

# Chem 1120

Final

**210 points**

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**Instructions:**

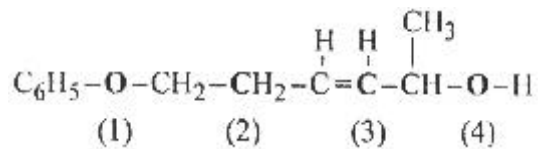
**This is a closed book, closed notebook test. You may not discuss this exam with anyone, either during or after the exam, until it has been graded and returned to you in class. You may not use any outside materials - including Periodic Tables - on this exam, except two 3" x 5" index cards and an English-foreign language dictionary if necessary. You may use a calculator to help you compute the correct answer but may not retrieve or view any reference materials that may be stored in your calculator.**

**Each question is worth 6 points. All questions are of equal value. Select the best single answer of those available.**

1. Which of the following statements is false?
- A. Hydrocarbons are compounds containing only carbon and hydrogen.
  - B. Constitutional isomers have the same molecular formula but a different arrangement of the atoms.
  - C. Saturated hydrocarbons contain only single bonds.
  - D. Some alkanes exhibit cis-trans isomerism.
  - E. All of the above statements are true.
2. How many secondary carbons can be found in 2,2,4,6-tetramethylheptane?
- A. 0
  - B. 1
  - C. 2
  - D. 3
  - E. 4
3. Given 4-methylhexane, which statement explains what is wrong with the name of the compound?
- A. The name cannot be 4-methylhexane because hexane can never have a substituent on the fourth carbon.
  - B. The name cannot be 4-methylhexane because it was not correctly numbered.
  - C. The compound should be called heptane to account for the seven carbons.
  - D. The compound should be called 2-propylbutane to account for the seven carbons.
  - E. The compound should be called 2-ethylpentane to account for the seven carbons.
4.  $\text{CH}_3\text{C}(\text{CH}_3)=\text{CHCH}_2\text{CH}_3$  and  $\text{CH}_3\text{CH}_2\text{C}(\text{CH}_3)=\text{CHCH}_3$  are:
- A. Geometric (cis-trans) isomers
  - B. Constitutional isomers
  - C. The same compound
  - D. Different compounds and are not isomers
  - E. Stereoisomers
5. Given the structure  $(\text{CH}_3)_2\text{C}=\text{C}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}=\text{CHCH}_2\text{C}(\text{CH}_2\text{CH}_3)=\text{CH}(\text{CH}_3)_3$  how many  $\text{sp}^2$  hybridized carbons are in the compound?
- A. 2
  - B. 4
  - C. 6
  - D. 8
  - E. None of the above

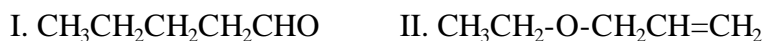
6. The product of the reaction of 1-butyne with excess chlorine is
- A. 1,2-dichlorobutene
  - B. 1,2-dichlorobutane
  - C. 1,1,2,2-tetrachlorobutene
  - D. 1,1,2,2-tetrachlorobutane
  - E. None of the above
7. Which of the following compounds is (are) capable of hydrogen bonding to others of the same molecule?
- I. 1-hexanol      II. 1,4-pentanediol      III. Octane      IV. Isopropyl methyl ether
- A. All of them
  - B. Only III
  - C. II and IV
  - D. I and II
  - E. None of the above
8. What is the major product of the dehydration of 2-methyl-2-butanol?
- A. 2-methyl-1-butene
  - B. 2-methyl-2-butene
  - C. Equal amounts of both
  - D. Impossible to predict the major product
  - E. This compound will not undergo dehydration
9. A product of the reaction of 2-pentanol and potassium permanganate is
- A. An aldehyde, depending on the conditions
  - B. An acid, depending on the conditions
  - C. A ketone
  - D. A and B
  - E. None of the above

10. What is the hybridization of the atoms in boldface type in the following compound?



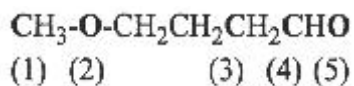
	<b>O-1</b>	<b>C-2</b>	<b>C-3</b>	<b>O-4</b>
<b>A.</b>	sp <sup>3</sup>	sp <sup>3</sup>	sp <sup>2</sup>	sp <sup>3</sup>
<b>B.</b>	sp <sup>2</sup>	sp <sup>3</sup>	sp	sp <sup>3</sup>
<b>C.</b>	sp <sup>2</sup>	sp <sup>3</sup>	sp <sup>2</sup>	sp <sup>3</sup>
<b>D.</b>	sp	sp <sup>3</sup>	sp	sp <sup>3</sup>
<b>E.</b>	None of the above			

