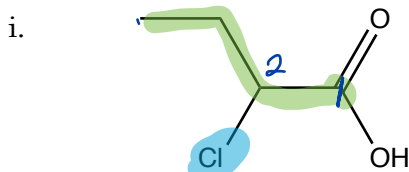


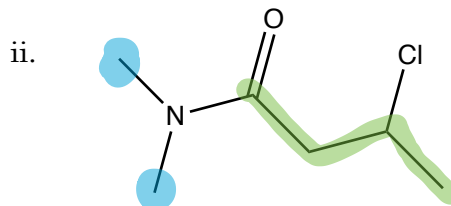
1. a. (2 pts. ea.) Identify the following compounds as acid chlorides, esters, carboxylic acids, or amides.

1. _____

b. (4 pts. ea.) Provide IUPAC names for the following compounds.



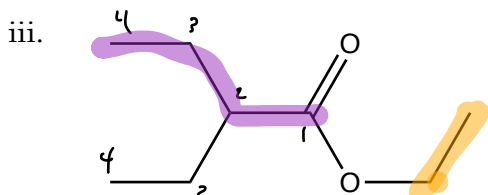
a. carboxylic acid



a. amide

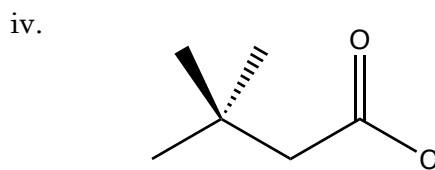
2-chloro-N,N-dimethylbutanamide

b. 2-chlorobutanoic acid



a. ester

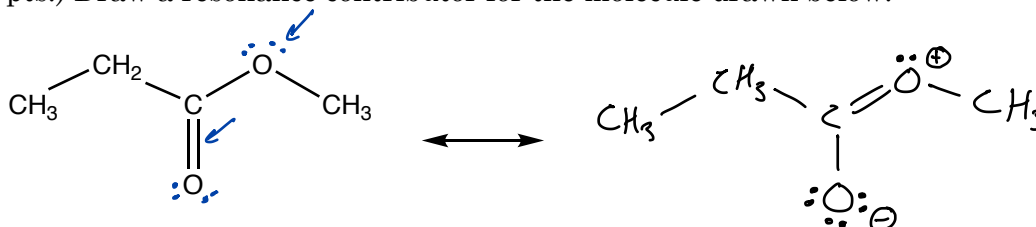
b. ethyl 2-ethylbutanoate



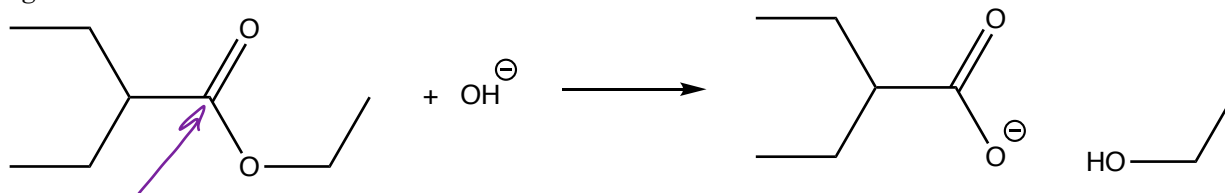
a. acid chloride

b. 3,3-dimethylbutanoyl chloride

2. (12 pts.) Draw a resonance contributor for the molecule drawn below.



