

# Exercices Complémentaires

## Chapitre 3 : Relations d'isomérisation entre les molécules organiques

### 3.1 Exercice 3.1

Ecrire les formules semi-développées de tous les isomères correspondant aux formules brutes suivantes :

- a)  $C_3H_9N$
- b)  $C_3H_7N$
- c)  $C_3H_6O$
- d)  $C_3H_4$

**CORRECTION** Exo 3.1 (page 5)

### 3.2 Exercice 3.2

Ecrire les formules semi-développées des composés de formule brute  $C_4H_8O$ . Se limiter aux formules ayant des liaisons carbone-carbone simples.

**CORRECTION** Exo 3.2 (page 6)

### 3.3 Exercice 3.3

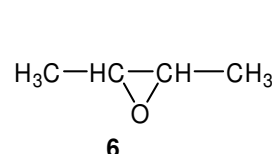
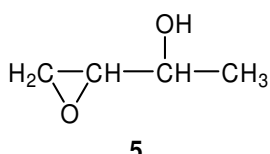
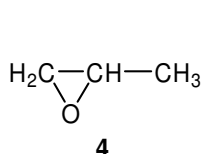
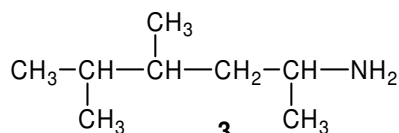
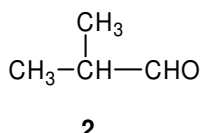
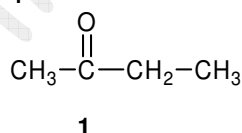
Ecrire les formules semi-développées de tous les isomères possibles des composés suivants :

- a)  $C_3H_6Br_2$
- b)  $C_3H_6BrCl$

**CORRECTION** Exo 3.3 (page 6)

### 3.4 Exercice 3.4

Parmi les molécules suivantes, quelles sont celles qui possèdent un ou plusieurs carbones asymétriques ?



**CORRECTION** Exo 3.4 (page 6)

### 3.5 Exercice 3.5

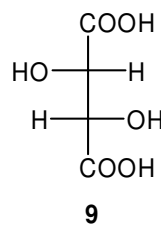
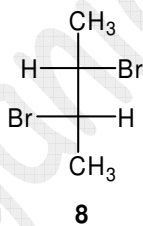
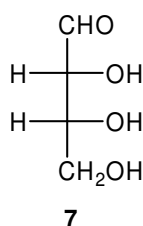
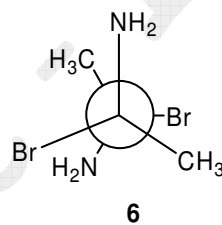
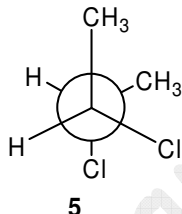
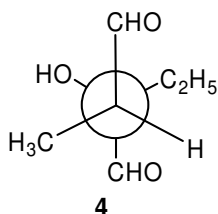
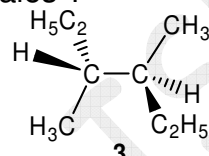
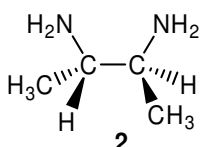
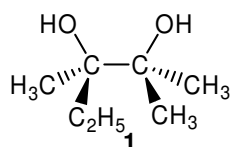
Selon la règle séquentielle de Cahn-Ingold-Prelog, quel est l'ordre de priorité des substituants suivants ? :

- |                     |                    |                                  |                     |
|---------------------|--------------------|----------------------------------|---------------------|
| a. -OH              | -OCH <sub>3</sub>  | -CH <sub>3</sub>                 | -CH <sub>2</sub> OH |
| b. -CN              | -NHCH <sub>3</sub> | -CH <sub>2</sub> NH <sub>2</sub> | -NH <sub>2</sub>    |
| c. -COOH            | -COCH <sub>3</sub> | -CHO                             | -CONH <sub>2</sub>  |
| d. -NH <sub>2</sub> | -SH                | -OCOCH <sub>3</sub>              | -CCl <sub>3</sub>   |

