃ has a lower boiling point than CH₃CH₂CHCH₃.

49) Primary and secondary amines exhibit hydrogen bonding; tertiary amines do not. Explain.
50) Explain why trimethylamine, (CH₃)₃N, has a considerably lower boiling point than propylamine CH₃CH₂CH₂NH₂, even though both compounds have the same molecular formula.

51) Which of the molecules below has the higher boiling point? Briefly explain your choice.

   CH₃CH₂CH₂OH  or  CH₃CH₂OCH₃

52) Would you expect sodium chloride (NaCl) to be highly soluble in the organic solvent hexane (CH₃CH₂CH₂CH₂CH₃)? Briefly explain your answer.

53) Which compound is more soluble in water? Briefly explain your choice.

   CH₃OCH₃  or  CH₃CH₂OH

54) Which compound is more soluble in water? Briefly explain your choice.

   (CH₃)₂NH  or  CH₃CH₂CH₃

55) Which intermolecular force is primarily responsible for the interactions among alkane molecules?

56) What is polarizability and how is it related to the size of an atom?

57) Arrange the following amines in order of increasing boiling point, lowest bp to highest bp: (CH₃)₂CHCH₂CH₂NH₂, (CH₃)₂CHN(CH₃)₂, and (CH₃)₂CHCH₂NHCH₃.

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

58) The eclipsed and staggered forms of ethane are said to differ in:
   A) structure.
   B) configuration.
   C) constitution.
   D) molecular formula.
   E) conformation.
59) Which of the following is the staggered conformation for rotation about the C1-C2 bond in the following structure?

\[ \text{CH}_3 \]
\[ \text{CH}_3\text{CHCH}_2\text{CH}_3 \]

I. \[ \text{CH}_3 \]
II. \[ \text{CH}_3 \]
III. \[ \text{CH}_3 \]
IV. \[ \text{CH}_3 \]
V. \[ \text{CH}_3 \]

A) I  B) II  C) III  D) IV  E) V

60) Among the butane conformers, which occur at energy minima on a graph of potential energy versus dihedral angle?

A) eclipsed and totally eclipsed  
B) gauche and anti  
C) eclipsed only  
D) gauche only  
E) anti only

61) Which of the following best explains the relative stabilities of the eclipsed and staggered forms of ethane? The ________ form has the most ________ strain.

A) eclipsed; steric  
B) eclipsed; torsional  
C) staggered; torsional  
D) staggered; steric

62) Which of the following best explains the reason for the relative stabilities of the conformers shown?

A) I has more torsional strain.  
B) II has more steric strain.  
C) I has more steric strain.  
D) II has more torsional strain.
63) Which of the following statements about the conformers that result from rotation about the C2–C3 bond of butane is correct?
   A) Torsional strain is absent in the eclipsed forms.
   B) The gauche conformer is an eclipsed one.
   C) Steric strain is absent in the eclipsed forms.
   D) The highest energy conformer is one in which methyl groups are eclipsed by hydrogens.
   E) none of the above

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

64) Draw the Newman projection that represents the most stable conformation of 3,3-dimethylhexane viewed along the C3–C4 bond.

65) Draw the Newman projection that represents the least stable conformation of 3,3-dimethylhexane viewed along the C3–C4 bond.

66) Draw the Newman structure for the most stable conformation of 1-bromopropane considering rotation about the C1–C2 bond.

67) Draw a Newman projection of the most stable conformation of 2-methylpropane.

68) Define the term conformation.

69) Use a sawhorse structure to depict the eclipsed conformer of ethane.

70) View a butane molecule along the C2–C3 bond and provide a Newman projection of the lowest energy conformer.

71) Provide a representation of the gauche conformer of butane.

72) Draw the Newman projection of the most stable conformation that results due to rotation about the C2–C3 bond in 2,3-dimethylbutane.

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

73) Which of the following correctly ranks the cycloalkanes in order of increasing ring strain per methylene?
   A) cyclopentane < cyclopropane < cyclobutane < cyclohexane
   B) cyclopropane < cyclopentane < cyclobutane < cyclohexane
   C) cyclohexane < cyclopentane < cyclobutane < cyclopropane
   D) cyclopentane < cyclobutane < cyclopentane < cyclopropane
   E) cyclopropane < cyclobutane < cyclohexane < cycloheptane

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

74) Describe the source of angle strain and torsional strain present in cyclopropane.
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

75) Which of the following correctly lists the conformations of cyclohexane in order of increasing energy?