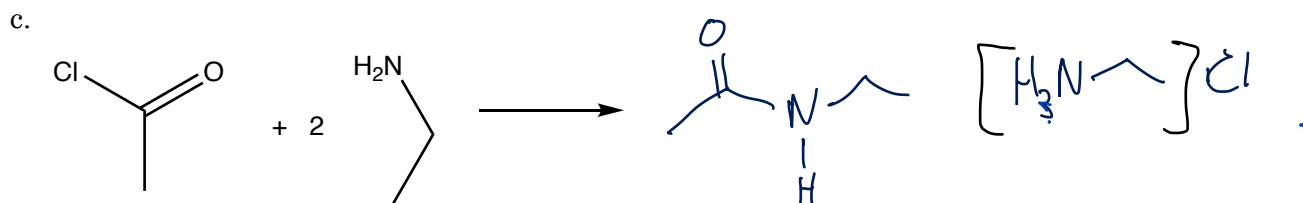
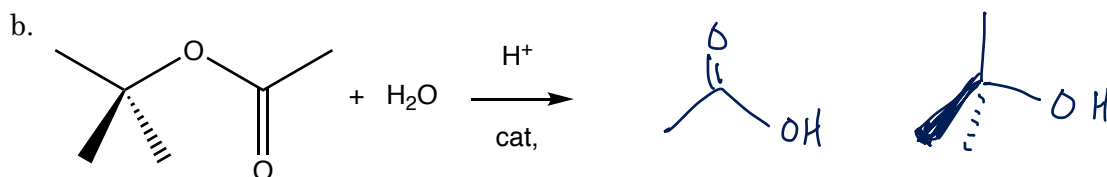
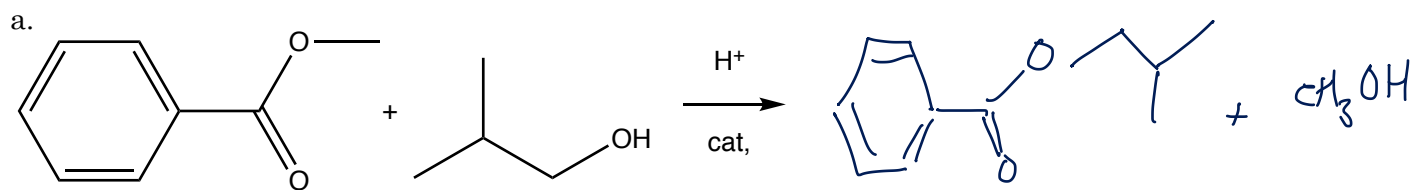
3. (12 pts) The reaction drawn below is not reversible. Briefly explain why the molecules on the right cannot react to form the molecules on the left.



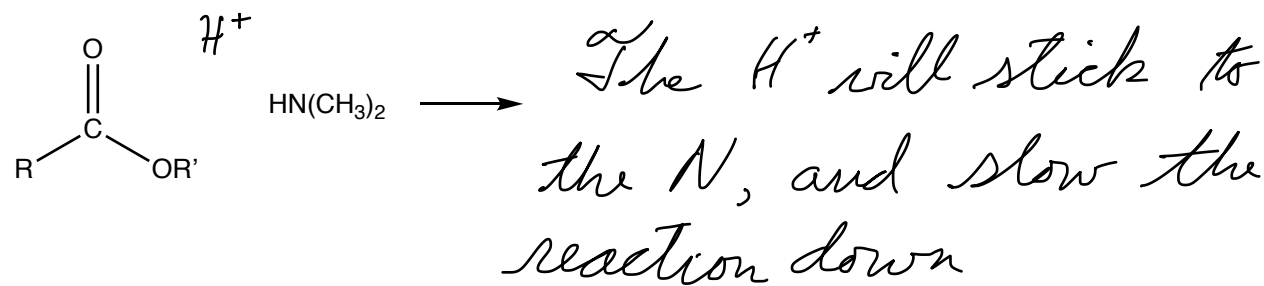
electrophilic

carboxylate ion is e⁻ rich and the extra e⁻ density repels the e⁻ rich nucleophile