### CORRECTION Exo 3.5 (page 7)

### 3.6 Exercice 3.6

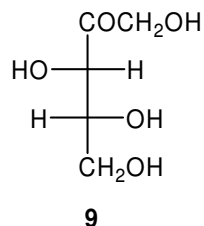
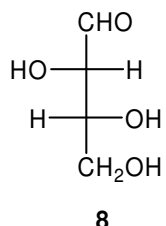
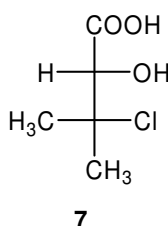
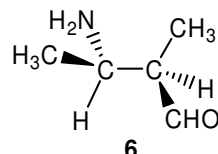
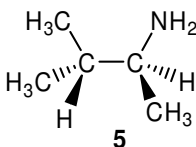
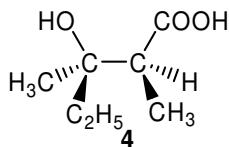
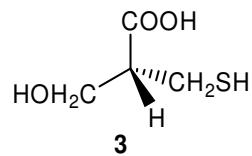
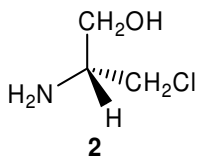
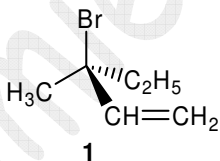
Parmi les molécules suivantes, quelles sont celles qui sont chirales ?



### CORRECTION Exo 3.6 (page 7)

### 3.7 Exercice 3.7

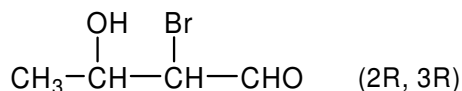
Déterminer la configuration absolue (R, S) des carbones asymétriques dans les molécules suivantes :



### CORRECTION Exo 3.7 (page 8)

### 3.8 Exercice 3.8

Représenter la molécule suivante :

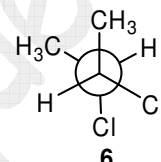
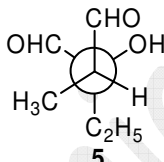
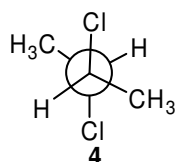
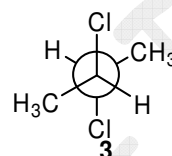
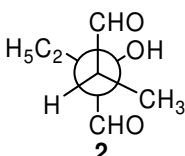
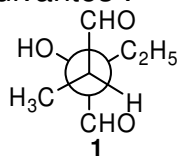


- Selon Fischer
- Selon Cram
- Selon Newman (axe C2-C3) avec les groupements CH<sub>3</sub> et CHO en ANTI.

### CORRECTION Exo 3.8 (page 8)

### 3.9 Exercice 3.9

Parmi les molécules suivantes :

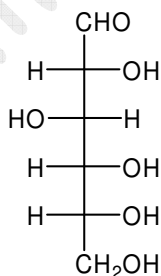


- Quelles sont celles qui sont énantiomères
- Quelles sont celles qui sont diastéréoisomères
- Quelles sont celles qui sont isomères de conformation
- Quelles sont celles qui sont méso
- Quelles sont celles qui sont chirales

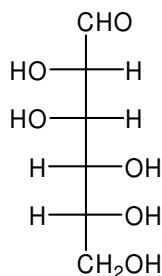
### CORRECTION Exo 3.9 (page 9)

### 3.10 Exercice 3.10

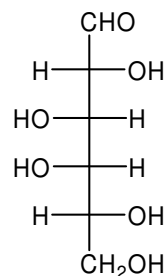
Soit les sucres en C4 suivants. Donner la configuration absolue de chaque carbone asymétrique. Ces trois composés sont-ils énantiomères ou diastéréoisomères ?



