

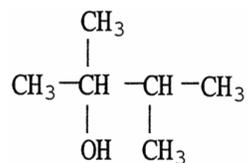
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) Compounds with the -OH group attached to a saturated alkane-like carbon are known as 1) _____
A) alcohols.
B) phenols.
C) ethers.
D) alkyl halides.
E) hydroxyls.
- 2) Compounds with an oxygen atom bonded to two organic groups are known as 2) _____
A) ethers.
B) hydroxides.
C) hydroxyls.
D) phenols.
E) alcohols.
- 3) None of the following organic compounds is very likely to form hydrogen bonds **except** 3) _____
A) alkanes. B) ethers. C) alkenes. D) aromatics. E) alcohols.
- 4) Alcohols, ethers, and phenols can be considered organic derivatives of the inorganic compound 4) _____
A) sodium hydroxide.
B) water.
C) carbon dioxide.
D) ammonia.
E) none of these

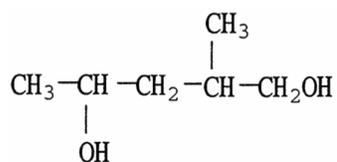
5) Which molecule shown is an ether?

5) _____

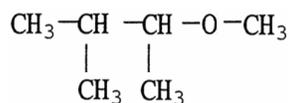
A)



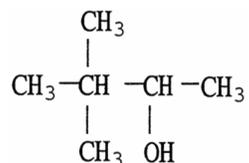
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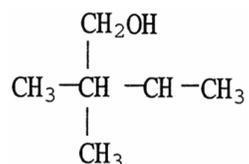
C)



D)



E)



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

- 6) What is the inorganic compound that can be considered the structural basis for alcohols and ethers? Discuss two ways in which the physical properties of alcohols and ethers are similar to properties of this compound. 6) _____

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

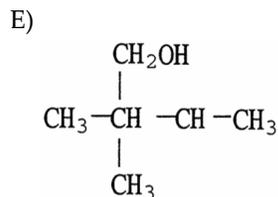
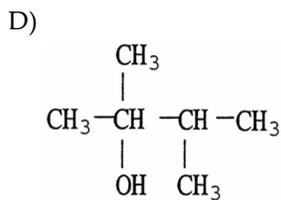
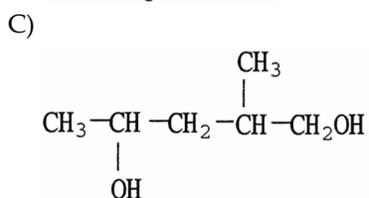
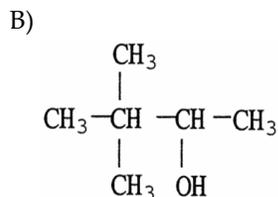
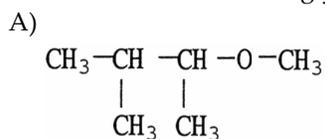
- 7) The alcohol which contains only one carbon atom and has the common name of wood alcohol is 7) _____
A) methanol. B) glycol. C) glycerol. D) ethanol. E) phenol.
- 8) The common name of CH_3OH is 8) _____
A) antifreeze.
B) grain alcohol.
C) wood alcohol.
D) rubbing alcohol.
E) glycerol.
- 9) The alcohol which contains two carbon atoms and has the common name of grain alcohol is 9) _____
A) glycol. B) ethanol. C) glycerol. D) phenol. E) methanol.

10) The common name of $\text{CH}_3\text{CH}_2\text{OH}$ is 10) _____
 A) wood alcohol.
 B) grain alcohol.
 C) antifreeze.
 D) rubbing alcohol.
 E) glycerol.

11) The molecule with three carbon atoms with an $-\text{OH}$ group on each, and used as a moisturizer is 11) _____
 A) glycerol. B) methanol. C) ethanol. D) phenol. E) glycol.

12) The common name of $\text{CH}_2(\text{OH})\text{CH}_2\text{OH}$ is 12) _____
 A) rubbing alcohol.
 B) antifreeze.
 C) wood alcohol.
 D) grain alcohol.
 E) glycerol.

