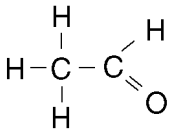
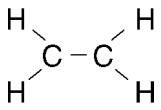
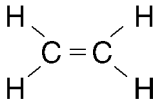
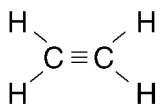
1. Which organic compound is a saturated hydrocarbon?
   A) ethane B) ethanol
   C) ethyne D) ethene

2. Which compound is a saturated hydrocarbon?
   A) hexane B) hexanal
   C) hexanol D) hexene

3. Which structural formula *correctly* represents a hydrocarbon molecule?
   A) 
   B) 
   C) 
   D) 

4. In saturated hydrocarbons, carbon atoms are bonded to each other by
   A) alternating double and triple covalent bonds
   B) alternating single and double covalent bonds
   C) single covalent bonds, only
   D) double covalent bonds, only

5. Which compound is classified as a hydrocarbon?
   A) chloroethane B) ethanoic acid
   C) ethanol D) ethane

6. Which formula represents a molecule of a saturated hydrocarbon?
   A) C_2H_2 B) C_4H_{10}
   C) C_6H_6 D) C_5H_8

7. What is the general formula for the members of the alkane series?
   A) C_nH_{2n} B) C_nH_{2n+2}
   C) C_nH_{2n-2} D) C_nH_{2n-6}

8. In which group could the hydrocarbons all belong to the same alkene series?
   A) C_2H_4, C_3H_6, C_4H_8 B) C_2H_2, C_2H_4, C_2H_6
   C) C_2H_4, C_2H_6, C_3H_6 D) C_2H_2, C_2H_4, C_4H_8

9. Natural gas is mostly comprised of
   A) methane B) butane
   C) propane D) ethane

10. Molecules of 2-methyl-propane and *n*-butane differ in their
    A) number of covalent bonds
    B) molecular formulas
    C) structural formulas
    D) number of carbon atoms

11. Which formula represents butane?
    A) $CH_3CH_2CH_3$ B) $CH_3CH_2CH_2CH_3$
    C) CH_3CH_3 D) $CH_3CH_2CH_2CH_2CH_3$

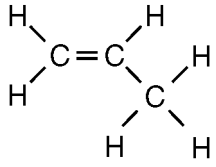
12. Which of the following compounds has the greatest possible number of isomers?
    A) propane B) butane
    C) ethane D) pentane

13. What is the total number of carbon atoms contained in an ethyl group?
    A) 1 B) 2
    C) 3 D) 4

14. Each member in the alkane series of hydrocarbons, when considered in successive order, has 1 more carbon atom and how many more hydrogen atoms?
    A) 1 B) 2
    C) 3 D) 4

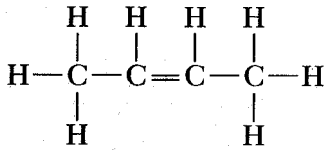
15. Which formula represents an unsaturated hydrocarbon?
    A) CH_2CHCl B) CH_3CHCH_2
    C) $CH_3CH_2CH_3$ D) CH_3CH_2Cl

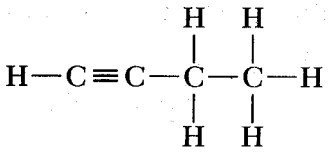
16. Given the structural formula:

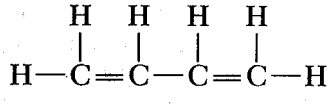


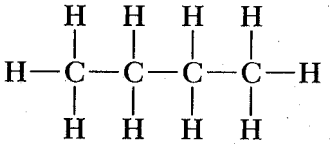
What is the IUPAC name of this compound?
    A) propene B) propane
    C) propanone D) propanal

17. Which structural formula represents a molecule of butane?

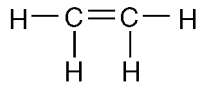
A) 

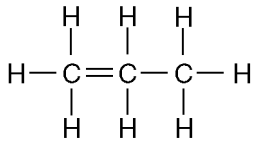
B) 

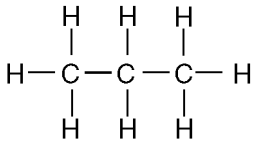
C) 

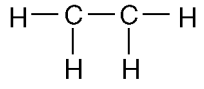
D) 

18. The empirical formula of a compound is CH_2. Which molecular formula is correctly paired with a structural formula for this compound?

