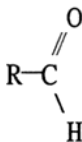


MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) The functional group illustrated by R—O—R' is an _____
A) ether. B) alcohol. C) alkyl. D) aldehyde. E) ester.

- 2) The functional group illustrated below is an _____

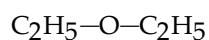


- A) ester. B) alkyl. C) alcohol. D) ether. E) aldehyde.

- 3) Two or more compounds with the same molecular formula but with the atoms connected differently are referred to as _____

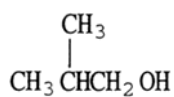
- A) functional groups.
B) normal alkanes.
C) branched alkanes.
D) conformations.
E) constitutional isomers.

- 4) Which molecule is **not** an isomer of the molecule shown? _____

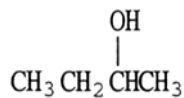


- A) $\text{C}_4\text{H}_9\text{OH}$
B) $\text{CH}_3-\text{O}-\text{CH}_2\text{CH}_2\text{CH}_3$

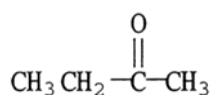
C)



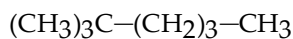
D)



E)



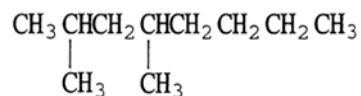
5) How many carbon atoms are there in the longest continuous chain of the molecule shown? 5) _____



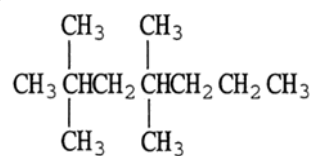
- A) 6
- B) 3
- C) 8
- D) 4
- E) cannot be determined without additional information

6) The condensed structure of 2,4-dimethyl-octane is 6) _____

A)

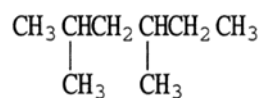


B)

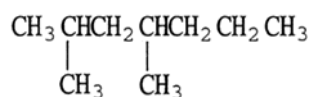


C) $\text{CH}_3\text{CH}_3\text{CH}_2\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$

D)

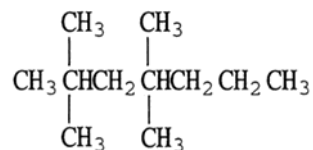


E)

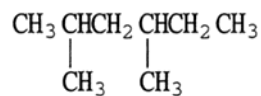


7) The condensed structure of 2,2,4,4-tetramethyl-heptane is 7) _____

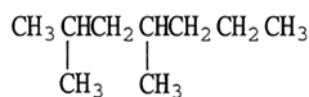
A)



B)

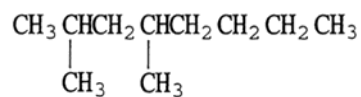


C)



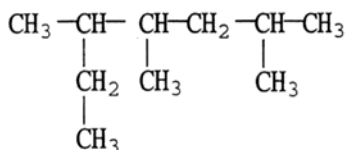
D) $\text{CH}_3\text{CH}_3\text{CH}_2\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$

E)



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

8) _____



- A) 3,5-dimethyl-2-ethylhexane
- B) 5-ethyl-2,4-dimethylhexane
- C) 3,4,6-trimethylheptane
- D) 2,4,5-trimethylheptane
- E) 2-ethyl-3,5-dimethylhexane

9) Which substance is **not** reactive with respect to alkanes?

9) _____

- A) Cl₂
- B) O₂
- C) H₂
- D) Br₂
- E) none of the above

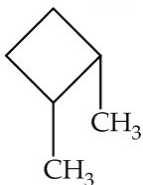
10) When hydrocarbons undergo complete combustion, the product(s) is(are)

10) _____

- A) CO₂.
- B) H₂O.
- C) H₂O and O₂.
- D) CO₂ and O₂.
- E) CO₂ and H₂O.

11) How many hydrogen atoms are present in the molecule shown?

11) _____



- A) 16
- B) 12
- C) 18
- D) 14
- E) 6

12) Ethylene and acetylene are the common names for the molecules _____ and _____, respectively.

12) _____

- A) C₂H₄ and C₂H₂
- B) C₂H₂ and C₂H₆
- C) C₂H₄ and C₃H₆
- D) C₂H₄ and C₂H₆
- E) C₂H₆ and C₃H₈

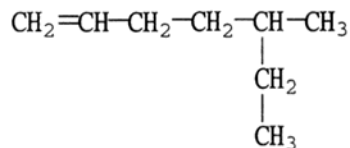
13) How many hydrogen atoms are contained in a molecule of 1,4-hexadiene?

