2019 ORG MECH: Electrophiles and Acids

Quiz #1 **25 pts** NAME:_____

1-4) Provide a definition for the terms:

ACID

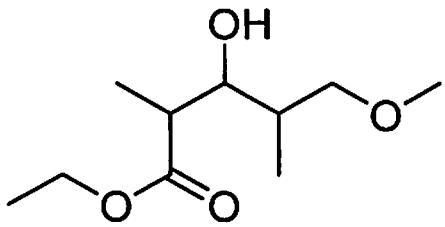
ELECTROPHILE

5-10) Chemical species in (a) and (b) below are totally **covalent** species — draw Lewis structures for them, and determine how many lone pairs are present in each molecule.

a) Hydrochloric Acid (HCl)

b) Sulfuric Acid (H_2SO_4)

11-15) For the below molecule drawn in line angle diagram (stick figure) format, determine:



a) The number of Carbon atoms.

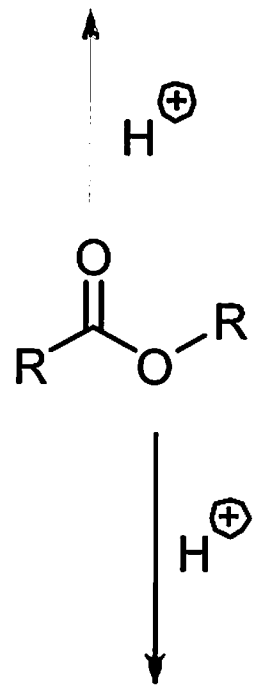
b) The number of Hydrogen atoms.

c) The number of chiral centers.

d) What is the name of the functional group which includes the right hand side Oxygen atom?

e) Is the Alcohol functional group *Primary, Secondary or Tertiary*?

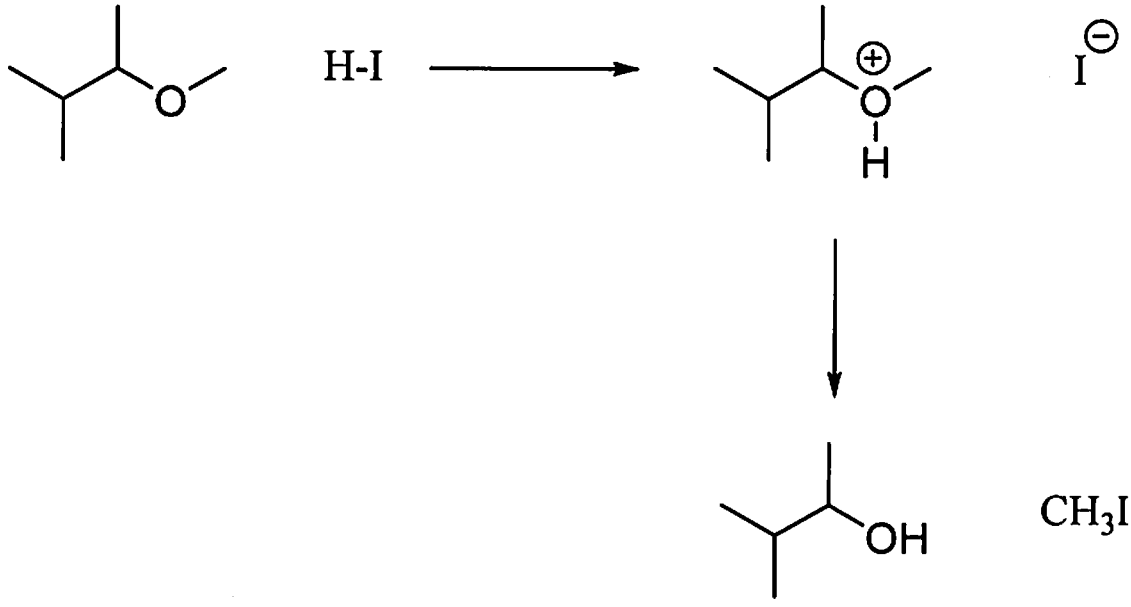
16-17) An *ester* functional group, shown below has two different Oxygen atoms. Draw the two products that are generated when each of the Oxygens is protonated.



18-19) On the above Ester, draw the curly arrows (*mechanism)* that account for the formation of each new protonated product.