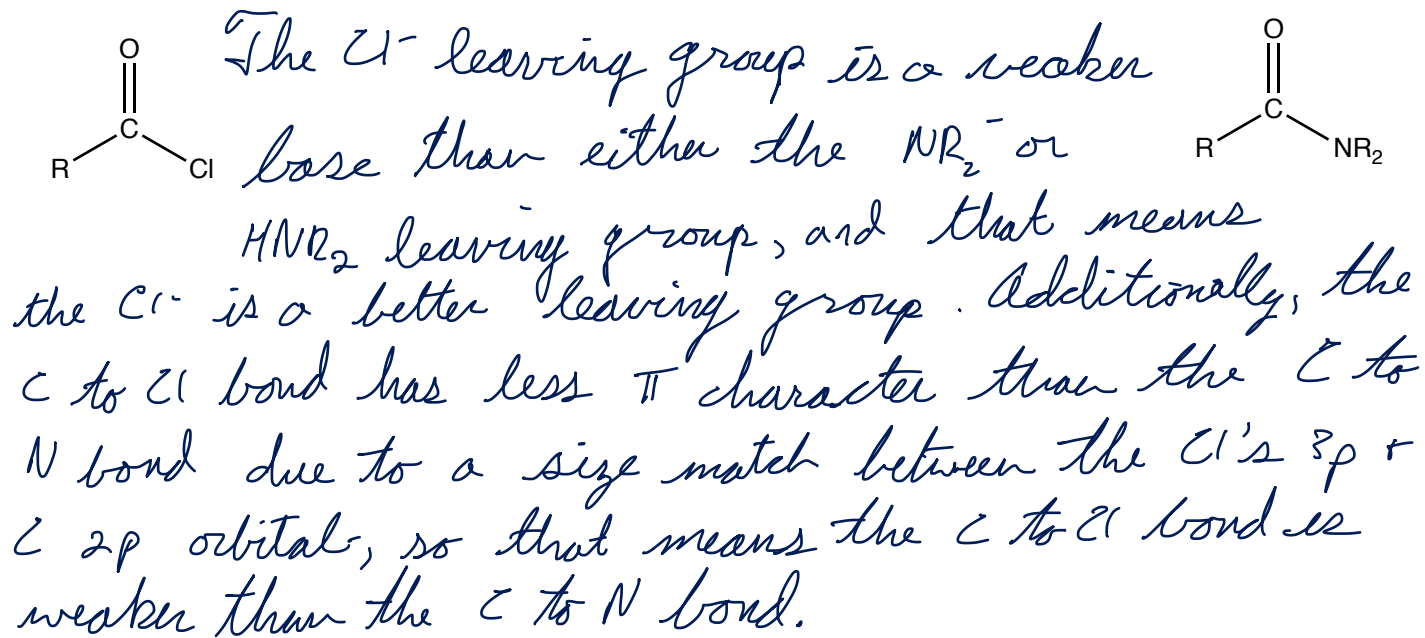
6. (6 pts. ea.) Predict the products for the following nucleophilic acyl substitution reactions.