13) _____

- A) 12
- B) 18
- C) 10
- D) 6
- E) 14

14) What is the IUPAC name of the molecule shown?

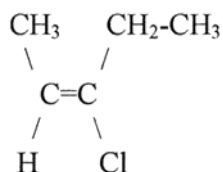
14) _____



- A) 2-ethyl-5-hexene
- B) octene
- C) 3-methyl-6-heptene
- D) 5-methyl-1-heptene
- E) 5-ethyl-1-hexene

15) The name of the molecule shown is

15) _____



- A) cis-3-chloro-2-pentene.
- B) trans-3-chloro-3-pentene.
- C) cis-3-chloro-3-pentene.
- D) monochloro-2-cis-pentene.
- E) trans-3-chloro-2-pentene.

16) Which of the following alkenes can exhibit *cis-trans* isomerism?

16) _____

- A) 2-methyl-2-octene
- B) 3-octene
- C) 1-pentene
- D) 1,1-dibromobutene
- E) none of these

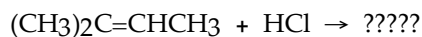
17) When an alkene undergoes a hydration reaction the product is an

17) _____

- A) ether. B) alkyne. C) alkane. D) aromatic. E) alcohol.

18) According to Markovnikov's rule, when HCl reacts with the molecule shown, which product will result?

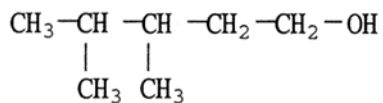
18) _____



- A) $(\text{CH}_3)_2\text{CClCH}_2\text{CH}_3$
- B) $(\text{CH}_3)_2\text{CClCHClCH}_3$
- C) $\text{Cl}_2\text{CHCHClCH}_3$
- D) $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_2\text{Cl}$
- E) $(\text{CH}_3)_2\text{CHCHClCH}_3$

- 19) The common name of $\text{CH}_2(\text{OH})\text{CH}_2\text{OH}$ is 19) _____
- A) grain alcohol.
 - B) ethylene glycol (antifreeze).
 - C) rubbing alcohol.
 - D) wood alcohol.
 - E) glycerol.

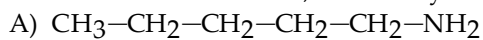
- 20) The IUPAC name of the alcohol shown is 20) _____



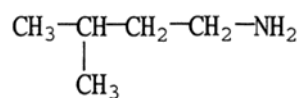
- A) 2,3-dimethyl-5-pentanol.
 - B) primary 2,3-dimethylpentanol.
 - C) 3,4-dimethyl-5-pentanol.
 - D) 3,4-dimethyl-1-pentanol.
 - E) 2,3-dimethyl-1-pentanol.
- 21) Which compound is the **most** soluble in water? 21) _____
- A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
 - B) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
 - C) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
 - D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
 - E) $\text{CH}_3\text{CH}_2\text{CH}_3$
- 22) Oxidation of an alcohol group results in formation of a(an) _____ group. 22) _____
- A) ether B) alkyl C) hydroxyl D) aromatic E) carbonyl
- 23) Which alcohol should be used to produce 2-methyl-3-pentene by dehydration? 23) _____
- A) 2-methyl-1-pentanol
 - B) 1-propanol and 2-propanol
 - C) 4-methyl-2-pentanol
 - D) 2-methyl-3-pentanol
 - E) 4-methyl-1-pentanol
- 24) Which compound is sometimes called carbolic acid? 24) _____
- A) ethanol B) phenol C) ether D) methanol E) glycerol

25) Which molecule shown is N,N-dimethylethylamine?

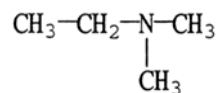
25) _____



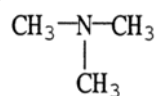
B)



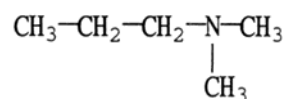
C)



D)

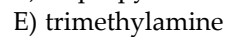
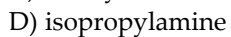
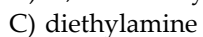
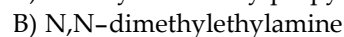


E)



26) Which compound is a secondary amine?

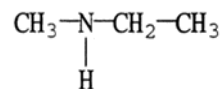
26) _____



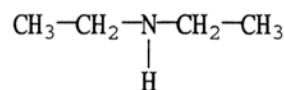
27) Which amine has the **lowest** boiling point?