20-22) One of the two protonated esters that you drew in the previous question is much more stable that the other. Redraw the more stable one in the space below, and explain the greater stability.

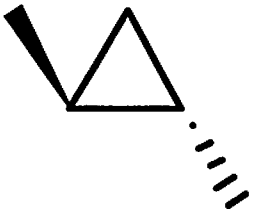
23-24) For the following reaction, draw in the curly arrows to complete the mechanism.



25) Why do you think the nucleophile prefers to attack the methyl substituent, and not the alkyl substituent on the other side of the Oxygen?

*****Bonus question for up to 2 points*****

Provide the (most precise as possible) IUPAC name for the following molecule.



hydrogen 1 **H** 1.0079																		helium 2 **He** 4.0026
lithium 3 **Li** 6.941	beryllium 4 **Be** 9.0122												boron 5 **B** 10.811	carbon 6 **C** 12.011	nitrogen 7 **N** 14.007	oxygen 8 **O** 15.999	fluorine 9 **F** 18.998	neon 10 **Ne** 20.180
sodium 11 **Na** 22.990	magnesium 12 **Mg** 24.305												aluminium 13 **Al** 26.982	silicon 14 **Si** 28.086	phosphorus 15 **P** 30.974	sulfur 16 **S** 32.065	chlorine 17 **Cl** 35.453	argon 18 **Ar** 39.948
potassium 19 **K** 39.098	calcium 20 **Ca** 40.078		scandium 21 **Sc** 44.956	titanium 22 **Ti** 47.867	vanadium 23 **V** 50.942	chromium 24 **Cr** 51.996	manganese 25 **Mn** 54.938	iron 26 **Fe** 55.845	cobalt 27 **Co** 58.933	nickel 28 **Ni** 58.693	copper 29 **Cu** 63.546	zinc 30 **Zn** 65.39	gallium 31 **Ga** 69.723	germanium 32 **Ge** 72.61	arsenic 33 **As** 74.922	selenium 34 **Se** 78.96	bromine 35 **Br** 79.904	krypton 36 **Kr** 83.80
rubidium 37 **Rb** 85.468	strontium 38 **Sr** 87.62		yttrium 39 **Y** 88.906	zirconium 40 **Zr** 91.224	niobium 41 **Nb** 92.906	molybdenum 42 **Mo** 95.94	technetium 43 **Tc** [98]	ruthenium 44 **Ru** 101.07	rhodium 45 **Rh** 102.91	palladium 46 **Pd** 106.42	silver 47 **Ag** 107.87	cadmium 48 **Cd** 112.41	indium 49 **In** 114.82	tin 50 **Sn** 118.71	antimony 51 **Sb** 121.76	tellurium 52 **Te** 127.60	iodine 53 **I** 126.90	xenon 54 **Xe** 131.29
caesium 55 **Cs** 132.91	barium 56 **Ba** 137.33	57-70 *	lutetium 71 **Lu** 174.97	hafnium 72 **Hf** 178.49	tantalum 73 **Ta** 180.95	tungsten 74 **W** 183.84	rhenium 75 **Re** 186.21	osmium 76 **Os** 190.23	iridium 77 **Ir** 192.22	platinum 78 **Pt** 195.08	gold 79 **Au** 196.97	mercury 80 **Hg** 200.59	thallium 81 **Tl** 204.38	lead 82 **Pb** 207.2	bismuth 83 **Bi** 208.98	polonium 84 **Po** [209]	astatine 85 **At** [210]	radon 86 **Rn** [222]
francium 87 **Fr** [223]	radium 88 **Ra** [226]	89-102 * *	lawrencium 103 **Lr** [262]	rutherfordium 104 **Rf** [261]	dubnium 105 **Db** [262]	seaborgium 106 **Sg** [266]	bohrium 107 **Bh** [264]	hassium 108 **Hs** [269]	meitnerium 109 **Mt** [268]	ununnilium 110 **Uun** [271]	unununium 111 **Uuu** [272]	ununbium 112 **Uub** [277]		ununquadium 114 **Uuq** [289]				

