Fall 2017: Organic 1 Exam 3 **Ch 9-11** **50 points**

Name _____

If you do not want your graded exam placed in the box outside my office, then please mark a cross here_____

1-10 Are True/False (10pts)

1) Terminal alkynes have the triple bond at the end of the carbon chain.

2) There are two different internal alkyne isomers of "pentyne".

3) The triple bonded Carbon atoms in an alkyne are sp hybridized.

4) Cyclobutanol is a cyclic, secondary alcohol.

5) The oxidation state (oxidation number) of Chromium in $Na_2Cr_2O_7$ is +6.

6) The Carbon-Carbon triple bond length is shorter than a Carbon-Carbon single bond.

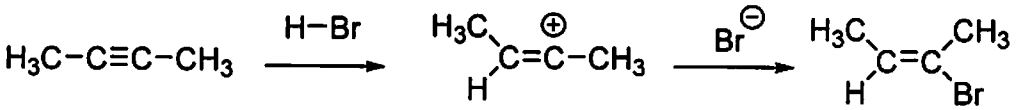
7) Molecules with a Carbon-Metal covalent bond are called organowoodic reagents.

8) Tertiary alcohols can be oxidized to aldehydes and carboxylic acids.

9) A triple bond consists of two π bonds and one σ bond.

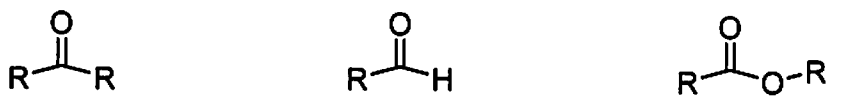
10) But-1-yne is more acidic than But-2-yne.

11) (3+1=4pts) a) Draw in the curly arrows to show the mechanism of the following electrophilic addition reaction.



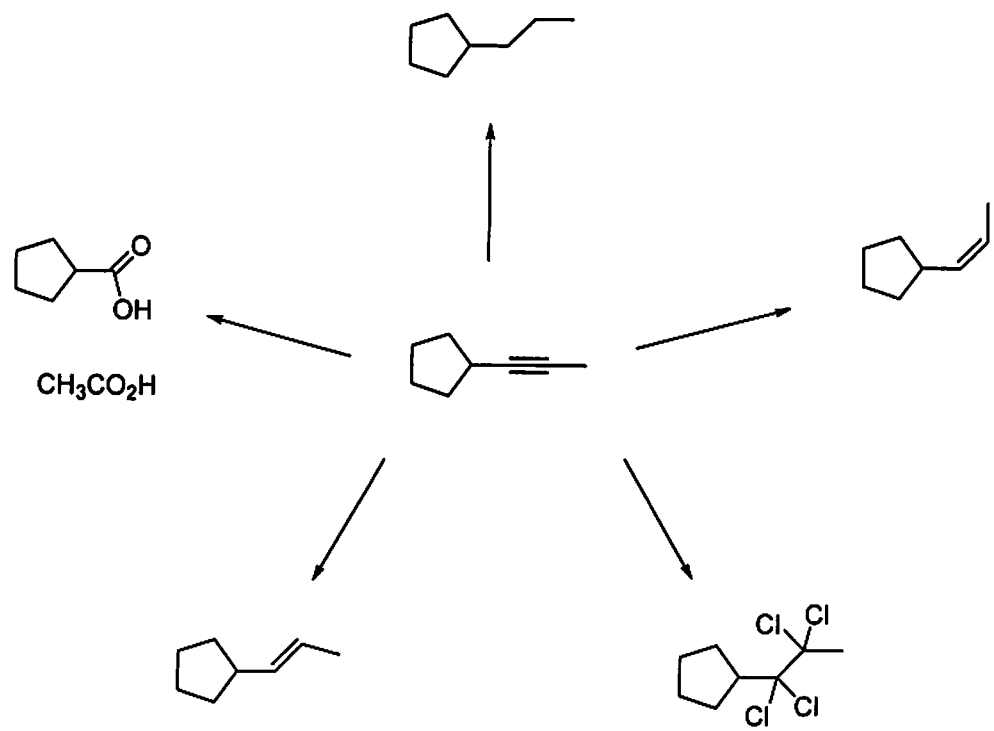
b) In terms of regiochemistry (e.g. Markovnikov), how would you describe this reaction?

12) (3pts) Provide the functional groups (e.g. alkene) for the following three structures.

