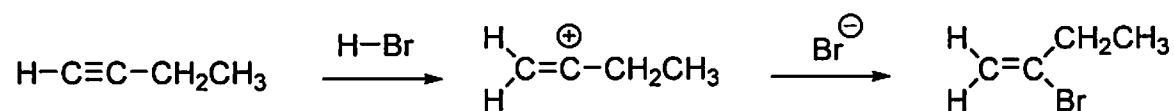


Name \_\_\_\_\_

1-10 Are True/False (10pts)

- 1) Terminal alkynes have the triple bond at the end of the carbon chain.
- 2) Butan-1-ol is chiral.
- 3) The triple bonded Carbon atoms in an alkyne are sp hybridized.
- 4) The oxidation state (oxidation number) of Chromium in  $\text{H}_2\text{CrO}_4$  is +4.
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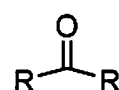
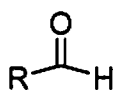
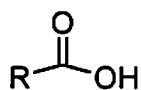
11) (3+1+1=5pts) a) Draw in the curly arrows to show the mechanism of the following *electrophilic addition* reaction.



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

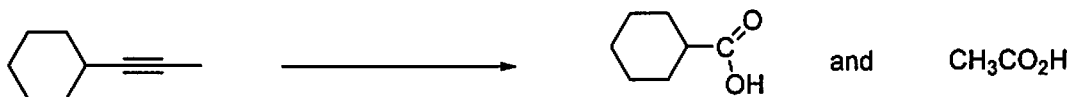
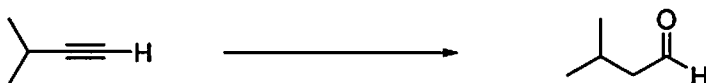
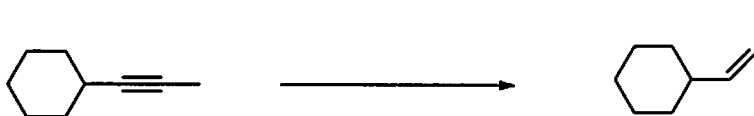
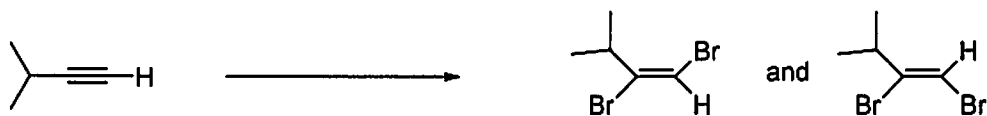
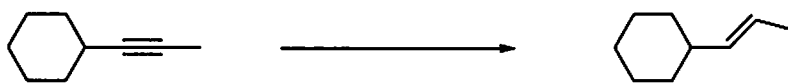
c) In terms of *stereochemistry* (e.g. *syn*), how would you describe the above reaction?

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



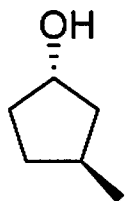
13) (1pts) Circle the functional group in Question (12) that is the best proton ( $\text{H}^+$ ) donor.

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



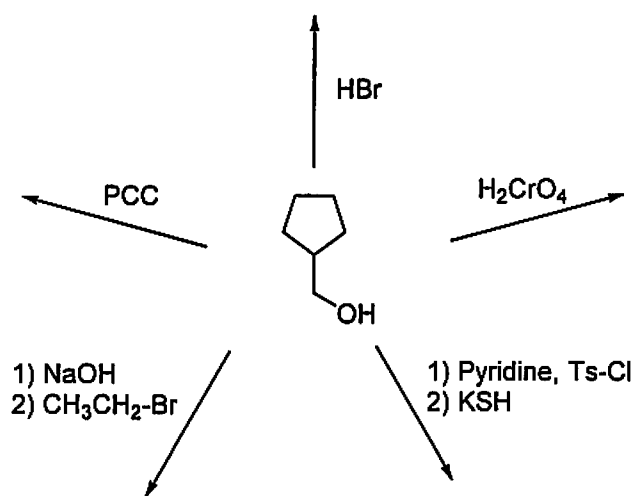
15) (2pts) Why is it NOT a very good (or precise) question to ask *what functional group is produced when an alcohol gets oxidized?*

16) (3pts) Name this molecule using IUPAC terminology.