*Lanthanide series	lanthanum 57 **La** 138.91	cerium 58 **Ce** 140.12	praseodymium 59 **Pr** 140.91	neodymium 60 **Nd** 144.24	promethium 61 **Pm** [145]	samarium 62 **Sm** 150.36	europium 63 **Eu** 151.96	gadolinium 64 **Gd** 157.25	terbium 65 **Tb** 158.93	dysprosium 66 **Dy** 162.50	holmium 67 **Ho** 164.93	erbium 68 **Er** 167.26	thulium 69 **Tm** 168.93	ytterbium 70 **Yb** 173.04
* *Actinide series	actinium 89 **Ac** [227]	thorium 90 **Th** 232.04	protactinium 91 **Pa** 231.04	uranium 92 **U** 238.03	neptunium 93 **Np** [237]	plutonium 94 **Pu** [244]	americium 95 **Am** [243]	curium 96 **Cm** [247]	berkelium 97 **Bk** [247]	californium 98 **Cf** [251]	einsteinium 99 **Es** [252]	fermium 100 **Fm** [257]	mendelevium 101 **Md** [258]	nobelium 102 **No** [259]

2019 ORG MECH: Electrophiles and Acids

Quiz #1 **25 pts** NAME: Perfect Answers.

1-4) Provide a definition for the terms:

ACID - Produces $H_3O^{\oplus}$ in aqueous solution
- A $H^{\oplus}$ donor
- A 2 electron acceptor

ELECTROPHILE

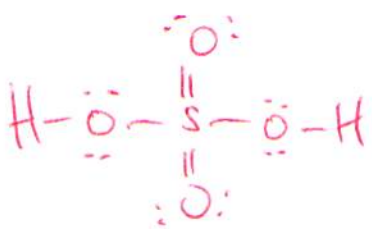
A 2 electron acceptor (Lewis Acid).

5-10) Chemical species in (a) and (b) below are totally **covalent** species — draw Lewis structures for them, and determine how many lone pairs are present in each molecule.

a) Hydrochloric Acid (HCl)

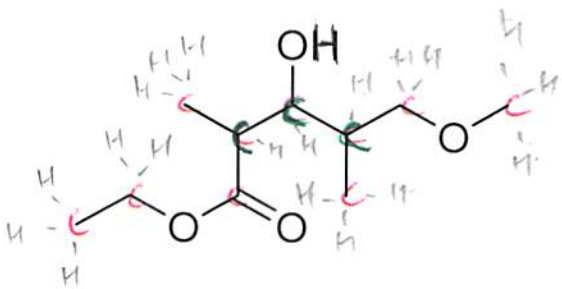
three lone pairs.

b) Sulfuric Acid (H_2SO_4)



Eight lone pairs.

11-15) For the below molecule drawn in line angle diagram (stick figure) format, determine:



a) The number of Carbon atoms. 10

b) The number of Hydrogen atoms. 20

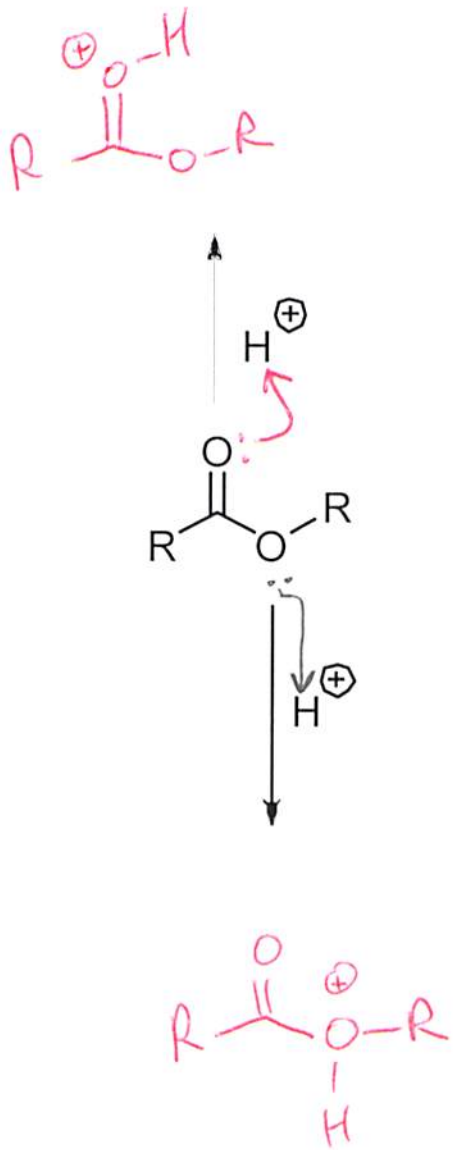
c) The number of chiral centers. 3

d) What is the name of the functional group which includes the right hand side Oxygen atom?

