

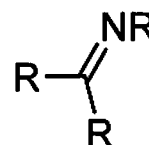
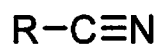
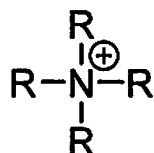
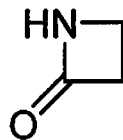
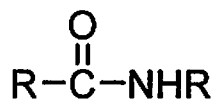
NAME: _____

If you do **not** wish to have your graded exam script placed outside my office, then please check this box

1-10) are True or False (10pts)

- 1) Carboxylic acid derivatives are defined as compounds that can be hydrolyzed to produce amines.
- 2) Oxidative cleavage of hex-3-yne produces two molecules of ethanoic acid.
- 3) K_a for Benzoic acid is around 6×10^5 .
- 4) Carboxylic acids can be reduced to primary alcohols by NH_3 .
- 5) Anhydrides are more reactive than Esters in nucleophilic acyl substitution reactions.
- 6) Ionic species are typically soluble in aqueous solvents.
- 7) Exothermic steps have "late" transition states.
- 8) Trichloroethanoic acid is a better proton donor than ethanoic acid.
- 9) *Trans-esterification* is a reaction where one *ester* is transformed into another *ester*.
- 10) Nitriles can be hydrolyzed to amides.

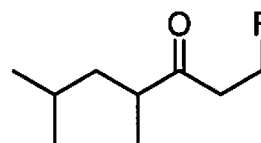
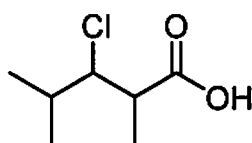
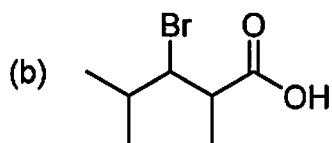
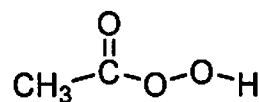
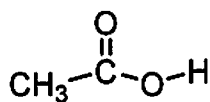
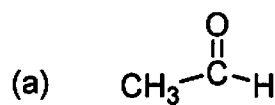
11) (6+1+1=8pts) i) Name the general class of organic compounds (functional group) that each of these species belongs to.



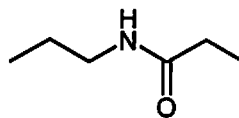
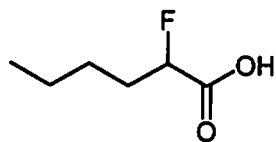
ii) Circle the *most basic* of the species.

iii) Underline the *least basic* of these species.

12) Circle the most acidic species in each threesome. (2+2=4pts)



13) (2+3=5pts) Name the following compounds in IUPAC acceptable terms.

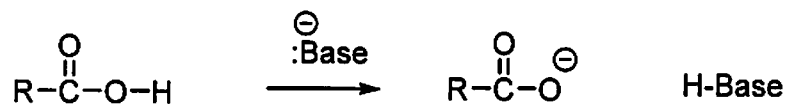


14) Draw the following molecules in line angle (stick figure) form.
(3+3=6pts)