A) half-chair < twist-boat < boat < chair
B) half-chair < boat < twist-boat < chair
C) chair < twist-boat < boat < half-chair
D) chair < twist-boat < half-chair < boat
E) chair < boat < twist-boat < half-chair

76) Which of the following is the most stable conformation of bromocyclohexane?

I. \[ \text{Br} \quad \text{H} \] 
II. \[ \text{Br} \quad \text{H} \] 
III. \[ \text{Br} \quad \text{H} \] 
A) I  B) II  C) III  D) IV  E) V

77) In the boat conformation of cyclohexane, the “flagpole” hydrogens are located:

A) on adjacent carbons.
B) on the same carbon.
C) on C-1 and C-4.
D) on C-1 and C-3.
E) none of the above

78) Which conformer is at a local energy minimum on the potential energy diagram in the chair-chair interconversion of cyclohexane?

A) fully eclipsed
B) half-chair
C) planar
D) boat
E) twist-boat

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

79) Draw the chair conformer of cyclohexane. Label the axial hydrogens (H_a) and the equatorial hydrogens (H_e).

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

80) The K_eq for the interconversion for the two chair forms of methylcyclohexane at 25 °C is 18. What % of the chair conformers feature an axial methyl group?

A) 75%  B) 50%  C) 95%  D) 5%  E) 25%
SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

81) The equilibrium constant for the ring-flip of fluorocyclohexane is 1.5 at 25 °C. Calculate the percentage of the axial conformer at the temperature.

82) Which of the following describes the most stable conformation of trans-1-tert-butyl-3-methylcyclohexane?
   A) The tert-butyl group is axial and the methyl group is equatorial.
   B) Both groups are equatorial.
   C) Both groups are axial.
   D) The tert-butyl group is equatorial and the methyl group is axial.
   E) none of the above

83) Name the compound shown below.

84) Which of the following has two equatorial alkyl substituents in its most stable conformation?
   A) trans-1,3-diethylcyclohexane
   B) cis-1,2-dimethylcyclohexane
   C) 1,1-dimethylcyclohexane
   D) cis-1,4-diethylcyclohexane
   E) cis-1,3-diethylcyclohexane

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

85) Draw the most stable conformation of trans-1-tert-butyl-3-methylcyclohexane.

86) Draw the most stable conformation of cis-1-isopropyl-2-methylcyclohexane.

87) Draw the most stable conformation of cis-1-isopropyl-2-methylcyclohexane.

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

88) How many constitutional isomers are possible for C_{6}H_{14}?
   A) 8
   B) 5
   C) 4
   D) 6
   E) 7

89) If an acyclic alkane hydrocarbon contains n carbon atoms, how many hydrogen atoms must it also contain?
   A) 2n
   B) n + 2
   C) n
   D) n - 2
   E) 2n + 2
1) C
   ID: oc5b 2-1
   Diff: 0

2) A
   ID: oc5b 2-2
   Diff: 0

3) A
   ID: oc5b 2-3
   Diff: 0

4) D
   ID: oc5b 2-4
   Diff: 0

5) D
   ID: oc5b 2-5
   Diff: 0

6) \[
   \text{The correct name is 2-methylbutane.}
   \]
   ID: oc5b 2-6
   Diff: 0

7) 

8) hexane or n-hexane
   ID: oc5b 2-8
   Diff: 0

9) 2, 5-dimethylheptane
   ID: oc5b 2-9
   Diff: 0

10) 5-sec-butyl-2, 2-dimethylnonane or
    2, 2-dimethyl-5-(1-methylpropyl) nonane
    ID: oc5b 2-10
    Diff: 0

11) 4-isopropyldecane or 4-(1-methyethyl) decane
    ID: oc5b 2-11
    Diff: 0

12) 3-ethyl-6-methyl-5-propynonane
    ID: oc5b 2-12
    Diff: 0
13) 3-ethyl-4, 4-dimethylheptane
   ID: oc5b 2-13
   Diff: 0

14) 
   \[
   \begin{align*}
   \text{CH}_3 & \quad \text{C (CH}_3)_3 \\
   \text{CH}_3 & \quad \text{CH}_3 \\
   \text{CH}_3 & \quad \text{C} \quad \text{CH}_2 \text{CH}_3 \\
   \text{CH}_2 \text{CH}_3 & \\
   \end{align*}
   \]
   ID: oc5b 2-14
   Diff: 0

