**Chemistry 104**

## Test #4A

**December 6, 2009**

***Please follow these instructions***

1. **There is only 1 correct answer for Multiple-choice questions (choose the best answer)**
2. **Please remember that only the answer sheets will be graded so record all your answers on the answer-sheet**

**3. Use the Periodic Table attached**

# December 6, 2009 Test 4A Chemistry 104

**Student’s Name:**

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| **Answer** | **Answer** | **Answer** |
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# Test # 4 Chemistry 104 Fall 2009

**Dr Pierre Goueth Student’s Name:**

**Multiple Choice Questions (2.5 pts each)**

1. The structure of amphetamine is shown.



Amphetamine is a \_\_\_\_\_ amine.

A. 1o B. 2o C. 3o D. 4o

2. How can you tell if a compound has been oxidized during a chemical reaction?

A. Hydrogen is lost from and/or oxygen is gained by the compound.

B. An oxygen is lost from the compound.

C. The compound is split into two or more fragments.

D. The compound has been joined with another compound.

3. What is the product if butanoic acid reacts with ammonia?

A. a secondary amine C. a butane compound with a nitrogen attached to each carbon

B. An amide D. a cyclic compound with one nitrogen and four carbons in the ring

4. Which compound is not an amine?

|  |  |  |  |
| --- | --- | --- | --- |
| A. |  | C. |  |
| B. |  | D. |  |

5. Is this molecule chiral, and, if so, which of its carbon atoms is chiral?



A. Yes, carbon 1 is chiral. B. Yes, is carbon 2 is chiral.

C. Yes, is carbon 3 is chiral. D. No, carbons 1 and 2 have the same structure.

6. A pair of isomers are determined to be *enantiomers*. That means they \_\_\_\_\_.

A. cannot be superimposed. C. have two or more atoms that have different groups attached.

B. can be superimposed. D. have different atomic connections.

7. Which is a tertiary (3º) alcohol.

A. 1-propanol B. 2-propanol C. 2-methyl-2-propanol D. 3-pentanol

8. What is the major organic product of the following reaction?



A. CH3CH=CH2 B. CH3CH2CH2Cr C. CH3CH2CH3 D. CH3CH2COOH

9. What is the major organic product of the following reaction?



A. CH3CH=CH2 B. CH3CH2CH2OH C. CH3CH2CH3 D. CH3CH2COOH

10. The compound that is expected to have the highest boiling point is \_\_\_\_\_.

A. the alcohol produced from methane. B. the thiol produced from methane.

C. methane. D. They all boil at the same temperature

11. An important reaction in chemistry is oxidation. Which is an oxidation reaction?

A. An alcohol is converted into a ketone. C. A double bond between an oxygen and a carbon is broken.

B. An oxygen is removed from an alcohol. D. A carbonyl group is modified to produce an alcohol.

12. What would be the product if we attempt to oxidize a 3º alcohol?

A. Tertiary alcohols cannot be oxidized. B. The product is a ketone.

C. The product is a carboxylic acid. D. The product is a thiol.

13. What is the classification of this monosaccharide?



A. aldopentose

B. aldohexose

C. ketopentose

D. ketohexose

14. Which of the following is an **L** monosaccharide?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A. |  | B. |  | C. |  | D. |  |

15. Shown at the right is D-arabinose:



Which of the following is L-arabinose?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A. |  | B. |  | C. |  | D. |  |

16. Which of the following is a deoxy sugar?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A. |  | B. |  | C. |  | D. |  |

17. Which are anomers?

A. aldotetrose and ketotetrose B. D-glucose and L-glucose

C. glucopyranose and glucofuranose D. α-D-galacose and β-D-galactose

18. Monosaccharides are \_\_\_\_\_.

A. compounds composed of water molecules bound to carbon atoms

B. polyhydroxy aldehydes and ketones

C. compounds that are built on the basis of the ketone carbon

D. molecules built from carbon, hydrogen, oxygen, and nitrogen

19. Maltose is hydrolyzed by the enzyme maltase into two molecules of glucose. Maltose is classified as \_\_\_\_\_.

A. a monosaccharide B. a disaccharide C. an oligosaccharide D. a polysaccharide

20. What is the product of the following reaction?



+ Benedict's Solution --------->

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A. |  | B. |  | C. |  | D. |  |

21. What can be said about the relationship of these two carbohydrates?

 

A. These two structures are not related. B. Both have four chiral carbons.

C. They are superimposable D. They are enantiomers.

22. Carbohydrates can have multiple chiral carbon atoms allowing for multiple isomers. How many stereoisomers would a carbohydrate with 5 chiral carbons have?

