CHIMIE ORGANIQUE

Stefan Matile (1-4, 10-13) – Sascha Hoogendoorn (5-9)
Sciences II, bureau 111/324
(SM 379 6519, SH 379 6085)

OBJECTIFS :

Introduction aux concepts fondamentaux de la chimie organique, aux classes de molécules organiques et leurs structures, propriétés physiques, et réactions

Donner une (brève) vision de la chimie organique moderne comme domaine centrale, créative et utile

ENSEIGNEMENT : cours ex cathedra
(13 x 2 h janvier - avril)
mediaserver (live streaming)
REPETITOIRES (en groupes, 9 x 2 h, super-important)
AUTO-APPRENTISSAGE

EVALUATION : Questionnaire à choix multiple

STRUCTURE et BIBLIOGRAPHIE :

1. J. McMurry, Chimie organique, les grands principes, Dunod, Paris
2000 (ISBN : 2 10 004183 5)
(2003, ISBN : 2 10 007343 5)
2007, ISBN : 2 10 050547 0

2. Notes des exemples dans le cours

3. A propos de… (pas contenu dans l'examen)

REPETITOIRES

ASSISTANTS

Arthur Gaucherand

Alenka Marsalek

Laurane Michel

Julia Moreno

Clement Narbonne

Raphaël Paquis

Saidbakhrom Saidjalolov

Nicolas Sellet

Semaine	Discussion
18	Exercice I
19	Exercice II
20	Exercice III
21	Exercice IV
22	Exercice V
23	Exercice VI
24	Exercice VII
25	Exercice VIII
25	**Répétition Générale** (Mardi 10H15-12H00)

Lundi - 13H15-15H00

Lundi, 9.2.26

Forum moodle

(https://moodle.unige.ch/)

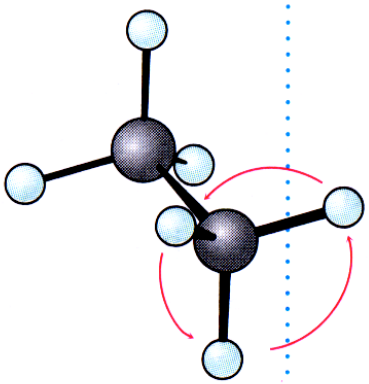
REPETITOIRE 9.2.26, 13H15

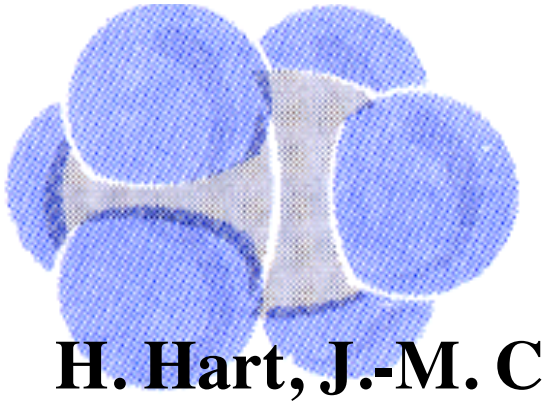
ASSISTANTS	FORMAT	SALLE
Laurane Michel	Débutant 1	SS 1-2
Arthur Gaucherand		
Julia Moreno	Débutant 2	SS 4-5
Raphaël Paquis		
Alenka Marsalek	Intermédiaire	Franceschetti
Clement Narbonne		
Saidbakhrom Saidjalolov	Avancé	SS 3
Nicolas Sellet		

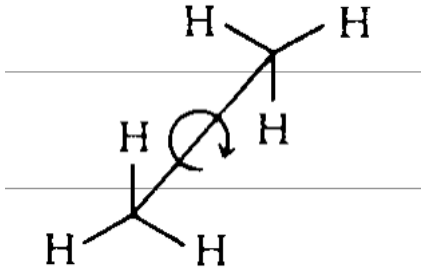
non pas enregistré

BIBLIOGRAPHIE :

McMurry







H. Hart, J.-M. Conia, Introduction à la chimie organique Masson, Paris, 1997 (ISBN : 2-7296-0668-8)

Le grand McMurry en anglais: https://openstax.org/details/books/organic-chemistry

Voir aussi :

J Clayden, N Greeves, S Warren, Chimie organique, De Boeck, Paris, Ed 2, 2013 (ISBN 978-2-8041-7441-5)

KPC Vollhardt, NE Schore, Traité de chimie organique, De Boeck, Paris, 1999 (ISBN : 2-8041-3153-X)

AW Johnson, Invitation à la chimie organique, De Boeck, Paris, 2003 (ISBN : 2-7445-0138-7)

McMurry :

Amazon.com, Dunod.com, librarie médicale

Internet Archive: https://archive.org/details/chimieorganiquel0000mcmu

Modèles :

http://www.maruzen.info/hgs/catalog/index.php #1003A, Organic Chemistry Basic Set, $28.00

http://sasm.fr/catalogue/modeles_squelettiques/modeles-moleculaires-squelettiques,C0150,.php, 29.05 €

CONTENU	McMurry
1. Généralités	(1, 2, 15)
2. Lipides - stéroïdes - alcanes - alcènes - arènes -	(2 - 5, 16)
3. Glucides - stéréochimie -	(6, 14)
4. Alcools - éthers – phénols - hydroquinones - thiols - disulfures	(8, 16)
5. Glucides - aldéhydes - cétones - imines -	(9, 14)
6. Protéines - lipides - acides - esters - amides -	(10, 11, 15, 16)
7. Acides nucléiques - amines -	(12, 16)

McMurry, Edition 2007

CHIMIE ORGANIQUE - CONTENU SPÉCIFIQUE

	A. COURS	B. AUTO-APPRENTISSAGE	C. Partie du livre à connaître (A+B)
1. Généralités *(1, 2, 15)*	2.6, 2.1, 1.3, (15.1), (15.3.1), (1.1), (1.2), (1.4), 1.6, (16.4)	1.1, 1.2, 1.4, 1.5, 2.6 ***Exercices I*** et 1.7,30,34; 2.15,16,34, 35,66; 15.8,17,18	**1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10**
2. Lipides – stéroïdes - alcanes - alcènes - arènes - *(2 - 5, 16)*	1.7, (2.2), (15.1), 2.5, (16.4), 2.7, 2.9, 2.8, 2.10, 2.11, 14.6, (16.5), 1.9, (15.9), (2.4), 1.8, 3.2, 3.3, 3.4, (16.2), 4.6, 4.9.1, 4.11, 5.2, (5.1), (15.5), (15.9)	2.2, 2.5, 2.9 ***Exercices II*** et 1.27,28,64; 2.5,8,23, 24,29,40,44,54,67,68,71; 3.8,19	**2.1, (2.2), (2.4), 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11** **3.2, 3.3, 3.4, (3.9), 3.10** **4.6, 4.9.1, 4.11** **(5.1), 5.2**
3. Glucides - stéréochimie - *(6, 14)*	(14.4), 14.2, 6.1, 6.2, 14.2, 14.3, (6.4), 6.6, (15.1), 6.7, 6.8, 6.11, 6.9, 14.3, 14.4, (15.9), (6.12)	***Exercices III*** et 6.3,18,22,23,24,46,58,59,60; 14.3,23,24,25,32,39,40; 15.2,19,26	**6.1, 6.2, (6.4), 6.6, 6.7, 6.8, 6.9, 6.11, (6.12)** **(7.4), (7.5), 7.10.1**
4. Alcools - éthers - phénols - thiols *(8, 15)*	1.9, 1.4, 8.2, 1.10, (8.3), (15.1), (15.2), 8.4.2, 8.4.3 8.5.2, 9.3.1, 14.7.3, (16.5), 8.6.4, (8.9), (15.5)	***Exercices IV*** et 8.6,41,42,54,62	**8.2, (8.3), 8.4.2, 8.4.3, 8.5.2, 8.6.4, (8.9)** **9.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10**
5. Glucides - aldéhydes - cétones - imines - *(9, 14)*	9.1, 9.5, 9.7, (3.9), (3.10), 14.4, 14.5, 14.6, 9.8, 9.9, 14.7.2, (14.8), (14.9), 9.9, 16.6, 10.6, (10.9), 9.6, (17.2.4), 9.10, 12.4.3, (17.5), (7.5.5),	***Exercices V, VI*** et 9.14,15,16,44,45; 12.11,12; 14.19,34,43,44,48**;** 17.8,9	**10.2, (10.3), (10.5), 10.6, (10.7), (10.8), (10.11), 10.12.1** **(11.1), 11.4, 11.8, 11.9, 11.10, 11.11** **12.2, 12.3, 12.4.2, 12.4.3, 12.6**
6. Protéines - lipides - acides - esters - amides - *(10, 11, 15, 16)*	10.2, 1.10, (10.3), (10.8), 10.6, (10.11), 16.3, (10.5), 10.12.1, (16.13), 15.10.1, (11.1), 16.5, 11.4, 11.8, 11.9, 11.10, 11.11, (17.4.2)	***Exercices VII, VIII*** et 10.5,20,21,28; 11.8,19,20,30,33,40,43	**14.2, 14.3, 14.4, 14.5, 14.6, 14.7.2/3, (14.8), (14.9), 14.10** **15.1, (15.2), 15.5, (15.9) 15.10.1** **(16.2), 16.3, (16.4), 16.5, 16.6, (16.7), (16.9), (16.13)**
7. Acides nucléiques - amines - *(12, 16)*	12.2, 12.3, 12.4.2, 8.8.2, (7.4), (7.5), 7.10.1, 12.6 (16.7), (16.9)	***Exercices VIII*** et 12.1,5,6,16,19,28,37	**(17.2.4), (17.4.2), (17.5)**

xx.x.y : seulement sujet y du chapitre xx.x
(xx.x) : seulement partie du chapitre xx.x

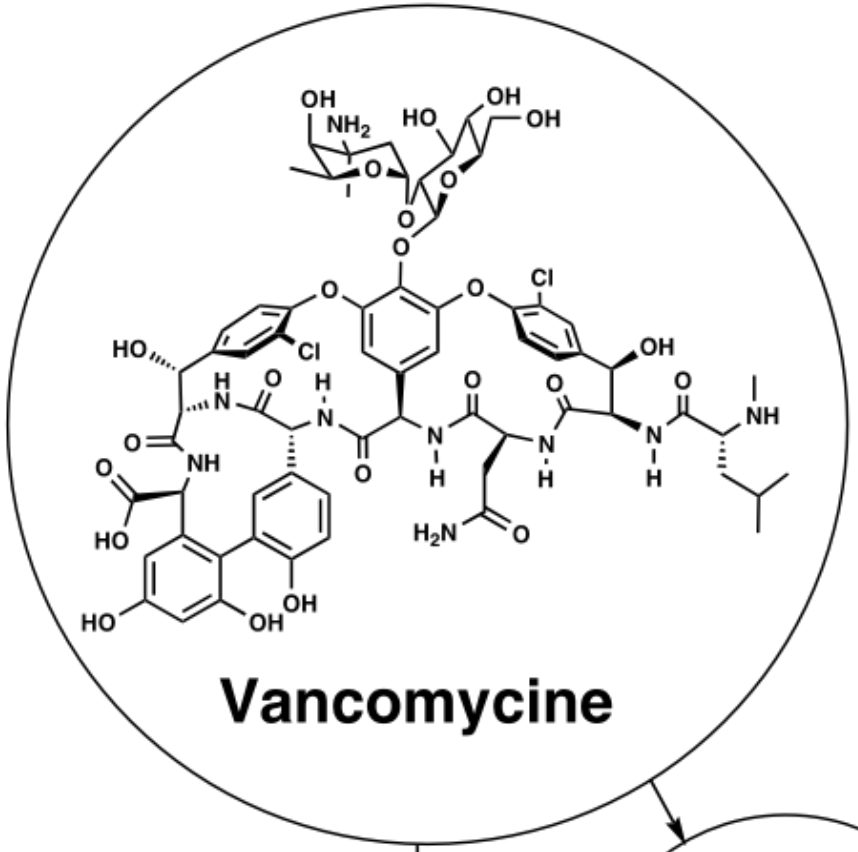
CHIMIE ORGANIQUE - CONTENU SPÉCIFIQUE

	A. COURS	B. AUTO-APPRENTISSAGE	C. Partie du livre à connaître (A+B)
1. Généralités *(1, 2, 15)*	2.6, 2.1, 1.3, (15.1), (15.4), (1.1), (1.2), (1.5), (16.4), 1.7	1.1, 1.2, 1.4, 1.5, 1.6, 2.6 ***Exercices I*** et 1.13,27,34; 2.14,15,27, 48,64; 15.9,52,53	**1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12**
2. Lipides – stéroïdes - alcanes - alcènes - arènes - *(2 - 5, 16)*	1.8, (2.2), (15.1), 2.5, (16.4), 2.7, 2.9, 2.8, 2.10, 2.11, 14.7, (16.5), 1.11, (15.10), (2.4), 1.8, 1.9, 1.10, (4.13), 3.2, 3.3, 3.4, (16.2), 4.6, 4.10.1, 4.12, 5.3, (5.2), (15.10)	2.2, 2.5, 2.9 ***Exercices II*** et 1.62,67,68; 2.4,7,22, 23,33,37,40,56,57,61,65; 3.10,58	**2.1, 2.2, (2.4), 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11** **3.2, 3.3, 3.4, (3.10), (3.11)** **4.6, 4.10.1, (4.12), (4.13)** **(5.2), 5.3**
3. Glucides - stéréochimie - *(6, 14)*	(14.4), 14.2, 6.1, 6.2, 14.2, (6.4), 6.6, (15.1), 6.7, 6.8, 6.11, 6.12, 6.9, 14.3, 14.4, (15.10), (6.14)	***Exercices III*** et 6.3,16,39,53,54,55,61, 62,63; 14.4,28,36,37,56,57,58; 15.2, 25,54	**6.1, 6.2, (6.4), 6.6, 6.7, 6.8, 6.9, 6.11, (6.12), (6.14)** **(7.6), (7.7), 7.12**
4. Alcools - éthers - phénols - thiols *(8, 15)*	1.11, 1.5, 8.2, 1.12, (8.3), (15.1), (15.2), (15.3), 8.5, 8.7.3, 9.4.1, 14.8.3, (16.5), 8.8.3, (8.12), 15.5	***Exercices IV*** et 8.8,37,38,39,49	**8.2, (8.3), 8.5, 8.7.3, 8.8.3, (8.12)** **(9.1), 9.2, 9.4.1, 9.6, 9.7, 9.8, 9.9.1, 9.11**
5. Glucides - aldéhydes - cétones - imines - *(9, 14)*	(9.1), 9.2, 9.6, 9.7, (3.10), (3.11), 14.5, 14.6, 14.7, (14.8), 9.8, (14.10), 8.5, 17.2.4, 9.9.1, 9.11.1, (17.5)	***Exercices V, VI*** et 9.15,38,39; 14.20,31,39,40,45, 17.9	**10.2, (10.3), (10.5), (10.6), (10.9), (10.10)** **(11.1), 11.4, 11.7, 11.8, 11.9, 11.10** **12.2, 12.3, 12.4.1, 12.6**
6. Protéines - lipides - acides - esters - amides - *(10, 11, 15, 16)*	10.2, (10.3), (10.5), (10.6), (10.9), (16.2), 16.3, 10.6.1, (15.1), (10.9), (16.12), (10.10), (15.11), (11.1), 11.4, 11.7, 11.8, 11.9, 11.10, (17.4)	***Exercices VII, VIII*** et 10.5,23,24,66; 11.9,32,41,42,49,50	**14.2, 14.3, 14.4, 14.5, 14.6, 14.7, (14.8)** **15.1, (15.2), (15.3), (15.4), 15.5, (15.10)** **(16.2), 16.3, (16.4), (16.5), (16.6), (16.7), (16.8), (16.12)**
7. Acides nucléiques - amines - *(12, 16)*	12.2, 12.3, (16.7), 12.4.1, 8.11, (7.6), (7.7), 7.12, 12.6, (16.6)	***Exercices VIII*** et 12.1,6,7,19,23,37,54	**(17.2), (17.5)**

xx.x.y : seulement sujet y du chapitre xx.x
(xx.x) : seulement partie du chapitre xx.x

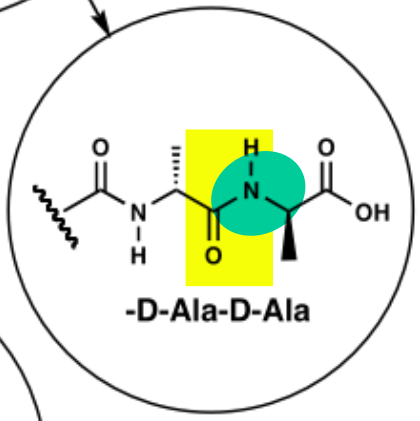
A propos de...

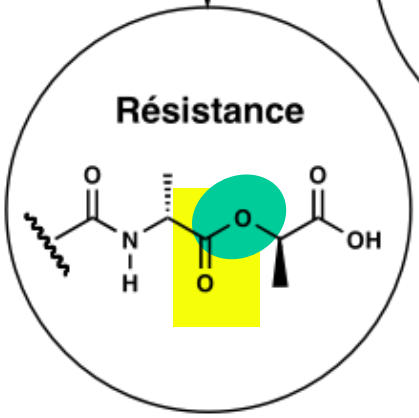
médecine et chimie organique



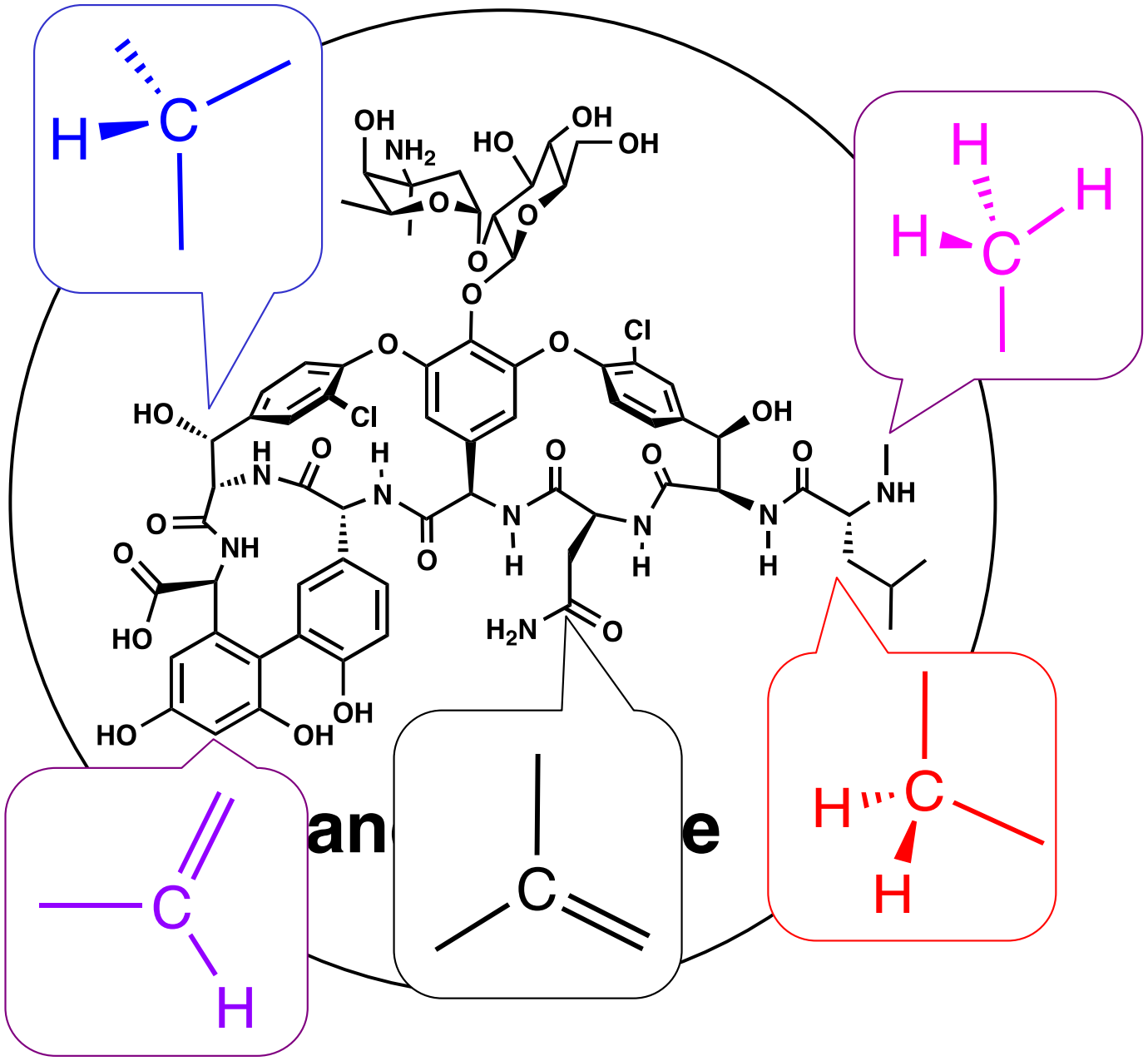
DEFINITION

chimie organique, travaille sur des molécules





Molécules - groupes fonctionnels - la vancomycine (2.1, dessiner : 2.6, 1.3)