15) 
   \[
   \begin{align*}
   \text{CH}_3 & \quad \text{CH}_3 \\
   \text{CH}_3 & \quad \text{CH}_2 \text{CH}_2 \text{CH}_2 \text{C} \quad \text{CH}_2 \text{CH}_3 \\
   \text{CH}_2 \text{CH}_3 &
   \end{align*}
   \]
   ID: oc5b 2-15
   Diff: 0

16) 
   \[
   \begin{align*}
   \text{CH}_3 & \quad \text{CH}_3 \\
   \text{CH}_3 & \quad \text{CH}_2 \text{CH}_2 \text{CH}_2 \text{CH}_2 \text{CH}_2 \text{CH}_3 \\
   \text{CH}_2 \text{CH}_3 & \quad \text{CH} \quad \text{(CH}_3)_2 \\
   \end{align*}
   \]
   ID: oc5b 2-16
   Diff: 0

17) 
   \[
   \begin{align*}
   \text{CH}_3 & \quad \text{CH}_3 \\
   \text{CH}_3 & \quad \text{CH}_3 \\
   \text{CH}_3 & \quad \text{CH}_1 \\
   \text{CH}_3 & \quad \text{CH}_3 \\
   \text{CH}_3 & \quad \text{CH}_3 \\
   \end{align*}
   \]
   ID: oc5b 2-17
   Diff: 0

18) 2, 2, 3, 6-tetramethylheptane
   ID: oc5b 2-18
   Diff: 0

19) 6-ethyl-2-methyl-5-propyldecane
   ID: oc5b 2-19
   Diff: 0

20) 4-ethyl-2,2,7-trimethylnonane
    ID: oc5b 2-20
    Diff: 0

21) 3-ethyl-4-isopropyloctane
    ID: oc5b 2-21
    Diff: 0
22) 4-butyl-1,2-dimethylcyclohexane
   ID: oc5b 2-22
   Diff: 0

23)

   ID: oc5b 2-23
   Diff: 0

24) 4-butyl-1-ethyl-2-methylcycloheptane
   ID: oc5b 2-24
   Diff: 0

25) C
   ID: oc5b 2-25
   Diff: 0

26) C
   ID: oc5b 2-26
   Diff: 0

27) D
   ID: oc5b 2-27
   Diff: 0

28)

   ID: oc5b 2-28
   Diff: 0

29)

   Ethyl alcohol
   ID: oc5b 2-29
   Diff: 0

   Dimethyl ether

30) E
   ID: oc5b 2-30
   Diff: 0

31) C
   ID: oc5b 2-31
   Diff: 0
32) \[\text{CH}_3\quad \text{CH} \equiv \text{CH}_2\text{CH}_2\text{OH}\quad \text{CH}_3\]

ID: oc5b 2–32
Diff: 0

33) 6,7-dimethyl-3-octanol

ID: oc5b 2–33
Diff: 0

34) \[\begin{array}{c}
\text{H} \\
\text{N} \\
\text{CH}_3 \\
\text{H}_3\text{C} \\
\text{Cl} \\
\text{CH}_3 \\
\text{CH}_3
\end{array}\]

ID: oc5b 2–34
Diff: 0

35) \[\begin{array}{c}
\text{CH}_3 \\
\oplus \\
\oplus \\
\text{CH}_3 \equiv \text{N} \\
\text{CH}_3 \equiv \text{Cl} \\
\text{CH}_3
\end{array}\]

ID: oc5b 2–35
Diff: 0

36) \[\begin{array}{c}
\text{H}_3\text{C} \\
\text{N} \\
\text{CH}_3 \\
\text{H} \\
\text{CH}_3 \\
\text{CH}_3
\end{array}\]

ID: oc5b 2–36
Diff: 0

37) Chlorine is a larger atom than fluorine and uses a 3p rather than 2p orbital. The overlap of a 2sp³ orbital with a 3p orbital is not as good as the overlap of a 2sp³ orbital with a 2p orbital, causing the bond to be longer and weaker.