27) _____

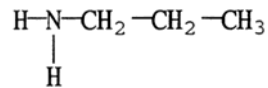
A)



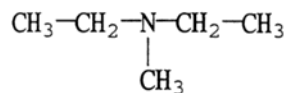
B)



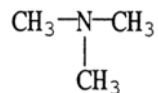
C)



D)



E)



28) The reaction that occurs between an amine and an acid is best illustrated by

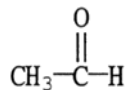
28) _____

- A) $(\text{CH}_3)_2\text{NH} + \text{HCl} \rightarrow (\text{CH}_3)_2\text{NH Cl}^- + \text{H}_3\text{O}^+$.
- B) $(\text{CH}_3)_2\text{NH} + \text{HCl} \rightarrow (\text{CH}_3)_2\text{NH}_2^+ + \text{OH}^-$.
- C) $(\text{CH}_3)_2\text{NH} + \text{HCl} \rightarrow (\text{CHH}_3)_2\text{N}^+\text{Cl}^-$.
- D) $(\text{CH}_3)_2\text{NH} + \text{H}_2\text{O} \rightarrow (\text{CH}_3)_2\text{N} + \text{H}_3\text{O}^+$.
- E) $(\text{CH}_3)_2\text{NH} + \text{HCl} \rightarrow (\text{CH}_3)_2\text{NH}_2^+\text{Cl}^-$.

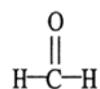
29) Which molecule is formaldehyde?

29) _____

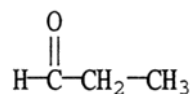
A)



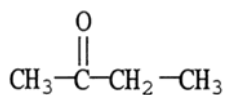
B)



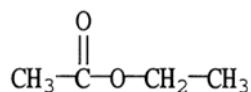
C)



D)



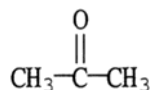
E)



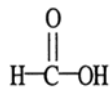
30) Which molecule is acetone?

30) _____

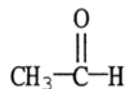
A)



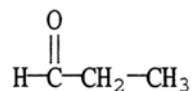
B)



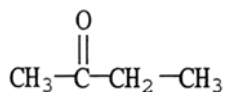
C)



D)

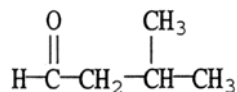


E)



- 31) The correct name for $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{CHO}$ is 31) _____
- A) 3-methyl-1-butanal.
 - B) 2-methylbutanal.
 - C) 3-methylbutanal.
 - D) 3-methyl-1-butanone.
 - E) isopentanal.

- 32) What is the IUPAC name of the compound shown? 32) _____



- A) 2-methylbutanal
- B) isopentanal
- C) 2-methyl-1-butanone
- D) 2-methyl-4-butanone
- E) 3-methylbutanal

- 33) Which compound has the **highest** boiling point? 33) _____

- A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- B) CH_3COCH_3
- C) CH_3CHO
- D) $\text{CH}_3\text{CH}_2\text{OH}$
- E) $\text{CH}_3\text{CH}_2\text{CHO}$

- 34) Tollens' reagent is used to 34) _____

- A) reduce ketones.
- B) oxidize ketones.
- C) distinguish amines from aldehydes.
- D) reduce aldehydes.
- E) distinguish aldehydes from ketones.

- 35) Oxidation of a ketone produces 35) _____

- A) a carboxylic acid.
- B) no reaction.
- C) an aldehyde.
- D) a primary alcohol.
- E) a secondary alcohol.

- 36) What is the product of oxidation of butanal? 36) _____

- A) butane
- B) 2-butanol
- C) 1-butanol
- D) butanoic acid
- E) no reaction

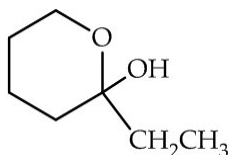
37) What is the product of the reduction of 3-methyl-2-pentanone? 37) _____
 A) 2-methyl-3-pentanol
 B) 3-methyl-2-pentanal
 C) 3-methyl-2-pentene
 D) no reaction
 E) 3-methyl-2-pentanol

38) Which pair of compounds can react to form a hemiacetal? 38) _____
 A) $\text{CH}_3\text{CH}_2\text{CHO}$ and $\text{CH}_3\text{CH}_2\text{OH}$
 B) CH_3COOH and $\text{CH}_3\text{CH}_2\text{OH}$
 C) CH_3COCH_3 and CH_3COOH
 D) CH_3COCH_3 and $\text{CH}_3\text{CH}_2\text{CHO}$
 E) $\text{CH}_3\text{CH}_2\text{CHO}$ and CH_3COOH

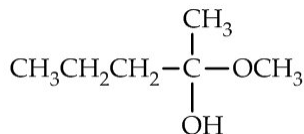
39) Hydrolysis of an acetal will produce 39) _____
 A) one aldehyde or ketone + two waters.
 B) two aldehydes or ketones + one ether.
 C) one aldehyde or ketone + two alcohols.
 D) one aldehyde or ketone + two ethers.
 E) two aldehydes or ketones + one alcohol.

