

# Chemistry Review

## Unit 7 - Organic Chemistry

Characteristics of Organic Compounds, Bonding, Homologous Series of Hydrocarbons, Organic Reactions

### Organic Chemistry

- 1. Organic compounds consist of carbon atoms which bond to each other in chains, rings and networks to form a variety of structures.**  
✓
- 2. Organic compounds can be named with the IUPAC system.**
- 3. Hydrocarbons are compounds that contain only carbon and hydrogen.**  
✓ Saturated hydrocarbons contain only single carbon-carbon bonds.  
✓ Unsaturated hydrocarbons contain at least one multiple carbon-carbon bond (double or triple bond).
- 4. Organic acids, alcohols, esters, aldehydes, ketones, ethers, halides, amines, amides, and amino acids are categories of organic molecules that differ in their structures.**
- 5. Functional groups give organic molecules distinct physical and chemical properties.**
- 6. Isomers of organic compounds have the same molecular formula but different structures and properties.**
- 7. In a multiple covalent bond, more than one pair of electrons are shared between two atoms. Unsaturated organic compounds contain at least one double or triple bond.**
- 8. Types of organic reactions include: addition, substitution, polymerization, esterification, fermentation, saponification, and combustion.**

## Unit 7 - Organic Chemistry

August 2007

22 A molecule of butane and a molecule of 2-butene both have the same total number of

- (1) carbon atoms           (3) single bonds  
(2) hydrogen atoms       (4) double bonds

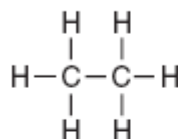
23 Which general formula represents the homologous series of hydrocarbons that includes the compound 1-heptyne?

- (1)  $C_n H_{2n-6}$                (3)  $C_n H_{2n}$   
(2)  $C_n H_{2n-2}$                (4)  $C_n H_{2n+2}$

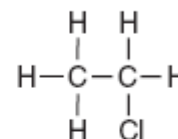
24 Which two compounds are isomers of each other?

- (1)  $CH_3CH_2COOH$  and  $CH_3COOCH_2CH_3$   
(2)  $CH_3CH_2CHO$  and  $CH_3COCH_3$   
(3)  $CH_3CHBrCH_3$  and  $CH_2BrCHBrCH_3$   
(4)  $CH_3CHOHCH_3$  and  $CH_3CHOHCH_2OH$

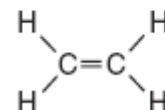
25 Which formula represents an unsaturated hydrocarbon?



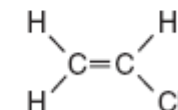
(1)



(3)

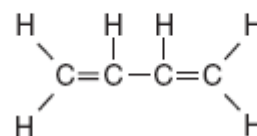


(2)



(4)

41 Given the formula of a substance:

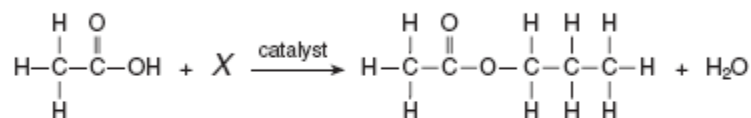


What is the total number of shared electrons in a molecule of this substance?

- (1) 22                               (3) 9  
(2) 11                               (4) 6

Base your answers to questions 64 through 66 on the information below.

The incomplete equation below represents an esterification reaction. The alcohol reactant is represented by X.



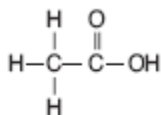
64 On the structural formula in *your answer booklet*, circle the acid functional group, only. [1]

65 Write an IUPAC name for the reactant represented by its structural formula in this equation. [1]

66 In the space in *your answer booklet*, draw the structural formula for the alcohol represented by X. [1]

## Unit 7 - Organic Chemistry

64



65 \_\_\_\_\_

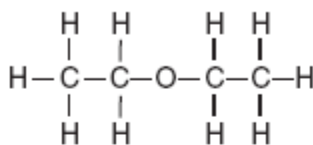
66

### June 2007

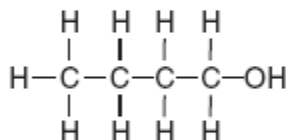
19 What is the total number of carbon atoms in a molecule of ethanoic acid?

- (1) 1                                      (3) 3  
(2) 2                                      (4) 4

20 Given the formulas for two compounds:



*and*



These compounds differ in

- (1) gram-formula mass  
(2) molecular formula  
(3) percent composition by mass  
(4) physical properties at STP

21 A double carbon-carbon bond is found in a molecule of

- (1) pentane                                      (3) pentyne  
(2) pentene                                      (4) pentanol

45 Which compound is an unsaturated hydrocarbon?

- (1) hexanal                                      (3) hexanoic acid  
(2) hexane                                      (4) hexyne

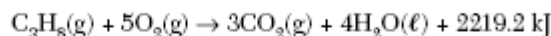
46 The organic compound represented by the condensed structural formula  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$  is classified as an

- (1) alcohol                                      (3) ester  
(2) aldehyde                                      (4) ether

## Unit 7 - Organic Chemistry

Base your answers to questions 69 through 72 on the information below.

Propane is a fuel that is sold in rigid, pressurized cylinders. Most of the propane in a cylinder is liquid, with gas in the space above the liquid level. When propane is released from the cylinder, the propane leaves the cylinder as a gas. Propane gas is used as a fuel by mixing it with oxygen in the air and igniting the mixture, as represented by the balanced equation below.