ID: oc5b 2–37
Diff: 0

38) A

ID: oc5b 2–38
Diff: 0

39) E

ID: oc5b 2–39
Diff: 0
40) C
   ID: oc5b 2–40
   Diff: 0

41) B
   ID: oc5b 2–41
   Diff: 0

42) A
   ID: oc5b 2–42
   Diff: 0

43) D
   ID: oc5b 2–43
   Diff: 0

44) E
   ID: oc5b 2–44
   Diff: 0

45) B
   ID: oc5b 2–45
   Diff: 0

46) C
   ID: oc5b 2–46
   Diff: 0

47) B
   ID: oc5b 2–47
   Diff: 0

48) CH₃CH₂CH₂CH₃ has greater van der Waals forces because it has a greater contact area than isobutane. Therefore, the boiling point of CH₃CH₂CH₂CH₃ is higher.
   ID: oc5b 2–48
   Diff: 0

49) The nitrogen in a tertiary amine is not attached to a hydrogen. Recall that for a molecule to exhibit hydrogen bonding it must have a hydrogen attached to a highly electronegative atom such as F, N, or O.
   ID: oc5b 2–49
   Diff: 0

50) Since hydrogen bonding is possible for propylamine and not for trimethylamine, the boiling point is higher for propylamine.
   ID: oc5b 2–50
   Diff: 0

51) CH₃CH₂CH₂OH has the higher boiling point since it is capable of intermolecular hydrogen bonding.
   ID: oc5b 2–51
   Diff: 0

52) One would not expect NaCl to be highly soluble in hexane. NaCl is an ionic solid (i.e., a very polar material) while hexane is nonpolar. Nonpolar solvent molecules do not solvate ions well. The attractions of oppositely charged ions to each other are vastly greater than the weak attractions of the ions for the solvent.
   ID: oc5b 2–52
   Diff: 0

53) CH₃CH₂OH is more soluble in water since it can donate a hydrogen bond to water and accept a hydrogen bond from water. CH₃OCH₃ can only accept a hydrogen bond from water; it has no hydrogen which can hydrogen bond to water.
   ID: oc5b 2–53
   Diff: 0
54) \((\text{CH}_3)_2\text{NH}\) is more soluble in water since it can hydrogen bond with water. Alkanes are not capable of hydrogen bonding with water.

55) Van der Waal's or London forces

56) Polarizability indicates the ease with which an electron cloud can be distorted. The larger the atom, the more loosely its nucleus holds the electrons in its outermost shell, and the more they can be distorted.

57) \((\text{CH}_3)_2\text{CHN(\text{CH}_3)_2} < (\text{CH}_3)_2\text{CHCH}_2\text{NHCH}_3 < (\text{CH}_3)_2\text{CHCH}_2\text{CH}_2\text{NH}_2\)

58) E

59) A

60) B

61) B

62) B

63) E

64)

65) eclipsed
66) Conformations are different arrangements of the same molecule formed by rotations about single bonds.

67)

68) Conformations are different arrangements of the same molecule formed by rotations about single bonds.

69) Conformations are different arrangements of the same molecule formed by rotations about single bonds.

70) Conformations are different arrangements of the same molecule formed by rotations about single bonds.
71) 

ID: oc5b 2-71  
Diff: 0

72) 

ID: oc5b 2-72  
Diff: 0

73) C  
ID: oc5b 2-73  
Diff: 0

74) The angle strain arises from the compression of the ideal tetrahedral bond angle of 109.5° to 60°. The large torsional strain occurs since all C–H bonds on adjacent carbons are eclipsed.  
ID: oc5b 2-74  
Diff: 0

75) C  
ID: oc5b 2-75  
Diff: 0

76) C  
ID: oc5b 2-76  
Diff: 0

77) C  
ID: oc5b 2-77  
Diff: 0

78) E  
ID: oc5b 2-78  
Diff: 0

79) 

ID: oc5b 2-79  
Diff: 0
Answer Key
Testname: QOITP1B

80) D
  ID: oc5b 2–80
  Diff: 0

81) $K_{eq} = \frac{[eq]}{[ax]} = 1.5$

$$\text{% axial} = \frac{[ax]}{[eq] + [ax]} \approx 100\%$$
$$\approx \frac{[1]}{[1.5] + [1]} \approx 100\%$$
$$\approx 40\%$$
  ID: oc5b 2–81
  Diff: 0

82) D
  ID: oc5b 2–82
  Diff: 0

83) D
  ID: oc5b 2–83
  Diff: 0

84) E
  ID: oc5b 2–84
  Diff: 0

85)

![Image](image1.png)
  ID: oc5b 2–85
  Diff: 0

86)

![Image](image2.png)
  ID: oc5b 2–86
  Diff: 0

87)

![Image](image3.png)
  ID: oc5b 2–87
  Diff: 0

88) B
  ID: oc5b 2–88
  Diff: 0
89) E
   ID: oc5b 2-89
   Diff: 0