Organic Chemistry. Christmas present 2012

Problem 1.
Draw structures corresponding to the following names:

a) 3-Aminopentanoic acid
b) N-methylaniline
c) Butyl propanoate
d) cis-4-methyl-2-pentene
e) p-Bromoiodobenzene
f) Z-2-bromo-2-butenoic acid

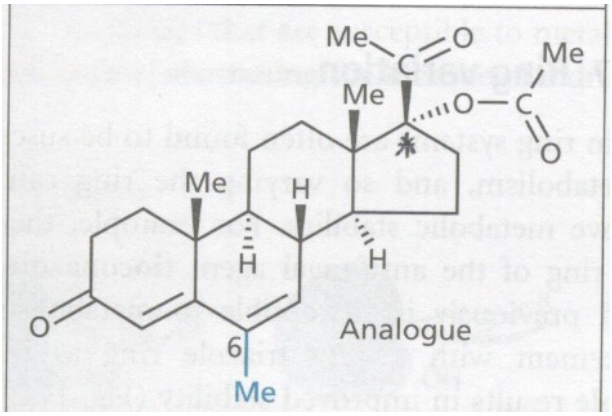
Problem 2.

a) Burning a small amount of the compound on a clean copper wire gave rise to a green flame
b) After treatment with sodium, destruction in water and filtration lead acetate was added to 1 ml of the solution, the 1 ml solution was acidified with sodium acetate and a brown precipitate appeared. What was detected?
c) The remaining part of the original filtrate is acidified and the volume is reduced to half by heating. Water is then added to restore the volume. 1 ml is acidified. Silver nitrate is added. A white precipitate was observed.
d) Addition of 2,4-dinitrophenyl hydrazine to a solution of the compound gave rise to a yellow precipitate.
e) Upon addition of bromine to a solution of the compound the bromine colour disappeared

f) Explain the observations made so far and tell which functional groups are present.
g) The molecular mass is 150.5. Suggest a structure for the molecule (many different isomers are possible).

Problem 3.

a) Identify with name the functional groups of the following molecule and the type (primary, secondary, tertiary or quaternary when appropriate)



b) Identify the centres of chirality if any are present
c) How many stereoisomers are possible?

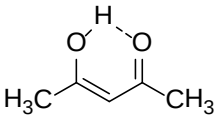
d) Give the priorities of substituents around the carbon marked with the asterisk. Explain your choices.

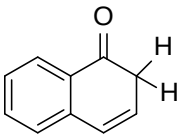
e)

Problem 4.

Generate structures based on the formula $C_4H_9NO_2$.
The following functional groups should be present: amides, esters, amines, amino acids and nitro compounds. Cis and trans structures, E- and Z structures. Cyclic and linear compounds.

Problem 5.
Write the tautomeric structures of

a) 

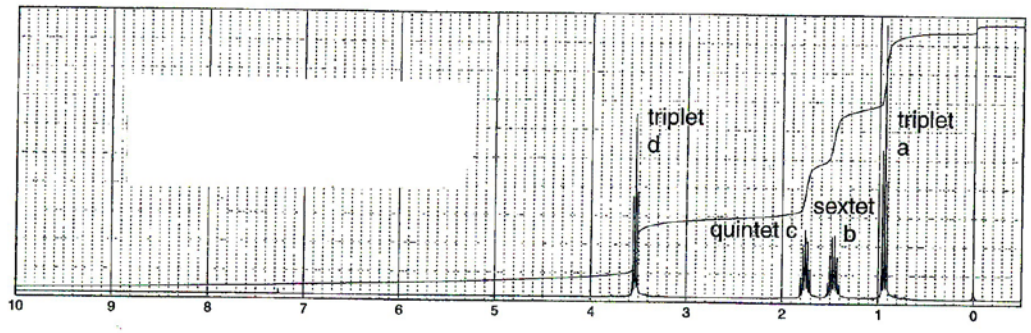
b) 

Problem 6.
What are the compounds after reduction of :

a) $CH_3CH_2S\text{-}S\text{-}CH_2CH_3$
b) $CH_3CH_2C{=}OH$
c) $CH_3CH_2C{=}ONH_2$

Problem 7.
Give structures corresponding to the following NMR spectra. The compound in spectrum **a** contains a halogen.

a.



The compound in spectrum **b** is an ester with the formula $C_6H_{12}O_2$

b.