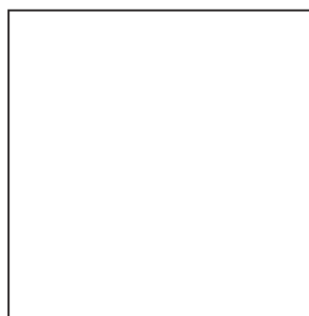


A small amount of methanethiol, which has a distinct odor, is added to the propane to help consumers detect a propane leak. In methanethiol, the odor is caused by the thiol functional group (-SH). Methanethiol,  $\text{CH}_3\text{SH}$ , has a structure that is very similar to the structure of methanol.

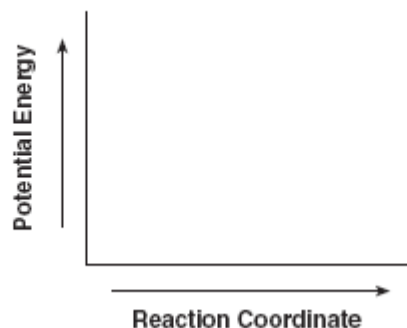
- 69 In the box in *your answer booklet*, draw a particle diagram to represent propane in a pressurized cylinder using the key in your answer booklet. Your response must include *at least six* molecules of propane in the gas phase and *at least six* molecules of propane in the liquid phase. [1]
- 70 On the diagram in *your answer booklet*, draw a potential energy diagram for this reaction. [1]
- 71 Determine the total amount of energy released when 2.50 moles of propane is completely reacted with oxygen. [1]
- 72 In the space in *your answer booklet*, draw a structural formula for a molecule of methanethiol. [1]

69

Key
○ = propane molecule



70



71 \_\_\_\_\_ kJ

72

## Unit 7 - Organic Chemistry

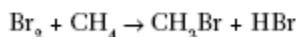
Base your answers to questions 77 through 79 on the information below.

Ozone gas,  $O_3$ , can be used to kill adult insects in storage bins for grain without damaging the grain. The ozone is produced from oxygen gas,  $O_2$ , in portable ozone generators located near the storage bins. The concentrations of ozone used are so low that they do not cause any environmental damage. This use of ozone is safer and more environmentally friendly than a method that used bromomethane,  $CH_3Br$ . However, bromomethane was more effective than ozone because  $CH_3Br$  killed immature insects as well as adult insects.

Adapted From: *The Sunday Gazette* (Schenectady, NY) 3/9/03

77 Determine the total number of moles of  $CH_3Br$  in 19 grams of  $CH_3Br$  (gram-formula mass = 95 grams/mol). [1]

78 Given the balanced equation for producing bromomethane:



Identify the type of organic reaction shown. [1]

79 Based on the information in the passage, state *one* advantage of using ozone instead of bromomethane for insect control in grain storage bins. [1]

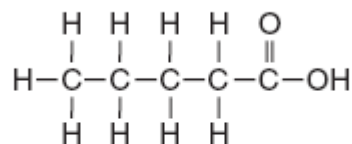
77 \_\_\_\_\_ mol

78 \_\_\_\_\_

79 \_\_\_\_\_

### January 2007

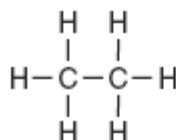
22 Given the structural formula:



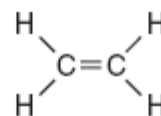
What is the IUPAC name of this compound?

- (1) pentanal                      (3) methyl pentanoate  
(2) pentanol                      (4) pentanoic acid

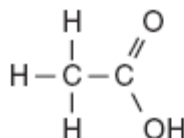
23 Which structural formula represents an unsaturated hydrocarbon?



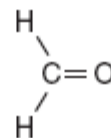
(1)



(3)



(2)



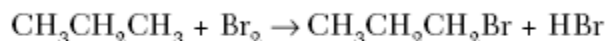
(4)

## Unit 7 - Organic Chemistry

25 Two substances have different physical and chemical properties. Both substances have molecules that contain two carbon atoms, one oxygen atom, and six hydrogen atoms. These two substances must be

- (1) isomers of each other
- (2) isotopes of each other
- (3) the same compound
- (4) the same hydrocarbon

26 Given the balanced equation representing a reaction:



This organic reaction is best classified as

- (1) an addition reaction
- (2) an esterification reaction
- (3) a polymerization reaction
- (4) a substitution reaction

### August 2006

17 The compounds 2-butanol and 2-butene both contain

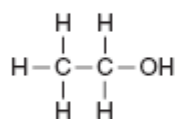
- (1) double bonds, only
- (2) single bonds, only
- (3) carbon atoms
- (4) oxygen atoms

20 Which organic compound is a saturated hydrocarbon?

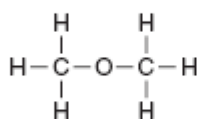
- (1) ethyne
- (2) ethene
- (3) ethanol
- (4) ethane

23 Given the structural formulas:

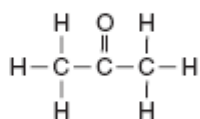
Formula A



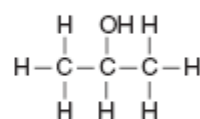
Formula B



Formula C



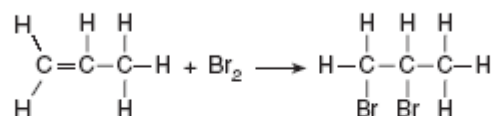
Formula D



Which two formulas represent compounds that are isomers of each other?