D - (+) - Glucose



D - (+) - Mannose



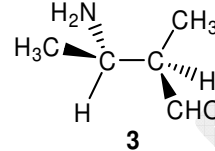
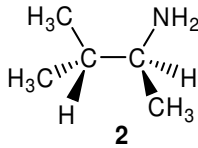
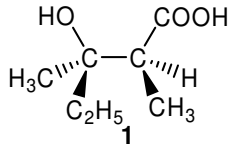
D - (+) - Galactose

### CORRECTION Exo 3.10 (page 9)

### 3.11 Exercice 3.11

Représenter les molécules suivantes selon Newman (axe C2-C3) en respectant les indications de conformation suivantes :

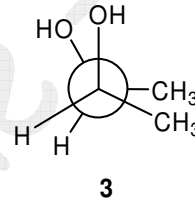
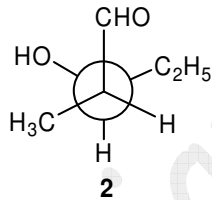
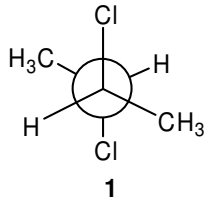
- Molécule **1** : groupements OH et COOH en ANTI ;
- Molécule **2** : groupements NH<sub>2</sub> et CH<sub>3</sub> en position gauche ;
- Molécule **3** : groupements NH<sub>2</sub> et CHO en ANTI.



### CORRECTION Exo 3.11 (page 9)

### 3.12 Exercice 3.12

Soit les molécules suivantes :



Déterminer les positions relatives :

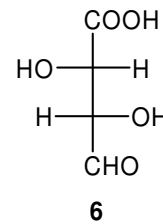
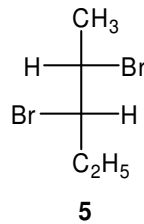
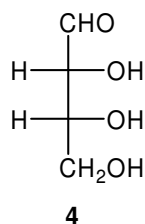
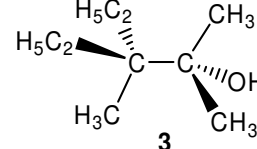
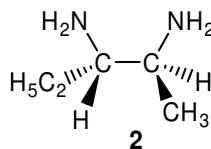
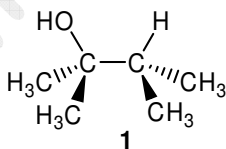
- des atomes de chlore dans la molécule **1** ;
- des groupements CHO et OH dans la molécule **2** ;
- des groupements OH dans la molécule **3**.

### CORRECTION Exo 3.12 (page 9)

### 3.13 Exercice 3.13

Représenter selon Newman (axe C2-C3) :

- les groupements OH et H de la molécule **1** en position GAUCHE ;
- les 2 groupements NH<sub>2</sub> de la molécule **2** en position GAUCHE ;
- les groupements OH et CH<sub>3</sub> de la molécule **3** en position SYN ;
- les groupements CHO et CH<sub>2</sub>OH de la molécule **4** en position ANTI ;
- les groupements CH<sub>3</sub> et C<sub>2</sub>H<sub>5</sub> de la molécule **5** en position SYN ;
- les groupements OH et CHO de la molécule **6** en position GAUCHE ;



