Chemistry 102 Name KEY

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Exam 2a Fall 2015

Multiple Choice (27 points)

Page 3 (24 points)

Page 4 (22 points)

Page 5 (18 points)

Page 6 (16 points)

Total (107 points)

Percent Grade \_\_\_\_\_\_\_\_\_\_\_\_

(24 points) Multiple Choice

1. The definition of enantiomers is:
   * + 1. A pair of objects that are mirror images of each other
       2. A pair of objects that are superimposable mirror images
       3. A pair of objects that are non-superimposable mirror images
       4. A pair of objects that are not mirror images
2. Which monosaccharides have the D configuration?

|  |  |  |  |
| --- | --- | --- | --- |
| 1. I, IV, V | 1. II, III, VI | 1. IV, V | 1. IV, VI |

1. What is the relationship between the following compounds?

|  |  |  |  |
| --- | --- | --- | --- |
| 1. enantiomers | 1. anomers | 1. structural isomers | 1. diastereomers |

1. The carbohydrate below may be classified as



|  |  |  |  |
| --- | --- | --- | --- |
| an aldopentose | 1. an aldohexose | 1. a ketopentose | 1. a ketohexose |

1. Which of the following polymers contains α-1,4 linkages between glucose units AND is **not** branched?

a) amylopectin b) amylose c) cellulose d) glycogen

1. What is the product when an alcohol gets oxidized two steps?

|  |  |  |
| --- | --- | --- |
| a. Aldehyde | b. Carboxylic acid | c. Ketone |
| d. Carboxylic ester | e. Acetal |  |

1. What is the product when a ketone gets reduced one step?

|  |  |  |
| --- | --- | --- |
| a. Aldehyde | b. Carboxylic ester | c. Secondary alcohol |
| d. Primary alcohol | e. Acetal |  |

1. Which alcohol is used in alcoholic beverages?

|  |  |  |
| --- | --- | --- |
| 1. Methanol | 1. Ethanol | 1. 2-Propanol |
| 1. 1,2-Ethanediol (“Ethylene glycol”) | 1. None of the above |  |

1. In any chemical reaction, the rate of the reaction can be increased by

|  |  |
| --- | --- |
| 1. Decreasing the temperature. | 1. Changing the size of the container. |
| 1. Adding water to the reaction. | 1. Adding product molecules to the reaction mixture. |
| 1. Increasing the concentrations of the reactants. |  |

Problems

1. (8 points) Determine the molecular formula and how many primary, secondary, tertiary and quaternary carbons are present by writing the correct number next to the designation below.



Molecular Formula\_\_\_\_\_\_\_C14H26\_\_\_\_\_\_\_\_\_\_

How many: 1o \_4­­\_\_ 2o \_4\_\_ 3o \_6\_\_ 4o \_0\_\_\_ carbons

1. (6 points) State whether the structures in each pair below are the same molecule, constitutional isomers, or not related.



\_\_\_ Constitutional isomers \_\_\_

\_\_ Same molecule \_\_\_\_

1. (6 points) Zetia, whose structure is shown below (structural formula), is the active substance in Vytorin. It is used to reduce absorption of cholesterol from dietary intake. For this compound mark with \* all the chiral carbons if no chiral carbons write achiral



1. (6 points) A certain reaction is endothermic and has an activation energy that is twice the value of the enthalpy change of the reaction. Draw a diagram, approximately to scale and with appropriately labeled axes that depicts the energy of the reaction as it progresses. Label the positions of the reactants (R), products (P). Clearly indicate the activation energy (Eact) and the enthalpy change of the reaction (ΔH). Also show the effect of a catalyst on the diagram and label activation energy of the catalyst (Ecat).



1. (8 points) Capsaicin is the active constituent of cayenne peppers responsible for the heat. Its structure is shown below. There are a variety of functional groups in this molecule, identify the circled functional groups.

A\_\_\_\_\_\_phenol\_\_\_\_\_\_\_\_



B\_\_\_\_\_amide\_\_\_\_\_\_\_\_\_\_\_\_\_

C\_\_\_\_\_alkene\_\_\_\_\_\_\_

D\_\_\_\_\_\_\_\_\_ether\_\_\_\_\_\_\_\_\_\_\_\_

1. (4 points) Draw following structure trans-2-bromo-5-methyl-3-heptene



1. (8 points) Name each of the following using correct systematic names.

 

\_\_\_4-tert-butyl-3,5-dimethyloctane \_\_\_\_\_\_ \_\_\_\_\_\_\_\_cis-3-ethylcyclopentanol \_\_\_\_\_\_\_\_\_\_\_

1. (12 points) Complete the following equations, showing the structures for the products formed. Write NR if no reaction occurs.



1. (6 points) Provide the Haworth projection of the β form of the monosaccharide gulose, whose Fisher projection is shown to the right.

 

1. (10 points) The structure of a trisaccharide is shown below



* 1. Circle and identify all acetal or hemiacetals in the trisaccharide
  2. Point an arrow to each glycosidic bond and identify its type (i.e. “1,2” etc.)
  3. Is this a reducing sugar? Explain your answer. No

The rings are locked due to the acetal linkages they cannot go to the open chain to be oxidized thus this trisaccharide is a non-reducing sugar

1. (6 points) Identify the type of reaction for each equation below. Also balance each equation. Your options for types of reactions are: combination (C), decomposition (D), combustion (B), single replacement (SR), double replacement (DR), or acid base neutralization (N).

a. Type: \_\_SR\_\_\_\_ \_3\_\_ Ba (s) + \_2\_\_ H3PO4 (aq) 🡪 \_3\_\_ H2 (g) + \_\_\_\_ Ba3(PO4)2 (s)

b. Type: \_\_C\_\_\_\_\_\_\_ \_2\_\_ K (s) + \_\_\_\_ F2 (g) 🡪 \_2\_\_\_ KF (s)

c. Type: \_\_DR\_\_\_\_\_\_\_ \_\_\_\_ Na2SO4 (aq) + \_\_\_\_ BaCl2 (aq) 🡪 \_\_\_\_ BaSO4 (s) + \_2\_\_ NaCl (aq)