- (1) A and B
- (2) A and C
- (3) B and D
- (4) C and D

Base your answers to questions 61 through 63 on the equation below, which represents an organic compound reacting with bromine.



61 What is the IUPAC name for the organic compound that reacts with  $\text{Br}_2$ ? [1]

62 What type of organic reaction is represented by this equation? [1]

63 What is the gram-formula mass of the product in this reaction? [1]

61 \_\_\_\_\_

62 \_\_\_\_\_

63 \_\_\_\_\_ g/mol

## Unit 7 - Organic Chemistry

Base your answers to questions 78 and 79 on the information below.

Many esters have distinctive odors, which lead to their widespread use as artificial flavorings and fragrances. For example, methyl butanoate has an odor like pineapple and ethyl methanoate has an odor like raspberry.

78 In the space in *your answer booklet*, draw a structural formula for the ester that has an odor like pineapple. [1]

79 What is a chemical name for the alcohol that reacts with methanoic acid to produce the ester that has an odor like raspberry? [1]

78

79 \_\_\_\_\_

### June 2006

17 Which formula represents a hydrocarbon?

- (1)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$
- (2)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
- (3)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$
- (4)  $\text{CH}_3\text{CH}_2\text{COOCH}_3$

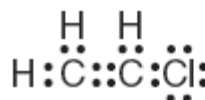
20 Which formula represents propyne?

- (1)  $\text{C}_3\text{H}_4$
- (2)  $\text{C}_3\text{H}_6$
- (3)  $\text{C}_5\text{H}_8$
- (4)  $\text{C}_5\text{H}_{10}$

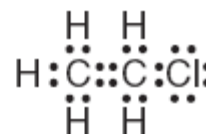
22 The compounds  $\text{CH}_3\text{OCH}_3$  and  $\text{CH}_3\text{CH}_2\text{OH}$  are isomers of each other. These two compounds must have the same

- (1) density
- (2) reactivity
- (3) melting point
- (4) molecular formula

39 Which Lewis electron-dot diagram represents chloroethene?



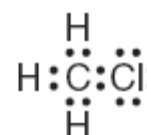
(1)



(3)



(2)



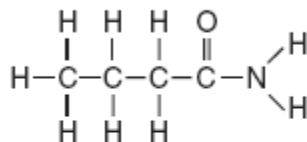
(4)

43 What is the IUPAC name for the compound that has the condensed structural formula  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$ ?

- (1) butanal
- (2) butanol
- (3) propanal
- (4) propanol

## Unit 7 - Organic Chemistry

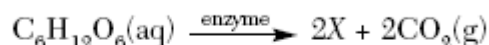
45 Given the formula:



This compound is classified as

- (1) an aldehyde                      (3) an amine  
(2) an amide                         (4) a ketone

46 Given the balanced equation with an unknown compound represented by X:



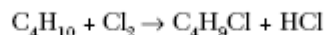
Which compound is represented by X?

- (1)  $\text{CH}_3\text{OH}(\text{aq})$   
(2)  $\text{CH}_2(\text{OH})_4(\text{aq})$   
(3)  $\text{CH}_3\text{CH}_2\text{OH}(\text{aq})$   
(4)  $\text{CH}_2\text{OHCH}_2\text{OH}(\text{aq})$

55 To which homologous series does  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$  belong? [1]      55 \_\_\_\_\_

Base your answers to questions 61 through 63 on the information below.

Given the balanced equation for an organic reaction between butane and chlorine that takes place at  $300.^\circ\text{C}$  and 101.3 kilopascals:



61 Identify the type of organic reaction shown. [1]

62 In the space *in your answer booklet*, draw a structural formula for the organic product. [1]

63 Explain, in terms of collision theory, why the rate of the reaction would *decrease* if the temperature of the reaction mixture was lowered to  $200.^\circ\text{C}$  with pressure remaining unchanged. [1]

61 \_\_\_\_\_

62

63 \_\_\_\_\_

\_\_\_\_\_

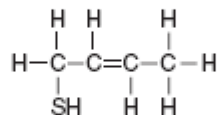
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## Unit 7 - Organic Chemistry

Base your answers to questions 71 and 72 on the information below.

A thiol is very similar to an alcohol, but a thiol has a sulfur atom instead of an oxygen atom in the functional group. One of the compounds in a skunk's spray is 2-butene-1-thiol. The formula of this compound is shown below.



71 Explain, in terms of composition, why this compound is a thiol. [1]

72 Explain, in terms of electron configuration, why oxygen atoms and sulfur atoms form compounds with similar molecular structures. [1]

71 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

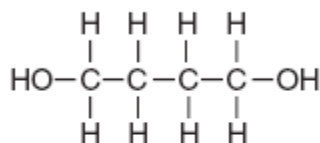
72 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## January 2006

9 Given the structural formula:



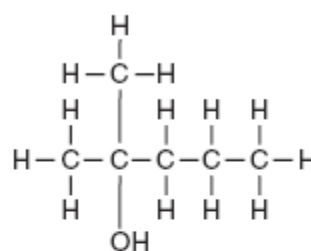
What is the empirical formula of this compound?