A) C_2H_4 

B) C_3H_8 

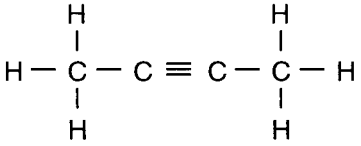
C) C_3H_8 

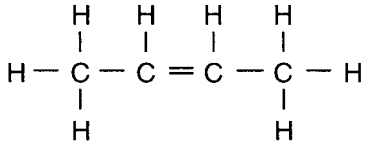
D) C_2H_4 

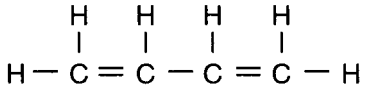
19. In which pair of hydrocarbons does each compound contain only one double bond per molecule?

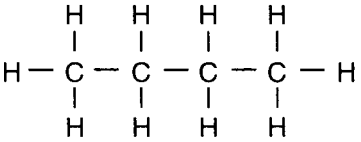
A) C_4H_8 and C_2H_4 B) C_2H_2 and C_3H_6
C) C_6H_6 and C_7H_8 D) C_2H_2 and C_2H_6

20. Which structural formula represents a member of the alkene series?

A) 

B) 

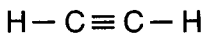
C) 

D) 

21. Which compound is a member of the same homologous series as C_3H_6?

A) C_3H_8 B) C_2H_6
C) C_2H_4 D) C_3H_4

22. Given the structural formula for ethyne:



What is the total number of electrons shared between the carbon atoms?

A) 6 B) 2
C) 3 D) 4

23. The compounds 2-butanol and 2-butene both contain

A) carbon atoms B) oxygen atoms
C) double bonds, only D) single bonds, only

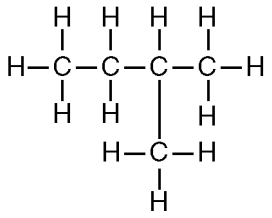
24. Which element has atoms that can bond with each other to form long chains or rings?

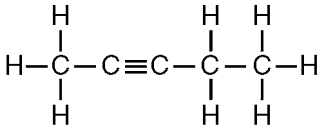
A) oxygen B) fluorine
C) nitrogen D) carbon

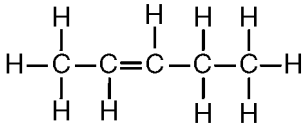
25. Which element must be present in an organic compound?

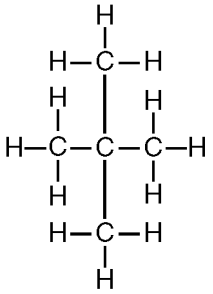
A) carbon B) nitrogen
C) oxygen D) hydrogen

26. Which structural formula represents 2-pentyne?

A) 

B) 

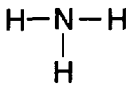
C) 

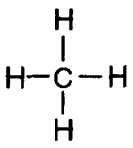
D) 

27. Organic compounds that are essentially non-polar and exhibit weak intermolecular forces have
    A) low melting points
    B) low vapor pressure
    C) high boiling points
    D) high electrical conductivity in solution

28. Which representation is the structural formula of an organic compound?

A) NH_3

B) 

C) 

D) CH_4

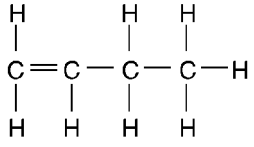
29. Compared with the rate of an inorganic reaction, the rate of an organic reaction is usually
    A) slower, because organic compounds are ionic.
    B) faster, because the organic compounds are molecules.
    C) faster, because organic compounds are ionic.
    D) slower, because the organic compounds are molecules.