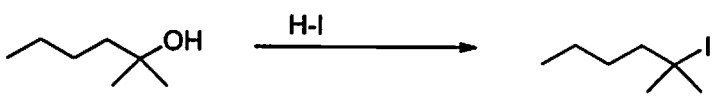


13) (2pts) Briefly explain the electronic difference between a hydride (H^-) and a proton (H^+).

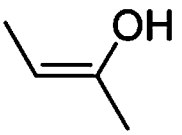
14) Provide reagents to achieve the following transformations. (10 pts)



15) Write the mechanism for the nucleophilic substitution of this tertiary alcohol. (4pts)



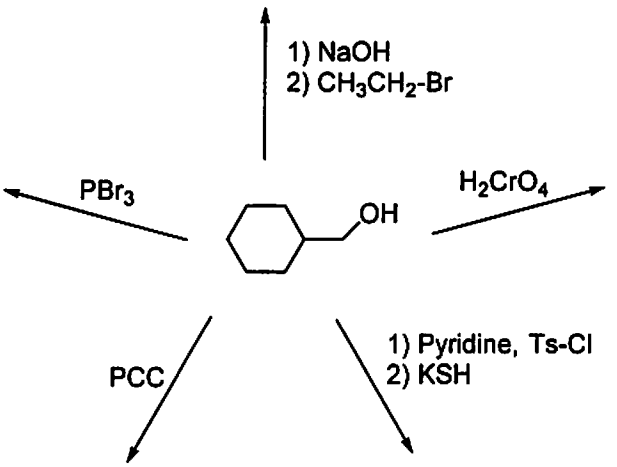
16) (2+2=4pts) Below is an example of an ENOL.



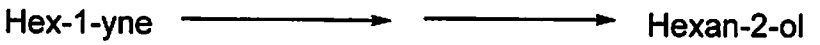
a) Why is an enol called an enol?

b) Draw the corresponding *keto* tautomeric form of the above *enol.*

17) Provide the products in the following reactions. (10pts)

