

Name \_\_\_\_\_

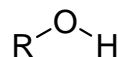
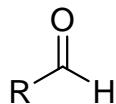
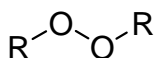
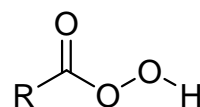
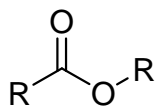
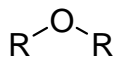
**If you do not want your graded exam placed in the box outside my office, then please check here \_\_\_\_\_**

*Answer all the questions.*

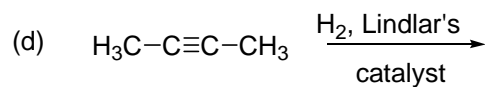
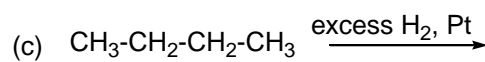
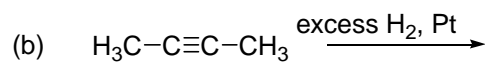
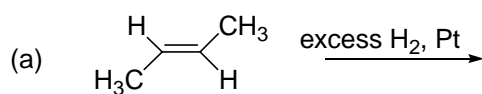
1-15 are True / False (15pts)

- 1) All alkynes have a carbon-carbon triple bond.
- 2) Alkynes are electron rich and are nucleophiles.
- 3) Alkynes contain sp hybridized carbons.
- 4) Alkynes can exist in Z and E isomeric forms.
- 5) Terminal alkynes have the triple bond flanked by alkyl substituents on both sides.
- 6) An alkyne has the same number of  $\pi$  bonds as a diene.
- 7) Tertiary alcohols cannot be oxidized.
- 8) Phenol is more acidic than cyclohexanol.
- 9) Cyclohexanol is a primary alcohol.
- 10) The carbon-carbon triple bond is shorter than a carbon-carbon single bond.
- 11) Primary alcohols can be oxidized to aldehydes.
- 12) Aldehydes can be reduced to primary alcohols.
- 13) Alkynes can be reduced to alkenes.
- 14) The Hammond Postulate states that for related systems, species that are similar in energy will be similar in structure.
- 15) 2-Butyne is more acidic than 1-butyne.

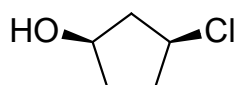
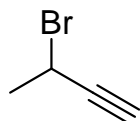
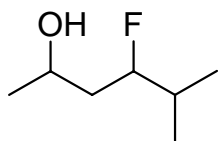
16) Name the class of compound (functional group) for each of the below molecules. (9pts)



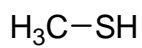
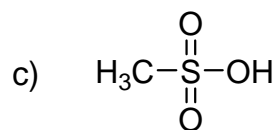
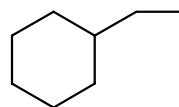
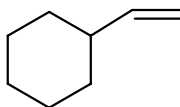
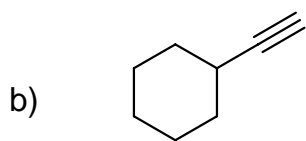
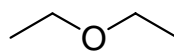
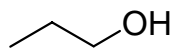
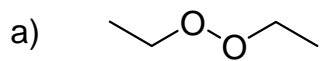
17) Give the products (if any) formed in the following reactions: (12pts)



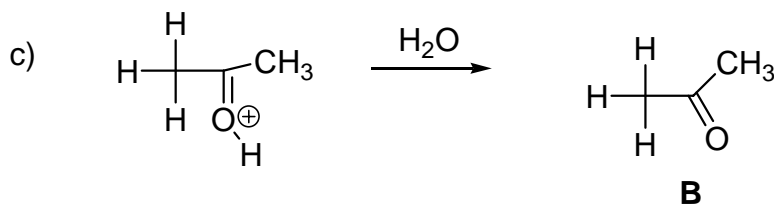
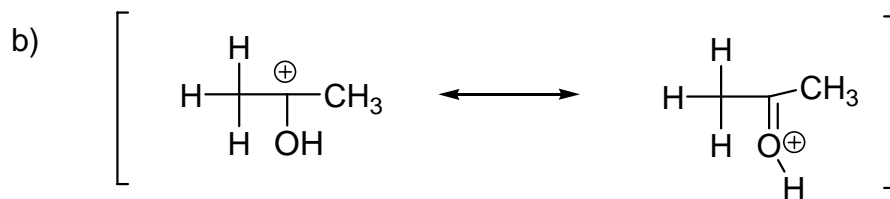
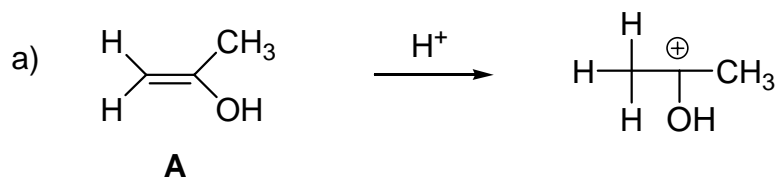
18) Name (in IUPAC form) the following three compounds. (12pts)