- (1)  $\text{CH}_3\text{O}$                       (3)  $\text{C}_4\text{H}_{10}\text{O}_2$   
(2)  $\text{C}_2\text{H}_5\text{O}$                       (4)  $\text{C}_8\text{H}_{20}\text{O}_4$

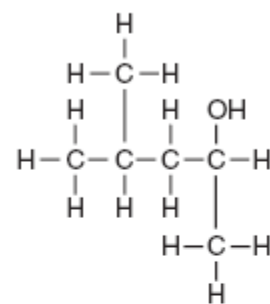
19 The multiple covalent bond in a molecule of 1-butene is a

- (1) double covalent bond that has 6 shared electrons  
(2) double covalent bond that has 4 shared electrons  
(3) triple covalent bond that has 6 shared electrons  
(4) triple covalent bond that has 4 shared electrons

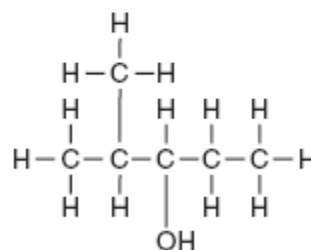
28 Which structural formula is correct for 2-methyl-3-pentanol?



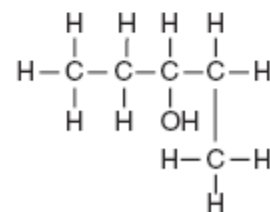
(1)



(3)



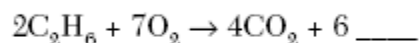
(2)



(4)

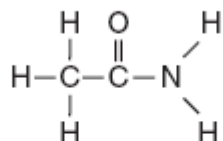
## Unit 7 - Organic Chemistry

- 42 Given the incomplete equation for the combustion of ethane:



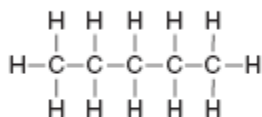
What is the formula of the missing product?

- (1)  $\text{CH}_3\text{OH}$                       (3)  $\text{H}_2\text{O}$   
(2)  $\text{HCOOH}$                      (4)  $\text{H}_2\text{O}_2$
- 44 Given the structural formula:



This compound is classified as an

- (1) amide                              (3) aldehyde  
(2) amine                             (4) alcohol
- 55 Given the structural formula of pentane:

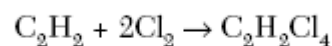


In the space in *your answer booklet*, draw a structural formula for an isomer of pentane. [1]

- 45 Which formula represents an unsaturated hydrocarbon?

- (1)  $\text{CH}_2\text{CHCl}$                       (3)  $\text{CH}_3\text{CH}_2\text{CH}_3$   
(2)  $\text{CH}_3\text{CH}_2\text{Cl}$                      (4)  $\text{CH}_3\text{CHCH}_2$

- 46 Given the balanced equation for an organic reaction:



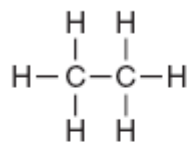
This reaction is best classified as

- (1) addition                          (3) fermentation  
(2) esterification                    (4) substitution

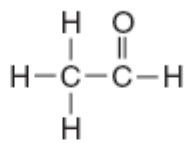
## Unit 7 - Organic Chemistry

August 2005

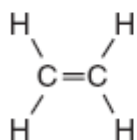
19 Which formula represents an unsaturated hydrocarbon?



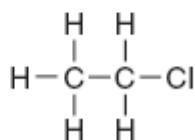
(1)



(3)

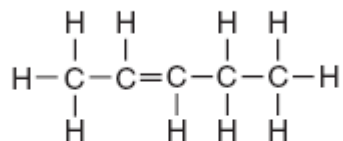


(2)



(4)

20 Given the formula:



What is the IUPAC name of this compound?

(1) 2-pentene

(3) 2-butene

(2) 2-pentyne

(4) 2-butyne

22 Atoms of which element can bond with each other to form ring and chain structures in compounds?

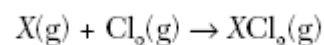
(1) C

(3) H

(2) Ca

(4) Na

47 Given the incomplete equation representing an organic addition reaction:



Which compound could be represented by X?

(1)  $\text{CH}_4$

(3)  $\text{C}_3\text{H}_8$

(2)  $\text{C}_2\text{H}_4$

(4)  $\text{C}_4\text{H}_{10}$

## Unit 7 - Organic Chemistry

Base your answers to questions 56 through 58 on the properties of propanone.

- 56 In the space in *your answer booklet*, draw the structural formula for propanone. [1]
- 57 Explain, in terms of molecular energy, why the vapor pressure of propanone increases when its temperature increases. [1]
- 58 A liquid's boiling point is the temperature at which its vapor pressure is equal to the atmospheric pressure. Using Reference Table *H*, what is the boiling point of propanone at an atmospheric pressure of 70 kPa? [1]

56

57 \_\_\_\_\_

\_\_\_\_\_

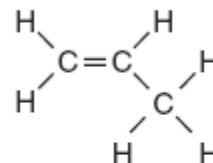
\_\_\_\_\_

58 \_\_\_\_\_ °C

### June 2005

- 21 Which element has atoms that can bond with each other to form long chains or rings?
- (1) carbon                      (3) oxygen  
(2) nitrogen                    (4) fluorine
- 22 Which formula represents an unsaturated hydrocarbon?
- (1)  $C_2H_6$                       (3)  $C_5H_8$   
(2)  $C_3H_8$                       (4)  $C_6H_{14}$

- 23 Given the structural formula:

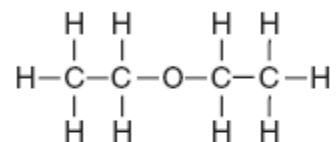


What is the IUPAC name of this compound?