11. Consider the following structures. Which statement(s) is (are) true?



- A.** I and II are the same compound.  
**B.** I and II are different compounds that are constitutional isomers.  
**C.** I and II are different compounds that are geometric isomers.  
**D.** I and II are different compounds that are not isomers.  
**E.** None of the above

12. What is the hybridization of the bold-faced atoms in the following structure?



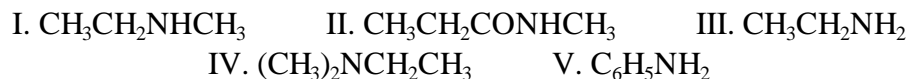
	<b>C-1</b>	<b>O-2</b>	<b>C-3</b>	<b>C-4</b>	<b>O-5</b>
<b>A.</b>	sp <sup>3</sup>	sp <sup>2</sup>	sp <sup>3</sup>	sp <sup>2</sup>	sp <sup>2</sup>
<b>B.</b>	sp <sup>2</sup>	sp <sup>3</sup>	sp <sup>2</sup>	sp <sup>3</sup>	sp <sup>3</sup>
<b>C.</b>	sp <sup>3</sup>	sp <sup>3</sup>	sp <sup>3</sup>	sp <sup>2</sup>	sp <sup>2</sup>
<b>D.</b>	sp	sp <sup>3</sup>	sp <sup>2</sup>	sp <sup>3</sup>	sp <sup>3</sup>
<b>E.</b>	None of the above				

13. Which of the following is an acetal?
- A.  $C_6H_5CH(OCH_3)_2$
  - B.  $(CH_3)_2COHCH_3$
  - C.  $CH_3CH_2CHOHCH_3$
  - D.  $(C_5H_{11})_2C(OCH_3)_2$
  - E. A and D
14. The products of the hydrolysis of a hemiacetal are:
- A. An alcohol
  - B. An aldehyde or a ketone
  - C. An alkene
  - D. A and B
  - E. A and C
15. The correct IUPAC name for  $(CH_3)_2CHCOOH$  is:
- A. 2-methylethanoic acid
  - B. Butanoic acid
  - C. 2-methylpropanoic acid
  - D. 2-methylbutanoic acid
  - E. None of the above
16. Arrange the following compounds in order of increasing melting point.
- I. Sodium propanoate      II. Propanoic acid      III. 2-methyl-1-butanol
- A.  $I < II < III$
  - B.  $II < III < I$
  - C.  $I < II < III$
  - D.  $III < II < I$
  - E. None of the above
17. What carboxylic acid and alcohol are needed to synthesize  $(CH_3)_3CCH_2CH_2COOCH_2CH_2CH_2CH_3$ ?
- A. 4,4-dimethylbutanoic acid and 1-butanol
  - B. 3,3,3-trimethylpropanoic acid and 2-propanol
  - C. 4,4-dimethylpentanoic acid and 1-butanol
  - D. Butanoic acid and 4,4-dimethylpentanol
  - E. None of the above

18. What are the products of the acid hydrolysis of butyl pentanoate?

- A. 1-methyl-1-propanol and pentanoic acid
- B. 1-butanol and pentanoic acid
- C. Butanoic acid and 1-pentanol
- D. 2-methylpropanoic acid and 2-methylbutanol
- E. None of the above

19. Consider the following structures:



Which of these compounds is a primary aliphatic amine?