19) Circle the compound with the *most acidic hydrogen* in each threesome: (6pts)



20) (i) For the following three steps of keto-enol tautomerization, draw in all the appropriate curly arrows representing movement of two electrons.  
(8+8pts)



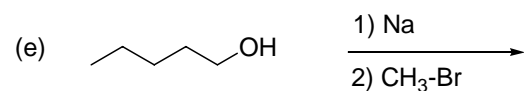
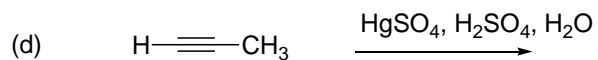
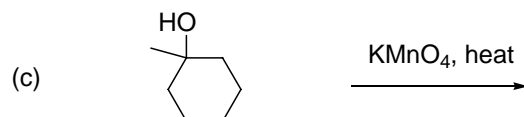
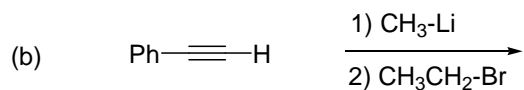
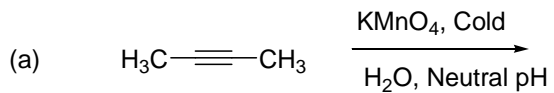
(ii) Which form, **A** or **B** is more stable ?

(iii) How many  $\text{sp}^2$  hybridized carbons are in **A** ?

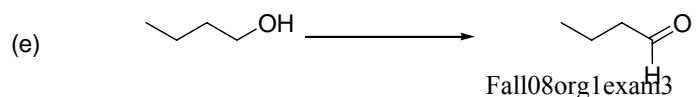
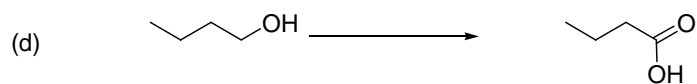
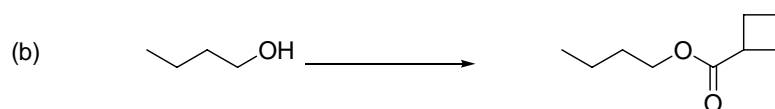
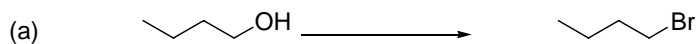
(iv) In step (a), is **A** behaving as an *acid* or a *base* ?

(v) **A** and **B** are isomers, but are they *structural isomers* or *stereoisomers* ?

21) Draw the products of the following transformations. (15pts)



22) Give reagents for the following transformations. (15pts)



**\*\*\*\*\*BONUS QUESTION For up to 3 points\*\*\*\*\***

Draw Lewis structures for 3 different (and chemically stable) isomers of  $C_3H_4$

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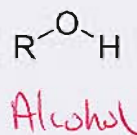
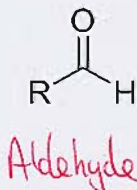
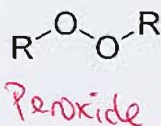
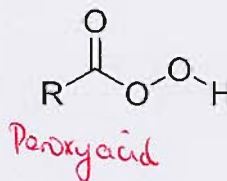
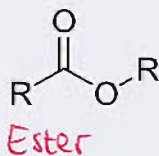
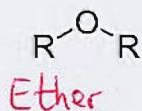
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Answer all the questions.

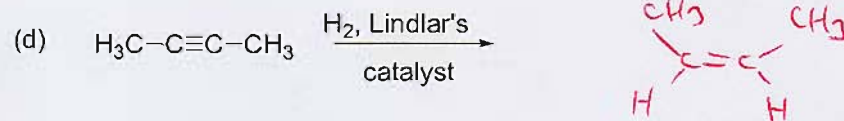
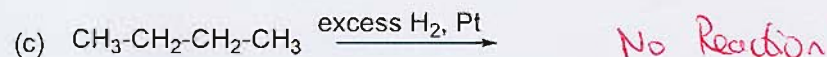
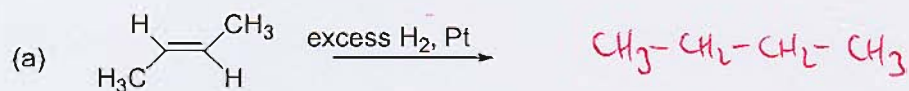
1-15 are True / False (15pts)