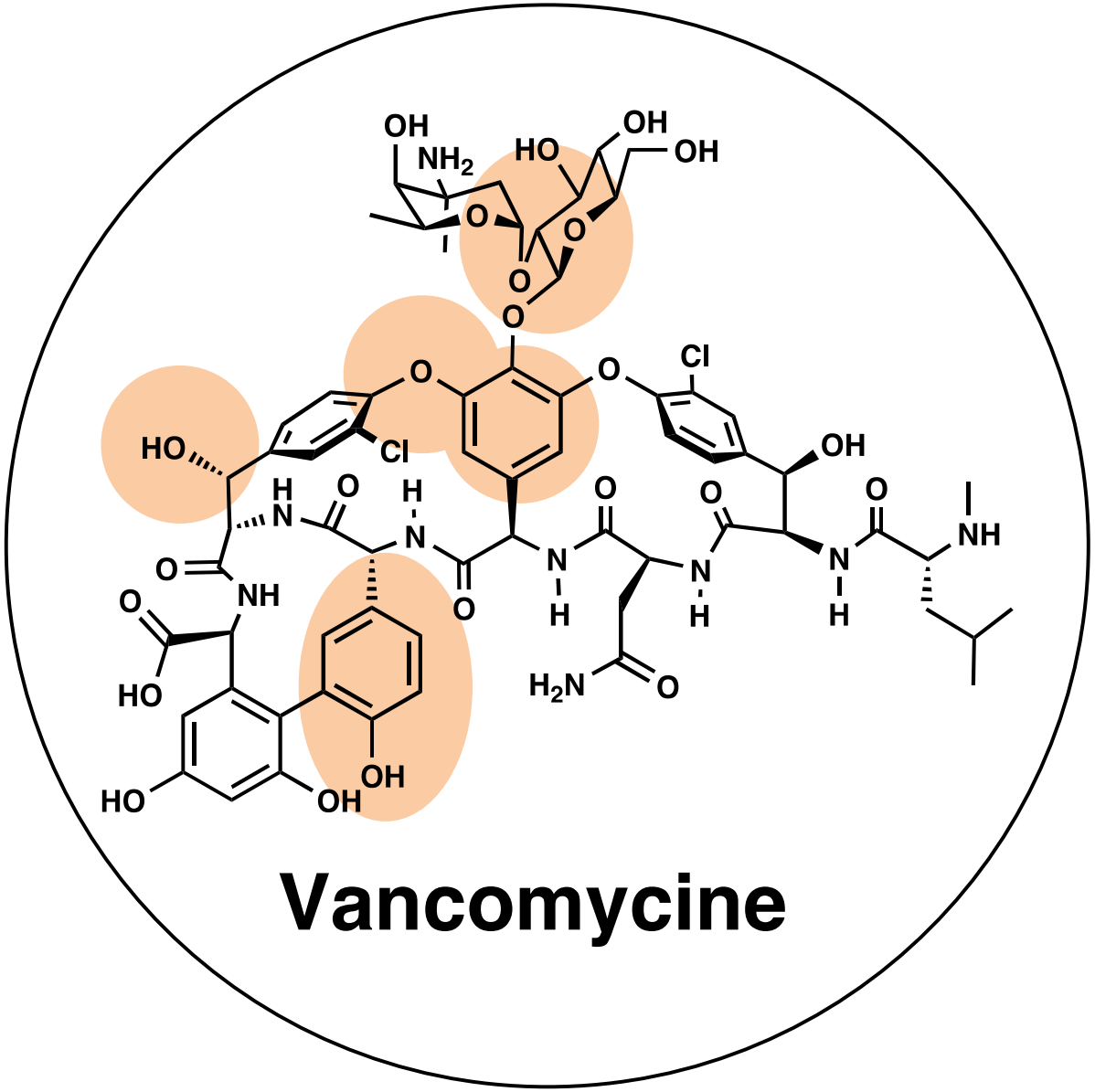


(antibiotique)

Produit naturel (Métabolite secondaire)

Les grandes familles

1. Produits naturels
2. Protéines
3. Nucléotides
4. Glucides
5. Lipides



Alcène

Alcyne

Arène

Alcool

Phénol

Thiol

Éther

Sulfure

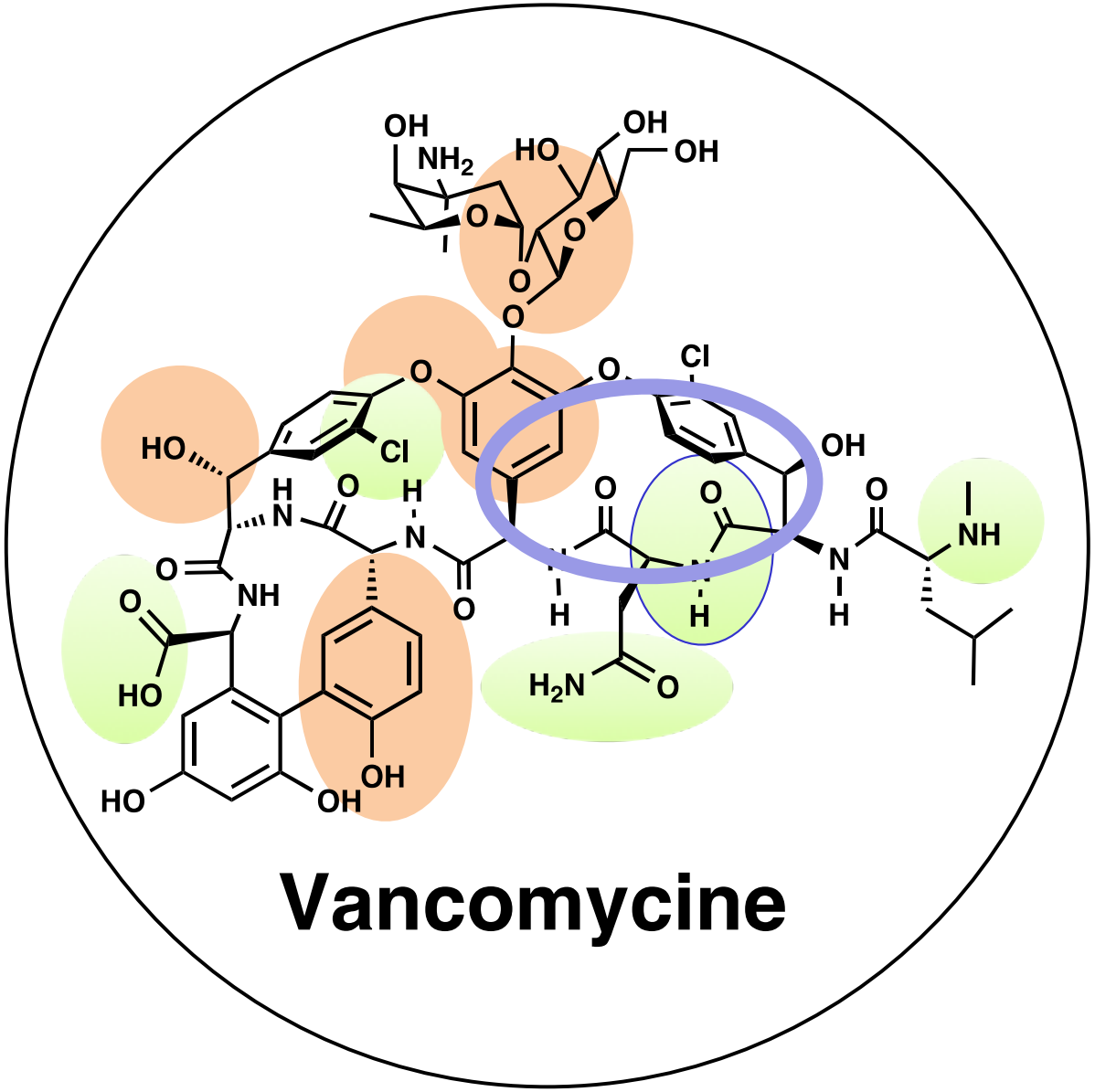
Disulfure

Aldéhyde

Cétone

Hémiacétal

Acétal



Acide carb.

Ester

Lactone

Amide

Lactame

Amine

Imine

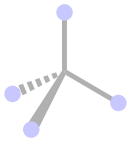
Halogénure

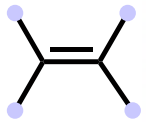
Phosphate

acyclique

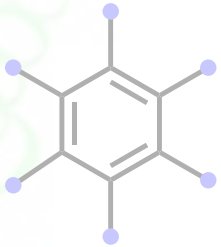
carbocyclique

hétérocyclique


Alkane


Alcène


Alkyne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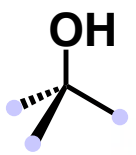
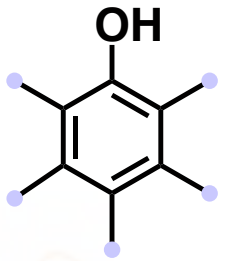
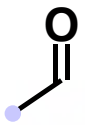


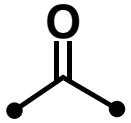
Alcool



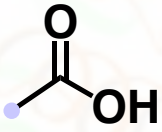
Phénol



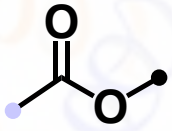
Aldéhyde



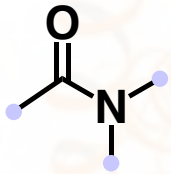
Cétone



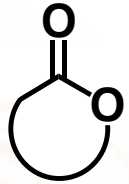
Acide carboxylique



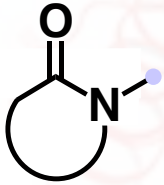
Ester



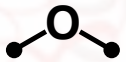
Amide



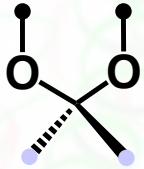
Lactone



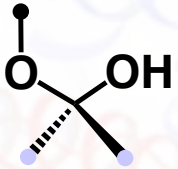
Lactame



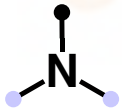
Éther



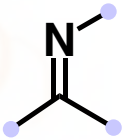
Acétal



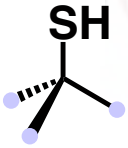
Hémiacétal



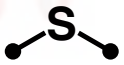
Amine



Imine

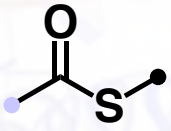


Thiol

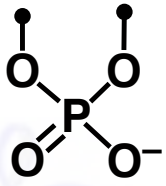


Sulfure

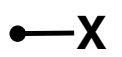
Disulfure



Thioester



Phosphodiester

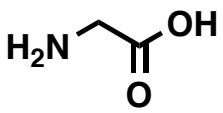


X = F, Cl, Br, I

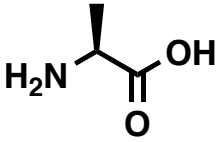
Halogénure

●● = Reste de la molécule ● = H possible

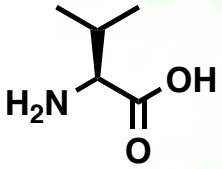
Les acides aminés (formes neutres)



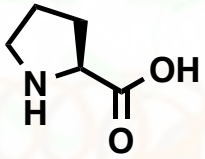
Glycine
(Gly, G)



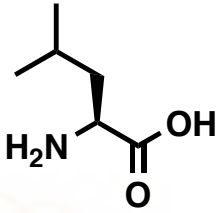
Alanine
(Ala, A)



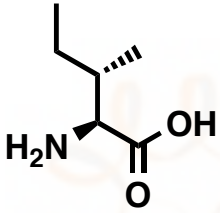
Valine
(Val, V)



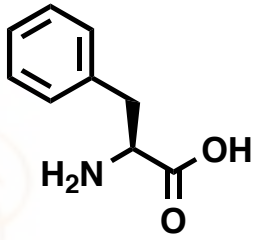
Proline
(Pro, P)



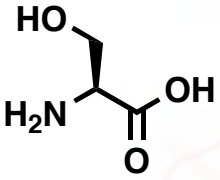
Leucine
(Leu, L)



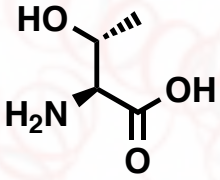
Isoleucine
(Ile, I)



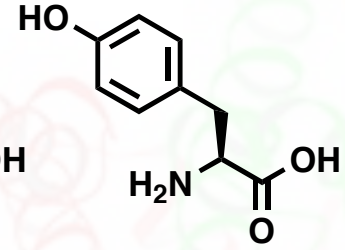
Phénylalanine
(Phe, F)



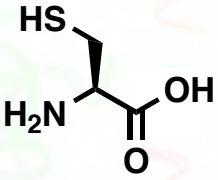
Sérine
(Ser, S)



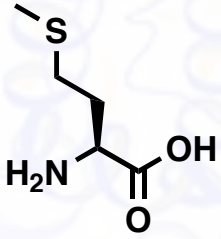
Thréonine
(Thr, T)



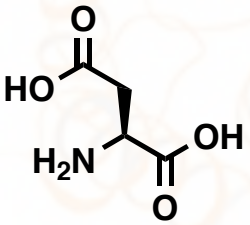
Tyrosine
(Tyr, Y)



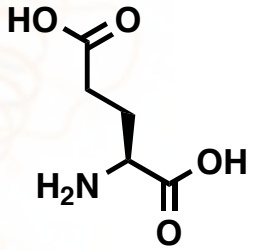
Cystéine
(Cys, C)



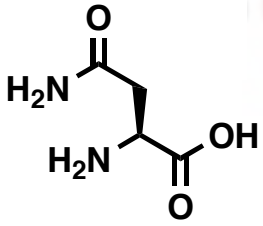
Méthionine
(Met, M)



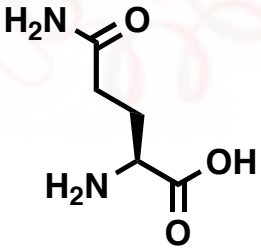
Acide aspartique
(Asp, D)



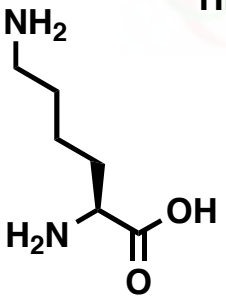
Acide glutamique
(Glu, E)



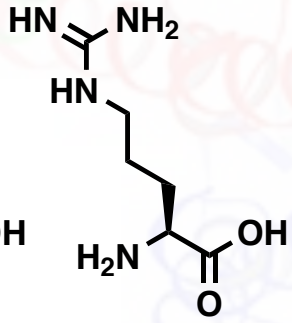
Asparagine
(Asn, N)



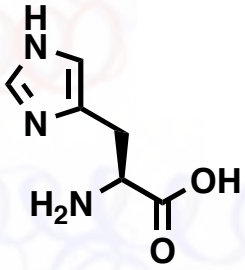
Glutamine
(Gln, Q)



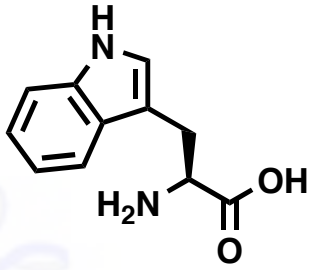
Lysine
(Lys, K)



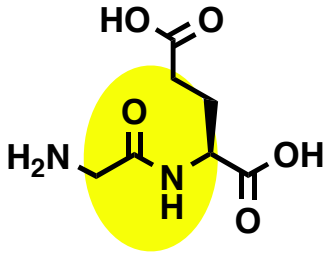
Arginine
(Arg, R)



Histidine
(His, H)



Tryptophane
(Trp, W)



Alcène

Alcyne

Arène

Alcool

Phénol

Thiol

Éther

Sulfure

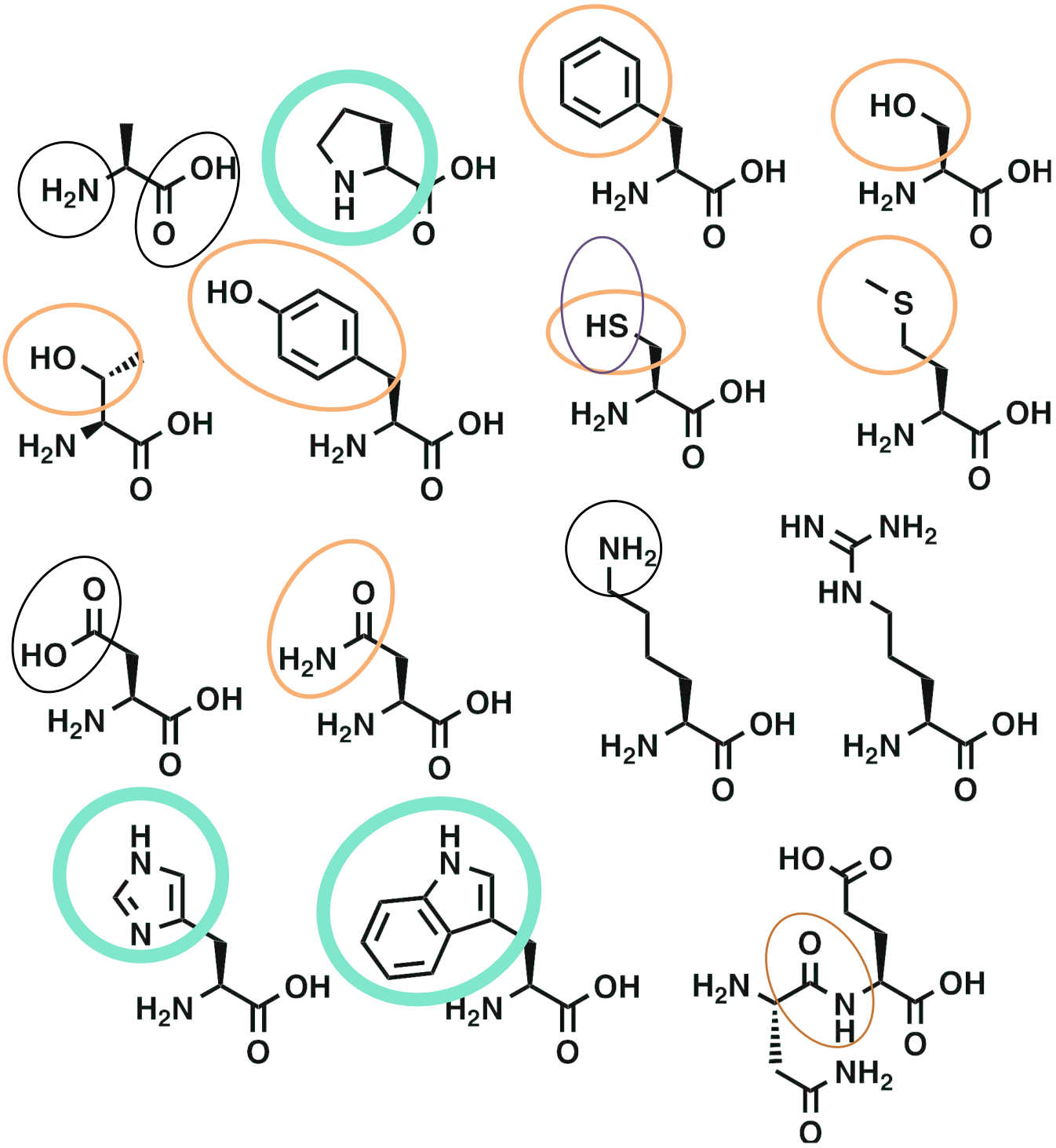
Disulfure

Aldéhyde

Cétone

Hémiacétal

Acétal



Acide carb.