Ether

e) Is the Alcohol functional group *Primary*, *Secondary* or *Tertiary*?

16-17) An *ester* functional group, shown below has two different Oxygen atoms. Draw the two products that are generated when each of the Oxygens is protonated.



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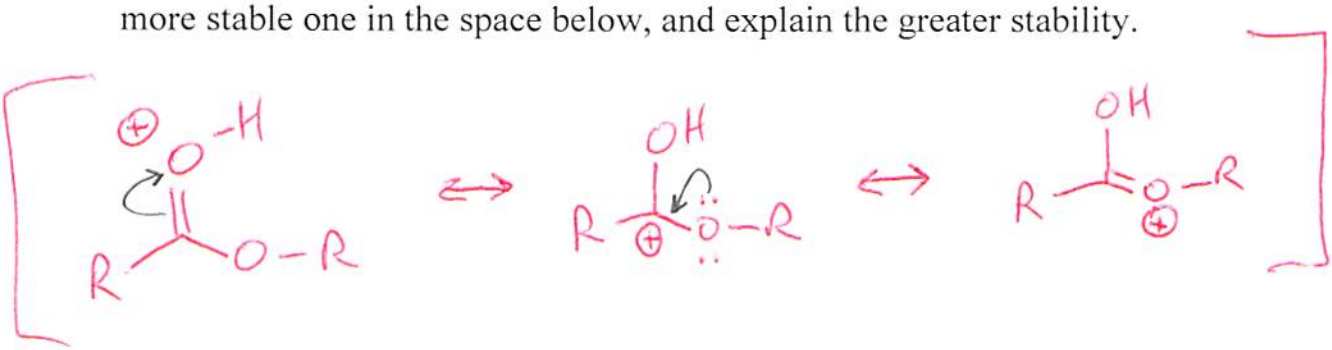
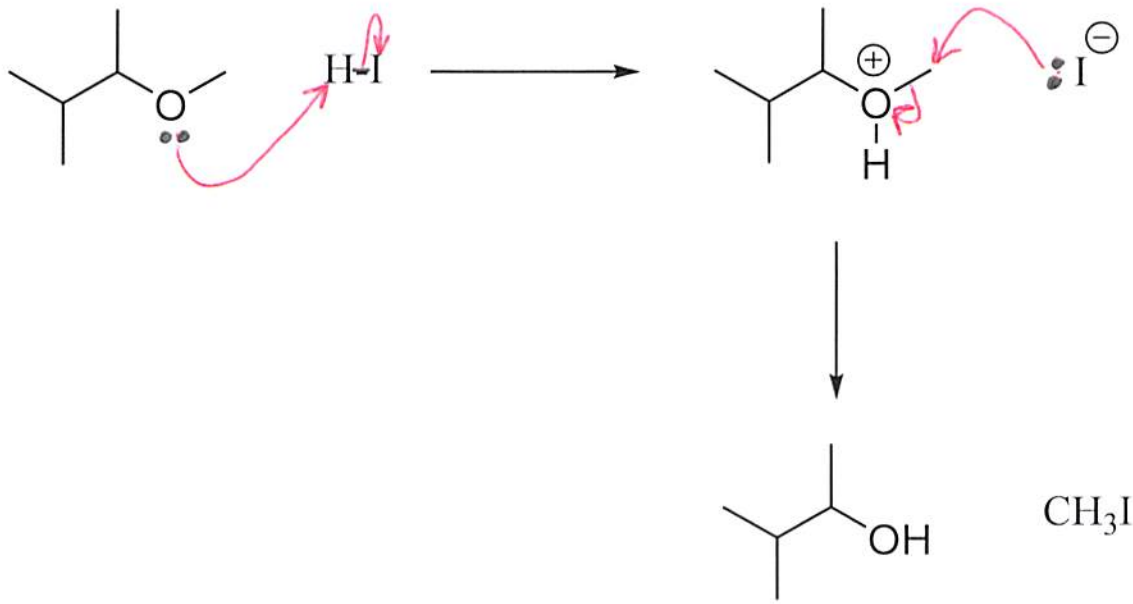


Resonance makes this one more stable.