A. 5 stereoisomers B. 20 stereoisomers C. 32 stereoisomers D. 60 stereoisomers

23. Benedict’s reagent is used for detecting reducing sugars.

A. A reduction of the sugar occurs producing an acid.

B. The aldehyde group in the sugar is oxidized.

C. The copper ion in the reagent is oxidized as the sugar is reduced.

D. The —OH groups are exchanged for hydrogens.

24. Fructose is different from glucose and galactose because

A. fructose is a pentose; the other sugars are hexoses.

B. fructose is a ketose; the other sugars are aldoses.

C. the cyclic form is a square; the other sugars display hexagons.

D. fructose doesn’t have an open form; the other sugars do have an open form.

25. Acidic solutions \_\_\_\_\_.

A. have a H+ concentration greater than the OH- concentration and a pH greater than 7.0

B. have a H+ concentration greater than the OH- concentration and a pH less than 7.0

C. have a H+ concentration less than the OH- concentration and a pH greater than 7.0

D. have a H+ concentration less than the OH- concentration and a pH less than 7.0

26. Which of the conditions below would drive this reaction to the right?

|  |  |
| --- | --- |
|  | |
| **pyruvic acid** | **lactic acid** |

A. Remove hydronium ion (H3O+) B. Add lactic acid

C. Add water D. Add pyruvic acid

27. One liter of a solution is found to contain 0.022 moles of HCl. Calculate the pH of the solution.

A. pH = 0.022 B. pH = 1.00 C. pH = 2.2 D. pH = 1.66

28. Calculate the pH of a solution containing 0.15 moles KOH dissolved in enough water to produce 1 liter of solution.

A. pH = 0.82 B. pH = 0.15 C. pH = 1.12 D. pH = 13.18

29. If a weak acid is dissolved in water

A. the value of *K*a will be small. B. the pH = 1/p*K*a.

C. the pH = *K*w. D. the pH is extremely large.

30. A buffer system can be produced using lactic acid (HLac) and sodium lactate (NaLac).

HLac  H+ + Lac–

Suppose we then add a small amount of an acid to the container.

A. The reaction will shift to the left. B. The reaction will shift to the right.

C. There will be no shift of the reaction. D. There is no prediction possible.

31. Which of the following cannot participate in hydrogen bonding?

A. phenols B. primary amines C. secondary amines D. tertiary amines

32. Given the following amines:

  

A B C

These three amines all have the same formula weight. Rank them in order of increasing boiling point. (lowest to highest)

A. A< B< C B. B< A< C C. C< B< A D. C< A< B

33. Which lowers the pH when added to water?

A. ethyl alcohol B. propanoic acid C. methyl amine D. methyl alcohol

34. Given: benzene, phenol, and sodium phenoxide. Rank these in order of increasing water solubility. (least to greatest)

A. benzene < phenol < sodium phenoxide B. phenol < benzene < sodium phenoxide

C. benzene < sodium phenoxide < phenol D. sodium phenoxide < phenol < benzene

**Short Answers**

1. (2 pts) Sketch and name a tertiary alcohol with 4-carbon atoms (show all atoms present).
2. (6pts) Draw the structure of the major organic product of each of the following reactions and name each one of them:

|  |  |  |
| --- | --- | --- |
| Reactants | Products | Name of product |
|  |  |  |
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1. (2 pts) Draw the structure of 2-butanamine. Identify the chiral atom.

1. (2pts) In the following equation, identify the acid, base, conjugate acid, and conjugate base.



acid\_\_\_\_\_\_\_\_\_\_\_\_\_ conjugate acid \_\_\_\_\_\_\_\_\_\_\_\_\_

base \_\_\_\_\_\_\_\_\_\_\_\_\_ conjugate base \_\_\_\_\_\_\_\_\_\_\_\_\_

5. (3pts) Shown below is a Fisher projection of galactose.  
 

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| 1. Is the galactose structure shown above D or an L sugar? |  |
| 1. Draw the structure of the product formed when carbon-1 of galactose is oxidized by Benedict's solution. |  |