- (1) propane                      (3) propanone  
(2) propene                      (4) propanal
- 25 The three isomers of pentane have different
- (1) formula masses  
(2) molecular formulas  
(3) empirical formulas  
(4) structural formulas

## Unit 7 - Organic Chemistry

47 Given the structural formula:

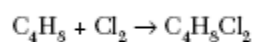


The compound represented by this formula can be classified as an

- (1) organic acid                      (3) ester  
(2) ether                                  (4) aldehyde

Base your answers to questions 59 and 60 on the information below.

Given the reaction between 1-butene and chlorine gas:



59 Which type of chemical reaction is represented by this equation? [1]

60 In the space in *your answer booklet*, draw the structural formula of the product 1,2-dichlorobutane. [1]

59 \_\_\_\_\_

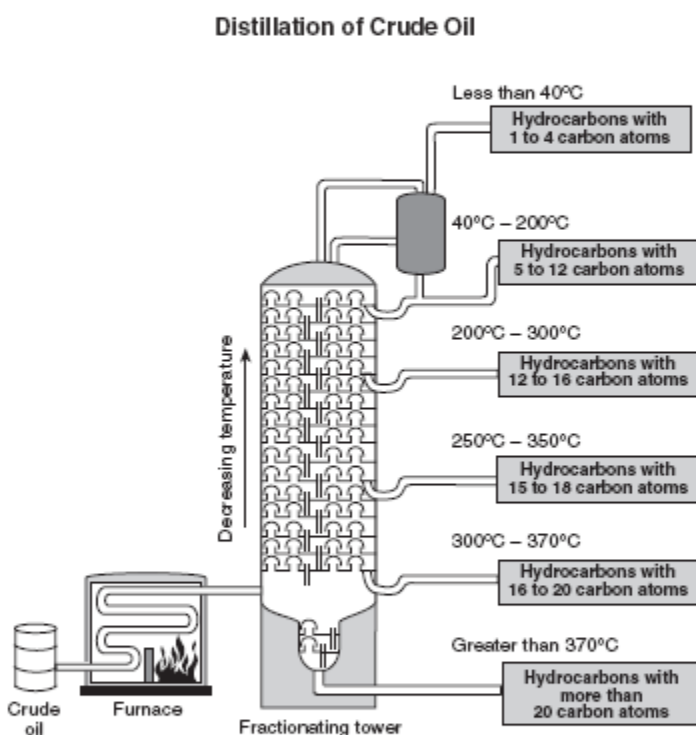
60

## Unit 7 - Organic Chemistry

Base your answers to questions 80 through 83 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  $400^{\circ}\text{C}$  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.



- 80 State the trend between the boiling point of the hydrocarbons contained in the crude oil and the number of carbon atoms in these molecules. [1]
- 81 Describe the relationship between the strength of the intermolecular forces and the number of carbon atoms in the different hydrocarbon molecules. [1]
- 82 Write an IUPAC name of *one* saturated hydrocarbon that leaves the fractionating tower at *less than*  $40^{\circ}\text{C}$ . [1]
- 83 How many hydrogen atoms are present in one molecule of octane? [1]

80 \_\_\_\_\_

\_\_\_\_\_

81 \_\_\_\_\_

\_\_\_\_\_

82 \_\_\_\_\_

83 \_\_\_\_\_

## Unit 7 - Organic Chemistry

January 2005

16 Which form of energy is converted to thermal energy when propane burns in air?

- (1) electromagnetic      (3) electrical  
(2) nuclear                (4) chemical

20 What is the total number of electron pairs that are shared between the two carbon atoms in a molecule of ethyne?

- (1) 1                                (3) 3  
(2) 2                                (4) 4

21 Which pair of compounds are isomers?

- (1)  $\text{NO}_2$  and  $\text{N}_2\text{O}_4$   
(2)  $\text{P}_2\text{O}_5$  and  $\text{P}_4\text{O}_{10}$   
(3)  $\text{HCOOH}$  and  $\text{CH}_3\text{COOH}$   
(4)  $\text{CH}_3\text{OCH}_3$  and  $\text{C}_2\text{H}_5\text{OH}$

22 Which organic compound is unsaturated?

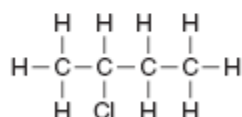
- (1) 2-methylbutane      (3) 2-hexanol  
(2) 2-chloropropane      (4) 2-pentene

Base your answers to questions 59 and 60 on the condensed structural formula below.



59 In the space provided in *your answer booklet*, draw the structural formula for this compound. [1]

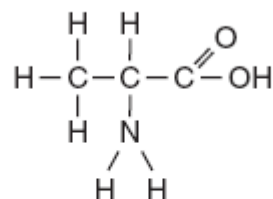
60 The formula below represents a product formed when HCl reacts with  $\text{CH}_3\text{CH}_2\text{CHCH}_2$ .



What is an IUPAC name for this product? [1]

59

44 Given the structural formula:

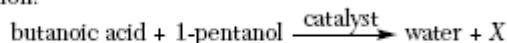


This structural formula represents a molecule of

- (1) an aldehyde                (3) a ketone  
(2) an ester                      (4) an amino acid

60 \_\_\_\_\_

61 Given the equation:



To which class of organic compounds does product X belong? [1]      61 \_\_\_\_\_

62 Identify the homologous series of hydrocarbons to which  $\text{CH}_3\text{CHCH}_2$  belongs. [1]      62 \_\_\_\_\_

## Unit 7 - Organic Chemistry

Base your answers to questions 77 through 79 on the information below.