a) *2-Bromo-3-hydroxybutanoic acid lactone.*

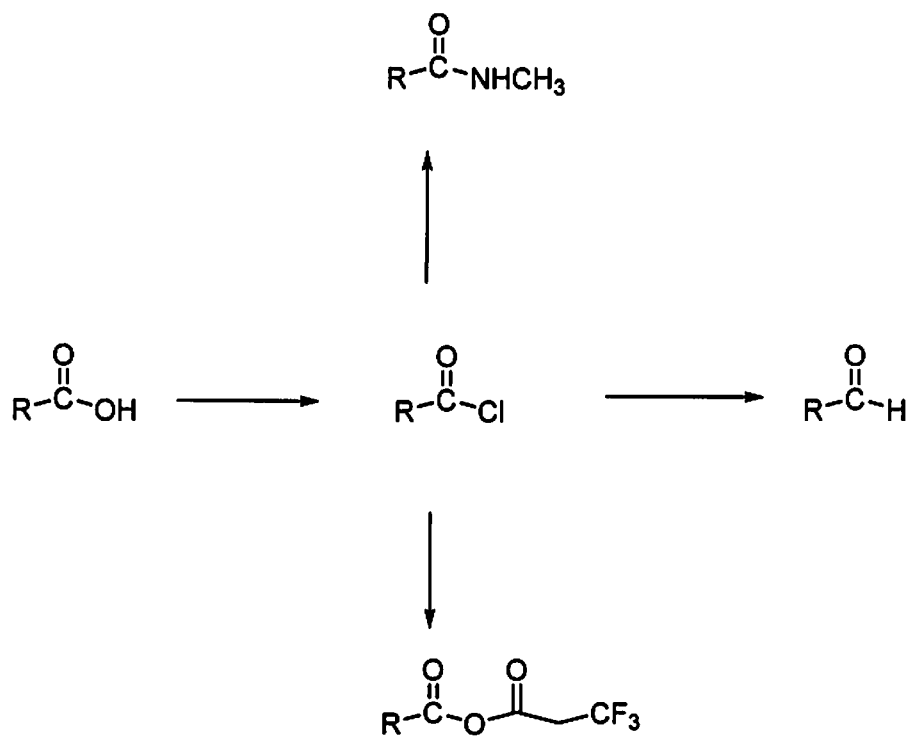
b) *3-Chloropentanoyl fluoride.*

15) Show the movement of electrons for this deprotonation. (2pts)

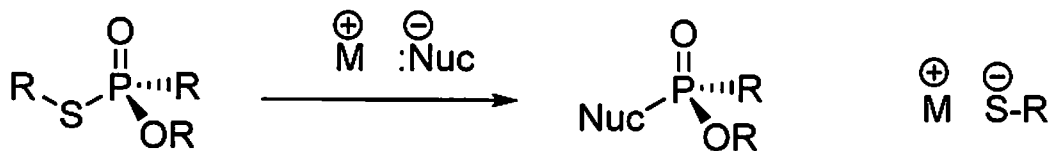


16) Show the movement of electrons that converts the carboxylate anion (RCO_2^-) from one resonance form into its other. (2pts)

17) Fill in all the missing reagents. (8pts)



18) (1+4=5pts) Recently a former Russian double agent and his daughter living in the UK were poisoned using a “Novichok” nerve agent. These deadly chemical weapons have the basic structure as shown below.



Chemical weapons like **Sarin** or **VX**.

i) What is the weakest covalent bond in these type of molecules?

ii) By applying what you know about the *nucleophilic acyl substitution* mechanism, write a mechanism showing how these nerve agents react with nucleophiles.

****Bonus Question** up to 2 points.**

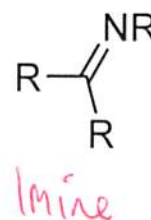
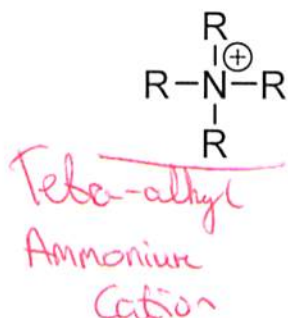
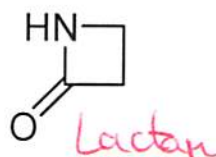
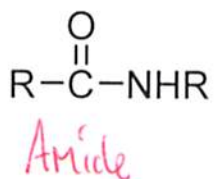
Why are *anhydrides* called anhydrides?