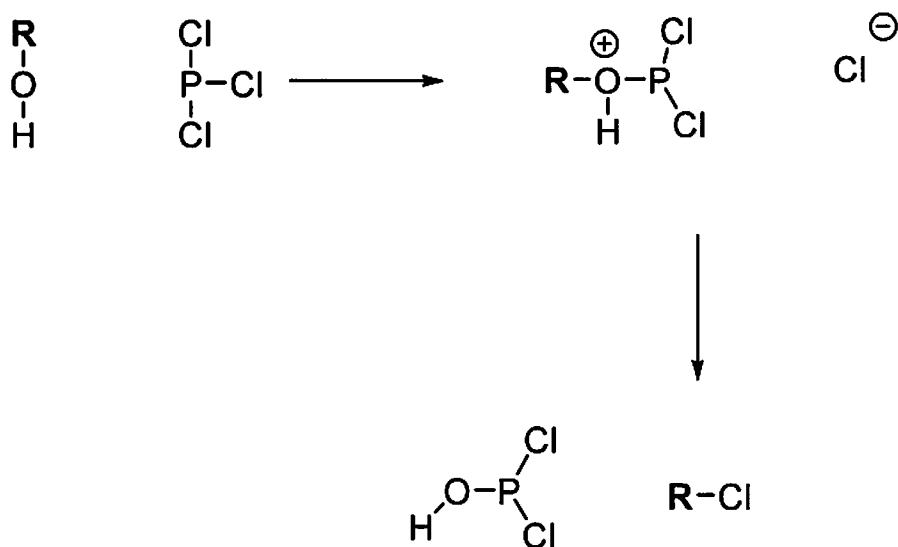


17) (3pts) Using any appropriate format you wish, draw the molecule that has the IUPAC name (*E*)-4-bromopent-3-en-2-ol.

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



19) (3pts) Draw in the curly arrows to describe the mechanism for this reaction of an alcohol with Phosphorous Trichloride.



**\*\*BONUS QUESTION up to 2 points\*\***

Provide a way to achieve the following (multistep) transformation.



hydrogen 1 H	helium 2 He	lithium 3 Li	beryllium 4 Be	boron 5 B	carbon 6 C	nitrogen 7 N	oxygen 8 O	fluorine 9 F	neon 10 Ne
sodium 11 Na	argon 18 Ar	magnesium 12 Mg	calcium 20 Ca	silicon 14 Si	phosphorus 15 P	phosphorus 15 P	sulfur 16 S	chlorine 17 Cl	argon 18 Ar
potassium 19 K	potassium 19 K	calcium 20 Ca	calcium 20 Ca	gallium 31 Ga	germanium 32 Ge	arsenic 33 As	selenium 34 Se	bromine 35 Br	potassium 39 K
rubidium 37 Rb	rubidium 37 Rb	strontium 38 Sr	strontium 38 Sr	zinc 30 Zn	cadmium 48 Cd	indium 49 In	tin 50 Sn	antimony 51 Sb	rubidium 87 Rb
cesium 55 Cs	cesium 55 Cs	barium 56 Ba	barium 56 Ba	copper 29 Cu	silver 47 Ag	mercury 80 Hg	thallium 81 Tl	lead 82 Pb	cesium 132.91 Cs
francium 87 Fr	francium 87 Fr	radium 88 Ra	radium 88 Ra	nickel 28 Ni	nickel 28 Ni	platinum 78 Pt	gold 79 Au	mercury 200.59 Hg	francium 223 Fr
				iron 26 Fe	iron 26 Fe	osmium 76 Os	iridium 77 Ir	platinum 195.08 Pt	
				cobalt 27 Co	cobalt 27 Co	rhodium 102.91 Rh	rhodium 102.91 Rh	gold 196.97 Au	
				chromium 24 Cr	chromium 24 Cr	technetium 98 Tc	technetium 98 Tc	mercury 200.59 Hg	
				manganese 25 Mn	manganese 25 Mn	ruthenium 101.07 Ru	ruthenium 101.07 Ru	thallium 204.38 Tl	
				vanadium 23 V	vanadium 23 V	rhodium 102.91 Rh	rhodium 102.91 Rh	uranium 238.03 U	
				titanium 22 Ti	titanium 22 Ti	iridium 223 Ir	iridium 223 Ir		
				scandium 21 Sc	scandium 21 Sc	uranium 238.03 U	uranium 238.03 U		
				yttrium 39 Y	yttrium 39 Y	uranium 238.03 U	uranium 238.03 U		
				zirconium 40 Zr	zirconium 40 Zr	uranium 238.03 U	uranium 238.03 U		
				niobium 41 Nb	niobium 41 Nb	uranium 238.03 U	uranium 238.03 U		
				molybdenum 42 Mo	molybdenum 42 Mo	uranium 238.03 U	uranium 238.03 U		
				technetium 43 Tc	technetium 43 Tc	uranium 238.03 U	uranium 238.03 U		
				ruthenium 44 Ru	ruthenium 44 Ru	uranium 238.03 U	uranium 238.03 U		
				rhodium 45 Rh	rhodium 45 Rh	uranium 238.03 U	uranium 238.03 U		
				nickel 28 Ni	nickel 28 Ni	uranium 238.03 U	uranium 238.03 U		
				copper 29 Cu	copper 29 Cu	uranium 238.03 U	uranium 238.03 U		
				zinc 30 Zn	zinc 30 Zn	uranium 238.03 U	uranium 238.03 U		
				gallium 31 Ga	gallium 31 Ga	uranium 238.03 U	uranium 238.03 U		
				germanium 32 Ge	germanium 32 Ge	uranium 238.03 U	uranium 238.03 U		
				arsenic 33 As	arsenic 33 As	uranium 238.03 U	uranium 238.03 U		
				selenium 34 Se	selenium 34 Se	uranium 238.03 U	uranium 238.03 U		
				bromine 35 Br	bromine 35 Br	uranium 238.03 U	uranium 238.03 U		
				kraton 36 Kr	kraton 36 Kr	uranium 238.03 U	uranium 238.03 U		
				rubidium 87 Rb	rubidium 87 Rb	uranium 238.03 U	uranium 238.03 U		
				cesium 132.91 Cs	cesium 132.91 Cs	uranium 238.03 U	uranium 238.03 U		
				francium 223 Fr	francium 223 Fr	uranium 238.03 U	uranium 238.03 U		