Ester

Lactone

Amide

Lactame

Amine

Imine

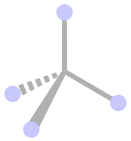
Halogénure

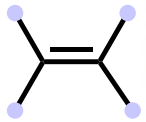
Phosphate

acyclique

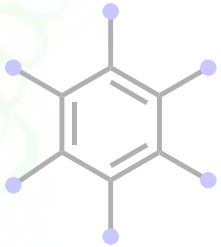
carbocyclique

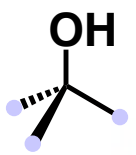
hétérocyclique


Alkane

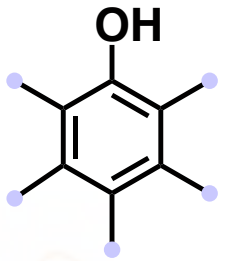

Alcène


Alkyne

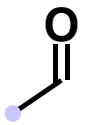

Arène



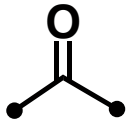
Alcool



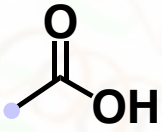
Phénol



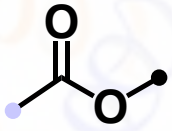
Aldéhyde



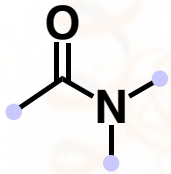
Cétone



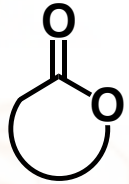
Acide carboxylique



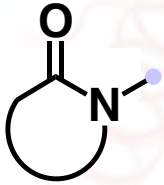
Ester



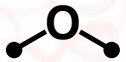
Amide



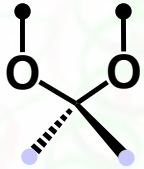
Lactone



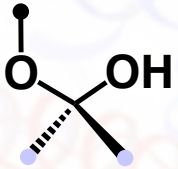
Lactame



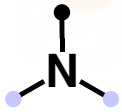
Éther



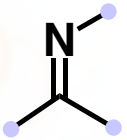
Acétal



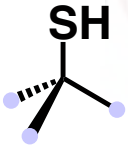
Hémiacétal



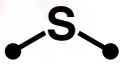
Amine



Imine

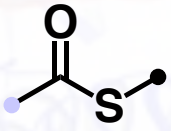


Thiol

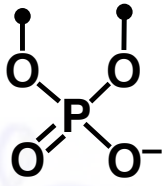


Sulfure

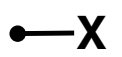
Disulfure



Thioester



Phosphodiester

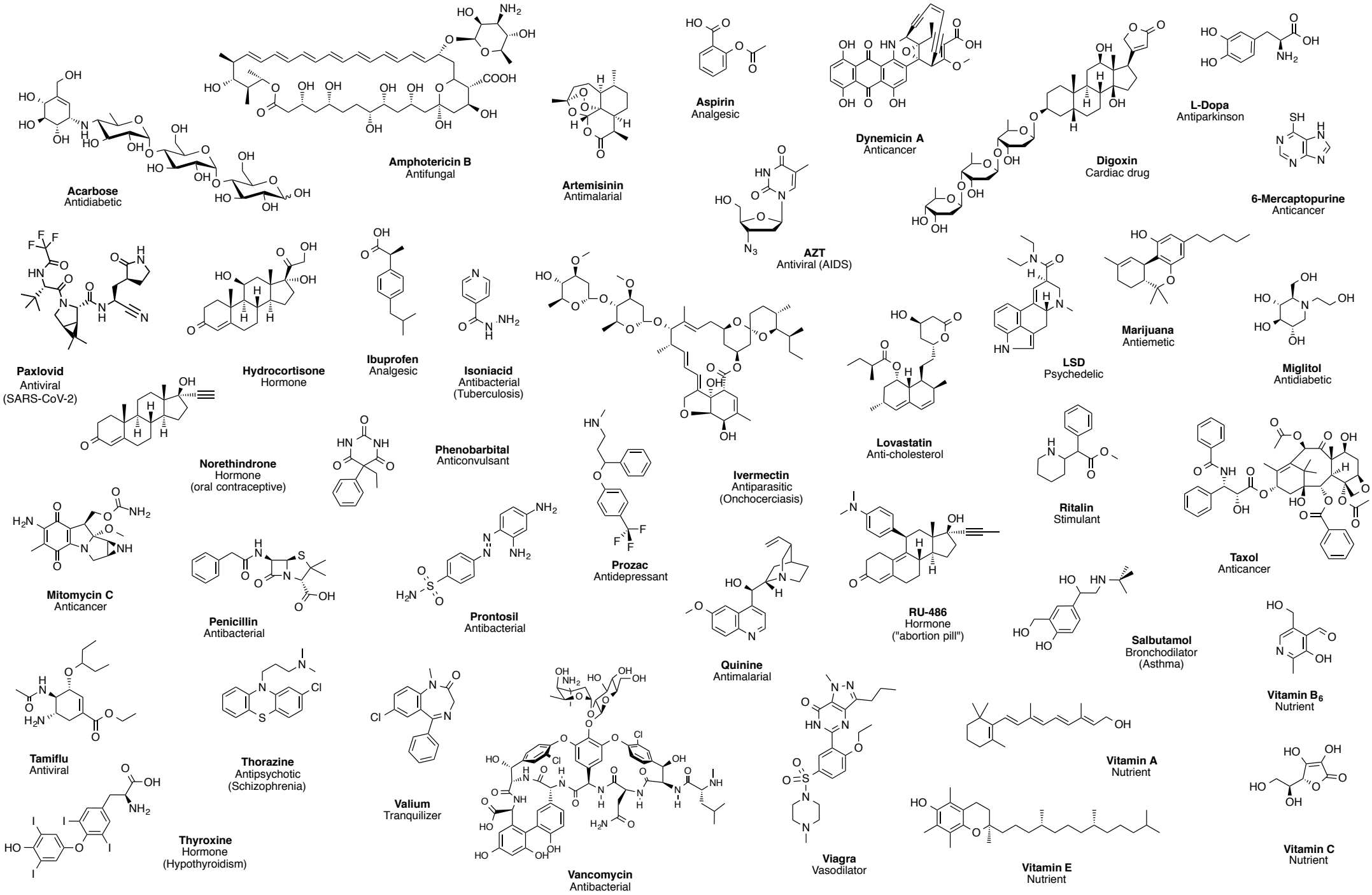


X = F, Cl, Br, I

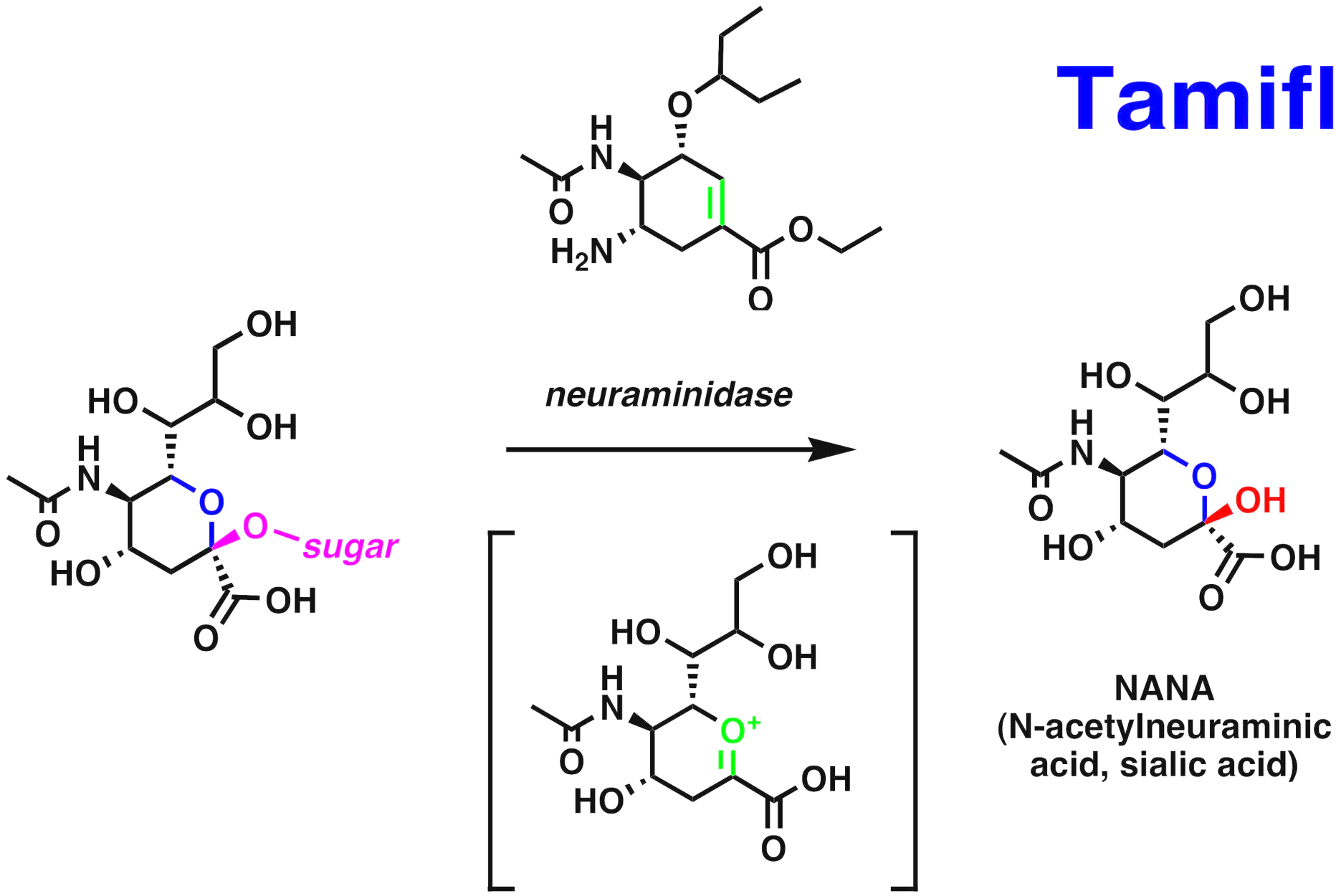
Halogénure

●● = Reste de la molécule ● = H possible

Molécules qui ont changé notre monde...

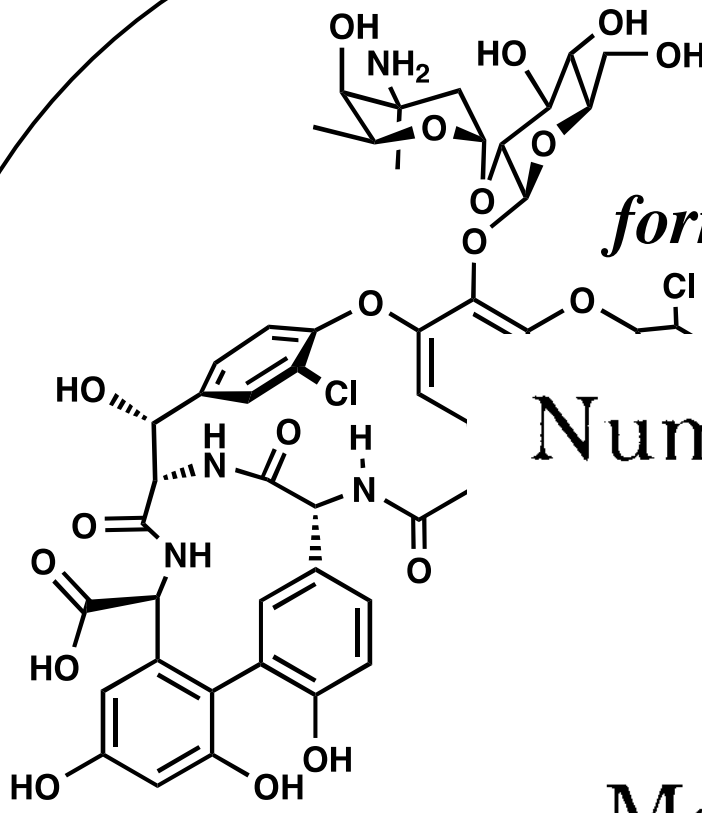


Tamiflu



NANA
(N-acetylneuraminic acid, sialic acid)

Molécules - atomes
le tableau périodique -
la vancomycine



Vanc(

formule moléculaire : $C_{66}H_{75}Cl_2N_9O_{24}$

Numéro atomique — 6

Nom — Carbone

Symbole — **C**

Masse atomique — 12,011

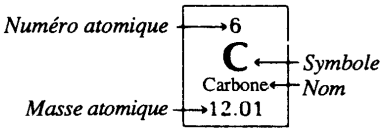
masse moléculaire : **1449,3**

(2, 618)

groupes

Tableau périodique des éléments

périodes

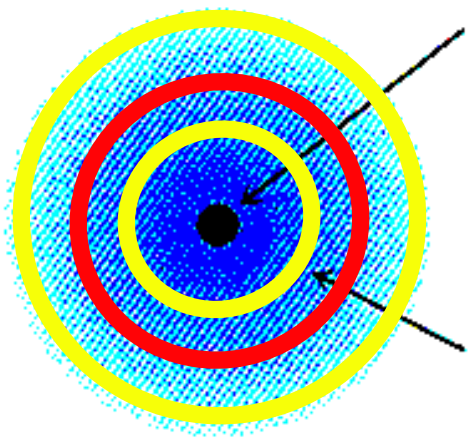


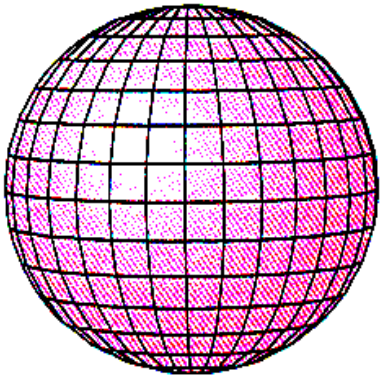
I A	II A	III B	IV B	V B	VI B	VII B	VIII B	VIII B	VIII B	I B	II B	III A	IV A	V A	VI A	VII A	VIII A
1 H Hydrogène 1.008																	2 He Hélium 4.00
3 Li Lithium 6.94	4 Be Béryllium 9.01											5 B Bore 10.81	6 C Carbone 12.01	7 N Azote 14.01	8 O Oxygène 16.00	9 F Fluor 19.00	10 Ne Néon 20.18
11 Na Sodium 22.99	12 Mg Magnésium 24.30											13 Al Aluminium 26.98	14 Si Silicium 28.09	15 P Phosphore 30.97	16 S Soufre 32.06	17 Cl Chlore 35.45	18 Ar Argon 39.95
19 K Potassium 39.10	20 Ca Calcium 40.08	21 Sc Scandium 44.96	22 Ti Titane 47.90	23 V Vanadium 50.94	24 Cr Chrome 52.00	25 Mn Manganèse 54.94	26 Fe Fer 55.85	27 Co Cobalt 58.93	28 Ni Nickel 58.70	29 Cu Cuivre 63.55	30 Zn Zinc 65.38	31 Ga Gallium 69.72	32 Ge Germanium 72.59	33 As Arsenic 74.92	34 Se Sélénium 78.96	35 Br Brome 79.90	36 Kr Krypton 83.80
37 Rb Rubidium 85.47	38 Sr Strontium 87.62	39 Y Yttrium 88.91	40 Zr Zirconium 91.22	41 Nb Niobium 92.91	42 Mo Molybdène 95.94	43 Tc Technétium 98.91	44 Ru Ruthénium 101.07	45 Rh Rhodium 102.91	46 Pd Palladium 106.4	47 Ag Argent 107.87	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Etain 118.69	51 Sb Antimoine 121.75	52 Te Tellure 127.60	53 I Iode 126.90	54 Xe Xénon 131.30
55 Cs Césium 132.91	56 Ba Baryum 137.33	57* La Lanthane 138.91	72 Hf Hafnium 178.49	73 Ta Tantale 180.95	74 W Tungstène 183.85	75 Re Rhénium 186.21	76 Os Osmium 190.2	77 Ir Iridium 192.22	78 Pt Platine 195.09	79 Au Or 196.97	80 Hg Mercure 200.59	81 Tl Thallium 204.37	82 Pb Plomb 207.2	83 Bi Bismuth 208.98	84 Po Polonium (209)	85 At Astate (210)	86 Rn Radon (222)
87 Fr Francium (223)	88 Ra Radium 226.03	89† Ac Actinium 227.03	104 § (261)	105 § (262)	106 § (263)	107 § (262)	108 § (265)	109 § (267)									

Lanthanides	58 Ce Cérium 140.12	59 Pr Praséodyme 140.91	60 Nd Néodyme 144.24	61 Pm Prométhium (145)	62 Sm Samarium 150.4	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.93	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93	68 Er Erbium 167.26	69 Tm Thulium 168.93	70 Yb Ytterbium 173.04	71 Lu Lutétium 174.97
Actinides	90 Th Thorium 232.04	91 Pa Protactinium 231.04	92 U Uranium 238.03	93 Np Neptunium 237.05	94 Pu Plutonium (244)	95 Am Américium (243)	96 Cm Curium (247)	97 Bk Berkélium (249)	98 Cf Californium (251)	99 Es Einsteinium (254)	100 Fm Fermium (257)	101 Md Mendélévium (258)	102 No Nobélium (259)	103 Lr Lawrencium (260)