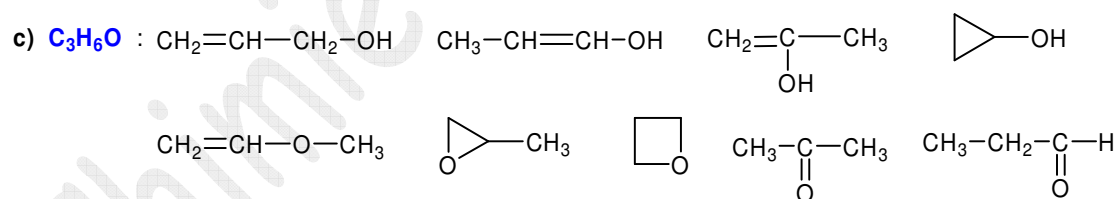
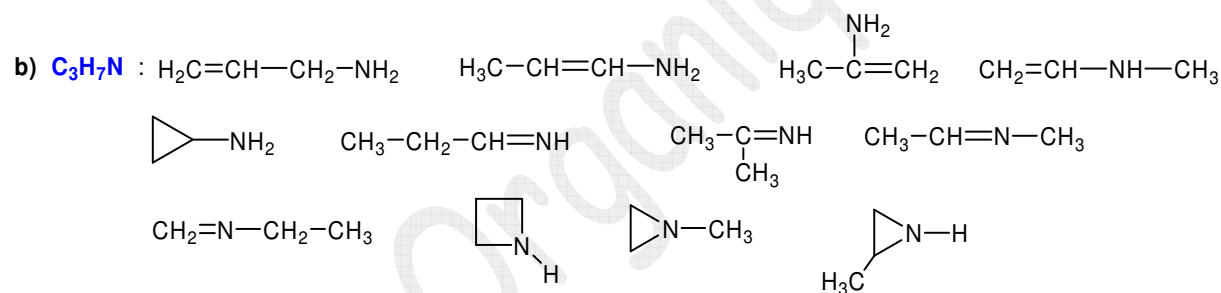
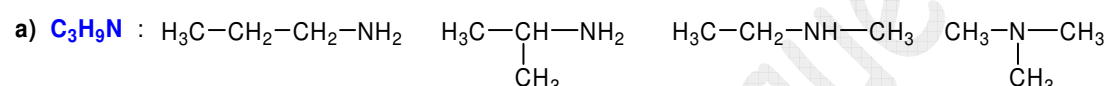
### CORRECTION Exo 3.13 (page 10)

# Correction des exercices complémentaires

## Chapitre 3: Relations d'isomérisation entre les molécules organiques

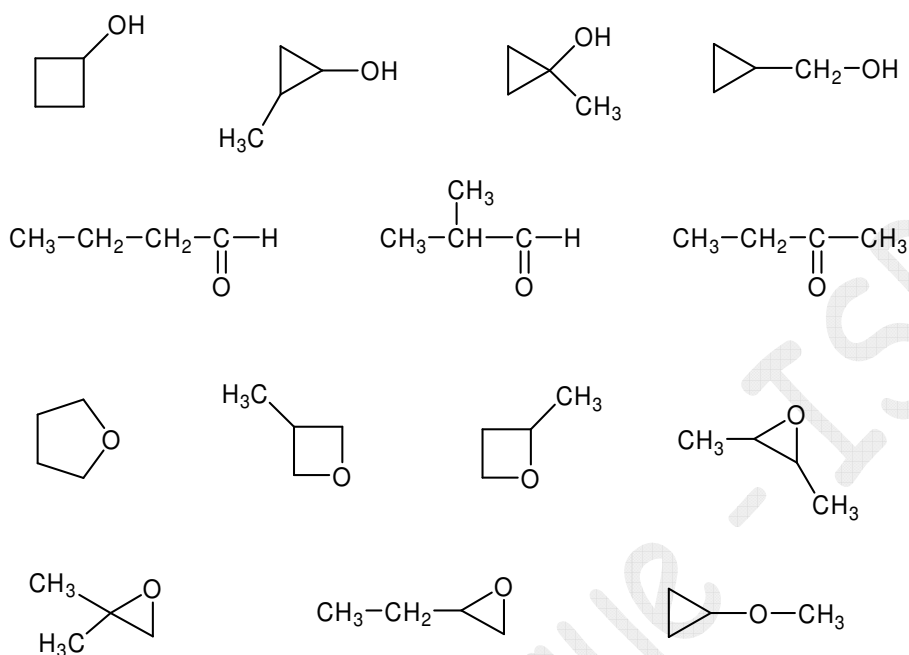
### 3.1 Exercice 3.1

Les formules semi-développées de tous les isomères :



