Organic II
Assignment # 5
Spring 2021

Name:_____

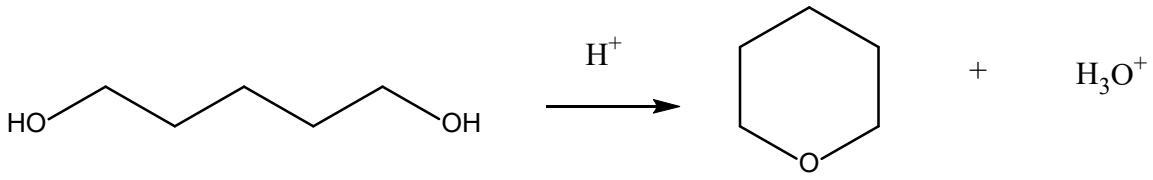
1) a) Which of the isomeric $C_4H_{10}O$ alcohols can be prepared by hydrogenation of aldehydes? Show the aldehyde and corresponding alcohol.

b) Which can be prepared by hydrogenation of ketones? Show the ketone and the corresponding alcohol.

c) Which alcohol cannot be prepared by hydrogenation of a carbonyl compound?

2) Give the synthesis of 3-methylpentane-1,5-diol from a dicarboxylic acid.

3) Give the mechanism for the following reaction.



4) Draw the structure of NAD^+ below.

5) Outline a brief synthesis of each of the following compounds from the indicated starting materials.

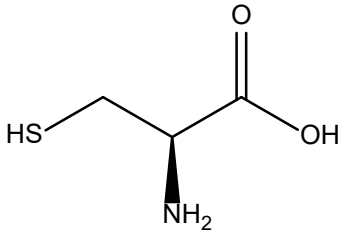
a) 2-Propen-1-thiol from propene

b) 1-hexanol from 1-bromobutane

c) 2-hexanol from 1-bromobutane

d) 2-Methyl-1,2-propanediol from tert-butyl alcohol

6) The amino acid cysteine has the structure below.



a) A second sulfur containing amino acid called cystine ($C_6H_{12}N_2O_4S_2$) is formed when cysteine undergoes biological oxidation. Suggest a reasonable structure for cystine.

b) Another metabolic pathway converts cysteine to cysteine sulfinic acid ($C_3H_7NO_4S$), then to cysteic acid ($C_3H_7NO_5S$). What are the structures of these two compounds?

7) Identify each of the following $C_4H_{10}O$ isomers on the basis of their ^{13}C NMR spectra.

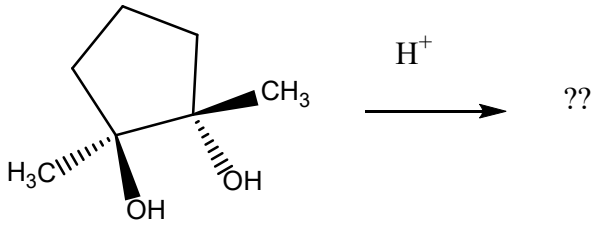
a) δ 31.2; CH_3
δ 68.9; C

b) δ 10.0; CH_3
δ 22.7; CH_3
δ 32: CH_2
δ 69.2; CH

c) δ 18.9: CH_3, area 2
δ 30.8; CH, area 1
δ 69.4: CH_2, area 1

8) A compound $C_3H_7ClO_2$ exhibited three peaks in its ^{13}C NMR spectrum at δ 46.8 (CH_2), δ 63.5 (CH_2), and δ 72.0 (CH). What is the structure of this compound?

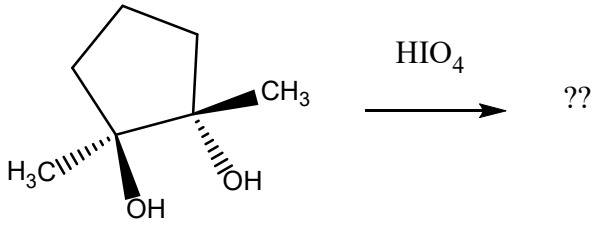
9) a) Draw the pinacol rearrangement product for the following reaction.



(1*S*,2*S*)-1,2-dimethylcyclopentane-1,2-diol

b) Which word or phrase best describes the stereochemistry of the product formed in the reaction above? Explain your answer.
I) Achiral
II) A single enantiomer of a chiral molecule
III) Chiral but racemic.

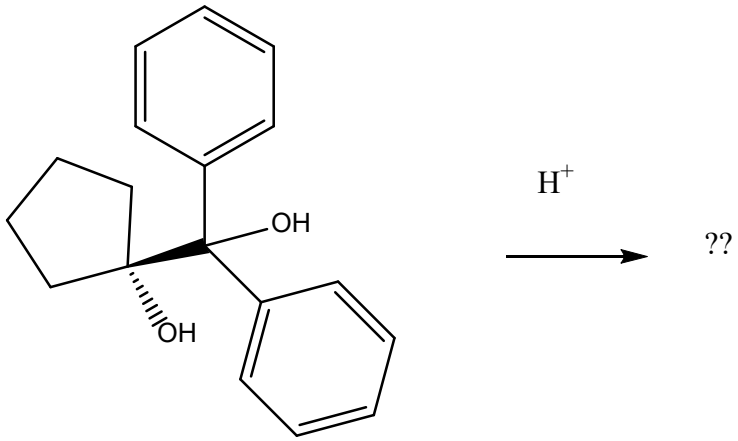
c) What is the product of the following reaction?



(1*S*,2*S*)-1,2-dimethylcyclopentane-1,2-diol

10) The pinacol reaction below begins with formation of the more stable of the two possible carbocations from the vicinal diol. A 99% yield of a single ketone was isolated.

a) What is this ketone?



1-(hydroxydiphenylmethyl)cyclopentan-1-ol

b) Explain your answer below.