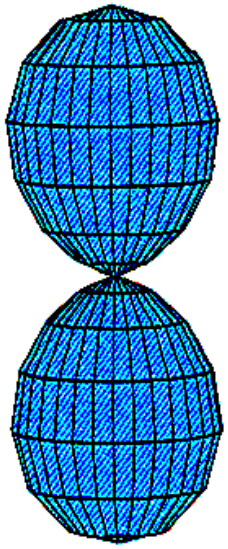
isotopes

Structure atomique

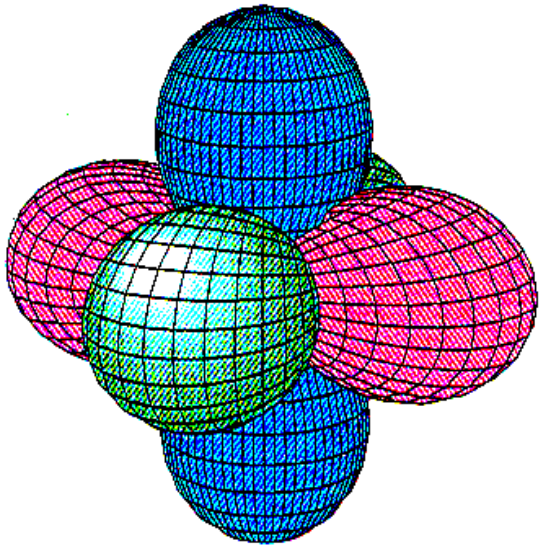




Une orbitale *s*



Une orbitale *p*



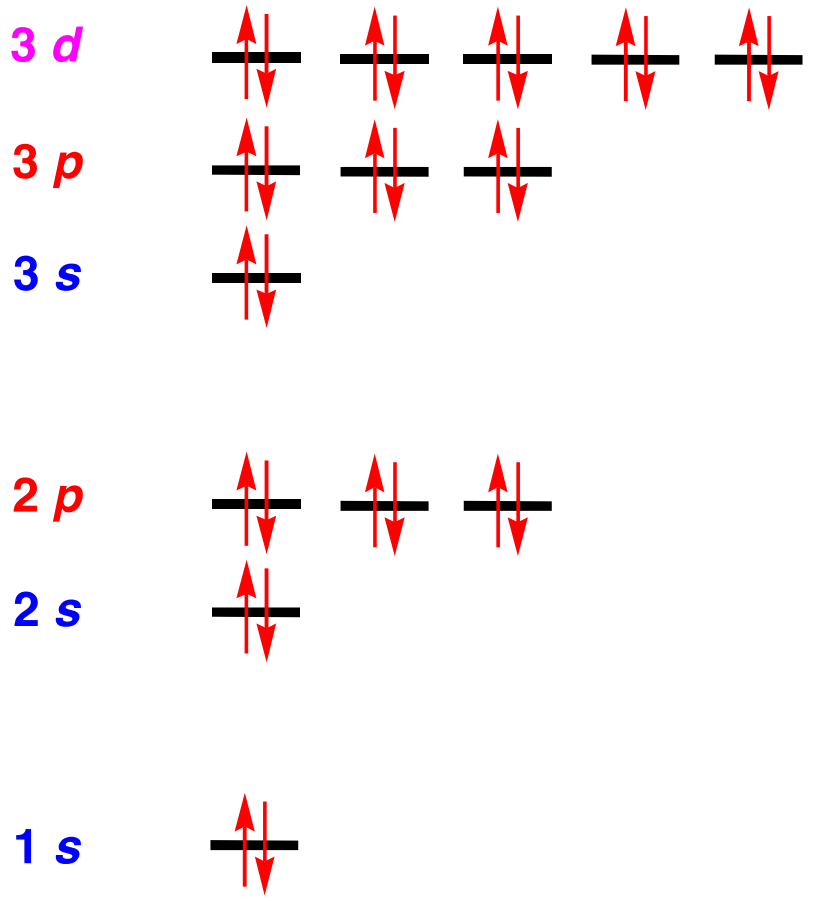
Trois orbitales 2*p*

Répartition des électrons

3e couche
(18 électrons maximum)

2e couche
(8 électrons maximum)

1re couche
(2 électrons maximum)



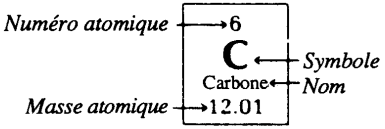
configuration électronique - couches de valence

(2, 618)

groupes

Tableau périodique des éléments

périodes



I A	II A	III B	IV B	V B	VI B	VII B	VIII B			I B	II B	III A	IV A	V A	VI A	VII A	VIII A
1 H Hydrogène 1.008																	2 He Hélium 4.00
3 Li Lithium 6.94	4 Be Béryllium 9.01											5 B Bore 10.81	6 C Carbone 12.01	7 N Azote 14.01	8 O Oxygène 16.00	9 F Fluor 19.00	10 Ne Néon 20.18
11 Na Sodium 22.99	12 Mg Magnésium 24.30											13 Al Aluminium 26.98	14 Si Silicium 28.09	15 P Phosphore 30.97	16 S Soufre 32.06	17 Cl Chlore 35.45	18 Ar Argon 39.95
19 K Potassium 39.10	20 Ca Calcium 40.08	21 Sc Scandium 44.96	22 Ti Titane 47.90	23 V Vanadium 50.94	24 Cr Chrome 52.00	25 Mn Manganèse 54.94	26 Fe Fer 55.85	27 Co Cobalt 58.93	28 Ni Nickel 58.70	29 Cu Cuivre 63.55	30 Zn Zinc 65.38	31 Ga Gallium 69.72	32 Ge Germanium 72.59	33 As Arsenic 74.92	34 Se Sélénium 78.96	35 Br Brome 79.90	36 Kr Krypton 83.80
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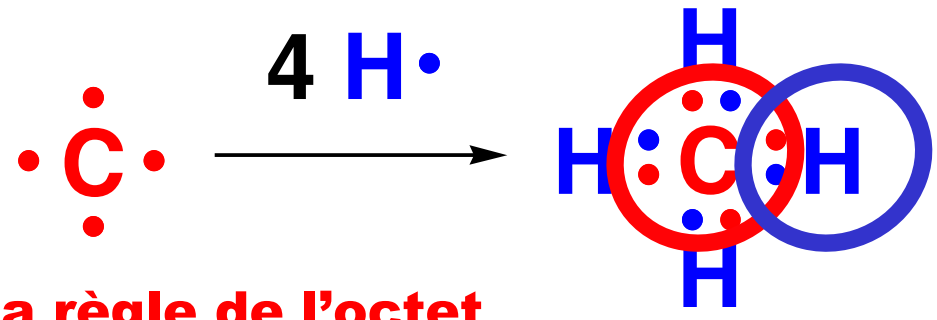
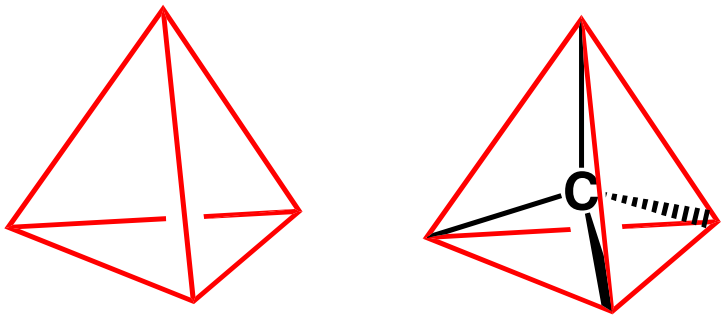
isotopes

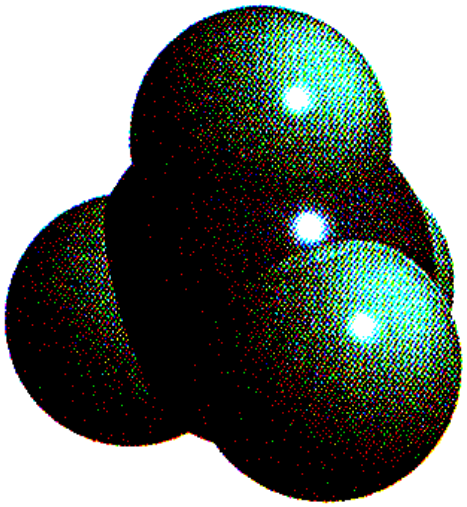
Liaisons covalentes
Méthane

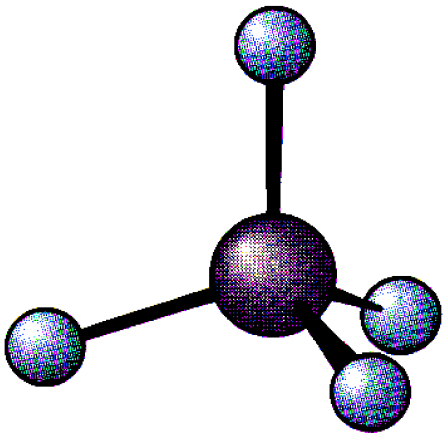


La règle de l'octet

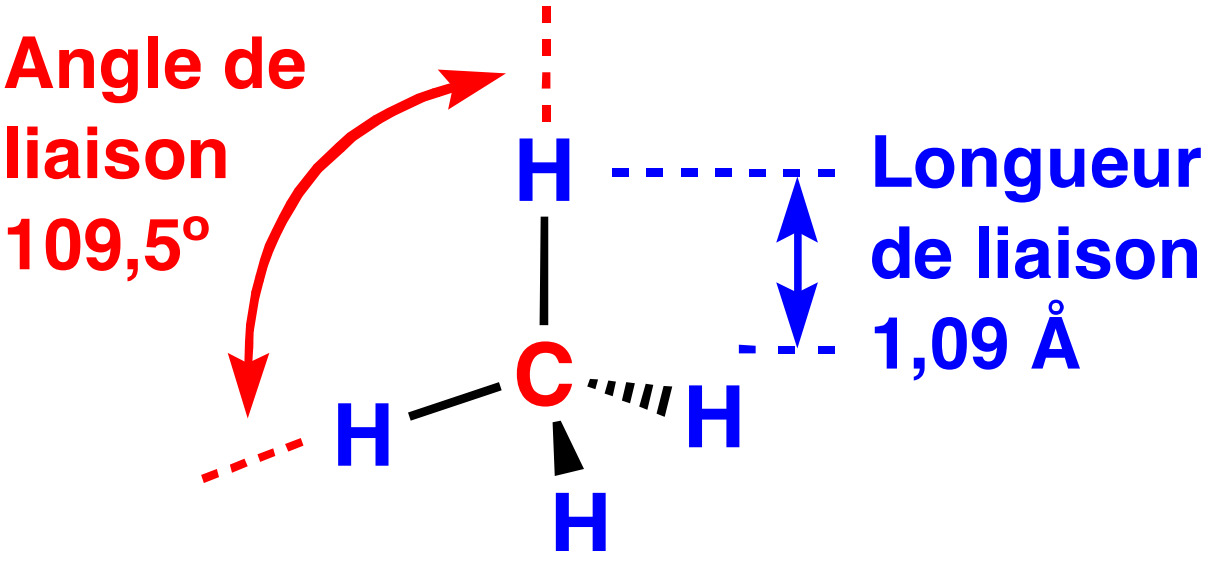


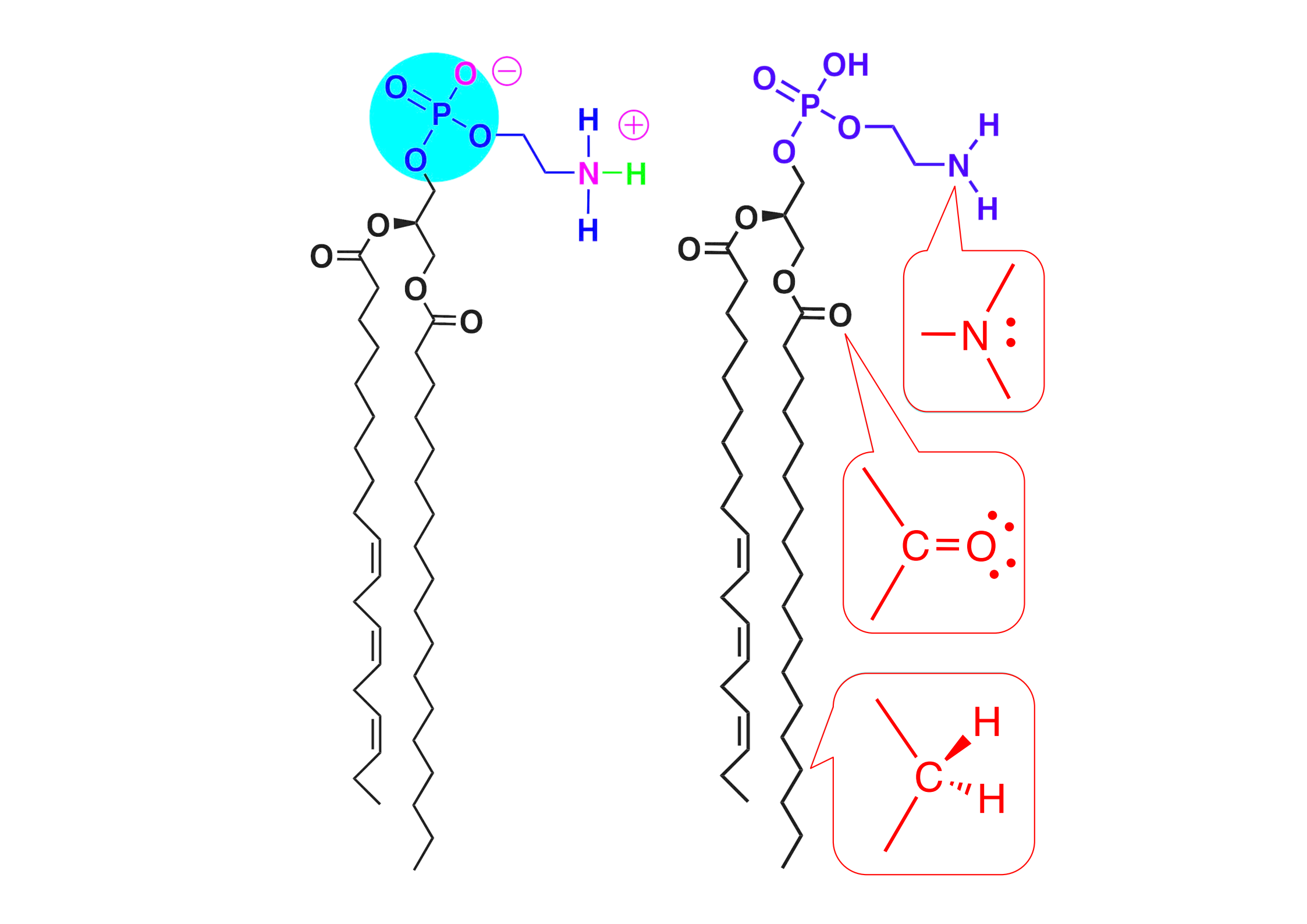
Un tétraèdre





Vue spatiale




O
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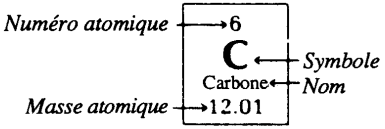
(2, 618)

groupes

Tableau périodique des éléments

périodes



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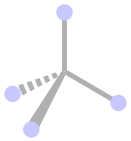
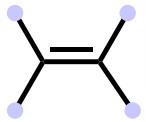
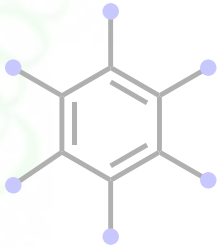
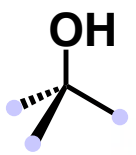
isotopes


Alkane

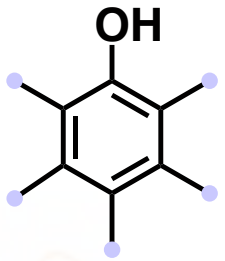

Alcène


Alkyne

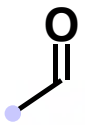

Arène



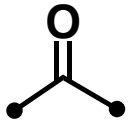
Alcool



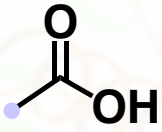
Phénol



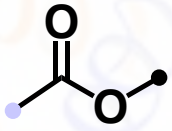
Aldéhyde



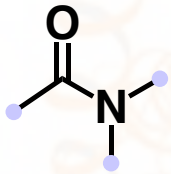
Cétone



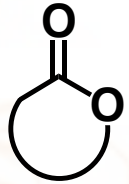
Acide carboxylique



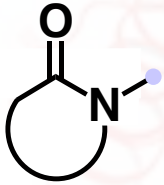
Ester



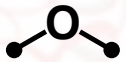
Amide



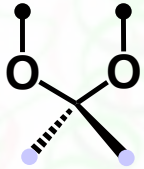
Lactone



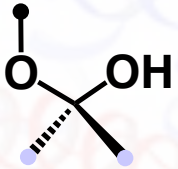
Lactame



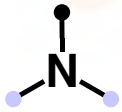
Éther



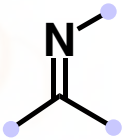
Acétal



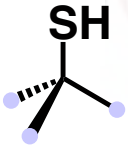
Hémiacétal



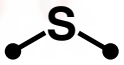
Amine



Imine

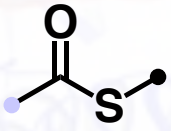


Thiol

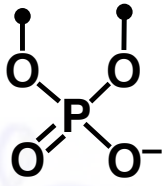


Sulfure

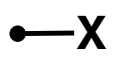
Disulfure



Thioester



Phosphodiester

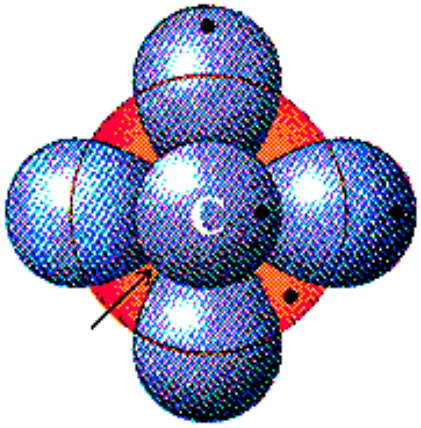


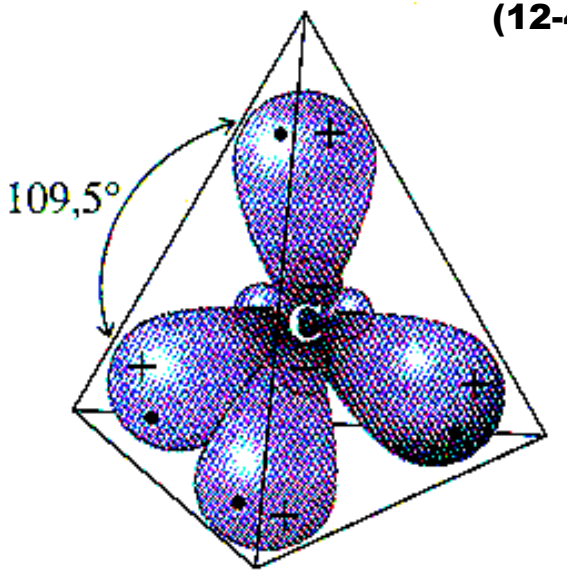
X = F, Cl, Br, I

Halogénure

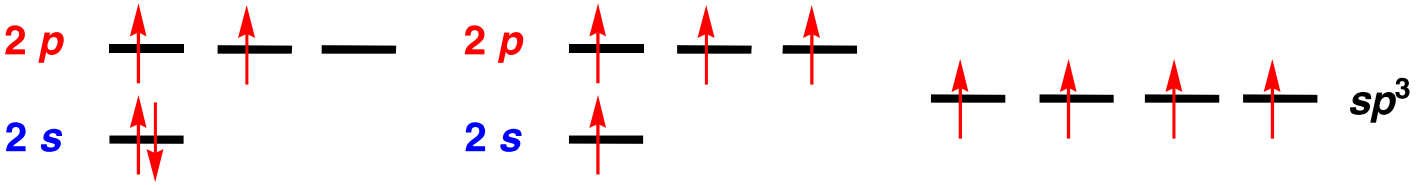
●● = Reste de la molécule ● = H possible

Hybridation du carbone





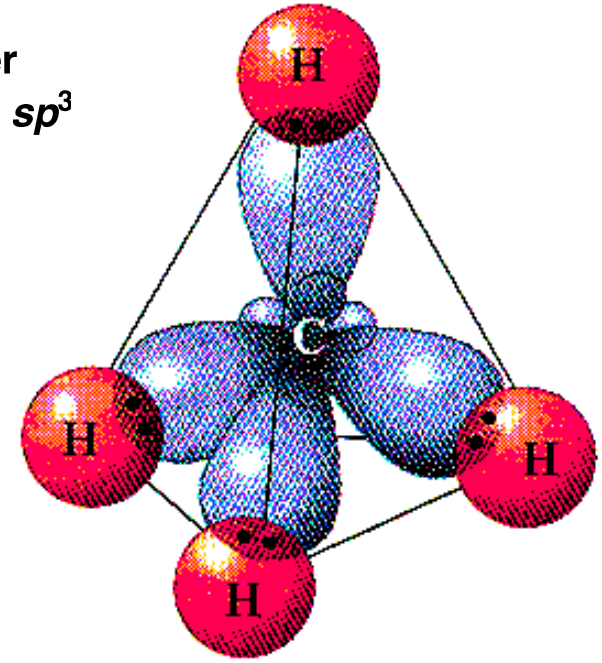
Énergie

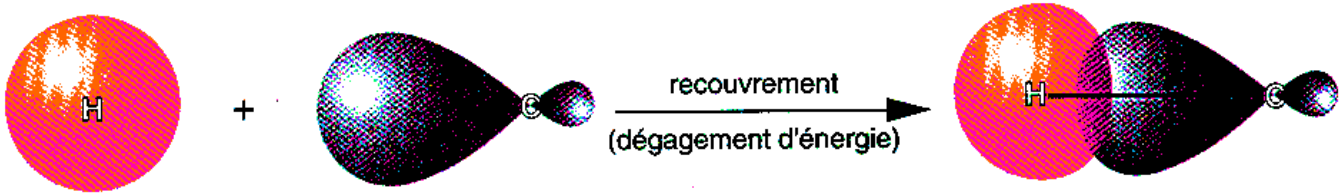


Orbitales atomiques du carbone

Un électron 2*s* est promu dans une orbitale 2*p*

Les orbitales *s* et *p* se combinent pour former quatre orbitales hybrides sp^3 équivalentes