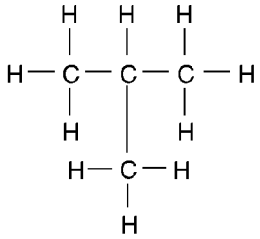
30. Organic compounds differ from inorganic compounds in that organic compounds generally have
    A) high melting points and are nonelectrolytes
    B) high melting points and are electrolytes
    C) low melting points and are electrolytes
    D) low melting points and are nonelectrolytes

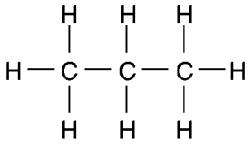
31. Which of the following has the lowest boiling point?
    A) ethane
    B) methane
    C) butane
    D) propane

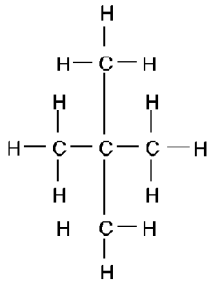
32. In a given homologous series of hydrocarbons, the boiling point generally increases as the size of the molecules increases. The best explanation for this statement is that in larger organic molecules
    A) the molecules are more symmetrical
    B) there are greater intermolecular forces
    C) the number of covalent bonds per molecule is greater
    D) more hydrogen bonding is possible

33. Which formula is an isomer of butane?

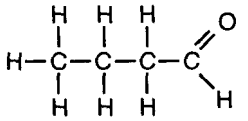
A) 

B) 

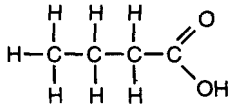
C) 

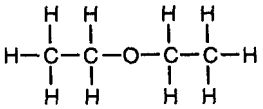
D) 

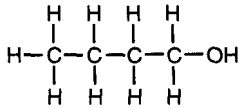
34. Given the compound:

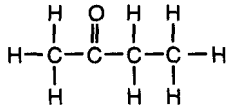


Which structural formula represents an isomer?

A) 

B) 

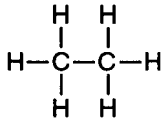
C) 

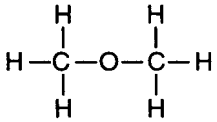
D) 

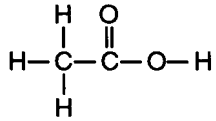
35. The four single bonds of a carbon atom are spatially directed toward the corners of a regular
A) rectangle B) tetrahedron
C) triangle D) square

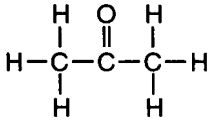
36. Which of these compounds has chemical properties most similar to the chemical properties of ethanoic acid?
A) $C_2H_5COOC_2H_5$ B) C_3H_7COOH
C) C_2H_5OH D) $C_2H_5OC_2H_5$

37. Which organic compound will dissolve in water to produce a solution that will turn blue litmus red?

A) 

B) 

C) 

D) 

38. Which statement is true for a compound whose formula is CH_3CH_2COOH?
A) It is an acid.
B) Its solution turns litmus blue.
C) It is an alcohol.
D) Its solution turns phenolphthalein pink.

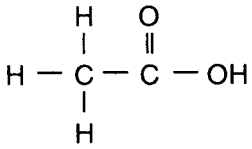
39. Which organic compound is a weak electrolyte?
A) pentane B) ethanoic acid
C) carbon tetrachloride D) benzene

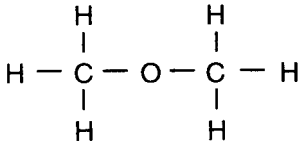
40. In an aqueous solution, which substance yields hydrogen ions as the only positive ions?
A) CH_3COOH B) KOH
C) C_2H_4 D) CH_4

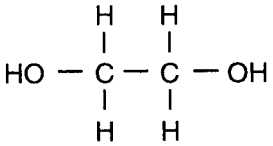
41. Which compound is an alcohol?
A) methanol B) butane
C) ethyne D) propanal

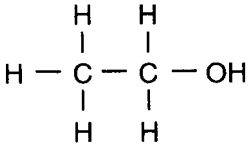
42. A compound with the formula CH_3CH_2OH is classified as an
A) acid B) alkane
C) alcohol D) alkene

