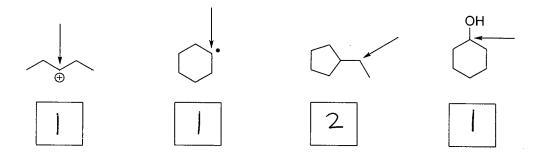
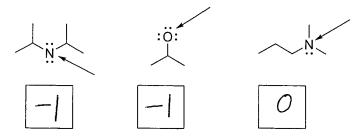
1)	Indicate which functional groups are present in each of these molecules by writing the appropriate letters in the box below each molecule. (14 pts)							
A B C D E	Alkene Alkyne Alcohol Ether Epoxide	F G H J K	Aldehyde Ketone Carboxylic acid Ester Amide		L M N O P	Anhydride Acid halide Amine Nitrile Aromatic ring		
	но	OH OH	ОН			Н		
	Prav Cholesterol	g	3-Phenylprop-2-enal Flavoring compound isolated from cinnamon tree bark					
	Å C	. H J		X	F	P		

1)

2) How many hydrogen atoms are attached to each of the indicated carbons? Write your answer in the box under each structure. All charges are shown. (8 pts)



Calculate the formal charge for each of the indicated atoms. All lone pairs are 3) shown. Write your answer in the box under each structure. (3 pts)



4) Identify the two orbitals that overlap to form each of the indicated bonds in the structure shown. All atoms in the structure are neutral, but lone pairs are not shown (you will have to draw them in). (16 pts)

5) Choose the best description of the hybridization of each of the indicated atoms. Choices are \overline{sp} , sp^2 , sp^3 . (4 pts)

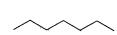
Oxygen:
$$\frac{1}{5p^3}$$
 Carbonyl carbon: $\frac{5p^2}{(this is 2-chlorobutane)}$ $\frac{\ddot{c}_1}{\ddot{c}_1}$ $\frac{\ddot{c}_1}{$

The carbon with the positive charge has four valence shell orbitals 6) (just like all carbons). Complete the table by writing how many of each type of valence orbital there are on this carbon. If there are no orbitals of a particular type on that carbon, write "0" (zero). (5 pts)

sp²	sp³	

Orbital type	S	p	sp	sp²	sp³
How many?	0	1	0	3	0

7) Provide acceptable IUPAC (systematic) names for each of the following molecules (15 pts).



heptane

2,3,4 - trimethy/hexane

2-chloro-5-methylcyclopentanol

8) Draw the requested molecules in the boxes provided and circle the correct choice underneath each name to classify the compound. (10 pts)

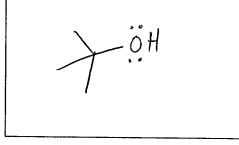
Tert-butyl alcohol

Classify this alcohol (circle one):

10

2°





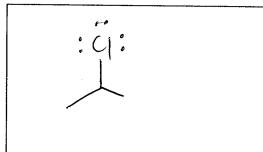
Isopropyl chloride

Classify this alkyl halide (circle one):

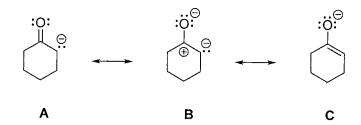
10



3°



9) Select the major resonance contributor. All lone pairs are shown in all structures. (5 pts)



- a. A b. B c. C
 - d. A and C
- e. All structures are equivalent
- 10) Give TWO reasons why you chose the structure you did as the major contributor. (The reasons do not have to be listed in order of importance.) (10 pts)

Reason 1: All atoms have octets

Reason 2: Negative charge on most electronegative element

11) Draw **one** other reasonable resonance contributor for each of the chemical species shown. Show the conversion of the original structure to your new structure using the appropriate curved arrow(s). Include all lone pairs and nonzero formal charges to receive full credit. Be sure your arrows are drawn clearly. (10 pts)