Une orbitale *s*

Une orbitale sp^3

Une liaison σ (s-sp^3)

Résumé 1

- Molécules - groupes fonctionnels - atomes -

- Atomes : Le tableau périodique - périodes - groupes - isotopes - configuration électronique - couches de valence -

- Groupes fonctionnels : Molécules en médecine - acides aminés - produits naturels - lipides -

- Molécules : La règle de l'octet - liaisons covalentes - hybridation - formule moléculaire - masse moléculaire -

(576)

La règle de l'octet

A
Couche électronique externe d'un atome

B
Mélange des orbitales atomiques de la même couche électronique de manière à former de nouvelles orbitales qui permettent de mieux décrire les liaisons entre atomes

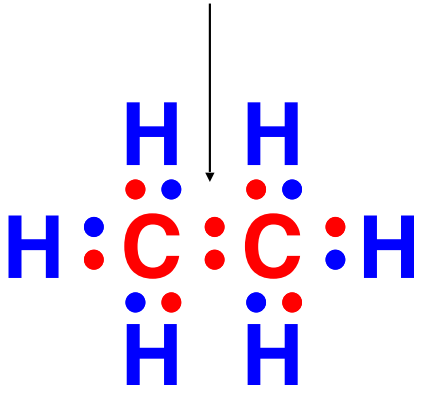
C
Formule indiquant la nature et le nombre de chacun des atomes d'une molécule

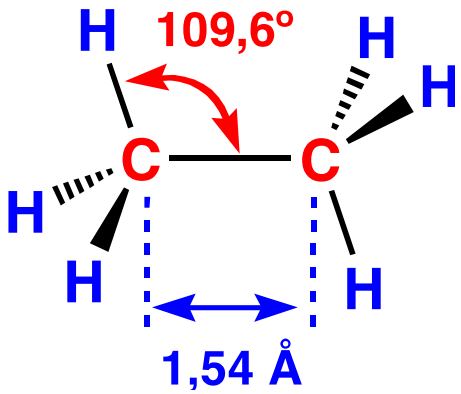
D
Distribution des électrons d'un atome dans les orbitales atomiques

E
Tendance des atomes avec un numéro atomique ≥ 4 à se combiner de façon à avoir huit électrons dans leur couche de valence

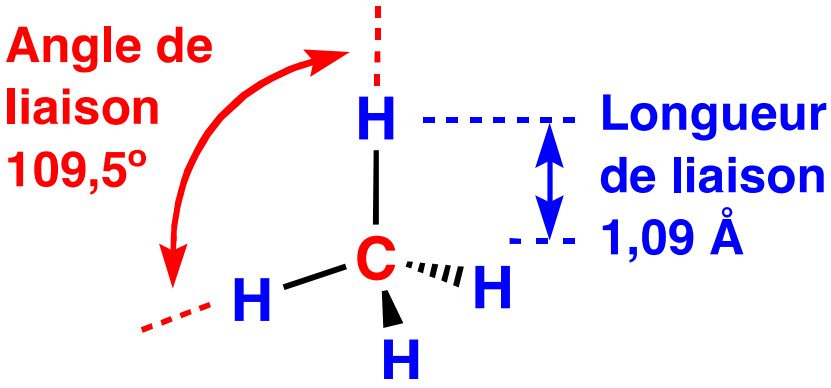
CONTENU	McMurry
1. Généralités	(1, 2, 15)
2. Lipides - stéroïdes - alcanes - alcènes - arènes -	(2 - 5, 16)
3. Glucides - stéréochimie -	(6, 14)
4. Alcools - éthers – phénols - hydroquinones - thiols - disulfures	(8, 16)
5. Glucides - aldéhydes - cétones - imines -	(9, 14)
6. Protéines - lipides - acides - esters - amides -	(10, 11, 15, 16)
7. Acides nucléiques - amines -	(12, 16)

Liaison σ du type sp^3 - sp^3



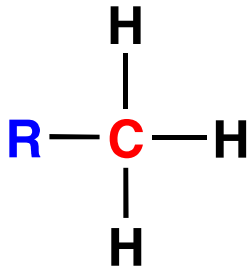


Alcanes

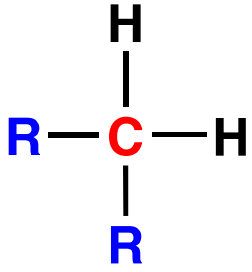


- **alcanes saturés, hydrocarbures**
- **composés aliphatiques**

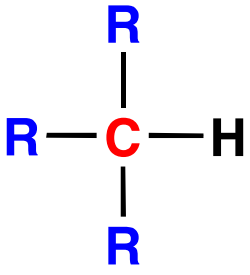
$$C_nH_{2n+2}$$



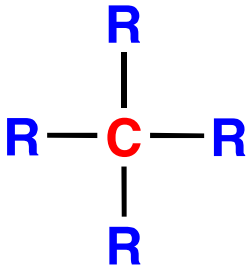
Carbone *primaire* (1°)
lié à un seul
autre carbone



Carbone *secondaire* (2°)
lié à deux
autres carbones



Carbone *tertiaire* (3°)
lié à trois
autres carbones



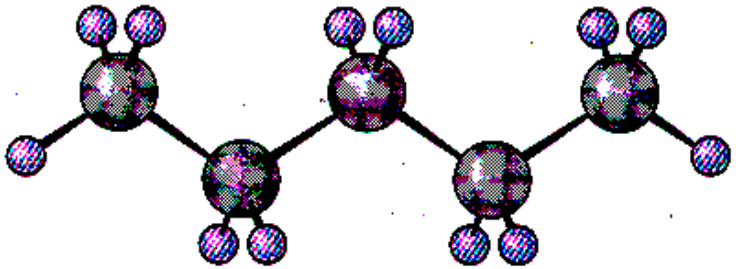
Carbone *quaternaire* (4°)
lié à quatre
autres carbones

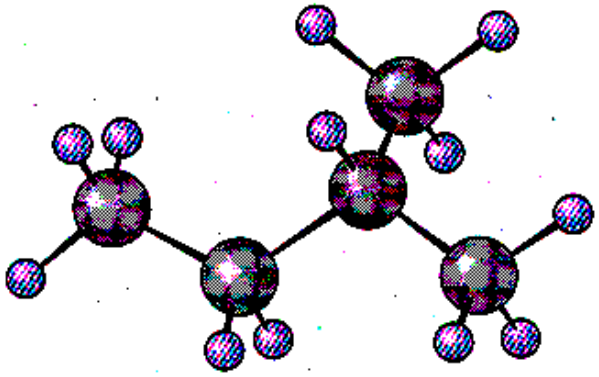
R = Reste de la molécule

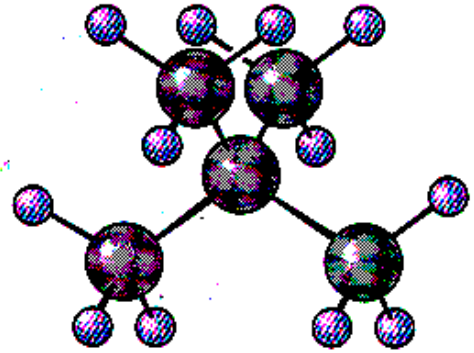
Isomères de constitution

Formule	*Nombre d'isomères*	*Formule*	*Nombre d'isomères*
C_6H_{14}	5	$C_{10}H_{22}$	75
C_7H_{16}	9	$C_{15}H_{32}$	4 347
C_8H_{18}	18	$C_{20}H_{42}$	366 319
C_9H_{20}	35	$C_{30}H_{62}$	4 111 846 763

C_5H_{12}

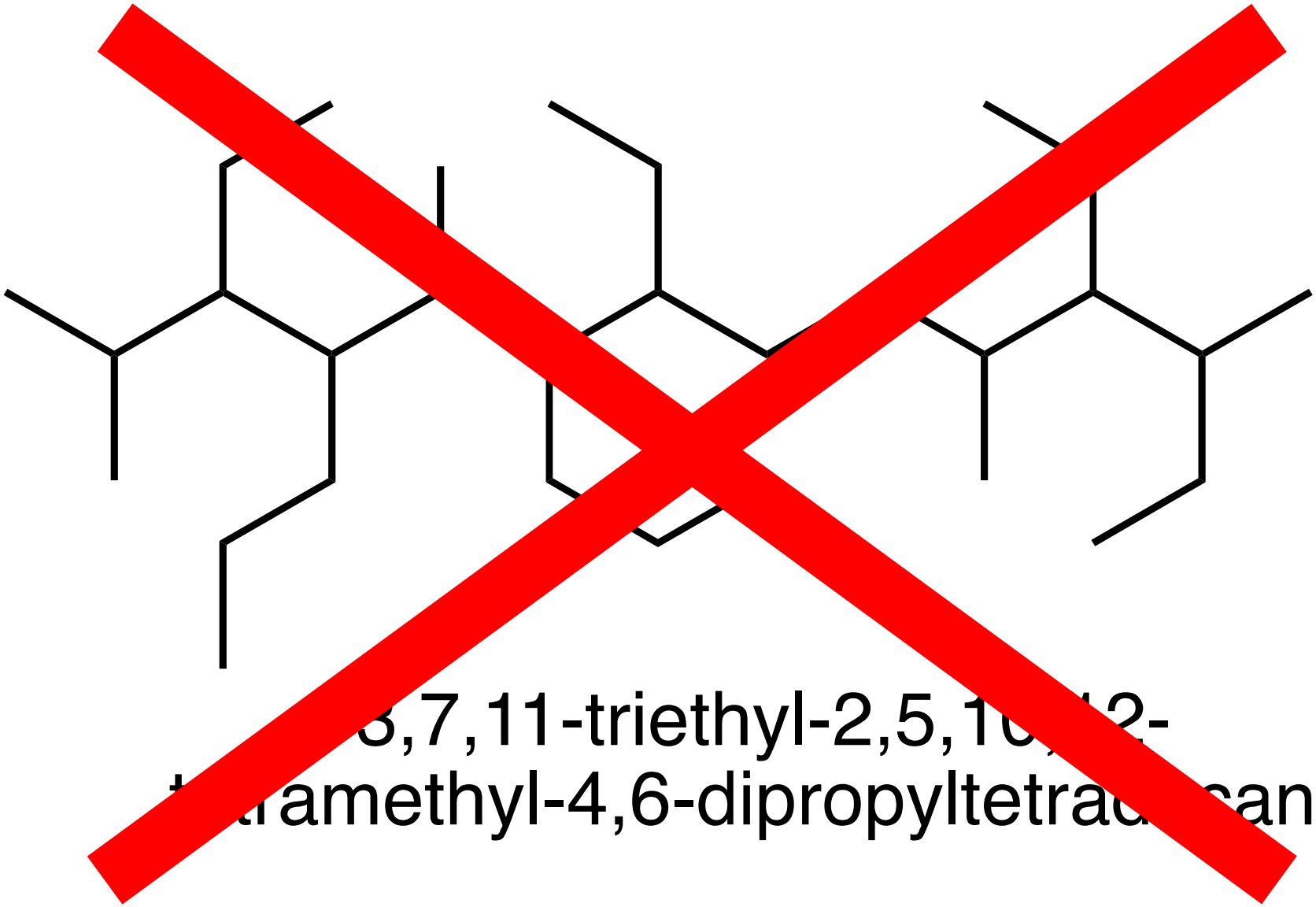






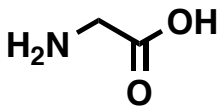
- alcanes linéaires (normaux)

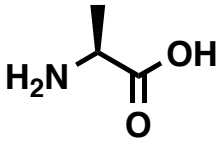
- alcanes ramifiés
- points d'ébullition

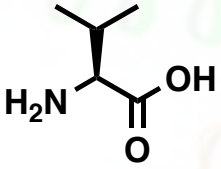


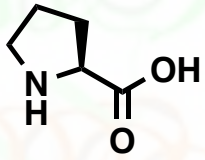
3,7,11-triethyl-2,5,10,12-
tetramethyl-4,6-dipropyltetradecane

Substituants alkyles (C_nH_{2n+1})

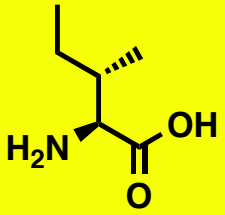

Glycine
(Gly, G)

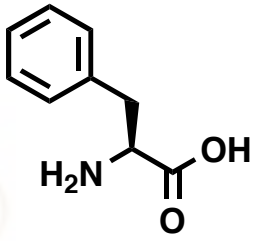

Alanine
(Ala, A)

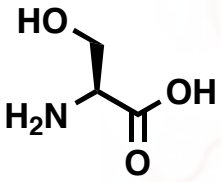

Valine
(Val, V)

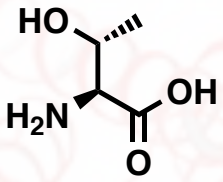

Proline
(Pro, P)

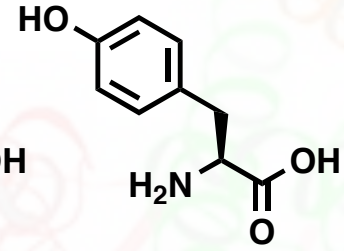

Leucine
(Leu, L)

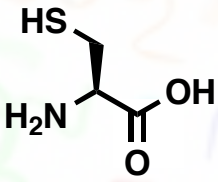

Isoleucine
(Ile, I)

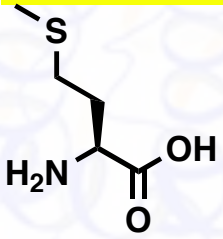

Phénylalanine
(Phe, F)

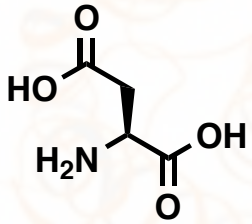

Sérine
(Ser, S)

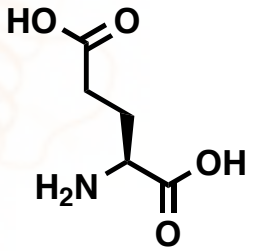

Thréonine
(Thr, T)

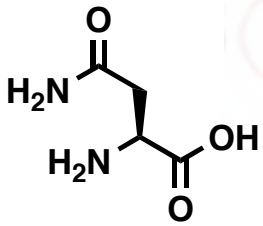

Tyrosine
(Tyr, Y)

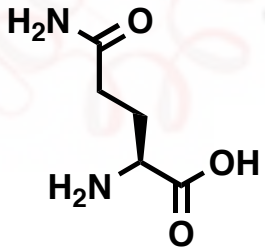

Cystéine
(Cys, C)

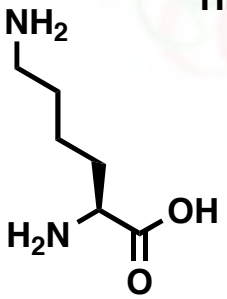

Méthionine
(Met, M)

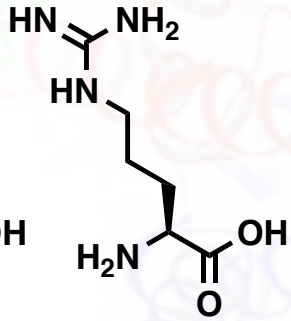

Acide aspartique
(Asp, D)

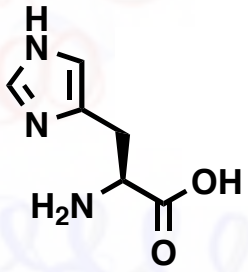

Acide glutamique
(Glu, E)

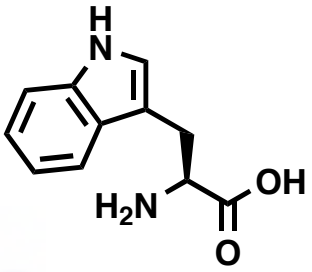

Asparagine
(Asn, N)

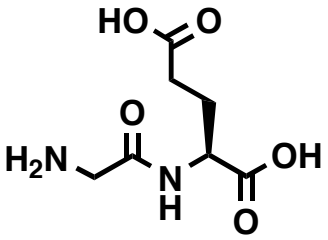

Glutamine
(Gln, Q)


Lysine
(Lys, K)

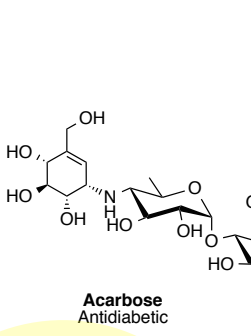

Arginine
(Arg, R)


Histidine
(His, H)

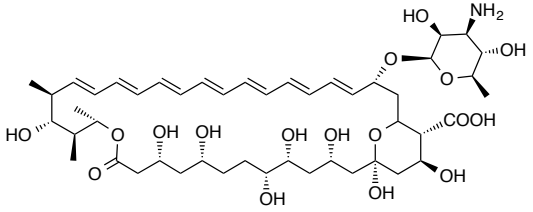

Tryptophane
(Trp, W)



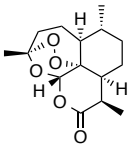
Molécules qui ont changé notre monde...