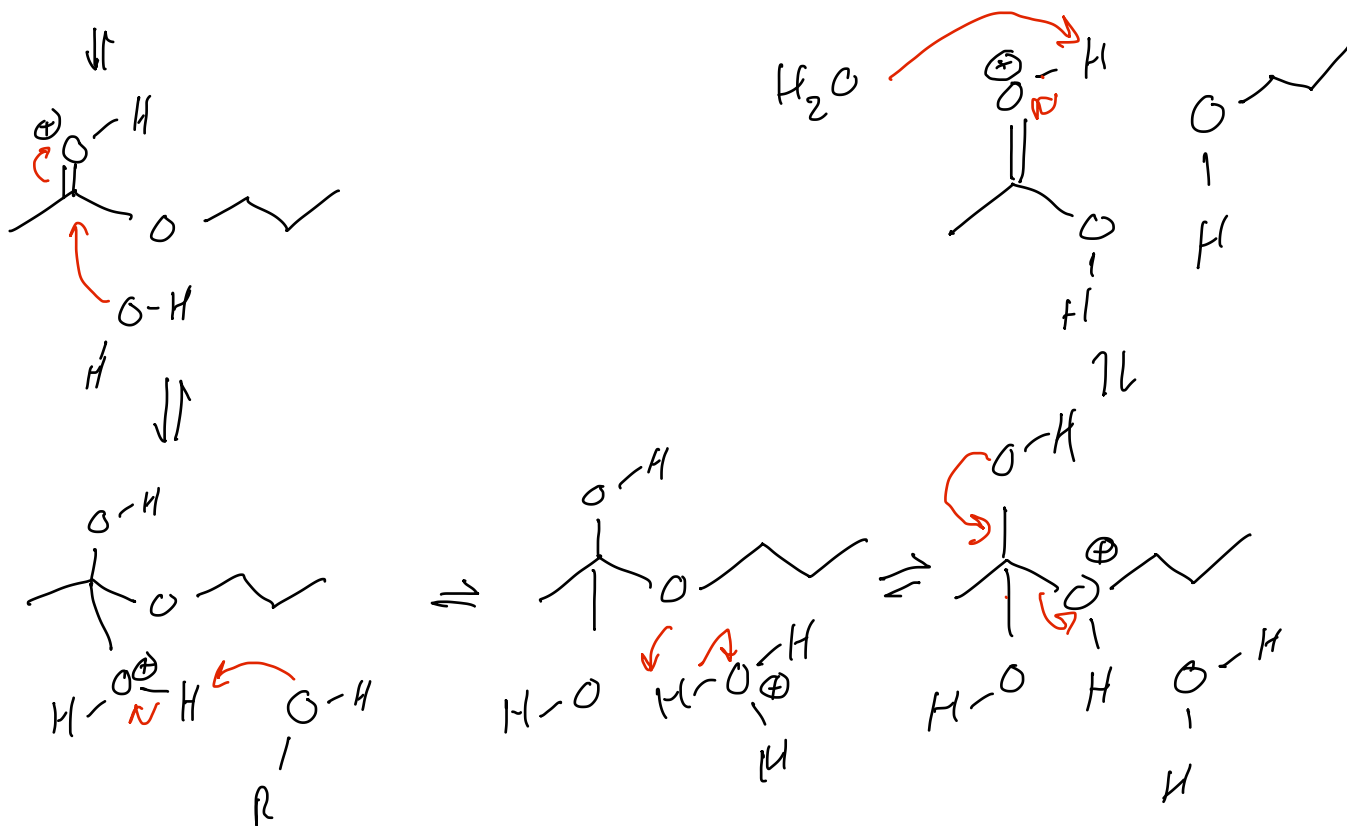
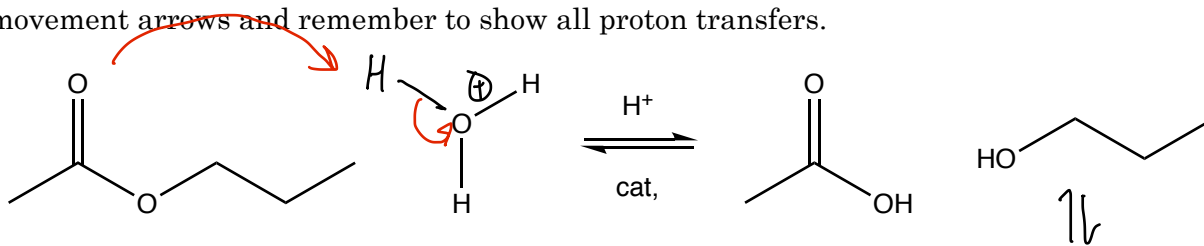
7. (12 pts.) Briefly explain why aminolysis of an ester cannot be catalyzed by the addition of acid.



8. (12 pts.) Briefly explain why acid chlorides are more reactive toward nucleophilic acyl substitution reaction than amides.



9. (12 pts.) Draw the mechanism for the hydrolysis of the following ester. Include electron movement arrows and remember to show all proton transfers.



1	H 1.0079																	2	He 4.0026		
3	4	Li 6.941	Be 9.012																	10	Ne 20.1797
11	12	Na 22.989	Mg 24.305																	18	Ar 39.948
19	20	K 39	Ca 40	Sc 21	Ti 22	V 23	Cr 24	Mn 25	Fe 26	Co 27	Ni 28	Cu 29	Zn 30	Ga 31	Ge 32	As 33	Se 34	Br 35	Kr 36		
37	38	Cs 56	Sr 57	Y 39	Zr 40	Nb 41	Mo 42	Tc 43	Ru 44	Rh 45	Pd 46	Ag 47	Cd 48	In 49	Sn 50	Sb 51	Te 52	I 53	Xe 54		
55	56	Rb 85	Ba 86	La 57	Hf 72	Ta 73	W 74	Re 75	Os 76	Ir 77	Pt 78	Au 79	Hg 80	Tl 81	Pb 82	Bi 83	Po 84	At 85	Rn 86		
87	88	Fr 87	Ra 88	Ac 89	Rf 104	Db 105	Sg 106	Bh 107	Hs 108	Mt 109	110	111	112	114	116					118	

58	Ce 58	Pr 59	Nd 60	Pm 61	Sm 62	Eu 63	Gd 64	Tb 65	Dy 66	Ho 67	Er 68	Tm 69	Yb 70	Lu 71
90	Th 90	Pa 91	U 92	Np 93	Pu 94	Am 95	Cm 96	Bk 97	Cf 98	Es 99	Fm 100	Md 101	No 102	Lr 103