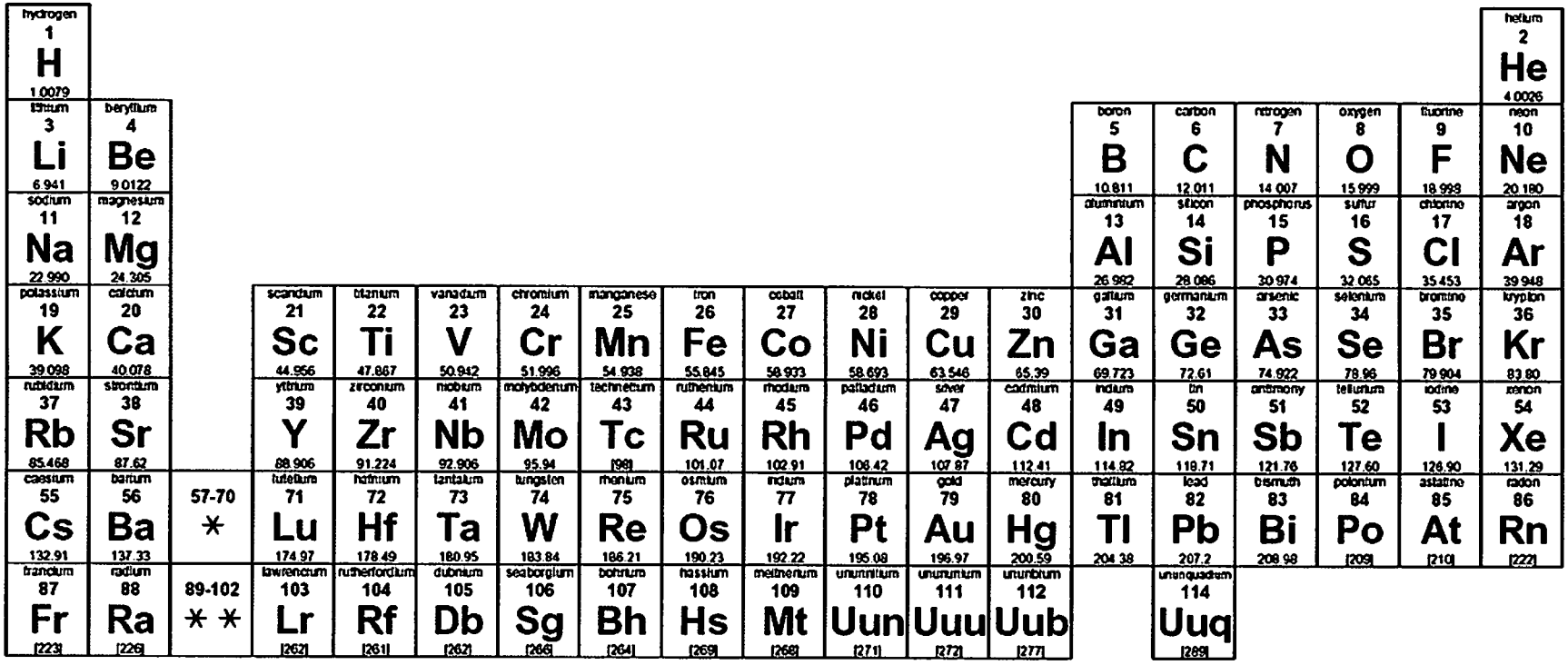


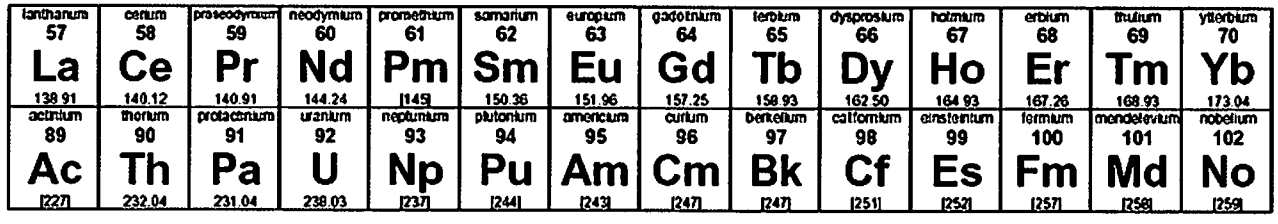
18) Provide the reagents you could use to achieve this (multi step) transformation. (3pts)



*****BONUS QUESTION up to 3 points*****

Draw *trans*-3-(2-hydroxyethyl)cyclopentanol.





*Lanthanide series

**Actinide series

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Name DOUGLAS S. HALFUL

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1-10 Are True/False (10pts)

1) Terminal alkynes have the triple bond at the end of the carbon chain. T

C-C≡C-C-C
C-C-C≡C-C
Some!

2) There are two different internal alkyne isomers of "pentyne". false

3) The triple bonded Carbon atoms in an alkyne are sp hybridized. T

4) Cyclobutanol is a cyclic, secondary alcohol. T

5) The oxidation state (oxidation number) of Chromium in $Na_2Cr_2O_7$ is +6. T

+2 -14

6) The Carbon-Carbon triple bond length is shorter than a Carbon-Carbon single bond. T

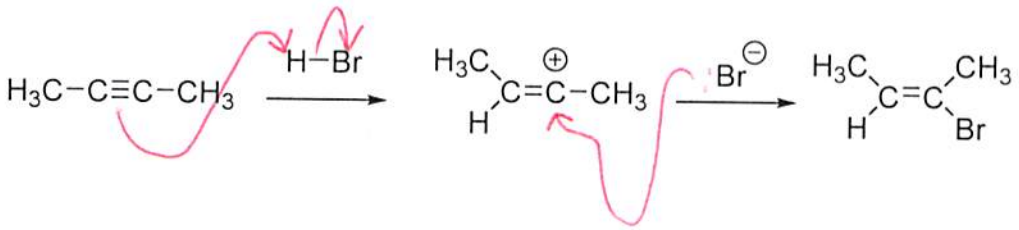
7) Molecules with a Carbon-Metal covalent bond are called organowoodic reagents. false

8) Tertiary alcohols can be oxidized to aldehydes and carboxylic acids. false

9) A triple bond consists of two π bonds and one σ bond. T

10) But-1-yne is more acidic than But-2-yne. T

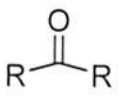
11) (3+1=4pts) a) Draw in the curly arrows to show the mechanism of the following electrophilic addition reaction.



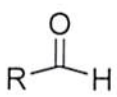
b) In terms of regiochemistry (e.g. Markovnikov), how would you describe this reaction?

Neither M nor AM.

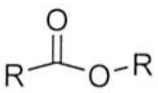
12) (3pts) Provide the functional groups (e.g. alkene) for the following three structures.