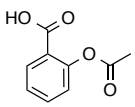
Acarbose
Antidiabetic



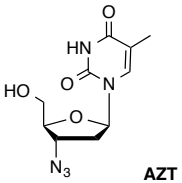
Amphotericin B
Antifungal



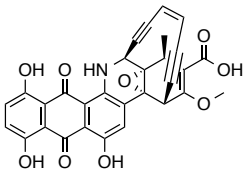
Artemisinin
Antimalarial



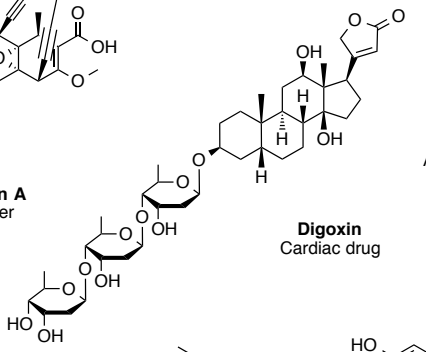
Aspirin
Analgesic



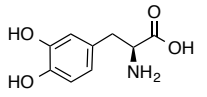
AZT
Antiviral (AIDS)



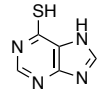
Dynemicin A
Anticancer



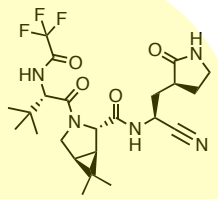
Digoxin
Cardiac drug



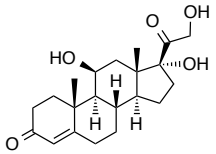
L-Dopa
Antiparkinson



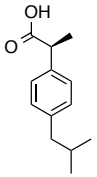
6-Mercaptopurine
Anticancer



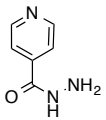
Paxlovid
Antiviral
(SARS-CoV-2)



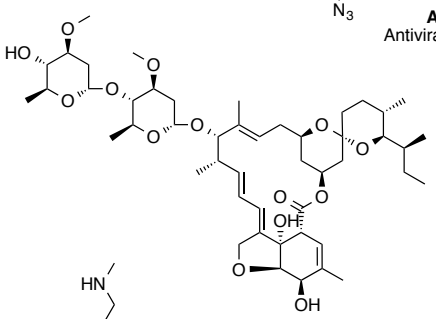
Hydrocortisone
Hormone



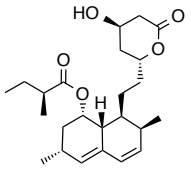
Ibuprofen
Analgesic



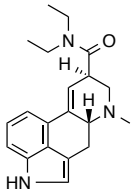
Isoniacid
Antibacterial
(Tuberculosis)



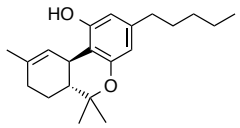
Ivermectin
Antiparasitic
(Onchocerciasis)



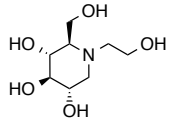
Lovastatin
Anti-cholesterol



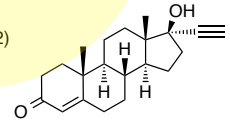
LSD
Psychedelic



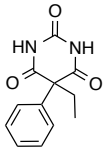
THC
Antiemetic



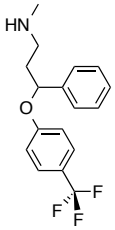
Miglitol
Antidiabetic



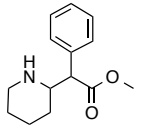
Norethindrone
Hormone
(oral contraceptive)



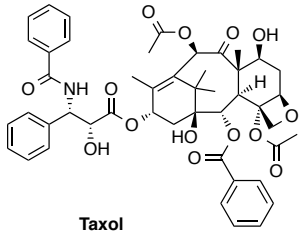
Phenobarbital
Anticonvulsant



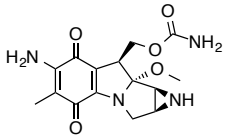
Prozac
Antidepressant



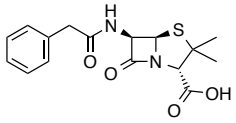
Ritalin
Stimulant



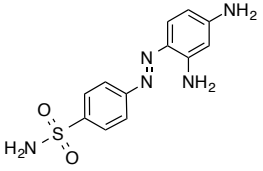
Taxol
Anticancer



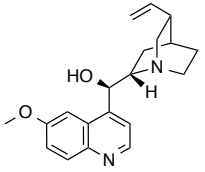
Mitomycin C
Anticancer



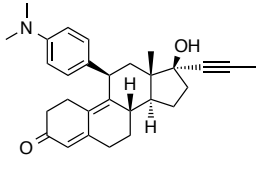
Penicillin
Antibacterial



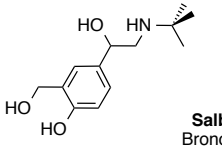
Prontosil
Antibacterial



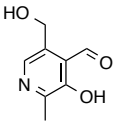
Quinine
Antimalarial



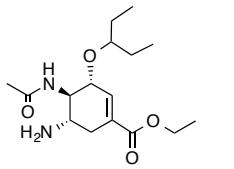
RU-486
Hormone
("abortion pill")



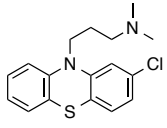
Salbutamol
Bronchodilator
(Asthma)



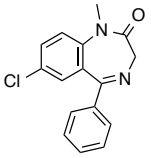
Vitamin B_6
Nutrient



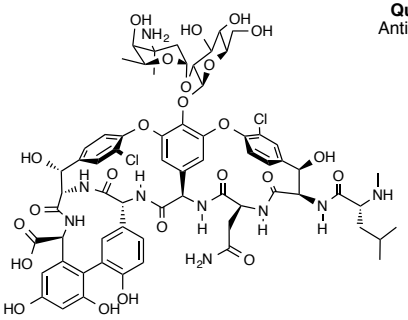
Tamiflu
Antiviral



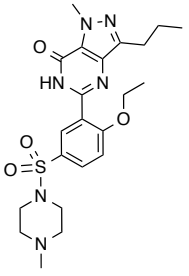
Thorazine
Antipsychotic
(Schizophrenia)



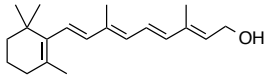
Valium
Tranquilizer



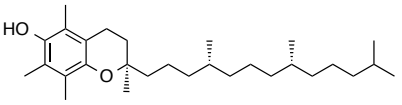
Vancomycin
Antibacterial



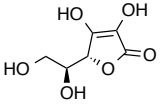
Viagra
Vasodilator



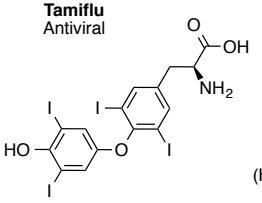
Vitamin A
Nutrient



Vitamin E
Nutrient

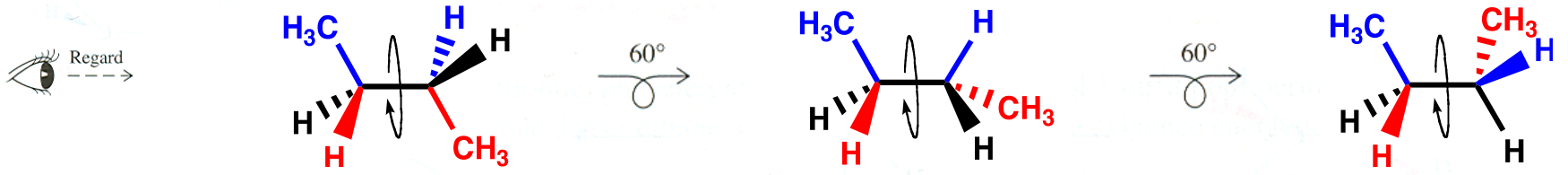


Vitamin C
Nutrient

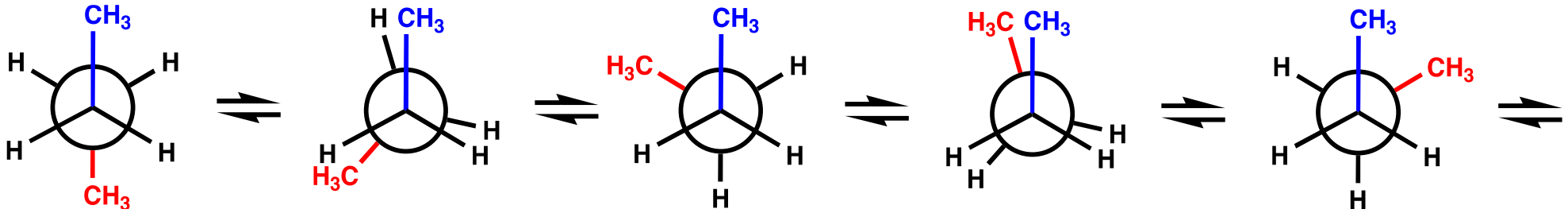


Thyroxine
Hormone
(Hypothyroidism)

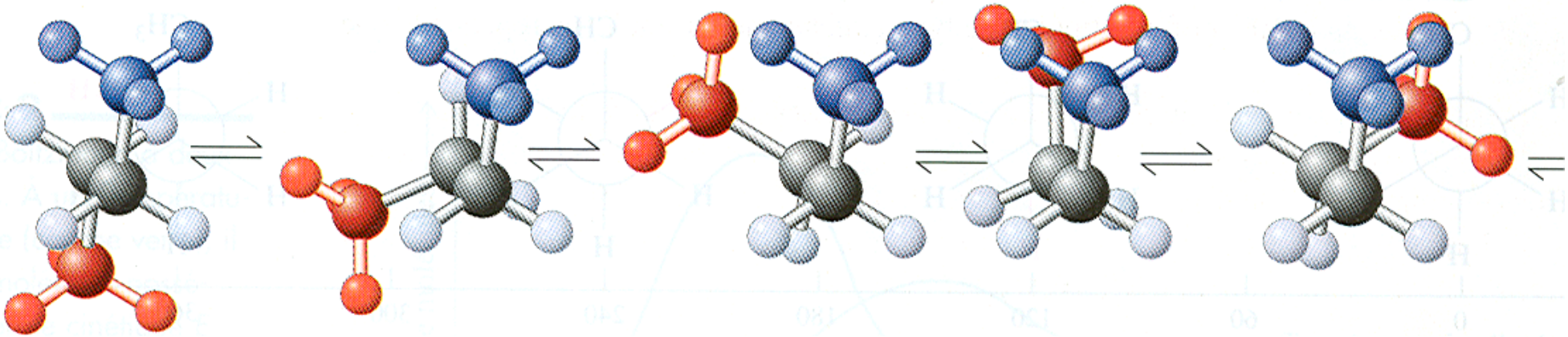
Isomères conformationnels (conformères)



Projection de Newman

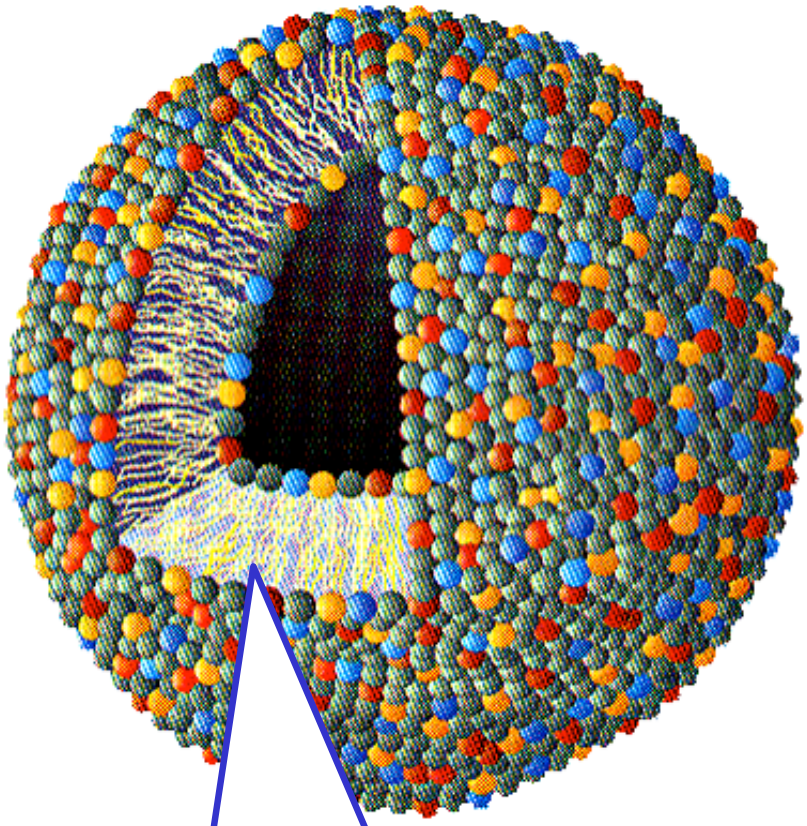


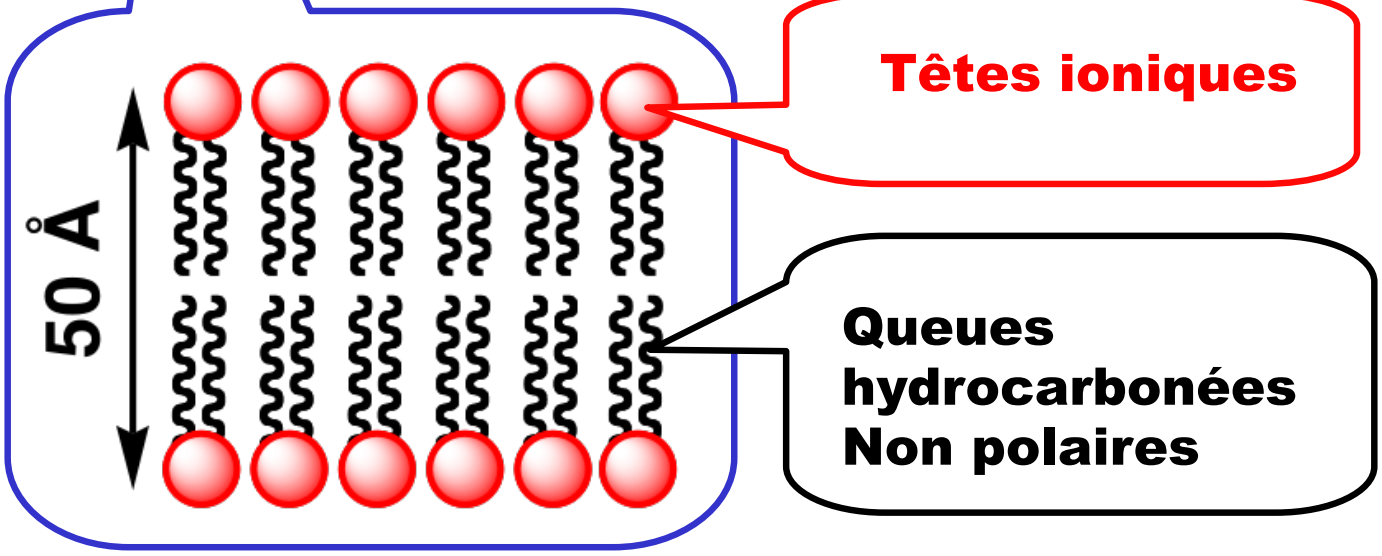
décalée (éclipsée) **décalée** (éclipsée) **décalée**

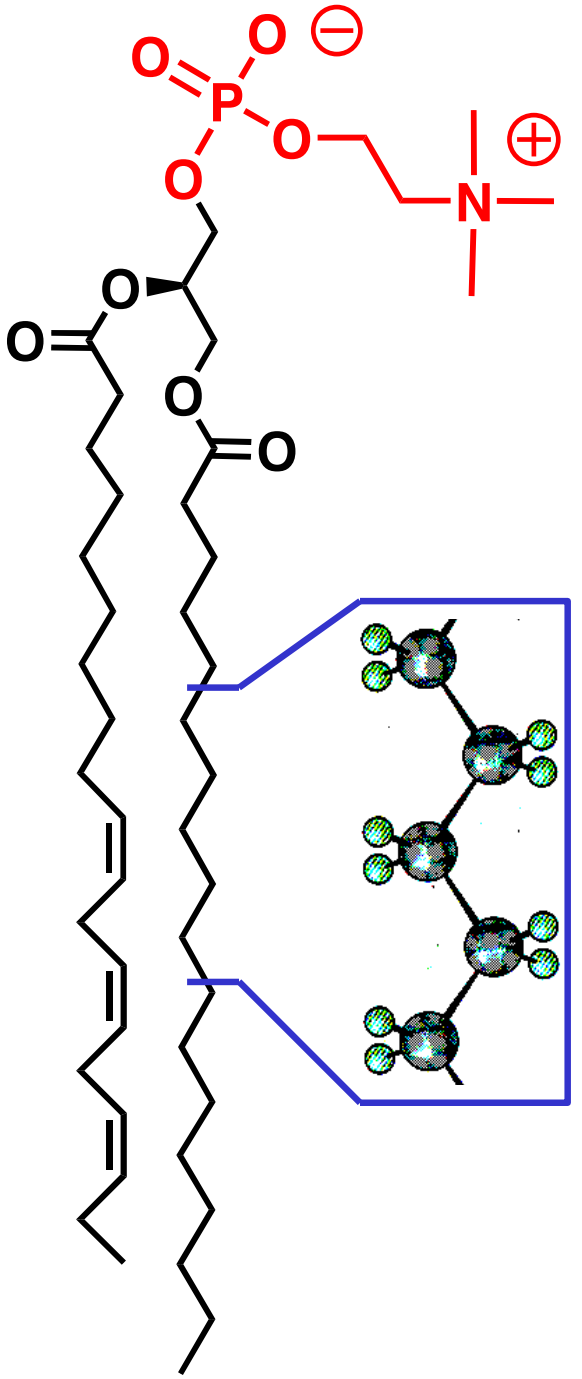


anti (gauche) (gauche)