40) Which of the following is an acetal? 40) _____

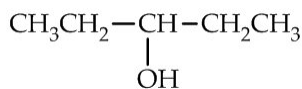
A)



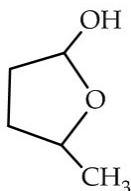
B)



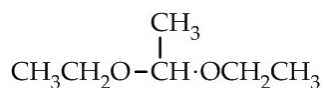
C)



D)



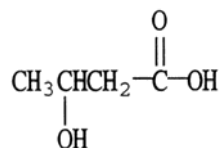
E)



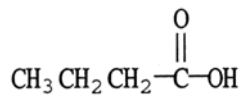
41) Which molecule shown is β -hydroxy butyric acid?

41) _____

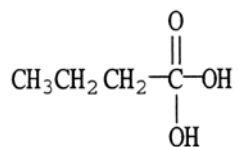
A)



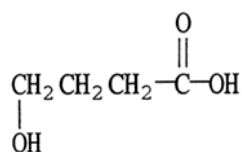
B)



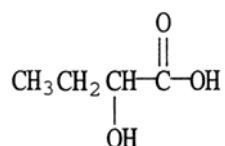
C)



D)

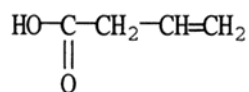


E)



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

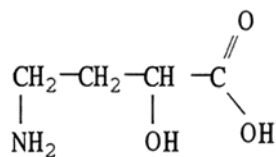
42) _____



- A) 3-butenic acid
- B) 1-butenic acid
- C) 4-butenic acid
- D) 1-butenic acid
- E) none of the above

43) What is the **common** name of the molecule shown?

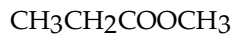
43) _____



- A) 1-amino-3-hydroxybutanoic acid
- B) 4-amino-2-hydroxybutanoic acid
- C) γ -amino- α -hydroxybutyric acid
- D) α -amino- γ -hydroxybutyric acid
- E) none of these

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

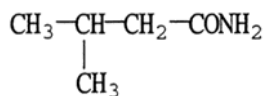
44) _____



- A) methyl ethanoate
- B) methyl propanoate
- C) 3-butanoic acid
- D) 2-butanoic acid
- E) propyl methanoate

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

45) _____



- A) N-methyl propanamide
- B) 3-methyl butanamide
- C) N-methyl butanamide
- D) 2-methyl propanamide
- E) 2-methyl butanamide

46) The solubility of compounds containing the carboxylic acid group can be increased by reaction with

46) _____

- A) sulfuric acid.
- B) nitric acid.
- C) water.
- D) benzoic acid.
- E) sodium hydroxide.

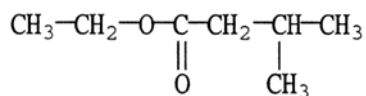
47) Which of these compounds is the most soluble in water?

47) _____

- A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
- B) $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_2\text{CH}_3$
- C) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{COO}^-\text{Na}^+$
- D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
- E) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$

48) Which carboxylic acid is used to prepare the ester shown?

48) _____



- A) CH_3COOH
- B) $\text{CH}_3\text{CH}_2\text{COOH}$
- C) $(\text{CH}_3)_2\text{CHCOOH}$
- D) $(\text{CH}_3)_2\text{CHCH}_2\text{COOH}$
- E) $\text{CH}_3(\text{CH}_2)_3\text{COOH}$

- 49) Hydrolysis of the ester ethyl acetate produces _____ 49) _____
- A) ethanol and acetic acid.
 - B) butanal and ethanol.
 - C) butanol.
 - D) butanoic acid.
 - E) ethanal and acetic acid.
- 50) When an **amide** is hydrolyzed under *acidic* conditions, the products are 50) _____
- A) an amine and a carboxylate ion.
 - B) an amine and a carboxylic acid.
 - C) an ammonium ion and a carboxylic acid.
 - D) an ammonium ion and a carboxylate ion.
 - E) There is no reaction.

Answer Key

Testname: 104_F09_E3

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