43. Which structural formula represents a monohydroxy alcohol?

A) 

B) 

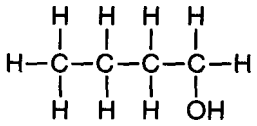
C) 

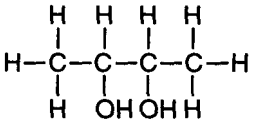
D) 

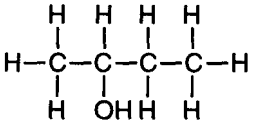
44. Methanal is the IUPAC name for an
A) ether B) alcohol
C) aldehyde D) acid

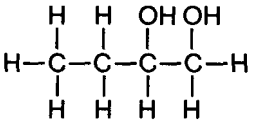
45. Which formula represents a ketone?
A) $HCHO$ B) CH_3COCH_3
C) $HCOOH$ D) CH_3CH_2OH

46. Which structural formula represents a primary alcohol?

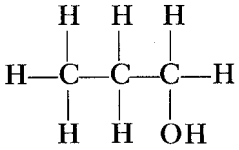
A) 

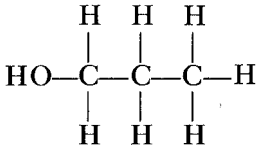
B) 

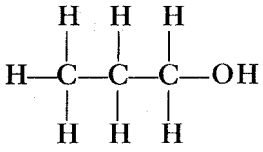
C) 

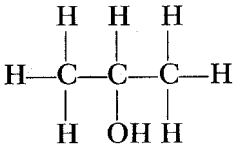
D) 

47. Which structural formula represents a secondary alcohol?

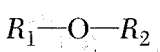
A) 

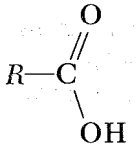
B) 

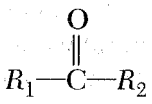
C) 

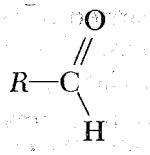
D) 

48. The general formula for aldehydes is

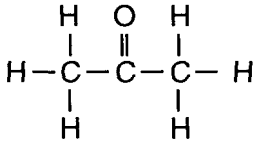
A) 

B) 

C) 

D) 

49. What is the name of the compound with the following formula?

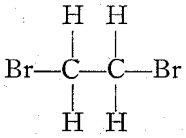


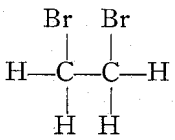
A) propanone
B) propanal
C) propanol
D) propanoic acid

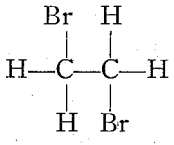
50. What is the minimum number of carbon atoms a ketone may contain?

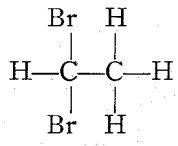
A) 1
B) 2
C) 3
D) 4

51. What is the correct formula of 1,1-dibromoethane?

A) 

B) 

C) 

D) 

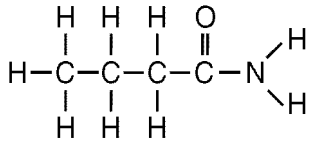
52. Which is an isomer of 2-chloropropane?

A) 1-chlorobutane
B) 1-chloropropane
C) butane
D) propane

53. The compound CH_3COOCH_3 is classified as

A) an acid
B) a hydrocarbon
C) an alcohol
D) an ester

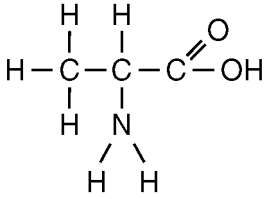
54. Given the formula:



This compound is classified as

A) an amide
B) a ketone
C) an amine
D) an aldehyde

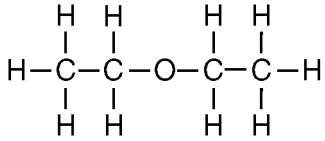
55. Given the structural formula:



This structural formula represents a molecule of

A) a ketone
B) an aldehyde
C) an amino acid
D) an ester

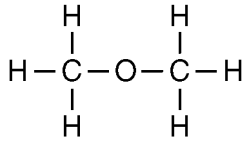
56. Given the structural formula:

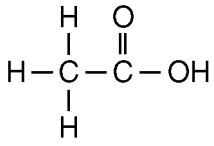


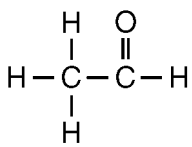
The compound represented by this formula can be classified as an

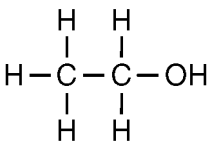
A) ester
B) organic acid
C) ether
D) aldehyde

57. Which structural formula represents an ether?

A) 

B) 

C) 

D) 

58. Which formula represents an ether?

A) CH_3-O-CH_3

B) $CH_3-\overset{\overset{O}{\|}}{C}-O-CH_3$

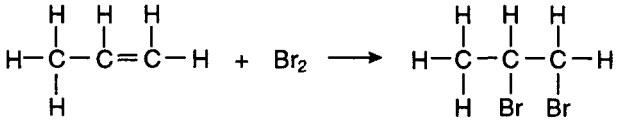
C) CH_3-OH

D) $CH_3-\overset{\overset{O}{\|}}{C}-OH$

59. As an addition reaction occurs, the number of electrons shared between carbon atoms

A) decreases
B) increases
C) remains the same

60. Given the organic reaction:



This reaction is an example of

A) addition
B) saponification
C) substitution
D) fermentation

61. Which is an example of an addition reaction?

A) $CH_3COOH + CH_3OH \rightarrow CH_3COOCH_3 + H_2O$

B) $C_2H_6 + Cl_2 \rightarrow C_2H_5Cl + HCl$
C) $C_3H_6 + H_2 \rightarrow C_3H_8$
D) $C_6H_{12}O_6 \rightarrow 2\ C_2H_5OH + 2\ CO_2$

62. In which type of reaction can an unsaturated hydrocarbon become saturated?

A) reduction with oxygen
B) addition
C) substitution with hydrogen
D) oxidation with oxygen

63. Given the equation:

$$CH_4 + Br_2 \rightarrow CH_3Br + HBr$$

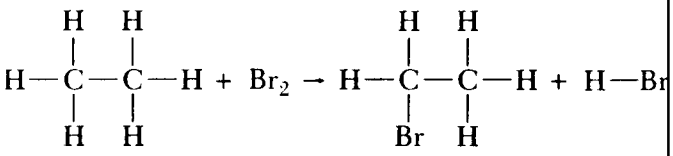
Which type of reaction does this equation represent?

A) substitution B) hydrogenation
C) addition D) polymerization

64. As a substitution reaction occurs, the number of electrons shared between carbon atoms

A) decreases B) increases
C) remains the same

65. Which organic product is formed by the reaction below?



A) bromobenzene B) bromoethene
C) bromoethane D) bromoethyne

66. The process of joining many small molecules into larger molecules is called

A) substitution B) neutralization
C) saponification D) polymerization

67. Which organic reaction produces rubber and plastics?

A) esterification B) polymerization
C) saponification D) fermentation

68. Cellulose, protein, and starch are classified as

A) synthetic polymers B) esters
C) natural polymers D) aldehydes

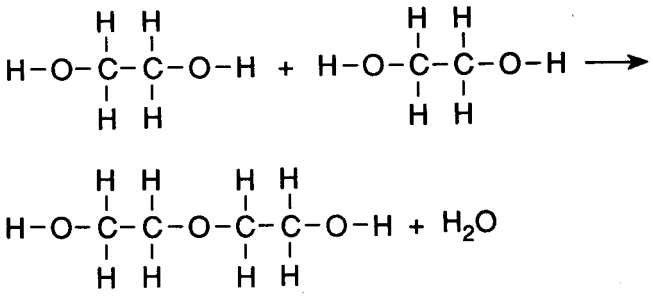
69. A condensation polymerization reaction produces a polymer and

A) H_2O B) O_2
C) CO_2 D) H_2

70. The fermentation of $C_6H_{12}O_6$ will produce CO_2 and

A) C_2H_5OH B) $Ca(OH)_2$
C) $C_3H_5(OH)_3$ D) $Cr(OH)_3$

71. Given the equation:



Which type of reaction is represented?