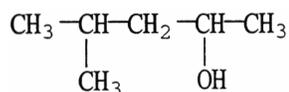
13) Which molecule shown is a glycol? 13) _____



14) The common name of 1,2-ethanediol is 14) _____
A) wood alcohol.
B) glycerol.
C) antifreeze.
D) rubbing alcohol.
E) grain alcohol.

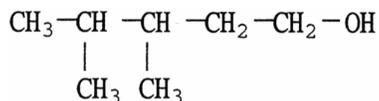
15) The common name of $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$ in water solution is 15) _____
A) wood alcohol.
B) rubbing alcohol.
C) grain alcohol.
D) antifreeze.
E) glycerol.

16) What is the IUPAC name of the compound shown? 16) _____



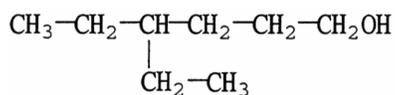
- A) 2,2-dimethyl-4-butanol
- B) 4-methyl-2-pentanol
- C) 2-methyl-4-pentanol
- D) 4,4-dimethyl-2-butanol
- E) 2-isohexanol

17) The IUPAC name of the alcohol shown is 17) _____



- A) primary 2,3-dimethylpentanol.
- B) 2,3-dimethyl-5-pentanol.
- C) 3,4-dimethyl-1-pentanol.
- D) 3,4-dimethyl-5-pentanol.
- E) 2,3-dimethyl-1-pentanol.

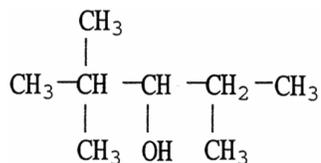
18) What is the IUPAC name of the compound shown? 18) _____



- A) isooctanol
- B) 3-ethyl-1-hexanol
- C) 4,4-diethyl-1-butanol
- D) 3-ethyl-6-hexanol
- E) 4-ethyl-1-hexanol

19) The name of the alcohol shown is

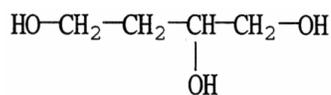
19) _____



- A) branched 3-octanol
- B) secondary 2,4,4-pentanol
- C) 2,2,4-trimethyl-3-pentanol
- D) 2,4,4-trimethyl-3-pentanol
- E) trimethyl-3-pentanol

20) What is the IUPAC name of the compound shown?

20) _____



- A) 2-hydroxy-1,4-butanediol
- B) butylene glycol
- C) butanetriol
- D) 1,3,4-butanetriol
- E) 1,2,4-butanetriol

21) Compounds of the type $\text{R}_3\text{C}-\text{OH}$ are referred to as _____ alcohols.

21) _____

- A) secondary
- B) primary
- C) quaternary
- D) tertiary
- E) none of the above

22) Compounds of the type $\text{R}_2\text{CH}-\text{OH}$ are referred to as _____ alcohols.

22) _____

- A) quaternary
- B) tertiary
- C) primary
- D) secondary
- E) none of the above

23) Compounds of the type RCH_2-OH are referred to as _____ alcohols.

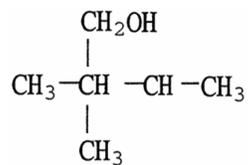
23) _____

- A) secondary
- B) tertiary
- C) quaternary
- D) primary
- E) none of the above

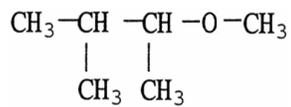
24) Which molecule shown is a primary alcohol?

24) _____

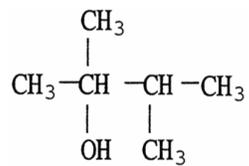
A)



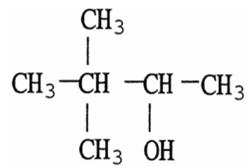
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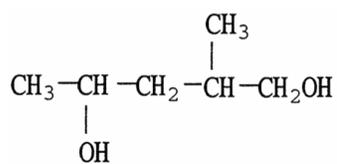
C)



D)



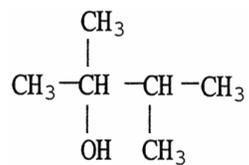
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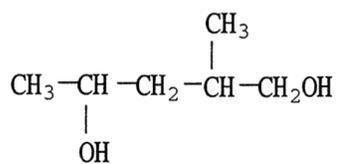
25) Which molecule shown is a secondary alcohol?