NAME: ALWAYS RUSSIAN THINGSIf you do **not** wish to have your graded exam script placed outside my office, then please check this box

1-10) are True or False (10pts)

- 1) Carboxylic acid derivatives are defined as compounds that can be hydrolyzed to produce amines. *false*
- 2) Oxidative cleavage of hex-3-yne produces two molecules of ethanoic acid. *false*
- 3) K_a for Benzoic acid is around 6×10^5 . *false*
- 4) Carboxylic acids can be reduced to primary alcohols by NH_3 . *false*
- 5) Anhydrides are more reactive than Esters in nucleophilic acyl substitution reactions. *T*
- 6) Ionic species are typically soluble in aqueous solvents. *T*
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- 8) Trichloroethanoic acid is a better proton donor than ethanoic acid. *T*
- 9) *Trans-esterification* is a reaction where one *ester* is transformed into another *ester*. *T*
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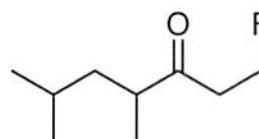
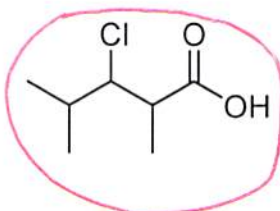
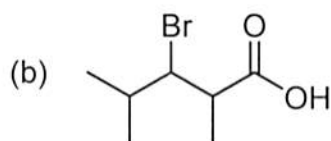
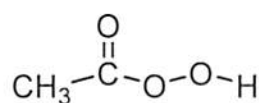
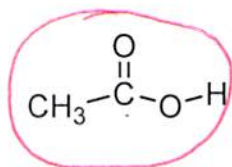
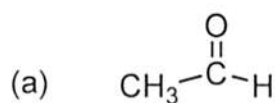
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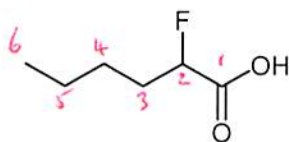
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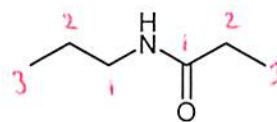
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2-FLUOROHEXANOIC
ACID