Two alcohols that are used in our everyday lives are rubbing alcohol and ethylene glycol. Rubbing alcohol is used as an antiseptic. Ethylene glycol is the main ingredient in antifreeze, which is used in automobile cooling systems.

77 Explain, in terms of *molecular polarity*, why rubbing alcohol, 2-propanol, is soluble in water. [1]

78 What is the gram-formula mass of ethylene glycol,  $C_2H_4(OH)_2$ ? [1]

79 In the space provided in *your answer booklet*, show a correct numerical setup for calculating the total number of moles of ethylene glycol needed to prepare 2.50 liters of a 10.0 M solution. [1]

77 \_\_\_\_\_

\_\_\_\_\_

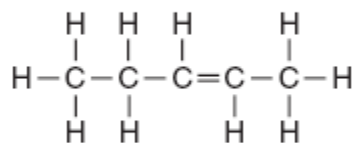
\_\_\_\_\_

78 \_\_\_\_\_ g/mol

79

### August 2004

22 What is the IUPAC name of the compound with the structural formula shown below?



(1) 2-pentene

(2) 3-pentene

(3) 2-pentyne

(4) 3-pentyne

23 Molecules of 1-bromopropane and 2-bromopropane differ in

(1) molecular formula

(2) structural formula

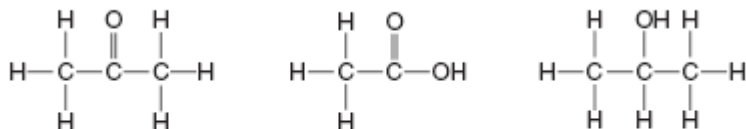
(3) number of carbon atoms per molecule

(4) number of bromine atoms per molecule



## Unit 7 - Organic Chemistry

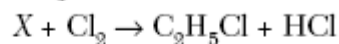
44 Given the three organic structural formulas shown below:



Which organic-compound classes are represented by these structural formulas, as shown from left to right?

- (1) ester, organic acid, ketone                      (3) ketone, aldehyde, alcohol  
(2) ester, aldehyde, organic acid                  (4) ketone, organic acid, alcohol

46 Given the equation:



Which molecule is represented by X?

- (1)  $\text{C}_2\text{H}_4$                       (3)  $\text{C}_3\text{H}_6$   
(2)  $\text{C}_2\text{H}_6$                       (4)  $\text{C}_3\text{H}_8$

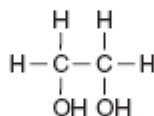
65 In the space provided in *your answer booklet*, draw the structural formula for butanoic acid. [1]

## Unit 7 - Organic Chemistry

Base your answers to questions 73 through 75 on the information below.

Ethene (common name ethylene) is a commercially important organic compound. Millions of tons of ethene are produced by the chemical industry each year. Ethene is used in the manufacture of synthetic fibers for carpeting and clothing, and it is widely used in making polyethylene. Low-density polyethylene can be stretched into a clear, thin film that is used for wrapping food products and consumer goods. High-density polyethylene is molded into bottles for milk and other liquids.

Ethene can also be oxidized to produce ethylene glycol, which is used in antifreeze for automobiles. The structural formula for ethylene glycol is:



At standard atmospheric pressure, the boiling point of ethylene glycol is 198°C, compared to ethene that boils at -104°C.

73 Identify the type of organic reaction by which ethene (ethylene) is made into polyethylene. [1]

74 According to the information in the reading passage, state *two* consumer products manufactured from ethene. [1]

75 Explain, in terms of *bonding*, why ethene is an unsaturated hydrocarbon. [1]

73 \_\_\_\_\_

74 \_\_\_\_\_ and \_\_\_\_\_

75 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## June 2004

22 Which element must be present in an organic compound?

- (1) hydrogen (3) carbon  
(2) oxygen (4) nitrogen

23 Which compound is a saturated hydrocarbon?

- (1) hexane (3) hexanol  
(2) hexene (4) hexanal

24 Given the reaction:



This reaction is an example of

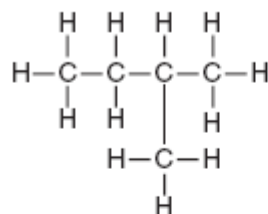
- (1) fermentation (3) hydrogenation  
(2) saponification (4) esterification

25 Which of these compounds has chemical properties most similar to the chemical properties of ethanoic acid?

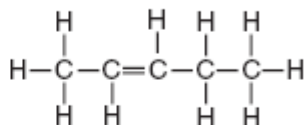
- (1) C<sub>3</sub>H<sub>7</sub>COOH (3) C<sub>2</sub>H<sub>5</sub>COOC<sub>2</sub>H<sub>5</sub>  
(2) C<sub>2</sub>H<sub>5</sub>OH (4) C<sub>2</sub>H<sub>5</sub>OC<sub>2</sub>H<sub>5</sub>

## Unit 7 - Organic Chemistry

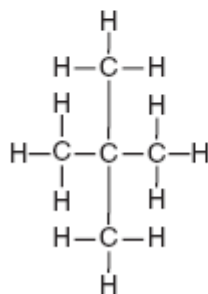
46 Which structural formula represents 2-pentyne?