A) esterification
B) addition polymerization
C) condensation polymerization
D) saponification

72. Which alcohol reacts with C_2H_5COOH to produce the ester $C_2H_5COOC_2H_5$?

A) C_4H_9OH B) C_2H_5OH
C) C_3H_7OH D) CH_3OH

73. Which compound will react with CH_3COOH to form the ester methyl ethanoate?

A) CH_3COOH B) CH_3OCH_3
C) CH_3COCH_3 D) CH_3OH

74. A reaction between an acid and alcohol produces an ester and

A) glycerol B) ethanol
C) carbon dioxide D) water

75. What are the two main products of a fermentation reaction?

A) sugar and water
B) sugar and carbon dioxide
C) ethanol and water
D) ethanol and carbon dioxide

76. What are the products of a fermentation reaction?

A) an alcohol and carbon monoxide
B) a salt and an acid
C) an alcohol and carbon dioxide
D) a salt and water

77. The hydrolysis of a fat by a base is called

A) polymerization B) neutralization
C) esterification D) saponification

78. Which reaction best represents the complete combustion of ethene?

A) $C_2H_4 + HCl \rightarrow C_2H_5Cl$
B) $C_2H_4 + Cl_2 \rightarrow C_2H_4Cl_2$
C) $C_2H_4 + 3\ O_2 \rightarrow 2\ CO_2 + 2\ H_2O$
D) $C_2H_4 + H_2O \rightarrow C_2H_5OH$

79. Which products are obtained when $CH_4(g)$ burns completely in an excess of oxygen?

A) CO_2 and CO B) CO and C
C) CO_2 and H_2O D) CO and H_2O

80. The principal products of saponification, a reaction between a fat and a base, are soap and

A) carbon dioxide B) water
C) ethyl alcohol D) glycerol

Base your answers to questions **81** and **82** on the information below.

Given the reaction between 1-butene and chlorine gas:

$$C_4H_8 + Cl_2 \rightarrow C_4H_8Cl_2$$

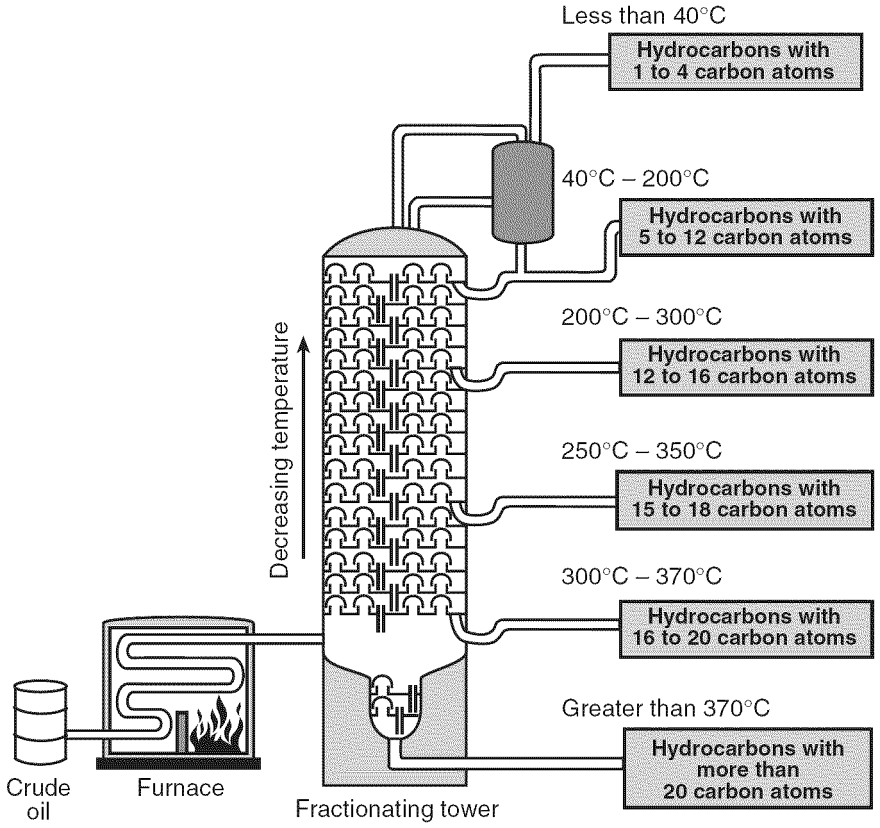
81. Which type of chemical reaction is represented by this equation?