Acides gras saturés - phospholipides - biomembranes

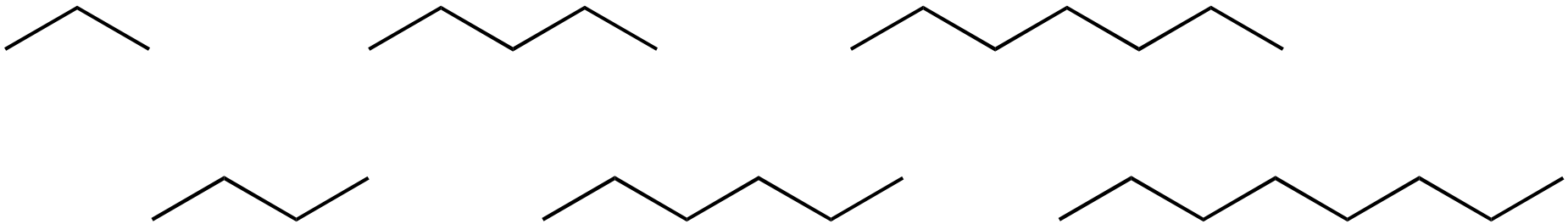




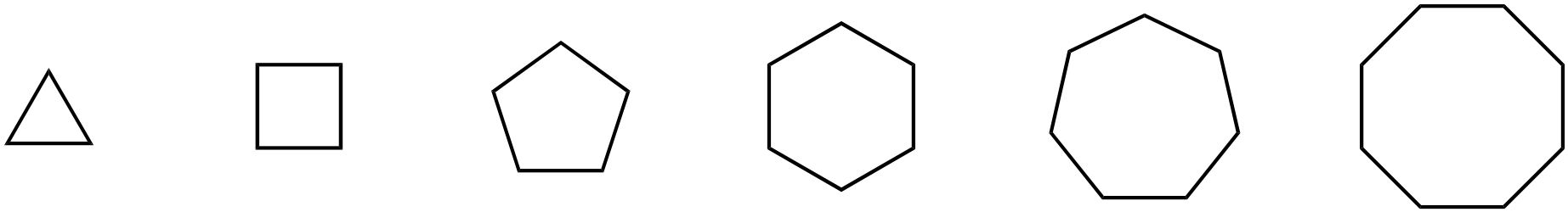


Cycloalcanes

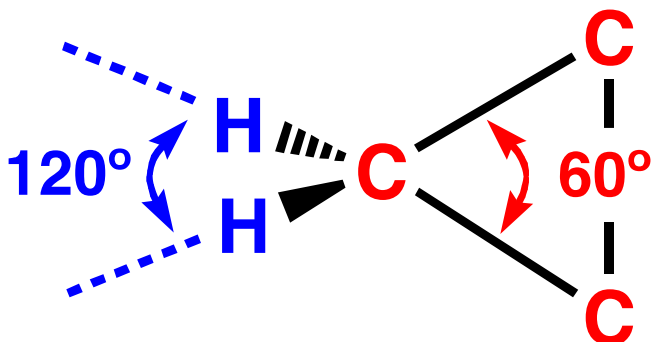
C_nH_{2n+2}

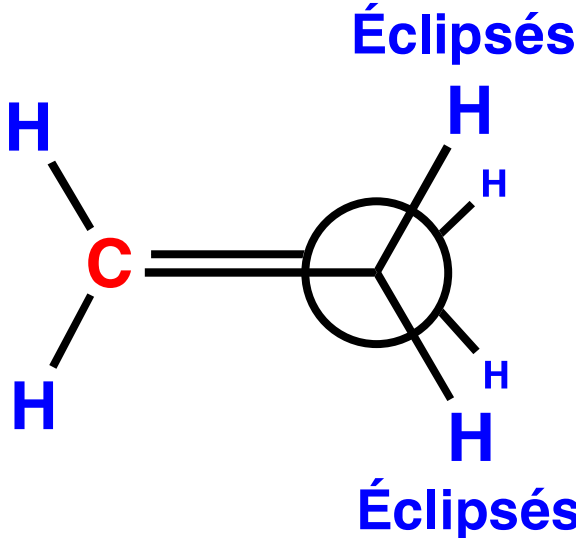


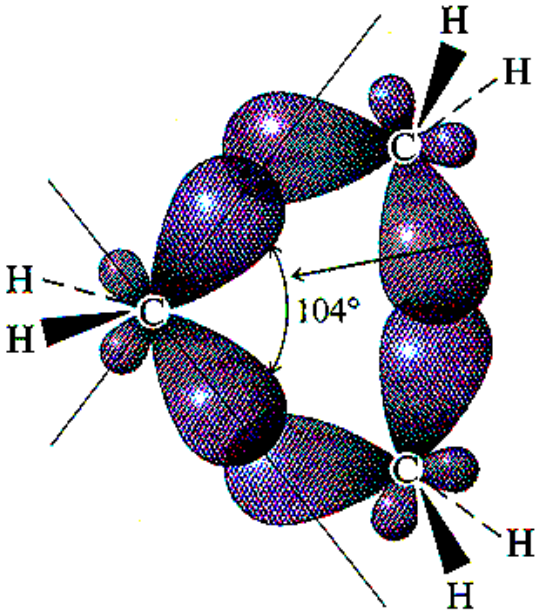
C_nH_{2n}

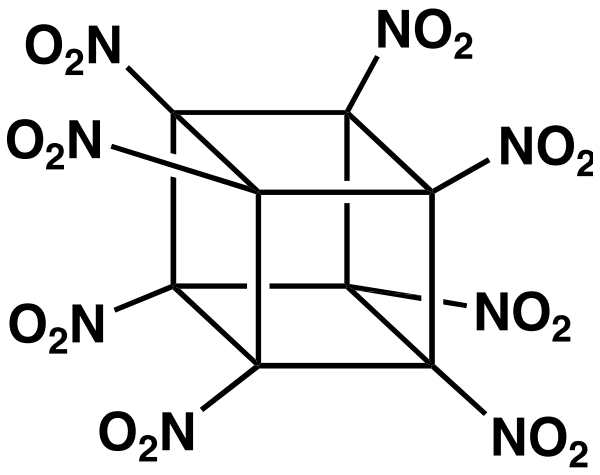


Tension de cycle



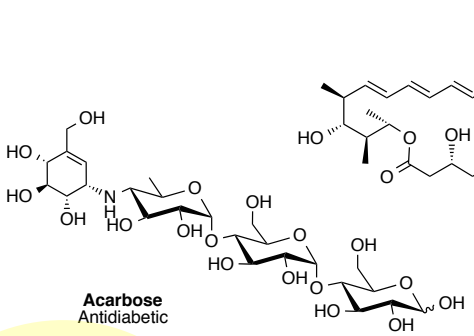




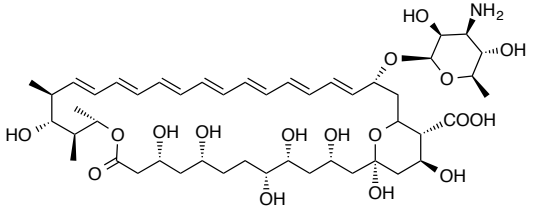


Octanitrocubane

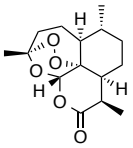
Molécules qui ont changé notre monde...



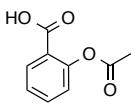
Acarbose
Antidiabetic



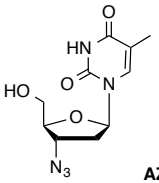
Amphotericin B
Antifungal



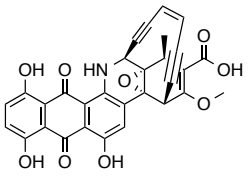
Artemisinin
Antimalarial



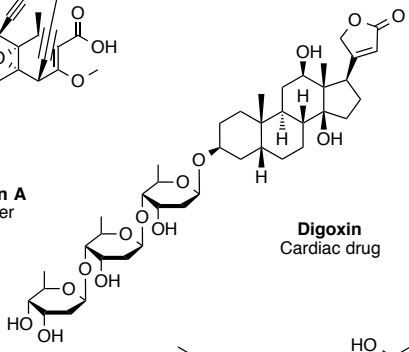
Aspirin
Analgesic



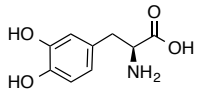
AZT
Antiviral (AIDS)



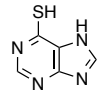
Dynemicin A
Anticancer



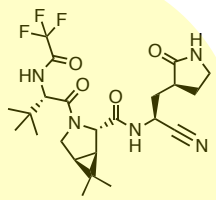
Digoxin
Cardiac drug



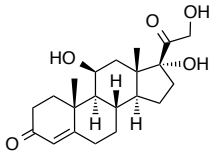
L-Dopa
Antiparkinson



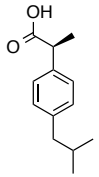
6-Mercaptopurine
Anticancer



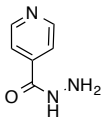
Paxlovid
Antiviral
(SARS-CoV-2)



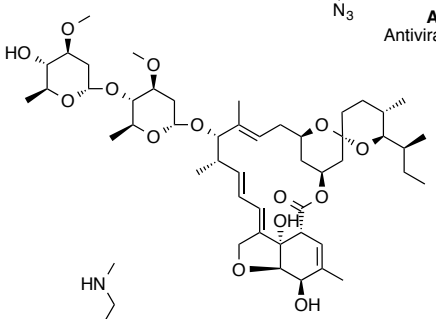
Hydrocortisone
Hormone



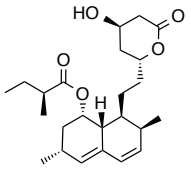
Ibuprofen
Analgesic



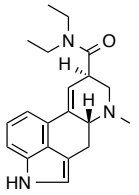
Isoniacid
Antibacterial
(Tuberculosis)



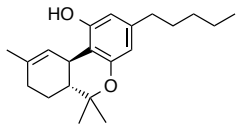
Ivermectin
Antiparasitic
(Onchocerciasis)



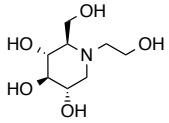
Lovastatin
Anti-cholesterol



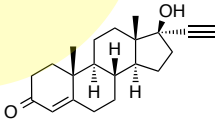
LSD
Psychedelic



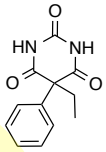
THC
Antiemetic



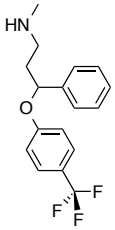
Miglitol
Antidiabetic



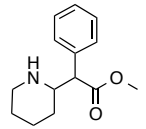
Norethindrone
Hormone
(oral contraceptive)



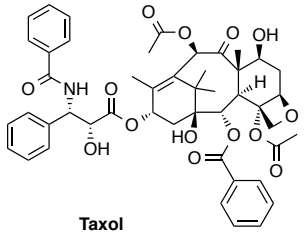
Phenobarbital
Anticonvulsant



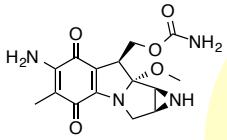
Prozac
Antidepressant



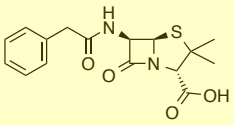
Ritalin
Stimulant



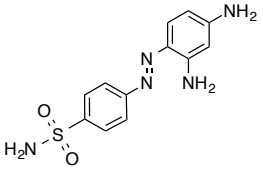
Taxol
Anticancer



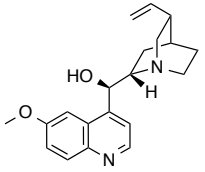
Mitomycin C
Anticancer



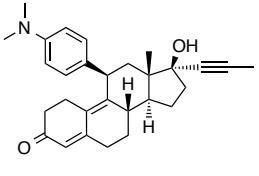
Penicillin
Antibacterial



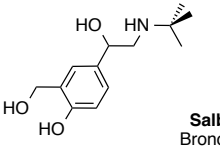
Prontosil
Antibacterial



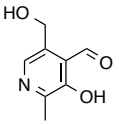
Quinine
Antimalarial



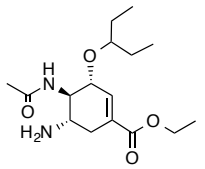
RU-486
Hormone
("abortion pill")



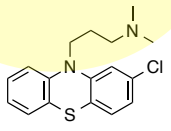
Salbutamol
Bronchodilator
(Asthma)



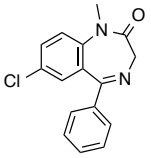
Vitamin B_6
Nutrient



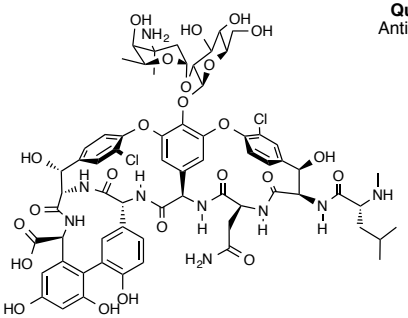
Tamiflu
Antiviral



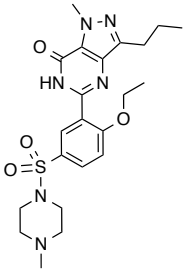
Thorazine
Antipsychotic
(Schizophrenia)



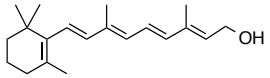
Valium
Tranquilizer



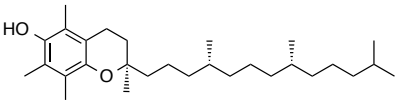
Vancomycin
Antibacterial



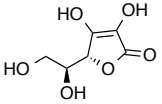
Viagra
Vasodilator



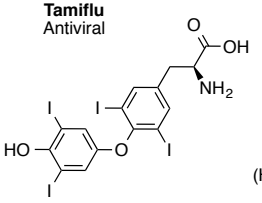
Vitamin A
Nutrient



Vitamin E
Nutrient

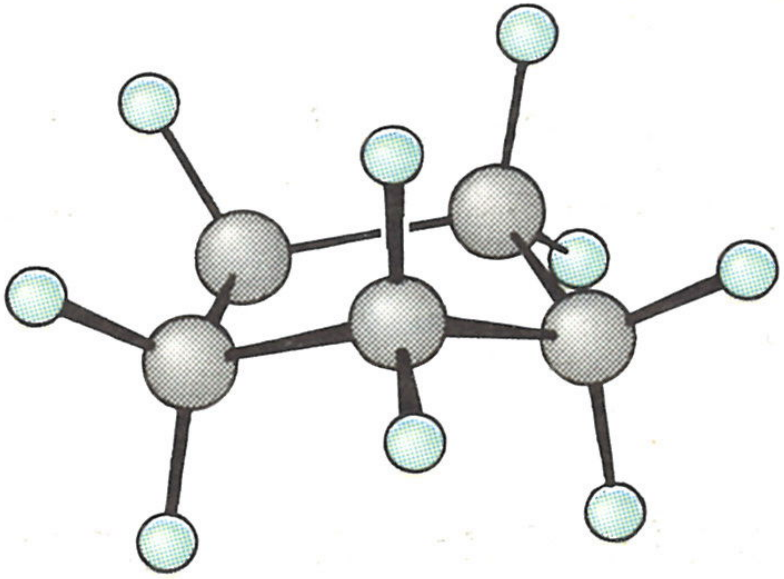


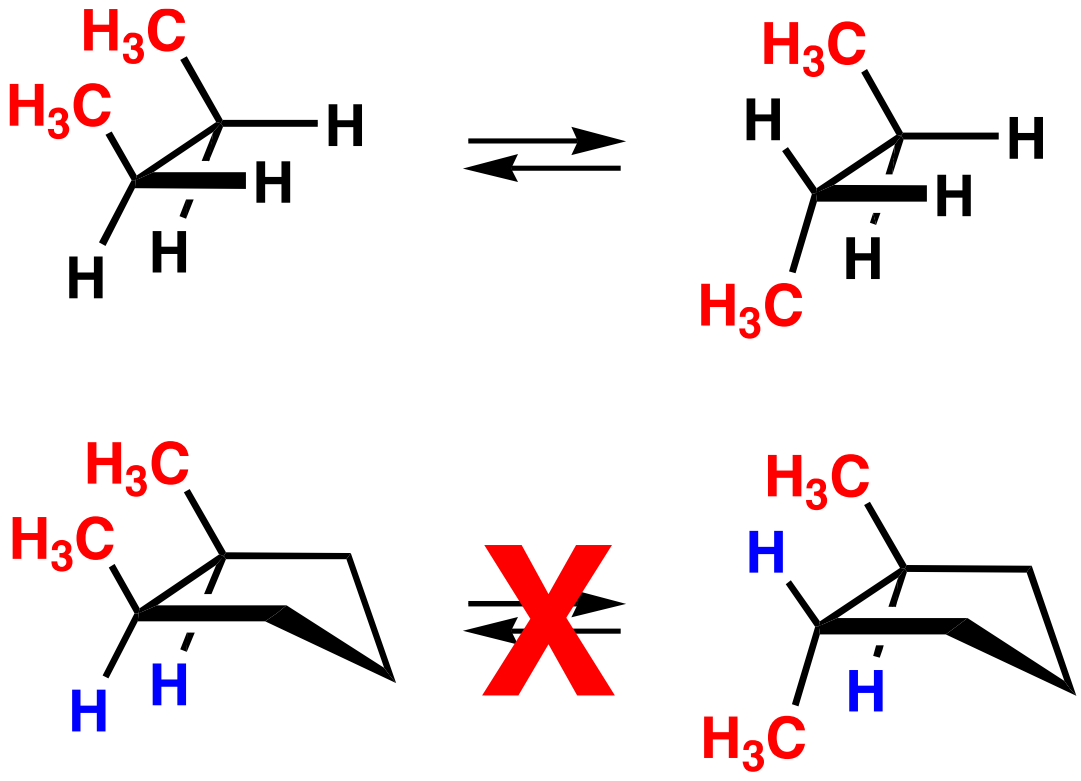
Vitamin C
Nutrient



Thyroxine
Hormone
(Hypothyroidism)

Stéréoisomères / Cyclopentane





cis
Eb 99 ºC

trans
Eb 92 ºC

(576)

Conformation décalée

A

isomères dont les atomes sont liés dans le même ordre, mais dont l'arrangement tridimensionnel est différent

B

une manière de représenter l'arrangement spatial d'une molécule en regardant le long d'une liaison

C

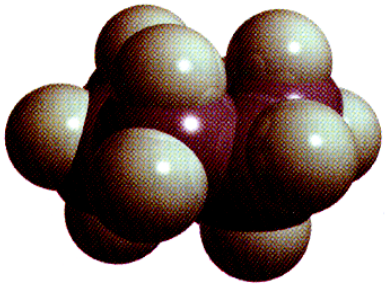
arrangement tridimensionnel des atomes autour d'une liaison, dans lequel les liaisons sur un atome coupent en deux les angles de liaison du second atome, lorsqu'elles sont vues en projection de Newman

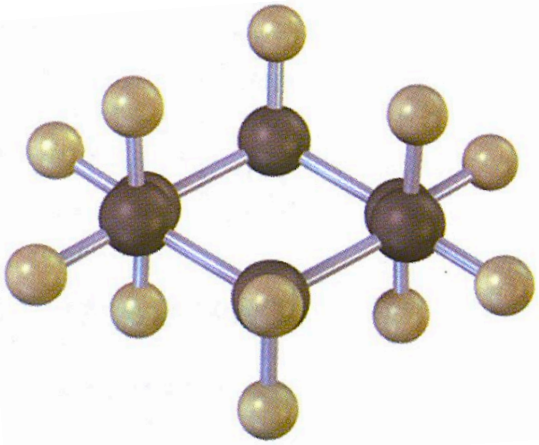
D

molécules avec même formule moléculaire, mais d'arrangements des atomes différents