23-24) For the following reaction, draw in the curly arrows to complete the mechanism.

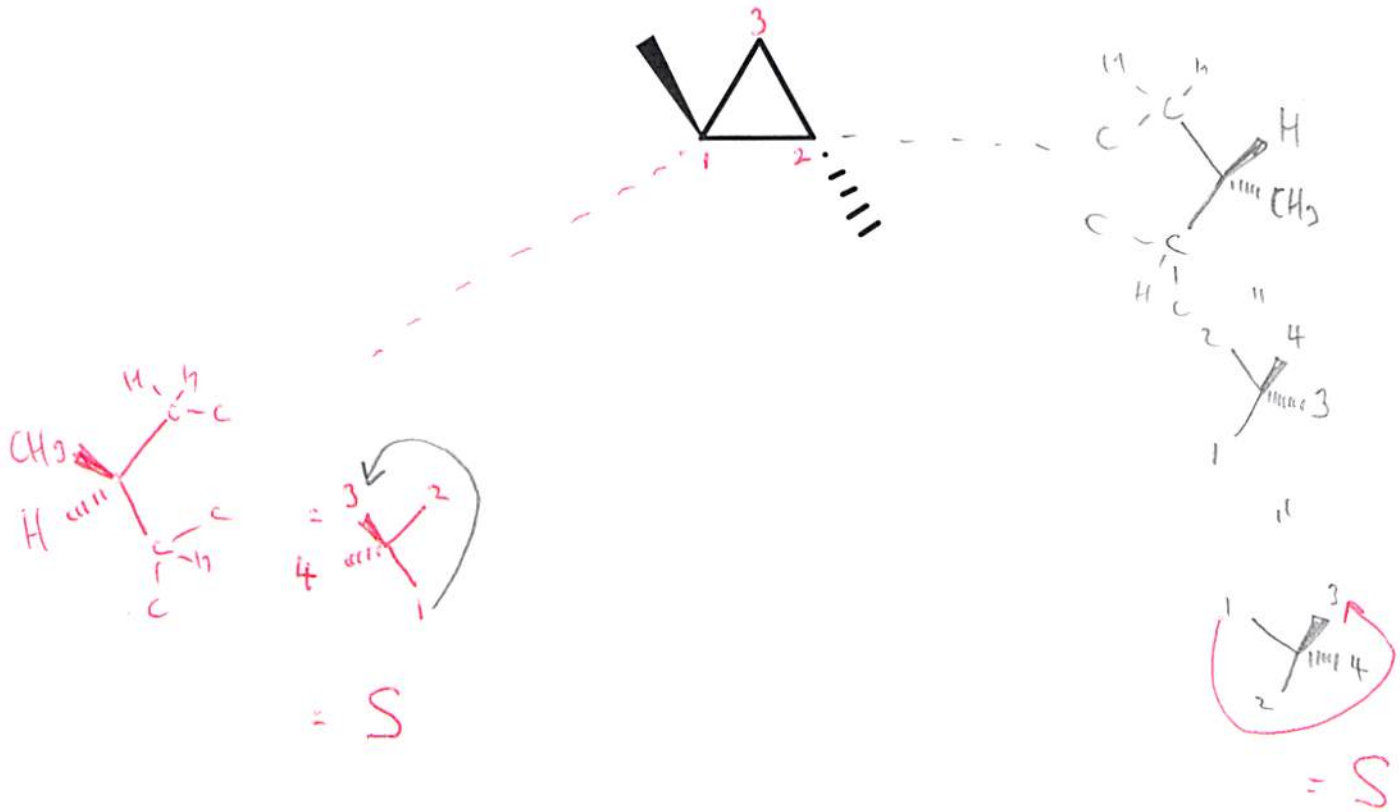


25) Why do you think the nucleophile prefers to attack the methyl substituent, and not the alkyl substituent on the other side of the Oxygen?

The SN2 attack favors the less sterically hindered site of attack.

Bonus question for up to 2points

Provide the (most precise as possible) IUPAC name for the following molecule.



(1S, 2S) - 1,2-dimethyl cyclo propane