\* Lanthanide series

lanthanum 57 La	cerium 58 Ce	praseodymium 59 Pr	neodymium 60 Nd	promethium 61 Pm	samarium 62 Sm	europium 63 Eu	gadolinium 64 Gd	terbium 65 Tb	dysprosium 66 Dy	holmium 67 Ho	erbium 68 Er	thulium 69 Tm	ytterbium 70 Yb
actinium 89 Ac	thorium 90 Th	protactinium 91 Pa	uranium 92 U	neptunium 93 Np	plutonium 94 Pu	americium 95 Am	curium 96 Cm	berkelium 97 Bk	californium 98 Cf	einsteinium 99 Es	fermium 100 Fm	mendelevium 101 Md	nobelium 102 No

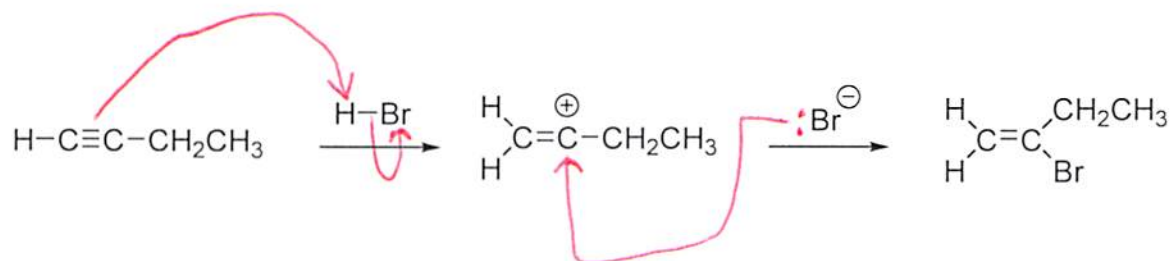
\* Actinide series

Name A ROUND OF DRINKS = CYCLIC ALCOHOL

1-10 Are True/False (10pts)

- 1) Terminal alkynes have the triple bond at the end of the carbon chain. T
- 2) Butan-1-ol is chiral. False
- 3) The triple bonded Carbon atoms in an alkyne are sp hybridized. T
- 4) The oxidation state (oxidation number) of Chromium in  $\text{H}_2\text{CrO}_4$  is +4. false
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11) (3+1+1=5pts) a) Draw in the curly arrows to show the mechanism of the following *electrophilic addition* reaction.



