

## Series N° 1

### Exercise 1

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

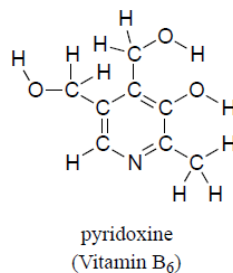
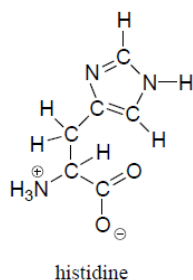
- |  |                                       |
|--|---------------------------------------|
| a) a nitrogen atom                         | b) an oxygen atom                     |
| c) a fluorine atom                         | d) a magnesium atom                   |
| e) a magnesium cation ( $\text{Mg}^{2+}$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

### Exercise 2

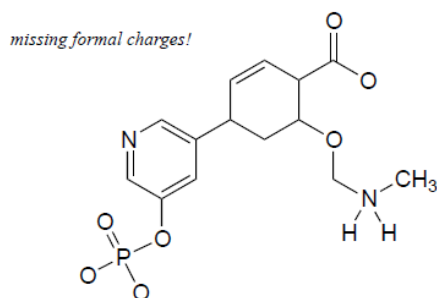
a) Write the condensed structural formula of the following compounds:

- (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<sub>6</sub>).



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.

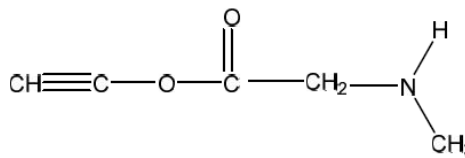
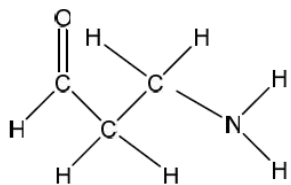
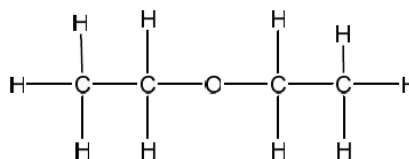
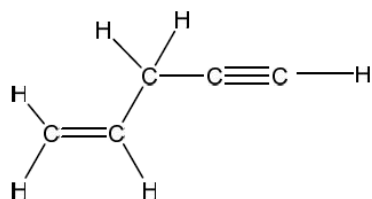
CO, HCN, CH<sub>3</sub>NH<sub>2</sub>, CH<sub>2</sub>NH,

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

(a) H<sub>2</sub>C=O

(b) CH<sub>3</sub>F

(c) HC≡N



### Exercise 3

1. Draw a constitutional isomer of ethanol, CH<sub>3</sub>CH<sub>2</sub>OH.
2. : Draw all of the possible constitutional isomers with the given molecular formula.

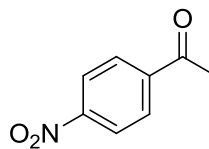
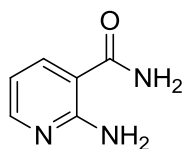
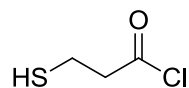
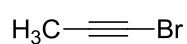
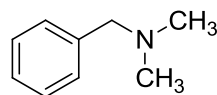
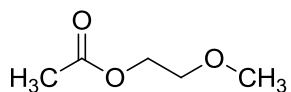
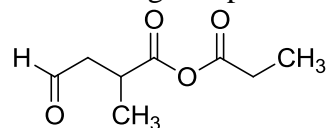
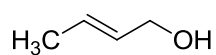
a) C<sub>5</sub>H<sub>12</sub>

b) C<sub>4</sub>H<sub>10</sub>

c) C<sub>3</sub>H<sub>9</sub>N

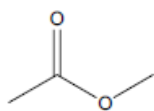
### Exercise 04

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

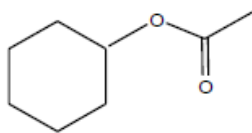


### Exercise 05

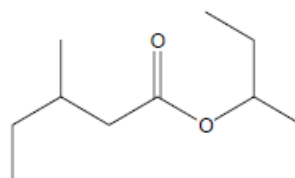
a) Reproduce and name the following molecules, then do the verification



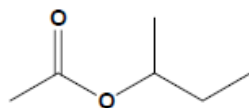
1.



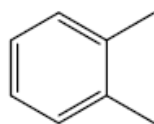
2.



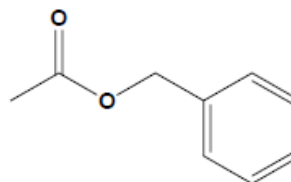
3.



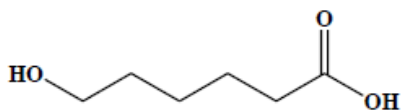
4.



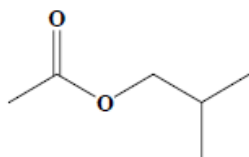
5.



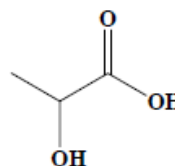
6.



7.

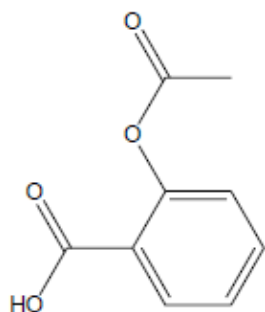


8.

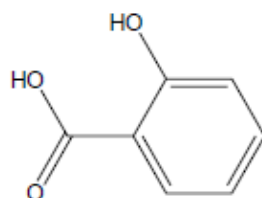


9.

b) Aromatic compounds :



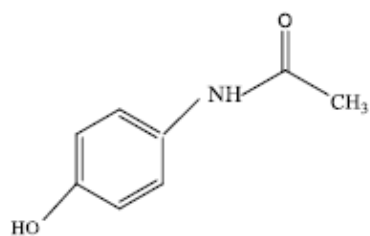
10.



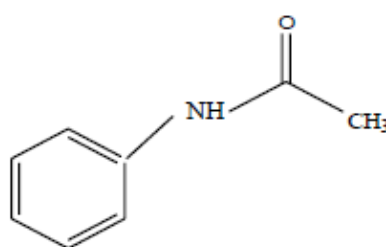
11.



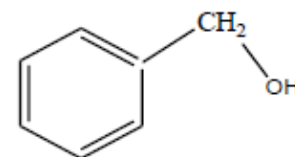
12.



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

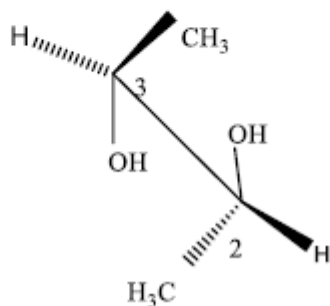
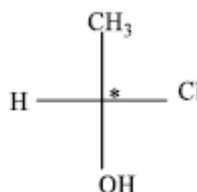
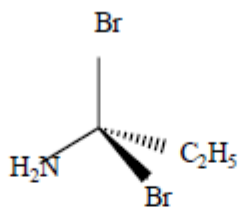
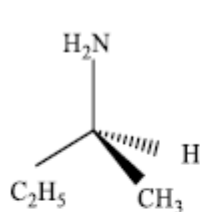
22. Phenylethanoate

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

24. Propionamide

### Exercise 06

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



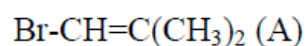
### Exercise 07

Give the limiting forms of the following molecules and ions:

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

### Exercise 08

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



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

**Exercise 09**

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.