Series N° 1

Exercise 01

The electron configuration of a carbon atom is $1s^2\ 2s^2\ 2p^2$, and that of a sodium cation (Na^+) is $1s^2\ 2s^2\ 2p^6$. Show the electron configuration for

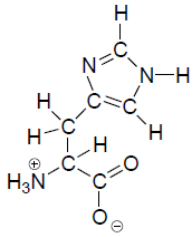
a) a nitrogen atom
b) an oxygen atom
c) a fluorine atom
d) a magnesium atom
e) a magnesium cation (Mg^{2+})
f) a potassium atom
g) a potassium ion (K^+)
h) a chloride anion (Cl^-)
i) a sulfur atom
j) a lithium cation (Li^+)
k) a calcium cation (Ca^{2+})

Exercise 02

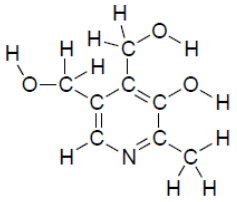
a) Write the condensed structural formula of the following compounds:

- (Z)-hex-2-ene
- 2-methylpent-2-ene
- (E)-4-methylpent-2-ene
- 2,3-dimethylbut-2-ene

b) Draw line structures for histidine (an amino acid) and pyridoxine (Vitamin B_6).

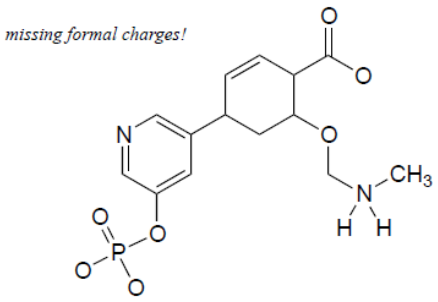


histidine



pyridoxine
(Vitamin B_6)

c) Add lone pair electrons and non-zero formal charges to the structural drawing below:

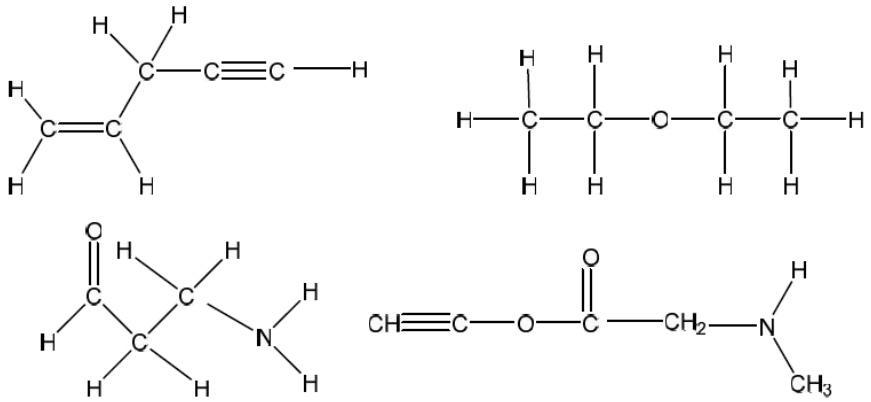


d) Determine the Hybridization around all atoms. Note that you'll need a correct Lewis structure to determine this.

CO, HCN, CH_3NH_2, CH_2NH,

e) Write the state of hybridization of carbon in the following compounds and shapes of each of the molecules.

(a) $H_2C=0$ (b) CH_3F (c) $HC\equiv N$



Exercise 03

1. Draw a constitutional isomer of ethanol, CH_3CH_2OH.
2. : Draw all of the possible constitutional isomers with the given molecular formula.

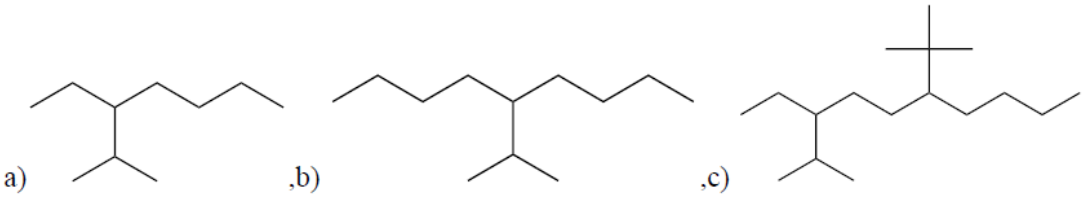
a) C_5H_{12}

b) C_4H_{10}

c) C_3H_9N

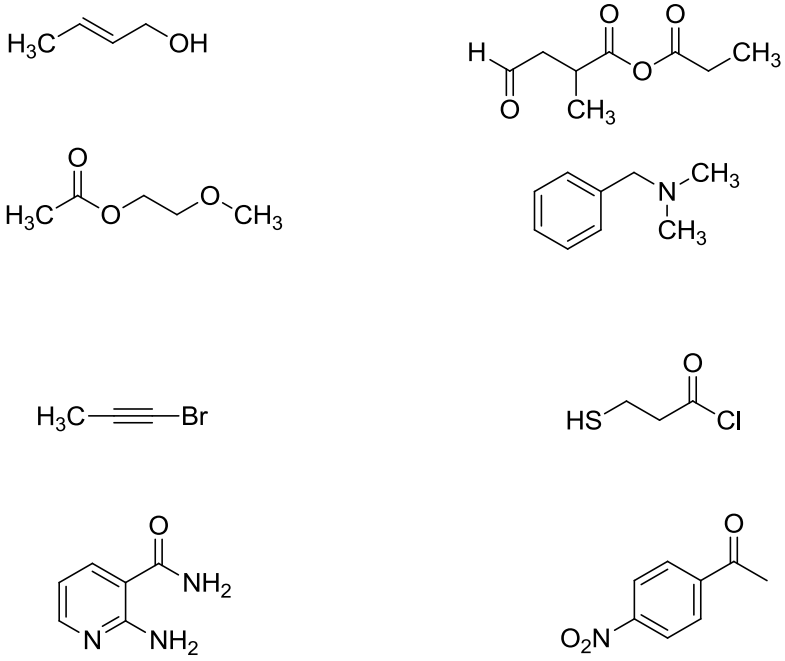
Exercise 04

Name the following molecule:



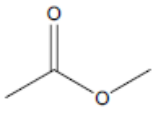
Exercise 05

Encircle and name the functional groups present in the following compounds:

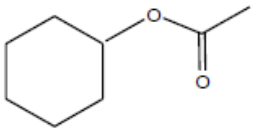


Exercise 06

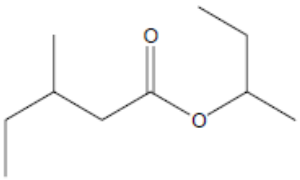
a) Reproduce and name the following molecules, then do the verification



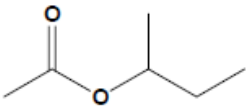
1.



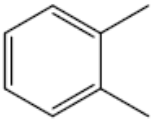
2.



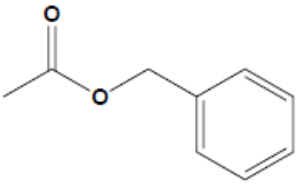
3.



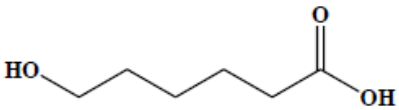
4.



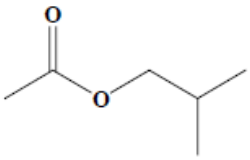
5.



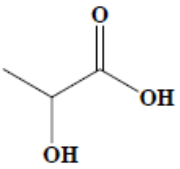
6.



7.

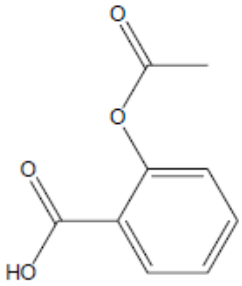


8.

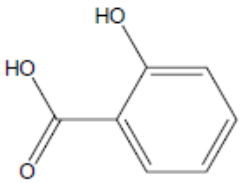


9.

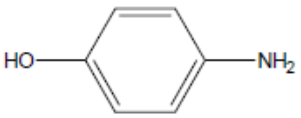
b) Aromatic compounds :



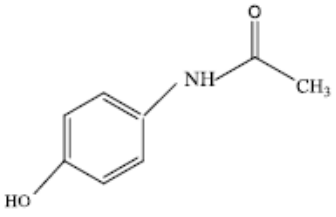
10.



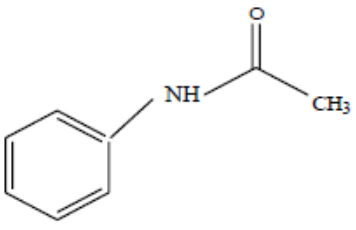
11.



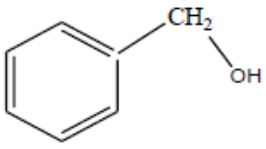
12.



13.



14.



15.

c) Write the condensed structural formula of the following compounds:

16. 2-aminobutanoic acid

17.Ethanoic anhydride

18.Glycerol (trialcohol)

19. Dimethylethanamine

20.N-ethyl-N-methylethanamine

21. 3-methylbutan-2-amine

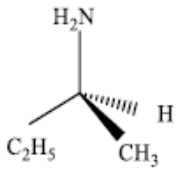
22.Phenylethanoate

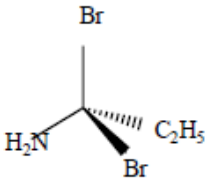
23.(R)2-(methylperoxy)butan-2-ol

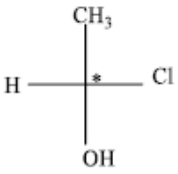
24.Propionamide

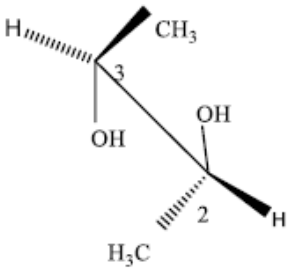
Exercise 07

1. Are the following molecules chiral and determine the absolute R\S configuration of the C*(s)? to justify









Exercise 08

Give the limiting forms of the following molecules and ions:

-Fluorobenzene, 4-nitrophenol, benzoic acid N,N-dimethylethenamine.

Exercise 09

We consider the addition reaction of alkene (A) with hydrogen bromide (HBr).

$$Br\text{-}CH{=}C(CH_3)_2\ (A)$$

1. Provide the products obtained.
2. Detail the reaction mechanism.
3. Is this reaction regioselective?

Exercise 10

Diethyl ether (A) is synthesized from ethanol in the presence of sulfuric acid.

1. Propose the synthesis of compound A via an SN1 mechanism.
2. Propose the synthesis of compound A via an SN2 mechanism.