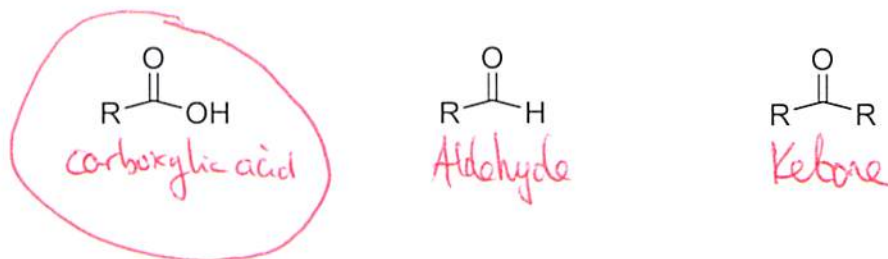
b) In terms of *regiochemistry* (e.g. *Markovnikov*), how would you describe the above reaction?

Markovnikov

c) In terms of *stereochemistry* (e.g. *syn*), how would you describe the above reaction?

Cannot tell / Not applicable / Both syn & anti

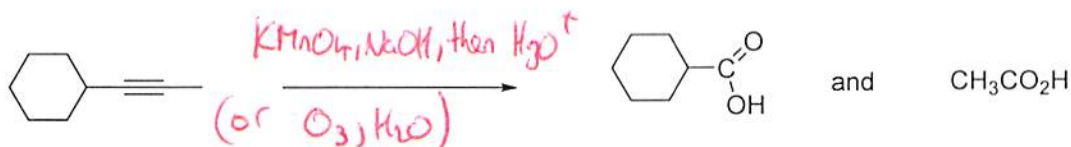
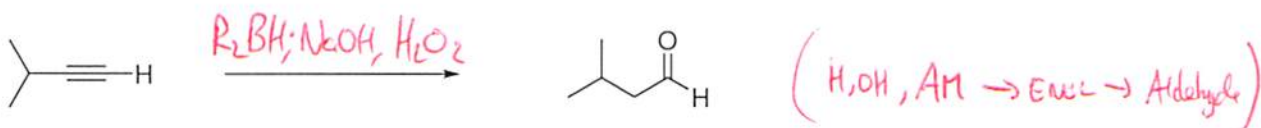
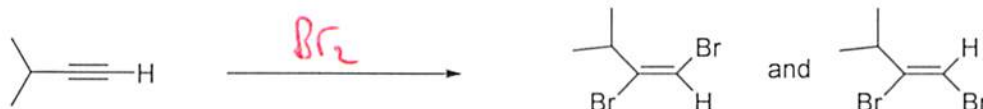
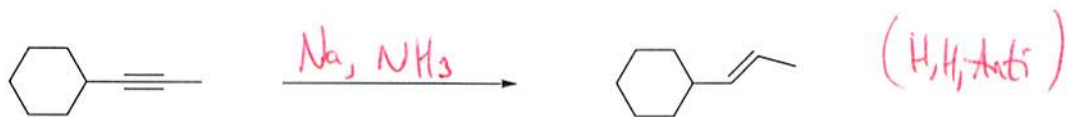
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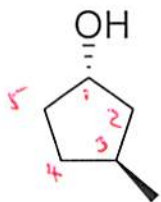


15) (2pts) Why is it NOT a very good (or precise) question to ask *what functional group is produced when an alcohol gets oxidized?*

Since it depends on (i) the class of alcohol, and (ii) the extent of oxidation.

primary alcohol → aldehyde or carboxylic acid  
 secondary alcohol → ketone  
 tertiary alcohol → no oxidation.