- 1) All alkynes have a carbon-carbon triple bond. T
- 2) Alkynes are electron rich and are nucleophiles. T
- 3) Alkynes contain sp hybridized carbons. T
- 4) Alkynes can exist in Z and E isomeric forms. F
- 5) Terminal alkynes have the triple bond flanked by alkyl substituents on both sides. F
- 6) An alkyne has the same number of  $\pi$  bonds as a diene. T
- 7) Tertiary alcohols cannot be oxidized. T
- 8) Phenol is more acidic than cyclohexanol. T
- 9) Cyclohexanol is a primary alcohol. F
- 10) The carbon-carbon triple bond is shorter than a carbon-carbon single bond. T
- 11) Primary alcohols can be oxidized to aldehydes. T
- 12) Aldehydes can be reduced to primary alcohols. T
- 13) Alkynes can be reduced to alkenes. T
- 14) The Hammond Postulate states that for related systems, species that are similar in energy will be similar in structure. T
- 15) 2-Butyne is more acidic than 1-butyne. F

16) Name the class of compound (functional group) for each of the below molecules. (9pts)

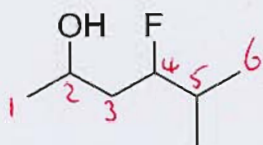


17) Give the products (if any) formed in the following reactions: (12pts)

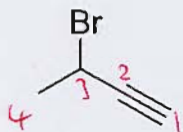




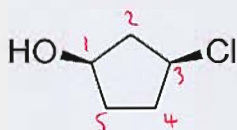
18) Name (in IUPAC form) the following three compounds. (12pts)



4-FLUORO-5-METHYL-2-HEXANOL



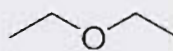
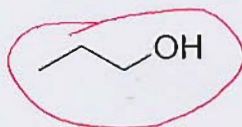
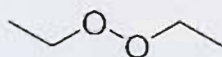
3-BROMO-1-BUTYNE



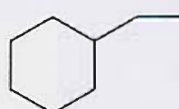
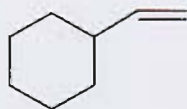
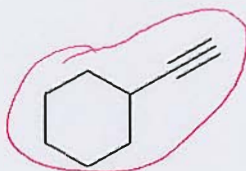
SYN-3-CHLORO CYCLOPENTANOL

19) Circle the compound with the *most acidic hydrogen* in each threesome:  
(6pts)

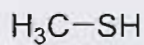
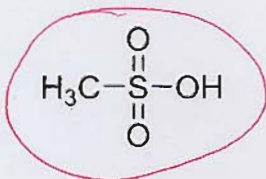
a)



b)

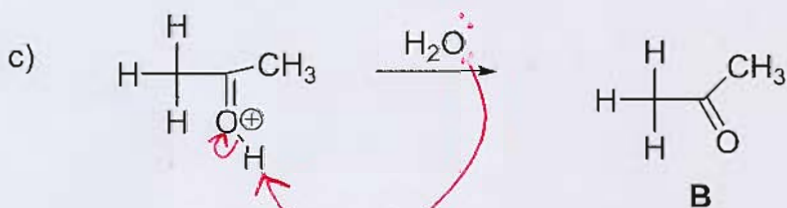
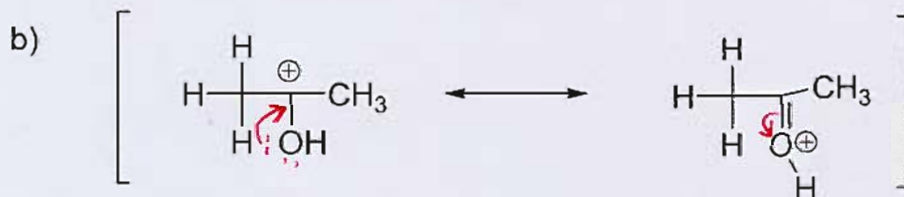
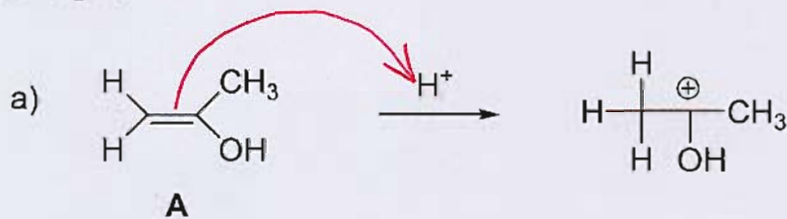


c)



20) (i) For the following three steps of keto-enol tautomerization, draw in all the appropriate curly arrows representing movement of two electrons.