Ketone



Aldehyde

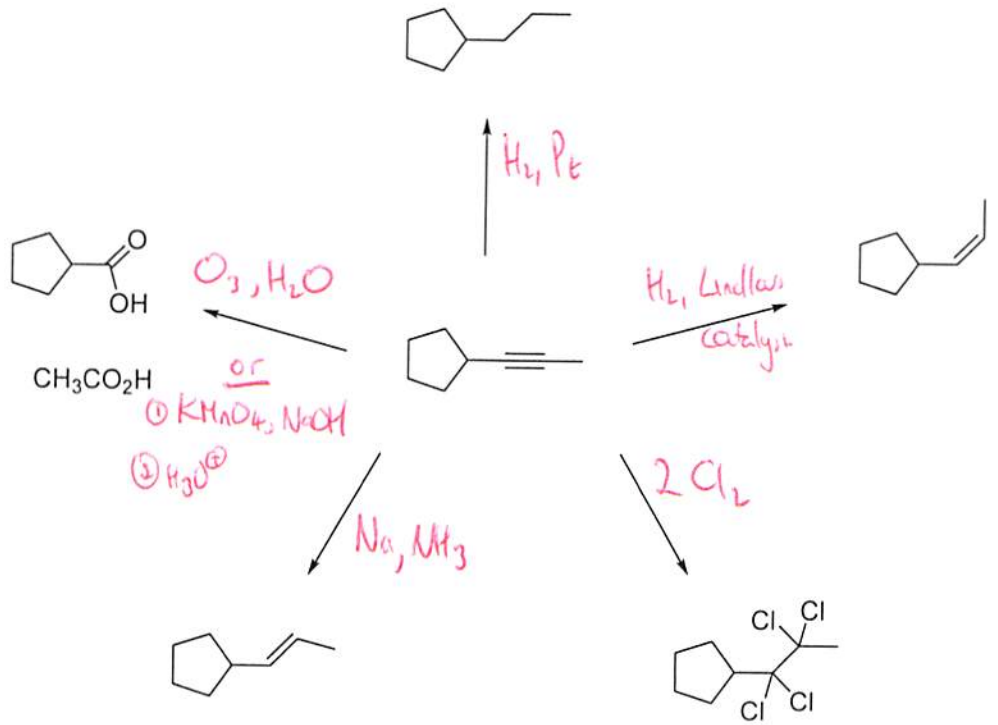


Ester

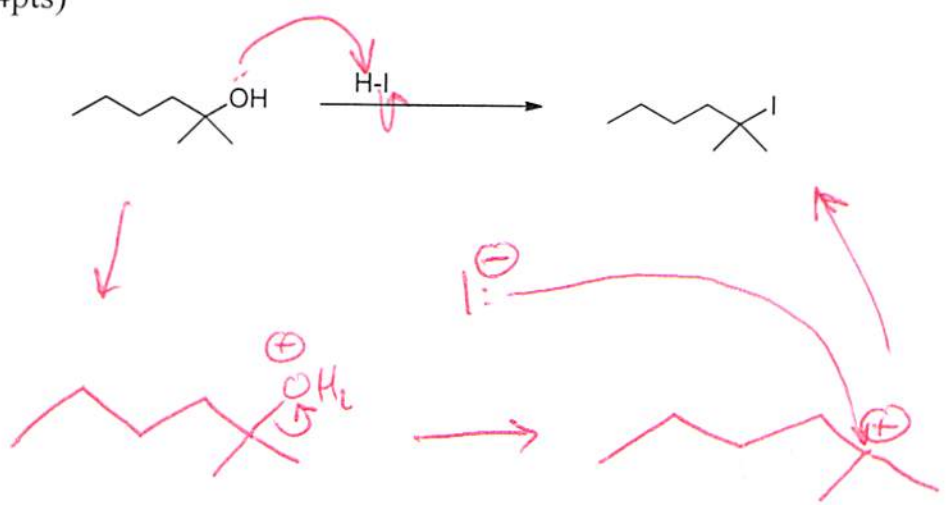
13) (2pts) Briefly explain the electronic difference between a hydride (H^-) and a proton (H^+).

Hydride is $:H^{\ominus}$ (two electrons) whereas $H^{\oplus}$ has zero electrons.