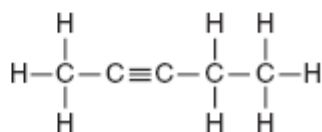
(1)



(3)



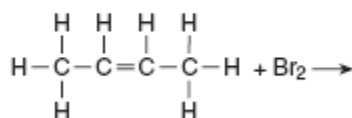
(2)



(4)

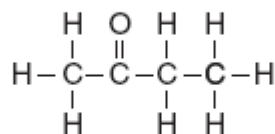
63 In the space to the right of the reactants and arrow provided in your answer booklet, draw the structural formula for the product of the reaction shown. [1]

63



January 2004

15 What is the IUPAC name of the compound with the following structural formula?



- (1) propanone                      (3) butanone  
 (2) propanal                        (4) butanal

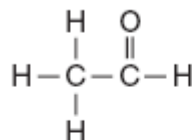
19 All organic compounds must contain the element

- (1) phosphorus                      (3) carbon  
 (2) oxygen                            (4) nitrogen

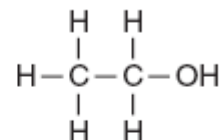
21 The functional group  $-\text{COOH}$  is found in

- (1) esters                              (3) alcohols  
 (2) aldehydes                        (4) organic acids

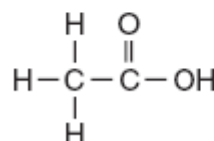
47 Which structural formula represents an ether?



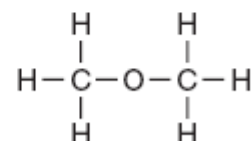
(1)



(3)

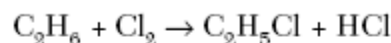


(2)



(4)

43 Given the equation:



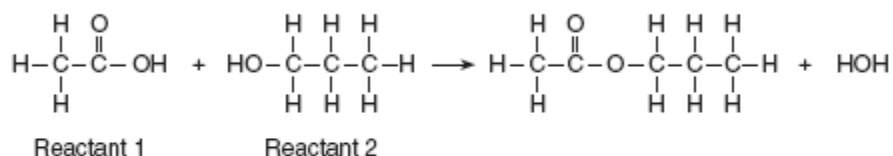
This reaction is best described as

- (1) addition involving a saturated hydrocarbon  
 (2) addition involving an unsaturated hydrocarbon  
 (3) substitution involving a saturated hydrocarbon  
 (4) substitution involving an unsaturated hydrocarbon

## Unit 7 - Organic Chemistry

Base your answers to questions 68 through 70 on the information below.

Many artificial flavorings are prepared using the type of organic reaction shown below.



68 What is the name of this organic reaction? [1]

69 To what class of organic compounds does reactant 2 belong? [1]

70 In the space provided in *your answer booklet*, draw the structural formula of an isomer of reactant 2. [1]

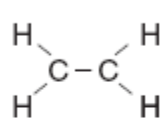
68 \_\_\_\_\_

69 \_\_\_\_\_

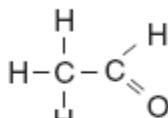
70

### August 2003

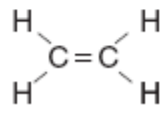
23 Which structural formula *correctly* represents a hydrocarbon molecule?



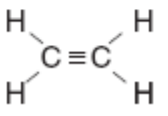
(1)



(3)

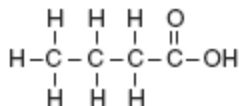


(2)

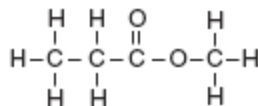


(4)

24 Given the structural formulas for two organic compounds:



and



The differences in their physical and chemical properties are primarily due to their different