(8+8pts)



(ii) Which form, **A** or **B** is more stable ?

**B**

(iii) How many sp<sup>2</sup> hybridized carbons are in **A** ?

**Two**

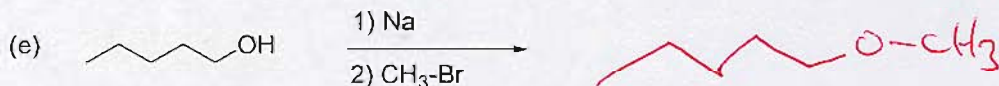
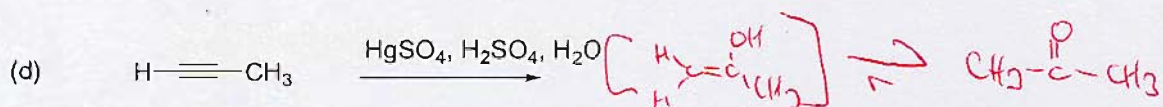
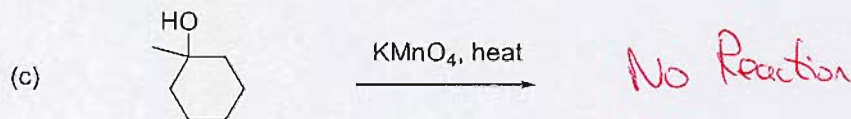
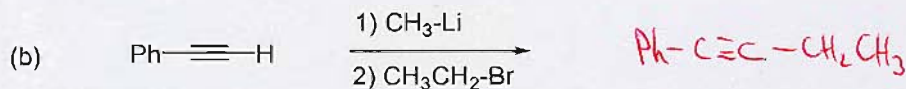
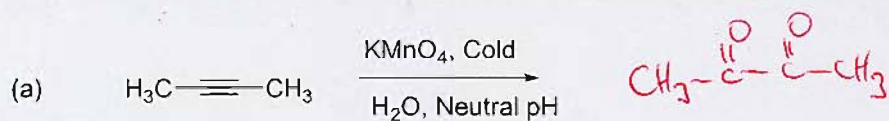
(iv) In step (a), is **A** behaving as an *acid* or a *base* ?

**Base**

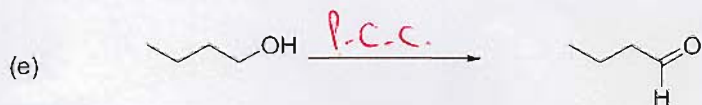
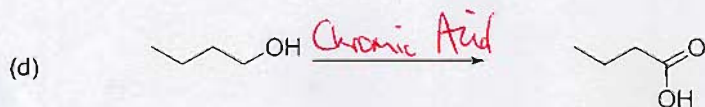
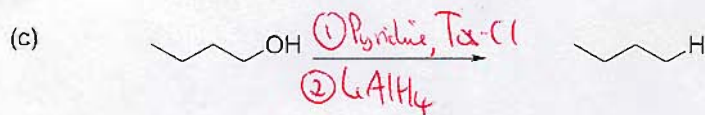
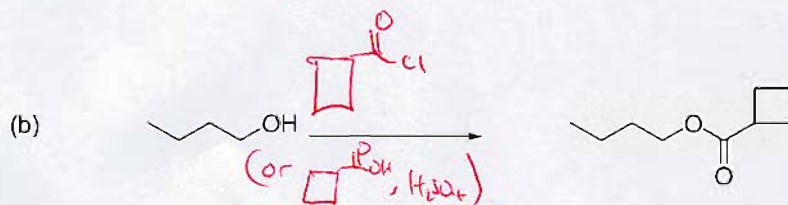
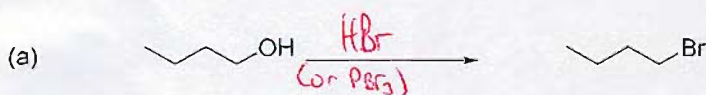
(v) **A** and **B** are isomers, but are they *structural isomers* or *stereoisomers* ?

**STRUCTURAL ISOMERS**

21) Draw the products of the following transformations. (15pts)



22) Give reagents for the following transformations. (15pts)



\*\*\*\*\*BONUS QUESTION For up to 3 points\*\*\*\*\*

Draw Lewis structures for 3 different (and chemically stable) isomers of  $C_3H_4$