14) Provide reagents to achieve the following transformations. (10 pts)



15) Write the mechanism for the nucleophilic substitution of this tertiary alcohol. (4pts)



(Tertiary cation, SN1)

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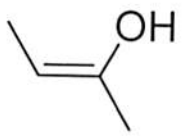
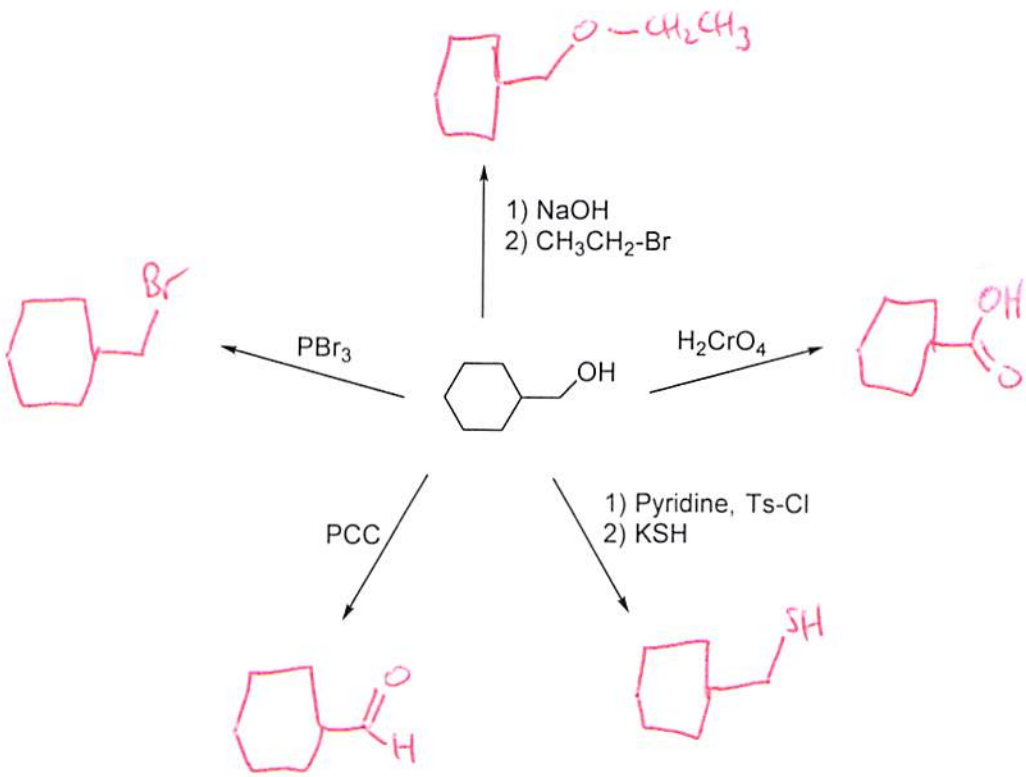


a) Why is an enol called an enol?

C=C is "ENE", C-OH = "OL", together make ENOL

b) Draw the corresponding *keto* tautomeric form of the above *enol*.

17) Provide the products in the following reactions. (10pts)



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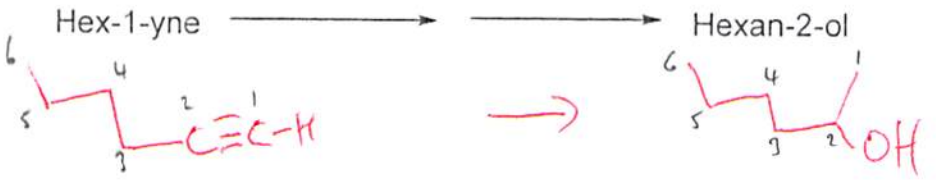
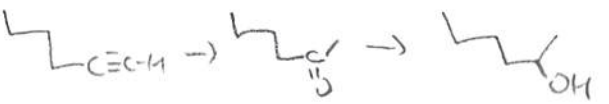
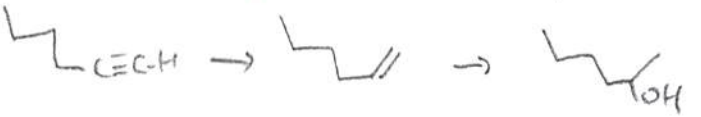


(A) $H_2SO_4, HgSO_4, H_2O$ then $NaBH_4, H_2O$ or $LiAlH_4, H_2O$ or H_2, Pt



(B) H_2, Lindlar's Cat. or Na, NH_3 then H_3O^+ or any Markovnikov H/OH addn



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