- A. I
- B. II
- C. III
- D. IV
- E. V

20. The formula  $\text{CH}_3\text{NHCH}_2\text{CH}_3$  represents:

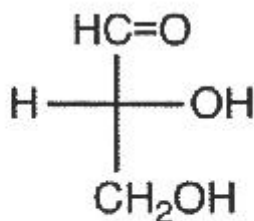
- A. A primary amine
- B. A secondary amine
- C. A tertiary amine
- D. A primary amide
- E. None of the above

21. What kind of compound is formed when an amine reacts with hydrochloric acid?

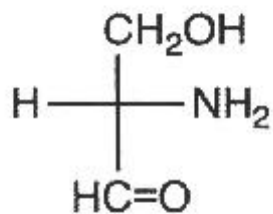
- A. Alkylammonium chloride
- B. Ammonium chloride
- C. Alkyl chlorides
- D. Quaternary amines
- E. None of the above

22. Which of the following statements is true?
- A. Constitutional isomers have the same connectivity but differ in their configurations.
  - B. Enantiomers are stereoisomers that are superimposable mirror images of each other.
  - C. Diastereomers are stereoisomers that are not enantiomers, that is, they are not mirror images of each other.
  - D. Stereoisomers are different compounds with the same molecular formula but different connectivity.
  - E. None of the above are true statements.
23. Which of the following stereoisomers are D-enantiomers?

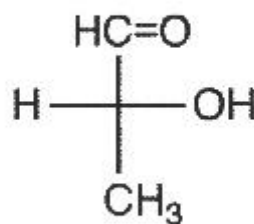
A)



B)



C)



- D) A and B
- E) A and C

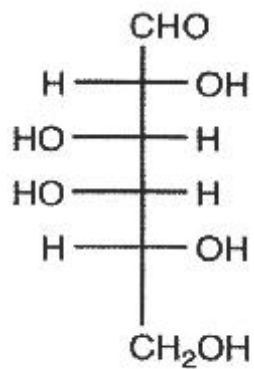
24. In the molecule  $\text{CH}_3\text{CH}(\text{C}_2\text{H}_5)\text{CH}_2\text{CHClCH}_3$  how many tetrahedral stereocenters (chiral carbons) are present?

- A. 0
- B. 1
- C. 2
- D. 3
- E. None of the above

25. All totaled, how many stereoisomers are possible for 2,3-hexanediol?

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5

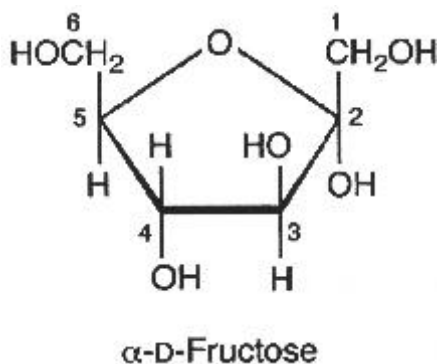
26. The following structure is an example of



D-Galactose

- A. An aldotetrose
- B. A ketotetrose
- C. An aldohexose
- D. A ketohexose

27. The following structure is



- A. alpha-D-fructopyranose
  - B. beta-D-fructopyranose
  - C. alpha-D-fructofuranose
  - D. beta-D-fructofuranose
28. Which of the following statements is not true about the structure of glycogen?
- A. It is a polymer made of alternating glucose and galactose units
  - B. It contains alpha(1->4) glycosidic linkages
  - C. It contains alpha(1->6) glycosidic linkages
  - D. The monosaccharide residues are all glucose
29. The glycosidic linkage between glucose molecules in cellulose is
- A. beta(1->4)
  - B. alpha(1->4)
  - C. beta(1->6)
  - D. alpha(1->6)
30. Lipids cannot be described as:
- A. Polar molecules
  - B. Nonpolar molecules
  - C. Hydrolyzable
  - D. Amphipathic
31. The process by which triacylglycerols produce glycerol and fatty acids is called
- A. Oxidation
  - B. Catalytic hydrogenation
  - C. Hydrolysis
  - D. The Hell-Volhard-Zellinsky reaction
  - E. None of the above

32. Hydrolysis of a mixture of sphingolipids may yield all of the following substances except
- A. Choline
  - B. Sphingosine
  - C. Phosphate
  - D. Glycerol
  - E. All of the above
33. The process by which polypeptides are converted into alpha-amino acids is
- A. Oxidation
  - B. Reduction
  - C. Hydrolysis
  - D. Acidification
  - E. None of the above
34. Which alpha-amino acid is responsible for the formation of disulfide bridges?
- A. Proline
  - B. Cysteine
  - C. Methionine
  - D. Asparagine
35. An example of an amino acid with an acidic side group is
- A. Histidine
  - B. Glutamic acid
  - C. Serine
  - D. Glycine