25) _____

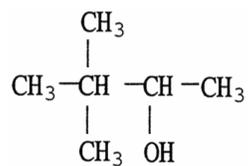
A)



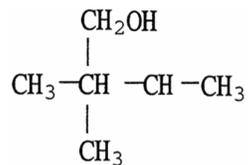
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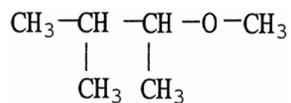
C)



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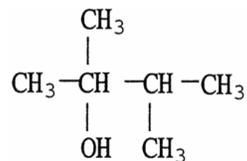
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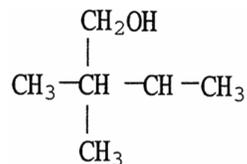
26) Which molecule shown is a tertiary alcohol?

26) _____

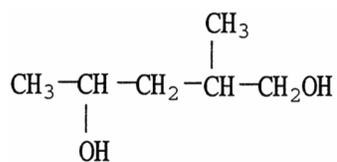
A)



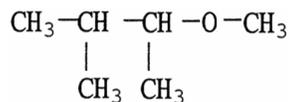
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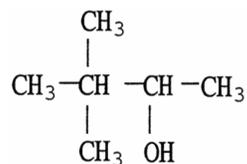
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D)



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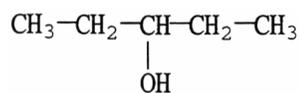
27) Which compound is a tertiary alcohol?

27) _____

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

28) The molecule shown is a _____ alcohol because _____.

28) _____



- A) primary; its -OH group is on the end of the molecule
- B) tertiary; the -OH is bonded to the number 3 carbon
- C) secondary; each group bonded to the hydroxyl carbon contains two carbon atoms
- D) secondary; the carbon bonded to the -OH group is bonded to two other carbons
- E) primary; it has one -OH group

- 29) An alcohol is classified as primary, secondary or tertiary based on _____
A) the number of carbon atoms bonded to the carbon bearing the OH group.
B) the number of hydrogens present in the alcohol.
C) the mass of the alcohol.
D) the number of carbon atoms in the molecule.
E) the number of OH groups present in the molecule.
- 30) How many isomeric alcohols exist with the formula $C_4H_{10}O$ _____
A) 3 B) 4 C) 5 D) 1 E) 2
- 31) The relatively high boiling point of alcohols in relation to their molecular weights is the result of _____
A) ionic bonding.
B) London forces.
C) dipolar forces.
D) covalent bonding.
E) hydrogen bonding.
- 32) All of the following properties of alcohols are affected by hydrogen bonding **except** _____
A) boiling point.
B) molecular weight.
C) miscibility with water.
D) ability to dissolve polar substances.
E) none of the above
- 33) Which compound is the **most** soluble in water? _____
A) $CH_3-CH_2-CH_2-OH$
B) $CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_3$
C) $CH_3-CH_2-CH_3$
D) $CH_3-CH_2-CH_2-CH_3$
E) $CH_3-CH_2-CH_2-CH_2-OH$
- 34) Which compound is the **least** soluble in water? _____
A) $CH_3-CH_2-CH_3$
B) $CH_3-CH_2-CH_2-CH_2-OH$
C) $CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_3$
D) $CH_3-CH_2-CH_2-OH$
E) $CH_3-CH_2-CH_2-CH_3$
- 35) Which compound has the **lowest** boiling point? _____
A) $CH_3-CH_2-CH_2-CH_2-CH_3$
B) $CH_3-CH_2-CH_2-CH_3$
C) $CH_3-CH_2-CH_2-CH_2-CH_2-OH$
D) $CH_3-CH_2-CH_2-OH$
E) $CH_3-CH_2-CH_2-CH_2-OH$