(1) number of carbon atoms

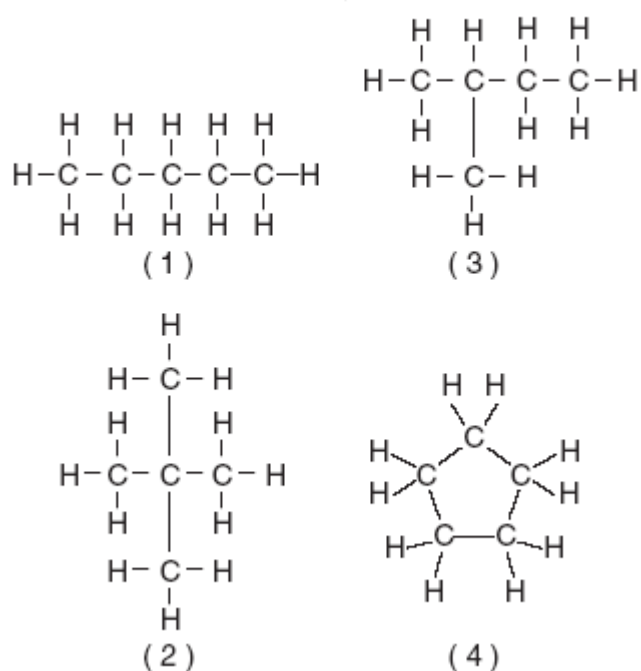
(3) molecular masses

(2) number of hydrogen atoms

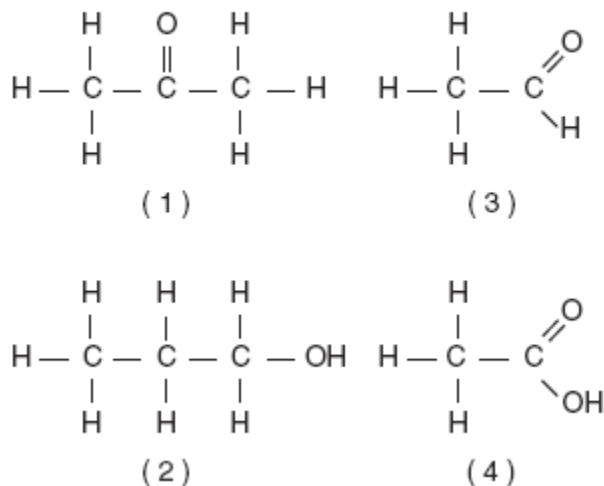
(4) functional groups

## Unit 7 - Organic Chemistry

25 Which structural formula represents a molecule that is *not* an isomer of pentane?

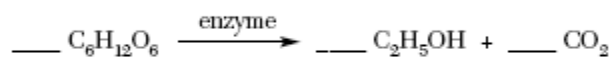


47 Which structural formula represents an alcohol?



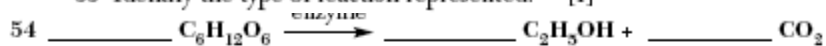
Base your answers to questions 54 and 55 on the information below.

Given the unbalanced equation:



54 Balance the equation provided in *your answer booklet*, using the lowest whole-number coefficients. [1]

55 Identify the type of reaction represented. [1]



55 \_\_\_\_\_

## Unit 7 - Organic Chemistry

June 2003

21 Which hydrocarbon is saturated?

- (1) propene                      (3) butene  
(2) ethyne                        (4) heptane

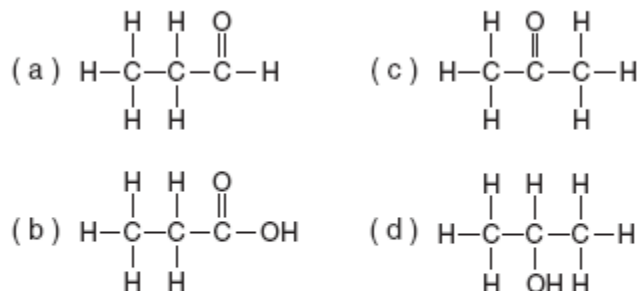
24 Which element has atoms that can form single, double, and triple covalent bonds with other atoms of the same element?

- (1) hydrogen                      (3) fluorine  
(2) oxygen                        (4) carbon

25 Which compound is an isomer of pentane?

- (1) butane                        (3) methyl butane  
(2) propane                      (4) methyl propane

44 Given the formulas of four organic compounds:

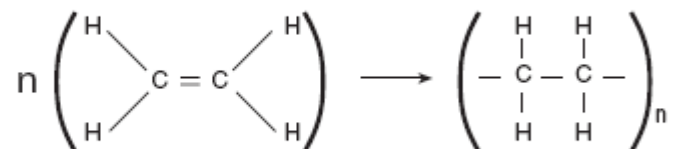


Which pair below contains an alcohol and an acid?

- (1) *a* and *b*                      (3) *b* and *d*  
(2) *a* and *c*                      (4) *c* and *d*

45 Which type of reaction is represented by the equation below?

Note: *n* and *n* are very large numbers equal to about 2000.



- (1) esterification                      (3) saponification  
(2) fermentation                      (4) polymerization

55

Base your answers to questions 55 and 56 on the information below.

Diethyl ether is widely used as a solvent.

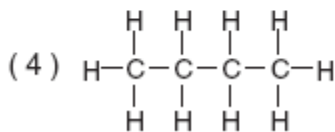
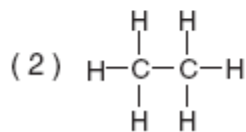
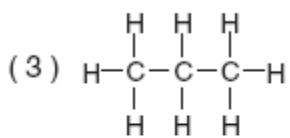
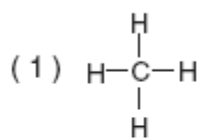
55 In the space provided in *your answer booklet*, draw the structural formula for diethyl ether. [1]

56 In the space provided in *your answer booklet*, draw the structural formula for an alcohol that is an isomer of diethyl ether. [1]

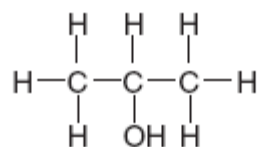
## Unit 7 - Organic Chemistry

January 2003

18 Which compound has an isomer?



49 Which type of organic compound is represented by the structural formula shown below?



(1) aldehyde

(3) ether

(2) alcohol

(4) ester

25 In saturated hydrocarbons, carbon atoms are bonded to each other by

(1) single covalent bonds, only

(2) double covalent bonds, only

(3) alternating single and double covalent bonds

(4) alternating double and triple covalent bonds

26 Which formula correctly represents the product of an addition reaction between ethene and chlorine?

(1)  $\text{CH}_2\text{Cl}_2$

(3)  $\text{C}_2\text{H}_4\text{Cl}_2$

(2)  $\text{CH}_3\text{Cl}$

(4)  $\text{C}_2\text{H}_3\text{Cl}$

61 How is the bonding between carbon atoms different in unsaturated hydrocarbons and saturated hydrocarbons? [1]

61 \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_