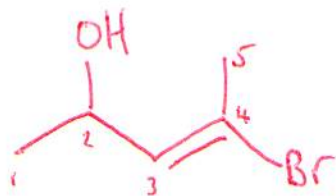
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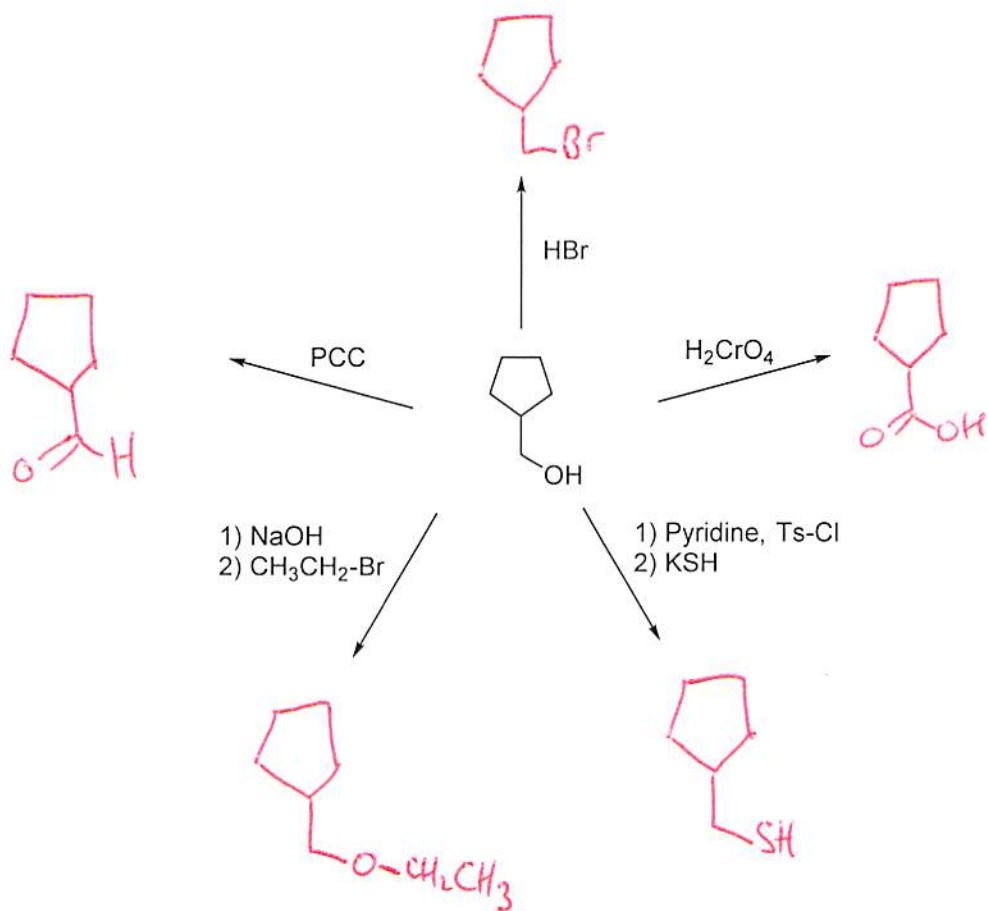
Trans-3-methylcyclopentanol

(+ if you add (1S, 3S)).

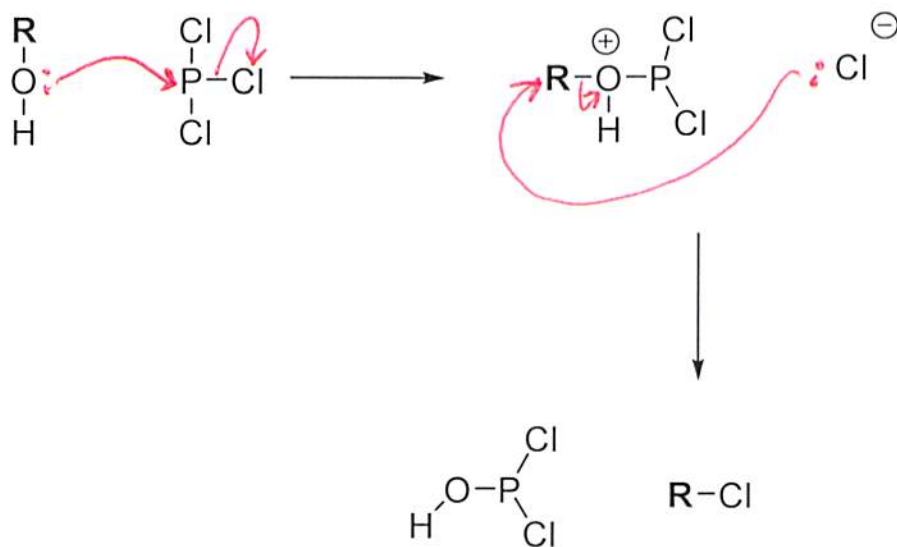
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