- 36) Which compound has the **highest** boiling point? 36) _____
A) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$
B) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$
C) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$
D) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_3$
E) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_3$
- 37) Which of the following is the **most** soluble in water? 37) _____
A) methanol
B) 1-butanol
C) 1-decanol
D) diethyl ether
E) decane
- 38) Which of the following is the **most** soluble in water? 38) _____
A) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-O-CH}_3$
B) $\text{CH}_3\text{-CH}_2\text{-O-CH}_2\text{-CH}_3$
C) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$
D) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_3$
E) $\text{OH-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$
- 39) Which of the following would be the **least** soluble in water? 39) _____
A) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$
B) $\text{OH-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$
C) $\text{CH}_3\text{-CH}_2\text{-O-CH}_2\text{-CH}_3$
D) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-O-CH}_3$
E) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_3$
- 40) Which compound has the **lowest** boiling point? 40) _____
A) $\text{CH}_3\text{-CH}_2\text{-O-CH}_2\text{-CH}_3$
B) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-O-CH}_3$
C) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$
D) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$
E) $\text{CH}_3\text{-CH}_2\text{-O-CH}_3$
- 41) Which compound has the **highest** boiling point? 41) _____
A) $\text{CH}_3\text{-CH}_2\text{-O-CH}_3$
B) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-O-CH}_3$
C) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$
D) $\text{CH}_3\text{-CH}_2\text{-O-CH}_2\text{-CH}_3$
E) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$

42) Which compound would you expect to have the **lowest** boiling point? 42) _____
A) dimethyl ether
B) ethanol
C) water
D) methanol
E) methane

43) Which alcohol is most soluble in water 43) _____
A) ethanol
B) 1-hexanol
C) 1-pentanol
D) 1-propanol
E) 1-butanol

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

44) Describe and explain the change in water solubility of straight-chain primary alcohols as molar mass increases. 44) _____

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

45) The product of dehydration of an alcohol is an 45) _____
A) alkane. B) alkene. C) ether. D) aldehyde. E) aromatic.

46) Oxidation of an alcohol group results in formation of a(an) _____ group. 46) _____
A) aromatic B) carbonyl C) ether D) hydroxyl E) alkyl

47) The symbol [O] written above a reaction arrow means 47) _____
A) oxygen is removed from one of the reactants during the reaction.
B) that a reduction reaction is occurring and oxygen is liberated.
C) the reaction consumes oxygen from the atmosphere.
D) that an oxidation reaction is occurring.
E) none of the above

48) Oxidation of R_2CH-OH will produce 48) _____
A) a ketone.
B) a carboxylic acid.
C) an aldehyde.
D) an alkene.
E) no reaction.

49) Oxidation of a tertiary alcohol will produce 49) _____
A) a carboxylic acid.
B) an aldehyde.
C) a ketone.
D) an alkene.
E) no reaction.

50) Treatment of $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—OH}$ with a limited amount of oxidizing agent will produce 50) _____
A) an alkene.
B) an aldehyde.
C) a ketone.
D) a carboxylic acid.
E) no reaction.

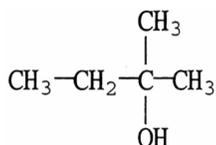
51) Treatment of $\text{CH}_3\text{—CH}_2\text{—OH}$ with an excess amount of oxidizing agent will produce 51) _____
A) a carboxylic acid.
B) an aldehyde.
C) a ketone.
D) an alkene.
E) no reaction.

52) Gentle oxidation of a primary alcohol will produce 52) _____
A) an ether.
B) an alkene.
C) a ketone.
D) an aldehyde.
E) a carboxylic acid.

53) Gentle oxidation of a secondary alcohol will produce 53) _____
A) a carboxylic acid.
B) a ketone.
C) an alkene.
D) an aldehyde.
E) an ether.

54) Strong oxidation of a primary alcohol will produce 54) _____
A) an alkene.
B) an ether.
C) a ketone.
D) an aldehyde.
E) a carboxylic acid.

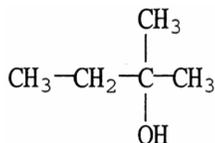
55) Treatment of the molecule shown with a strong oxidizing agent will produce 55) _____



- A) an aldehyde.
B) an alkene.
C) a ketone.
D) a carboxylic acid.
E) no reaction.

56) Treatment of the molecule shown with a dehydrating agent will produce

56) _____



- A) a carboxylic acid.
- B) an alkene.
- C) a ketone.
- D) an aldehyde.
- E) no reaction.

57) The major product obtained from dehydration of 2-hexanol is

57) _____

- A) 2-hexene.
- B) 1-hexene.
- C) 3-hexene.
- D) 2-hexanone.
- E) 2-hexanal.