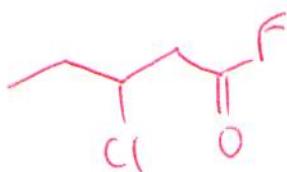
N-Propylpropanamide

14) Draw the following molecules in line angle (stick figure) form.
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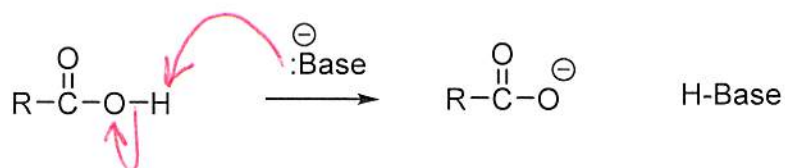
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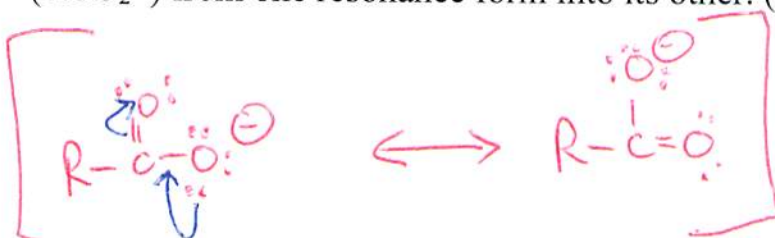
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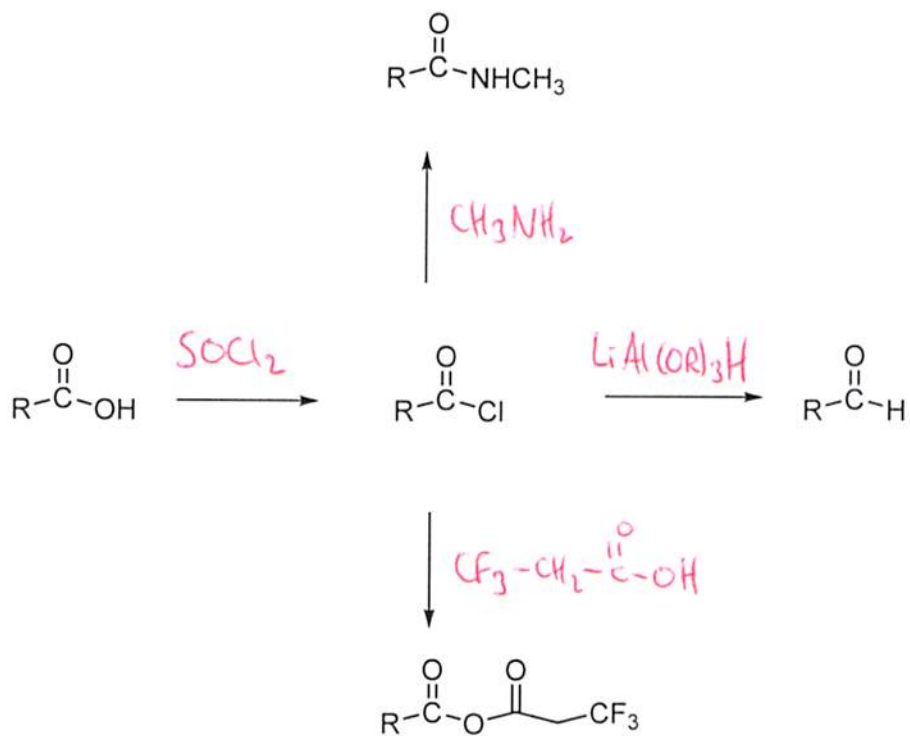
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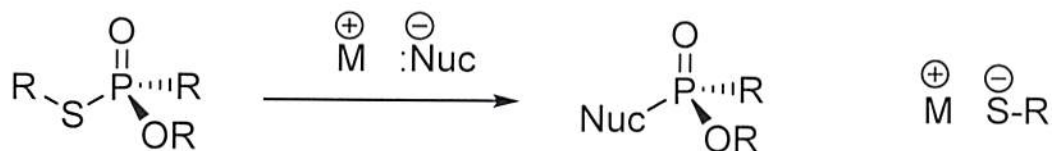
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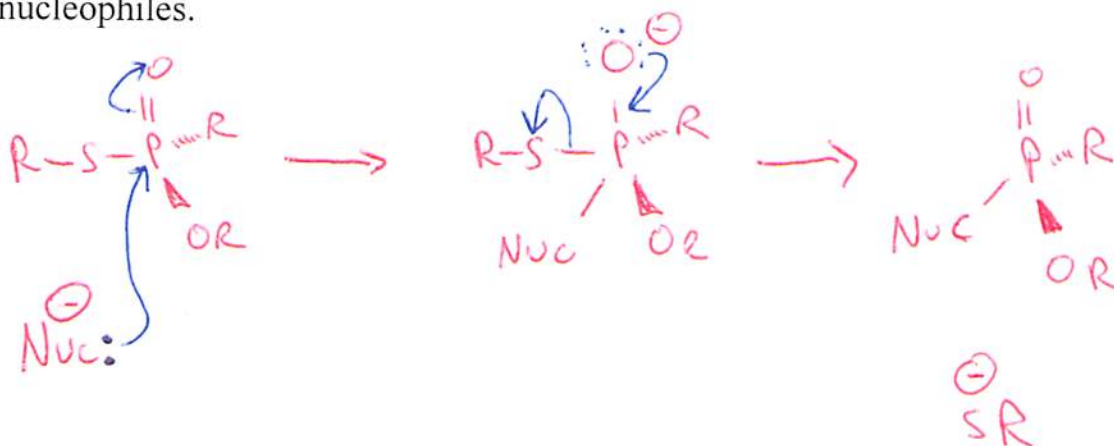


Chemical weapons like **Sarin** or **VX**.

i) What is the weakest covalent bond in these type of molecules?

The P-O π bond

ii) By applying what you know about the *nucleophilic acyl substitution* mechanism, write a mechanism showing how these nerve agents react with nucleophiles.



****Bonus Question** up to 2 points.**

Why are *anhydrides* called anhydrides?

Anhydride are produced from the formal DEHYDRATION (removal of water) of two carboxylic acid groups.