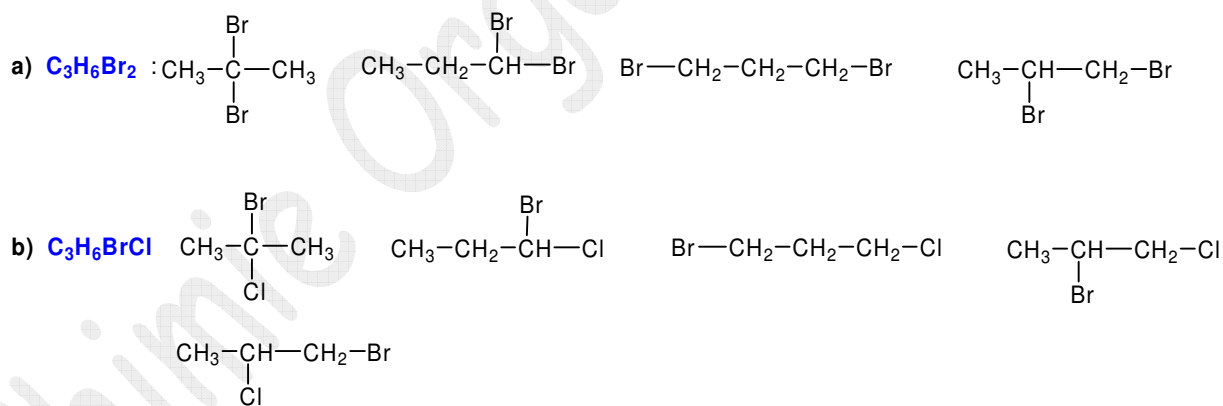
### 3.2 Exercice 3.2

Les formules semi-développées des composés de formule brute  $C_4H_8O$ , se limitant aux formules ayant des liaisons carbone-carbone simples.



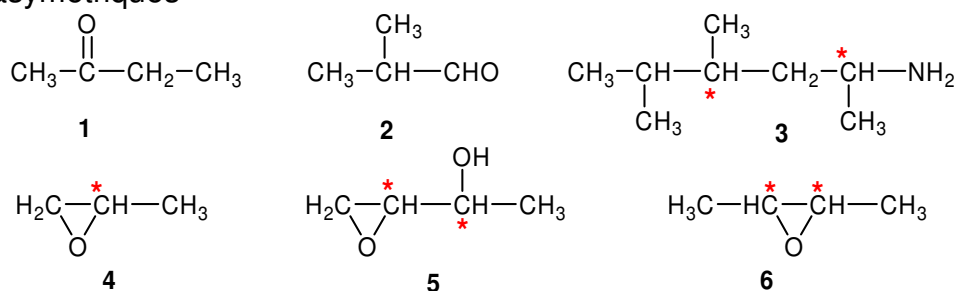
### 3.3 Exercice 3.3

Les formules semi-développées de tous les isomères :