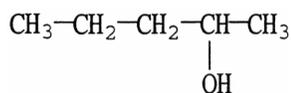
58) Which alcohol should be used to produce 2-methyl-3-pentene by dehydration?

58) _____

- A) 4-methyl-2-pentanol
- B) 2-methyl-3-pentanol
- C) 1-propanol and 2-propanol
- D) 2-methyl-1-pentanol
- E) 4-methyl-1-pentanol

59) The major product resulting from the dehydration of

59) _____



will be

- A) 1-pentene.
- B) n-pentane.
- C) 2-pentene.
- D) 1,3-pentanediol.
- E) 1,2-pentanediol.

60) What is the product of the oxidation of a secondary alcohol?

60) _____

- A) ketone
- B) carboxylic acid
- C) aldehyde
- D) alkyne
- E) alkene

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

61) Oxidation reactions are defined differently in organic chemistry than they are in inorganic chemistry. Give the definition of both and explain their similarities. 61) _____

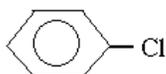
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

62) The simplest aromatic alcohol, recognized by its strong medicinal odor and used as a disinfectant is 62) _____
A) glycol. B) methanol. C) phenol. D) ethanol. E) glycerol.

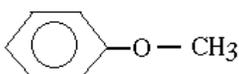
63) Which compound is sometimes called carbolic acid? 63) _____
A) phenol B) ethanol C) glycerol D) ether E) methanol

64) Compounds with the -OH group attached to an aromatic ring are known as 64) _____
A) alkyl halides.
B) alcohols.
C) ethers.
D) hydroxyls.
E) phenols.

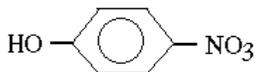
65) Which molecule would be considered a derivative of phenol? 65) _____
A)



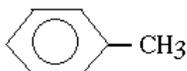
B)



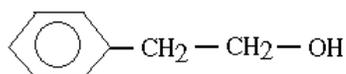
C)



D)



E)



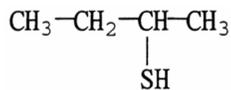
66) Which molecule would be the **most** acidic? 66) _____
A) 1-hexanol
B) dimethyl ether
C) water
D) phenol
E) ethanol

67) When phenol acts as an acid, a _____ ion is produced. 67) _____
A) phenolate B) benzyl C) phenyl D) phenoxide E) phenolic

- 68) The molecule $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—O—CH}_2\text{—CH}_3$ can be classified as 68) _____
A) an ether.
B) an alcohol.
C) an aldehyde.
D) an alkane.
E) a ketone.
- 69) All of the following are properties of ethers **except** 69) _____
A) Except for flammability, ethers are relatively unreactive.
B) Low molecular weight ethers are flammable and evaporate easily.
C) The molecules are polar, but do not form hydrogen bonds with other ether molecules.
D) Ethers dissolve readily in water in all proportions.
E) Ethers dissolve many organic compounds readily.
- 70) What is the IUPAC name of the compound shown? 70) _____
 $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—O—CH}_3$
A) isobutyl ether
B) 1,2-etherbutane
C) butyl ether
D) methyl propyl ether
E) propyl methyl ether
- 71) Ether molecules are polar, but do not form hydrogen bonds with other ether molecules because 71) _____
A) ether molecules are so reactive that they never have an opportunity to form hydrogen bonds.
B) the molecules are generally too large.
C) there are too many hydrogen atoms on the molecules to bond with just one oxygen atom.
D) there is no hydrogen atom bonded to the oxygen.
E) only binary compounds form hydrogen bonds.
- 72) Organic compounds which are sulfur analogs of alcohols are referred to as 72) _____
A) halides.
B) sulfuric alcohols.
C) thiols.
D) carbonyls.
E) disulfides
- 73) Which property of thiols makes them useful as additives to natural gas? 73) _____
A) disinfectant
B) color
C) solubility
D) odor
E) flammability
- 74) The reaction conditions which would result in formation of disulfides from thiols are 74) _____
A) strong acid.
B) mild oxidizing.
C) gentle heat.
D) strong heat.
E) none of these

75) What is the IUPAC name of the compound shown?