82. Draw the structural formula of the product 1,2-dichlorobutane.

Base your answers to questions **83** through **86** on the information and diagram below and on your knowledge of chemistry.

Crude oil is a mixture of many hydrocarbons that have different numbers of carbon atoms. The use of a fractionating tower allows the separation of this mixture based on the boiling points of the hydrocarbons.

To begin the separation process, the crude oil is heated to about 400°C in a furnace, causing many of the hydrocarbons of the crude oil to vaporize. The vaporized mixture is pumped into a fractionating tower that is usually more than 30 meters tall. The temperature of the tower is highest at the bottom. As vaporized samples of hydrocarbons travel up the tower, they cool and condense. The liquid hydrocarbons are collected on trays and removed from the tower. The diagram below illustrates the fractional distillation of the crude oil and the temperature ranges in which the different hydrocarbons condense.



83. State the trend between the boiling point of the hydrocarbons contained in the crude oil and the number of carbon atoms in these molecules.

84. Describe the relationship between the strength of the intermolecular forces and the number of carbon atoms in the different hydrocarbon molecules.

85. Write an IUPAC name of *one* saturated hydrocarbon that leaves the fractionating tower at *less than* 40°C.

86. How many hydrogen atoms are present in one molecule of octane?

_____

87. Base your answers to the following questions on the information below.

> Gasoline is a mixture of hydrocarbons, one of which is octane. Sometimes water gets into the fuel tank of the automobile. Because it can not mix with the gasoline, it sinks to the bottom of the fuel tank. In cold weather the water can sometimes freeze in the gas lines and interrupt the flow of gasoline to the engine. An additive that contains the alcohol, methanol, can be added to the fuel tank that prevents the freezing of water by forming a solution with water that won't freeze.

a Draw the structural formula of the gasoline component, *octane*.

b Draw the structural formula of the gasoline additive, *methanol*.

c Explain why the water can dissolve in the alcohol, methanol, but not dissolve in the gasoline.

Organic Chemistry Practice Test
Answer Key

1. A
2. A
3. C
4. C
5. D
6. B
7. B
8. A
9. A
10. C
11. B
12. D
13. B
14. B
15. B
16. A
17. D
18. A
19. A
20. B
21. C
22. A
23. A
24. D
25. A
26. B
27. A
28. C
29. D
30. D
31. B
32. B
33. B
34. D
35. B
36. B
37. C
38. A
39. B
40. A
41. A
42. C
43. D
44. C
45. B
46. A
47. D
48. D
49. A
50. C

Version A

Organic Chemistry Practice Test
Answer Key

51. D
52. B
53. D
54. A
55. C
56. C
57. A
58. A
59. A
60. A
61. C
62. B
63. A
64. C
65. C
66. D
67. B
68. C
69. A
70. A
71. C
72. B
73. D
74. D
75. D

76. C
77. D
78. C
79. C
80. D

81. addition; chlorination; halogenation; redox; synthesis

82. Essay

83. As the number of carbon atoms in these molecules increases, the boiling point increases.

84. The intermolecular forces are weaker for molecules that have fewer carbon atoms.

85. methane; ethane; propane; methyl propane; butane

86. 18

87. a) Drawing; b) Drawing; c) Water and alcohol are both similar (polar) and "like dissolves like."

Version A

Organic Chemistry Practice Test

Name _____ Class _____ Date _____

Version A