### 3.4 Exercice 3.4

\* : carbones asymétriques



### 3.5 Exercice 3.5

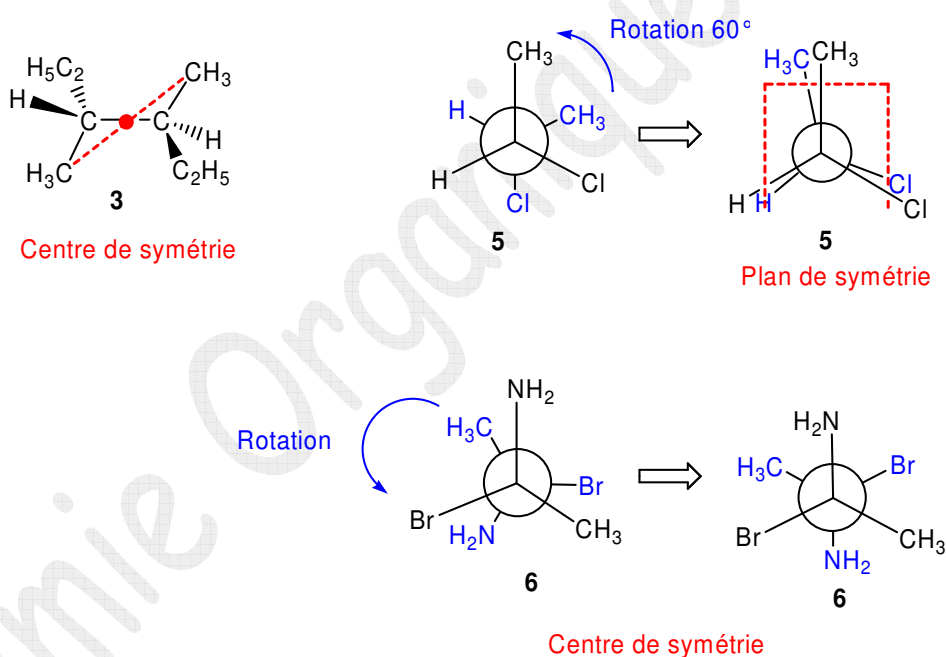
Ordre de priorité selon les règles de Cahn-Ingold-Prelog.

- a)  $-\text{OCH}_3$   $-\text{OH}$   $-\text{CH}_2\text{OH}$   $-\text{CH}_3$
- b)  $-\text{NHCH}_3$   $-\text{NH}_2$   $-\text{CN}$   $-\text{CH}_2\text{NH}_2$
- c)  $-\text{COOH}$   $-\text{CONH}_2$   $-\text{COCH}_3$   $-\text{CHO}$
- d)  $-\text{SH}$   $-\text{OCOCH}_3$   $-\text{NH}_2$   $-\text{CCl}_3$

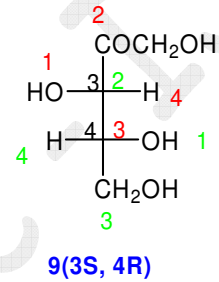
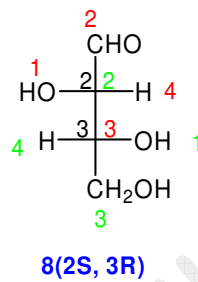
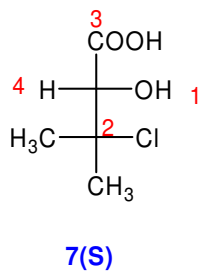
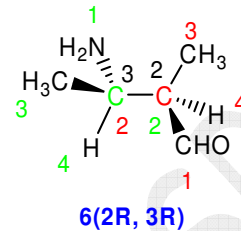
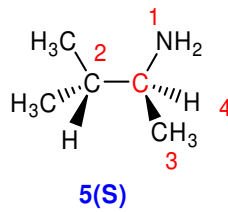
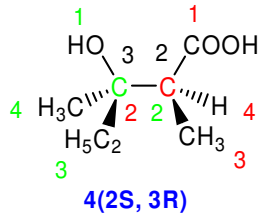
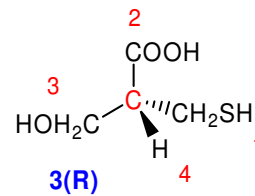
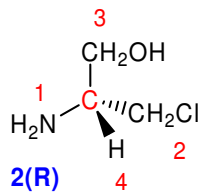
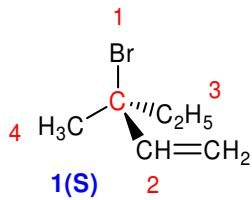
### 3.6 Exercice 3.6

1 (1 C\*)    2 (2 C\*)    4 (2 C\*)    7 (2 C\*)    8 (2 C\*)    9 (2 C\*)

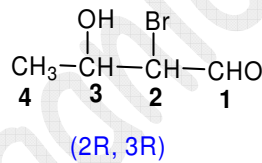
**Attention** : 3, 5 et 6 ne sont pas chirales malgré la présence de 2 carbones asymétriques. Ce sont des composés **méso**.