75) _____



- A) 1-methyl-1-propanethiol
- B) 3-thiobutanol
- C) 2-thiobutane
- D) 1-methyl-1-thiopropene
- E) 2-butanethiol

76) When a thiol is oxidized the product is

76) _____

- A) a ketone.
- B) an alkene
- C) sulfuric acid.
- D) a disulfide.
- E) an aldehyde.

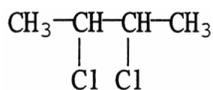
77) The most characteristic feature of thiols is _____

77) _____

- A) odor
- B) solubility in water
- C) color
- D) reactivity with water
- E) boiling point

78) What is the IUPAC name of the compound shown?

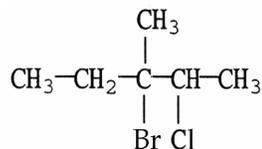
78) _____



- A) 1,2-dichloro-1,2-dimethylethane
- B) di(chloroethane)
- C) 2,3-dichlorobutane
- D) 1,2-dichloro-1-methylpropane
- E) 2,3-dichlorobutane

79) What is the IUPAC name for the compound shown?

79) _____



- A) 3-bromo-2-chloro-3-methylpentane
- B) bromochlorohexane
- C) 3-bromo-4-chloro-3-methylpentane
- D) 3-bromomethyl-2-chloro-pentane
- E) none of these

80) All of the following can be classified as alkyl halides **except**

80) _____

- A) styrene, the monomer used to make foam coffee cups.
- B) CFC's used as refrigerants.
- C) chloroform, an anesthetic.
- D) thyroxine, a thyroid hormone.
- E) methyl bromide, an insecticide.

MATCHING. Choose the item in column 2 that best matches each item in column 1.

Match the following.

81) glycol

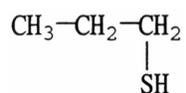
A) $-\text{OC}_2\text{H}_5$

81) _____

82) alkoxy group

B)

82) _____



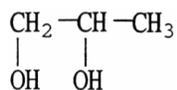
83) _____

83) disulfide

84) thiol

C)

84) _____



D) $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{S}-\text{S}-\text{CH}_2-\text{CH}_3$

Answer Key

Testname: UNTITLED1

- 1) A
- 2) A
- 3) E
- 4) B
- 5) C
- 6) Alcohols and ethers can be considered to be derivatives of water. Similar physical properties include:
Polarity: Water is a very polar molecule; alcohols and ethers also display polarity.
Boiling point: Water has a higher boiling point than predicted on the basis of its molar mass. Alcohols also share this characteristic, but ethers do not.
Solubility: Water is miscible with other polar liquids; alcohols and ethers of low molar mass are miscible with water and with each other because of their polarity.
- 7) A
- 8) C
- 9) B
- 10) B
- 11) A
- 12) B
- 13) C
- 14) C
- 15) B
- 16) B
- 17) C
- 18) E
- 19) C
- 20) E
- 21) D
- 22) D
- 23) D
- 24) A
- 25) C
- 26) A
- 27) C
- 28) D
- 29) A
- 30) B
- 31) E
- 32) B
- 33) A
- 34) C
- 35) B
- 36) A
- 37) A
- 38) E
- 39) E
- 40) E
- 41) C
- 42) E
- 43) A

Answer Key

Testname: UNTITLED1

- 44) As the molar mass of these alcohols increases, the water solubility decreases. This occurs because the polarity of the hydroxyl group, which is the reason for the interaction with the polar water molecules, becomes less important as the size of the nonpolar hydrocarbon portion of the molecule increases.
- 45) B
- 46) B
- 47) D
- 48) A
- 49) E
- 50) B
- 51) A
- 52) D
- 53) B
- 54) E
- 55) E
- 56) B
- 57) A
- 58) A
- 59) C
- 60) A
- 61) The inorganic definition of oxidation is loss of electrons. The organic definition is formation of additional bonds between carbon and oxygen (or a decrease in the number of carbon-hydrogen bonds). These are similar because when carbon forms a bond with electronegative oxygen, it essentially loses some of its attraction for its electrons.
- 62) C
- 63) A
- 64) E
- 65) C
- 66) D
- 67) D
- 68) A
- 69) D
- 70) D
- 71) D
- 72) C
- 73) D
- 74) B
- 75) E
- 76) D
- 77) A
- 78) E
- 79) A
- 80) A
- 81) C
- 82) A
- 83) D
- 84) B