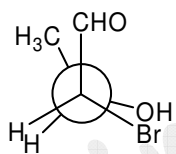
### 3.7 Exercice 3.7



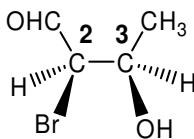
### 3.8 Exercice 3.8



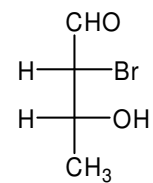
Cram



Vue en face de C2



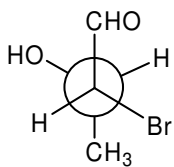
⇒  
Vue "par dessous"



Fischer

Chaîne principale horizontale (à l'arrière)  
Groupements verticaux à l'avant

⇓  
Rotation de 180° de C3



Newman(C2-C3)  
Conformation où CH<sub>3</sub> et CHO sont en ANTI

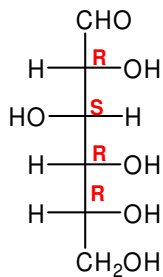


### 3.9 Exercice 3.9

- a) énantiomères : (1 et 2) ; (2 et 5)
- b) diastéréoisomères : (3 et 6) ; (4 et 6)
- c) isomères de conformation : (1 et 5)
- d) méso : 3, 4
- e) chirales : 1, 2, 5, 6

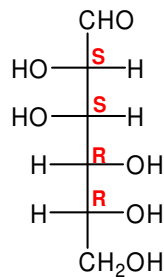
### 3.10 Exercice 3.10

Configuration absolue et relation d'isomérisie :



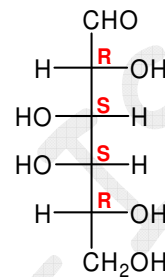
(+) - Glucose

1



(+) - Mannose

2

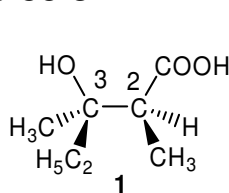


(+) - Galactose

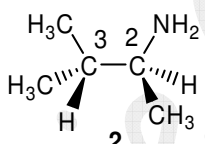
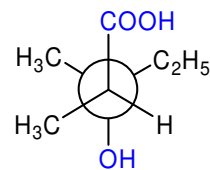
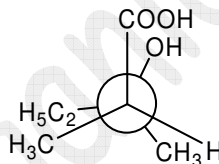
3

Les molécules 1, 2 et 3 sont diastéréoisomères.

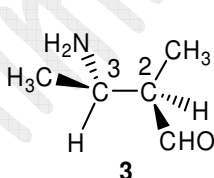
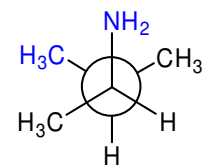
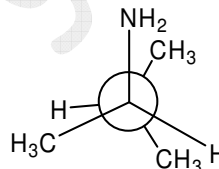
### 3.11 Exercice 3.11



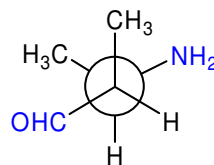
1



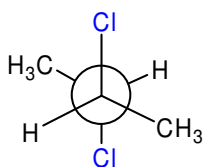
2



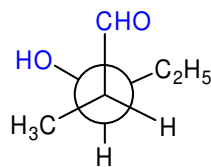
3



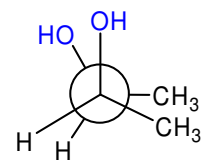
### 3.12 Exercice 3.12



1 : les 2 Cl en ANTI  
(angle de 180°)



2 : OH et CHO en position gauche  
(angle de 60°)



3 : les 2 OH en SYN  
(angle de 0°)

### 3.13 Exercice 3.13