E

molécules qui ne diffèrent que par la rotation autour des liaisons simples



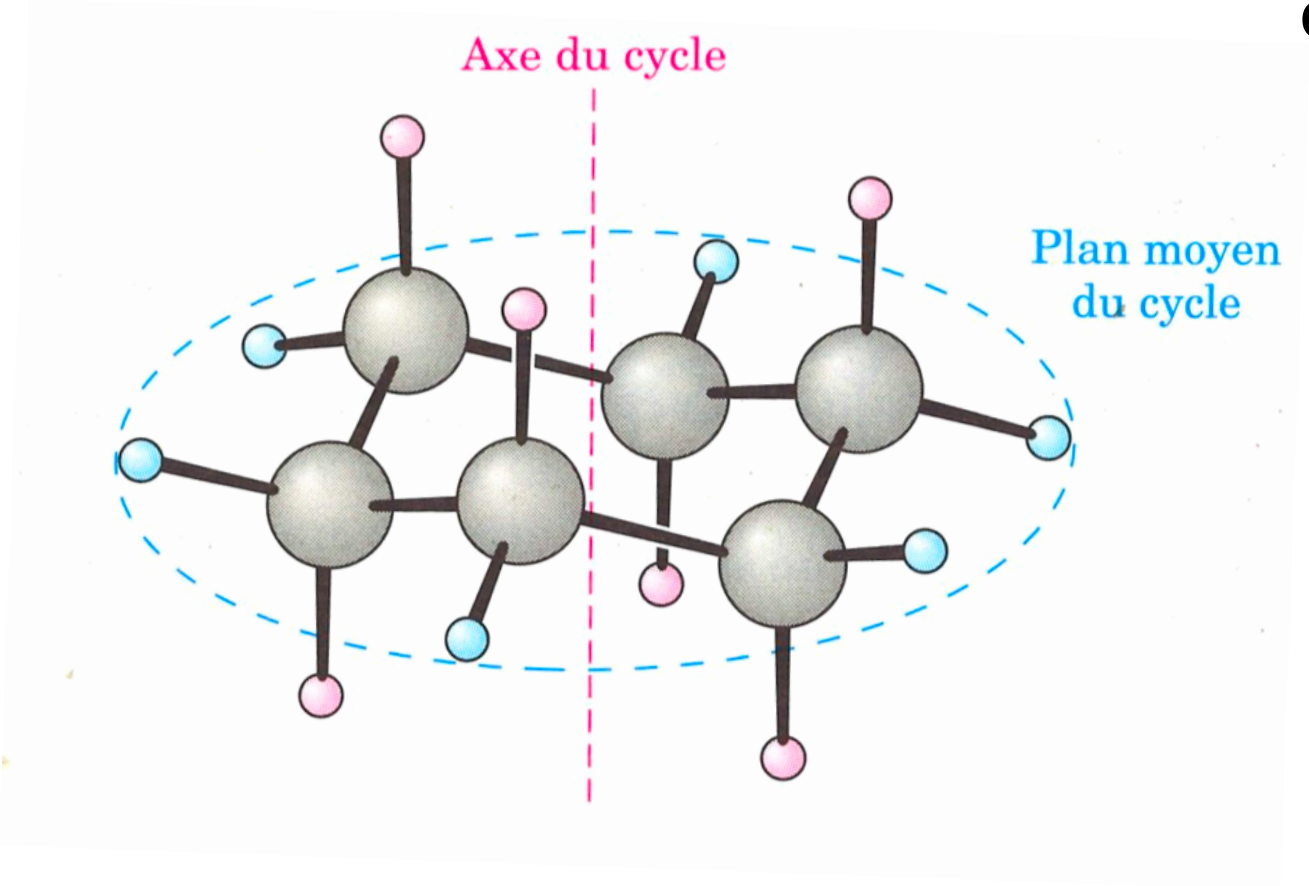


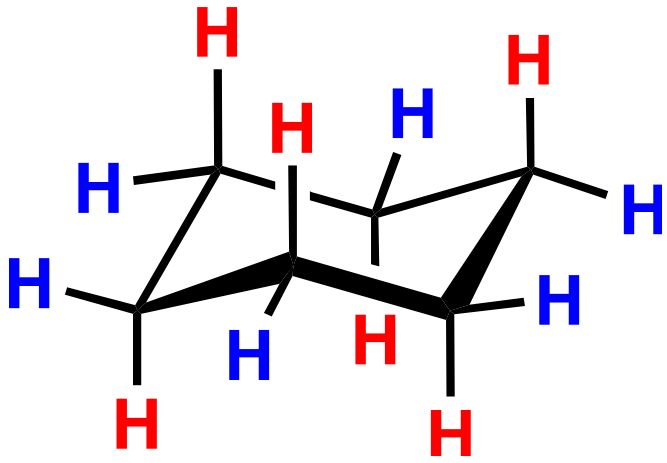
Cyclohexane
Hexagone

Liaisons équatoriales

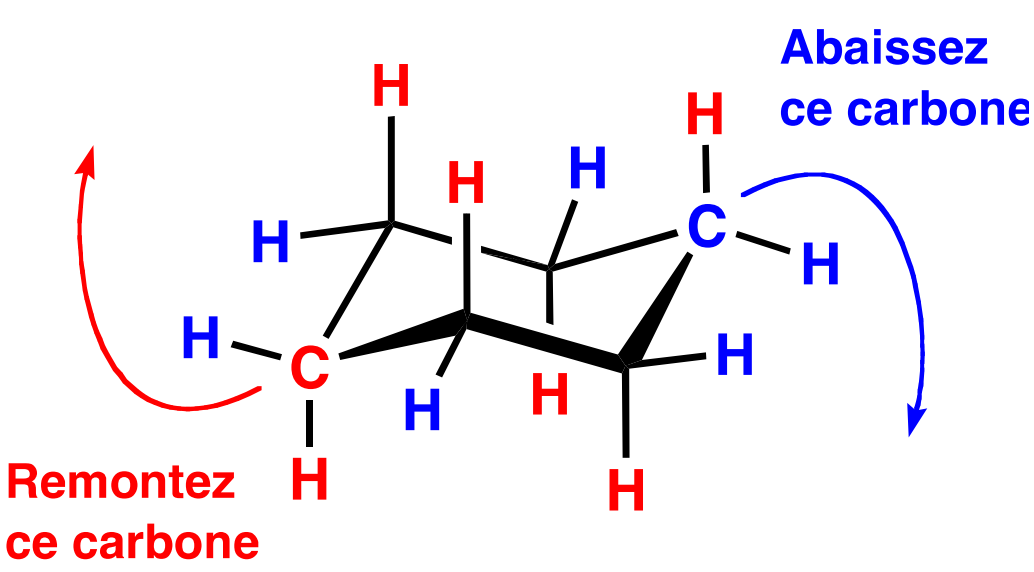
Liaisons axiales

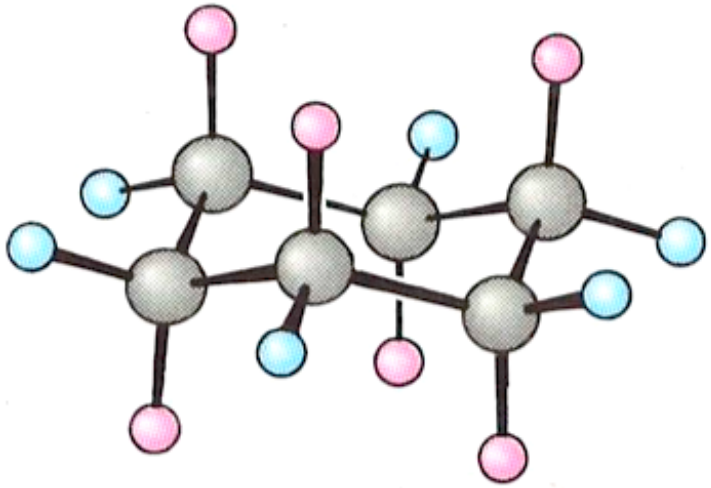
Conformation chaise





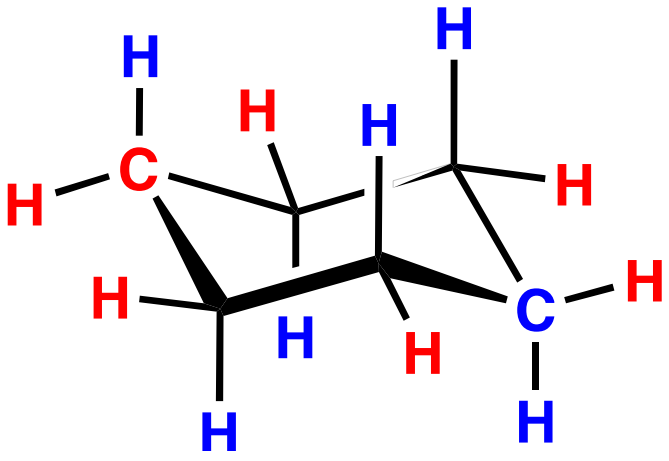
Conformations du cyclohexane

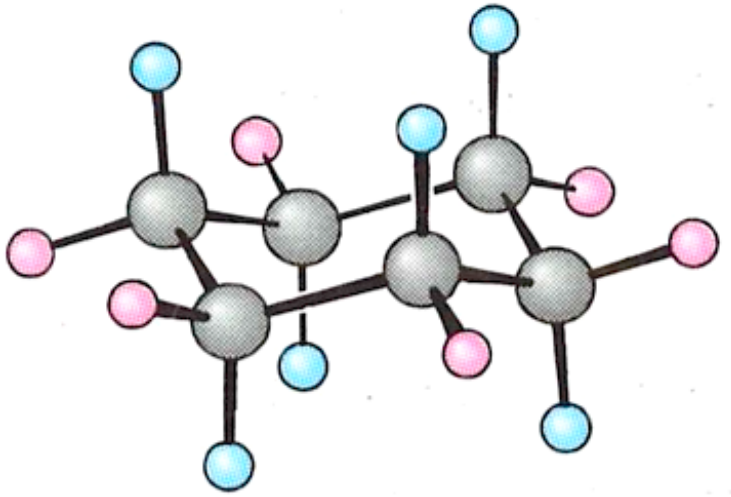




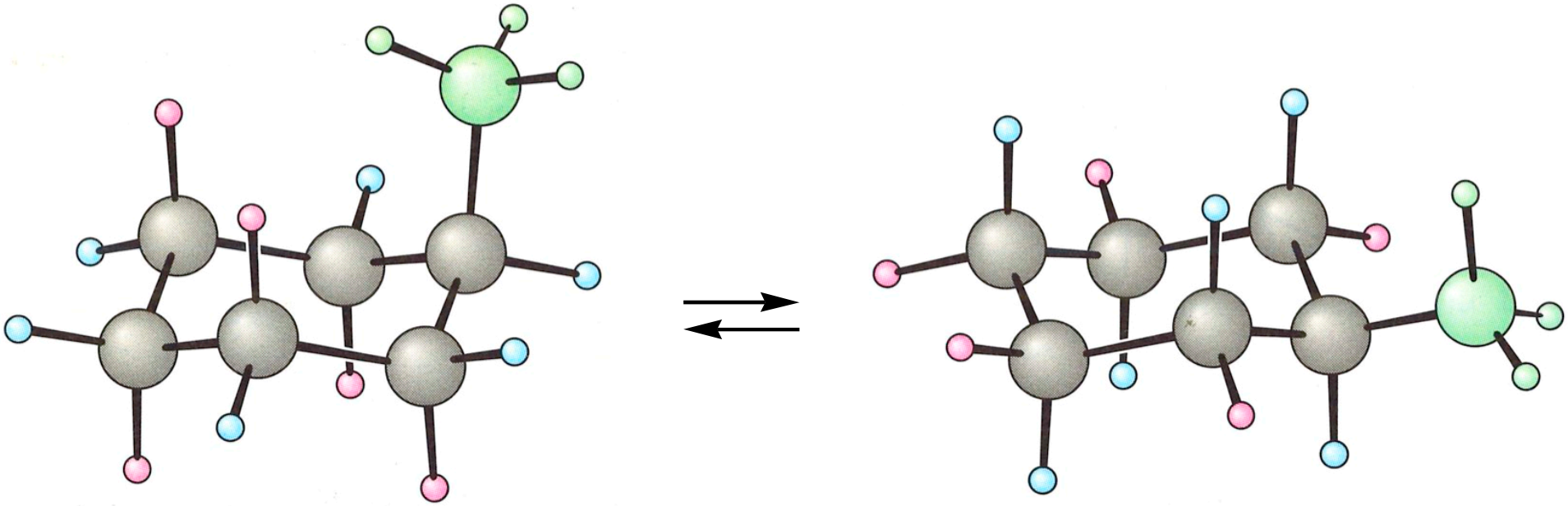
Basculement

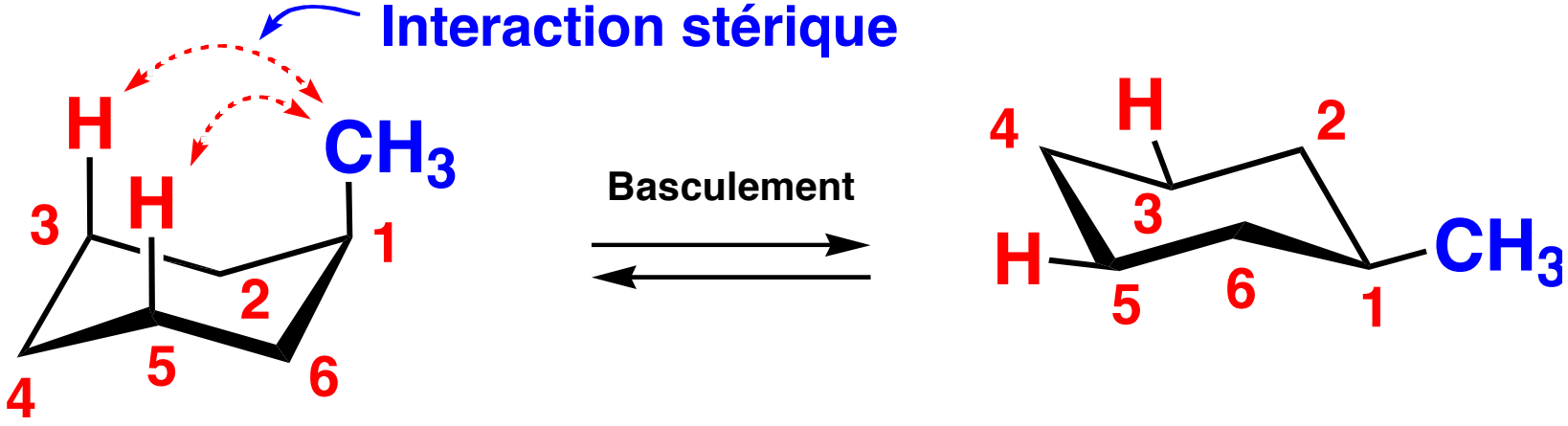
Basculement





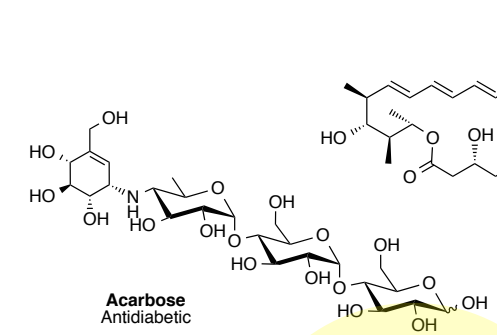
Conformations du cyclohexane



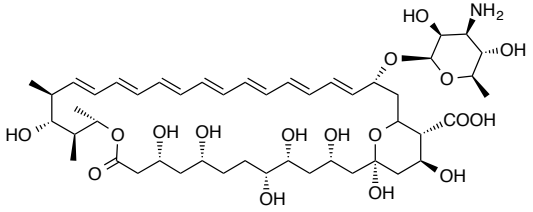


Interaction 1,3-diaxiale : **Contrainte stérique**

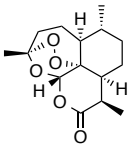
Molécules qui ont changé notre monde...



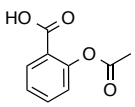
Acarbose
Antidiabetic



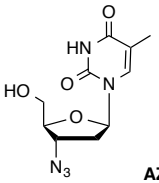
Amphotericin B
Antifungal



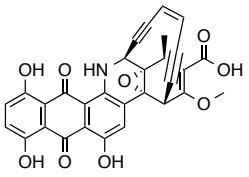
Artemisinin
Antimalarial



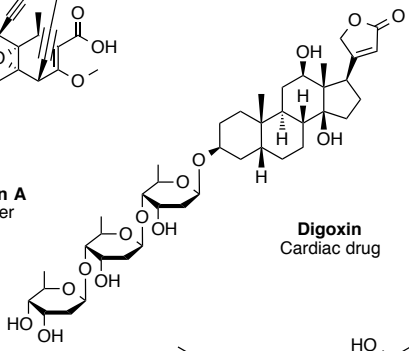
Aspirin
Analgesic



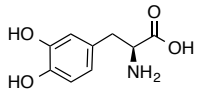
AZT
Antiviral (AIDS)



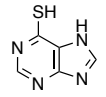
Dynemicin A
Anticancer



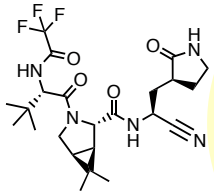
Digoxin
Cardiac drug



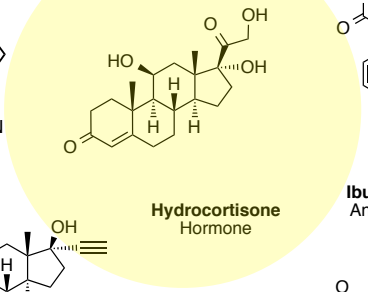
L-Dopa
Antiparkinson



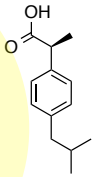
6-Mercaptopurine
Anticancer



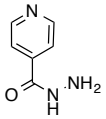
Paxlovid
Antiviral
(SARS-CoV-2)



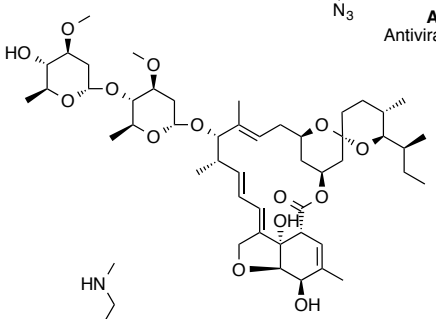
Hydrocortisone
Hormone



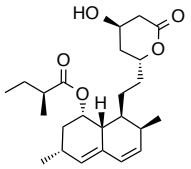
Ibuprofen
Analgesic



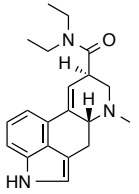
Isoniacid
Antibacterial
(Tuberculosis)



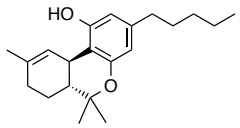
Ivermectin
Antiparasitic
(Onchocerciasis)



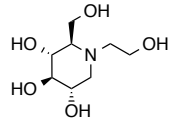
Lovastatin
Anti-cholesterol



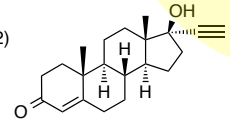
LSD
Psychedelic



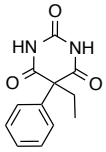
Marijuana
Antiemetic



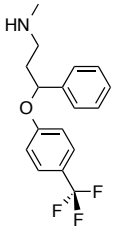
Miglitol
Antidiabetic



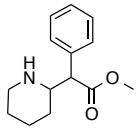
Norethindrone
Hormone
(oral contraceptive)



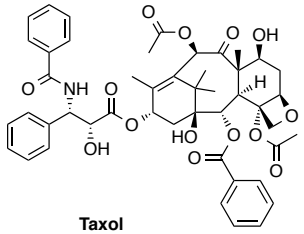
Phenobarbital
Anticonvulsant



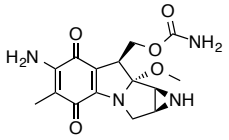
Prozac
Antidepressant



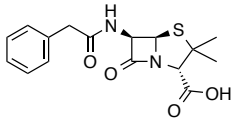
Ritalin
Stimulant



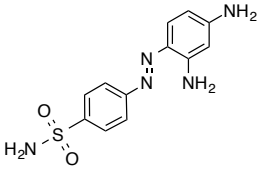
Taxol
Anticancer



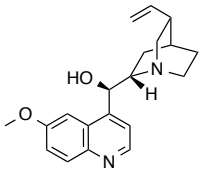
Mitomycin C
Anticancer



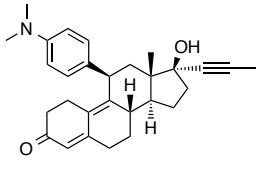
Penicillin
Antibacterial



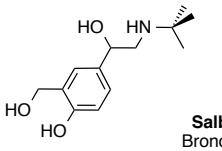
Prontosil
Antibacterial



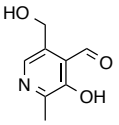
Quinine
Antimalarial



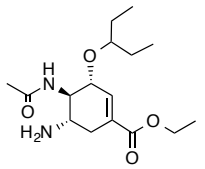
RU-486
Hormone
("abortion pill")



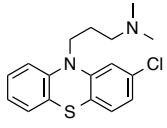
Salbutamol
Bronchodilator
(Asthma)



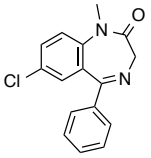
Vitamin B_6
Nutrient



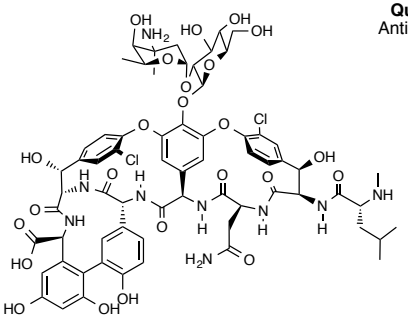
Tamiflu
Antiviral



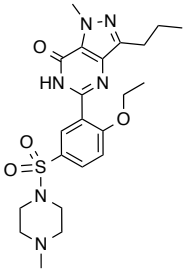
Thorazine
Antipsychotic
(Schizophrenia)



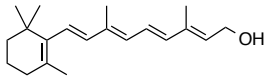
Valium
Tranquilizer



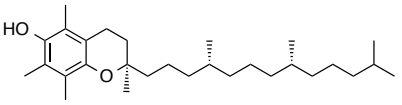
Vancomycin
Antibacterial



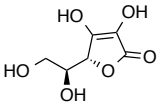
Viagra
Vasodilator



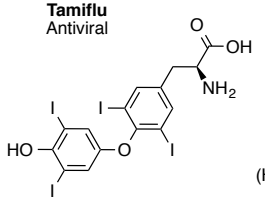
Vitamin A
Nutrient



Vitamin E
Nutrient

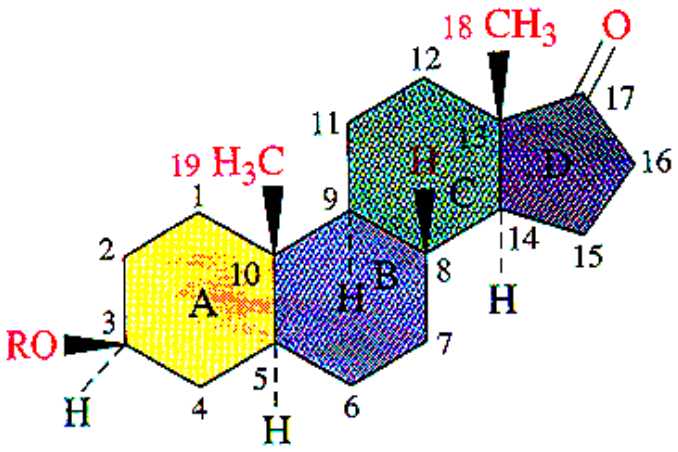


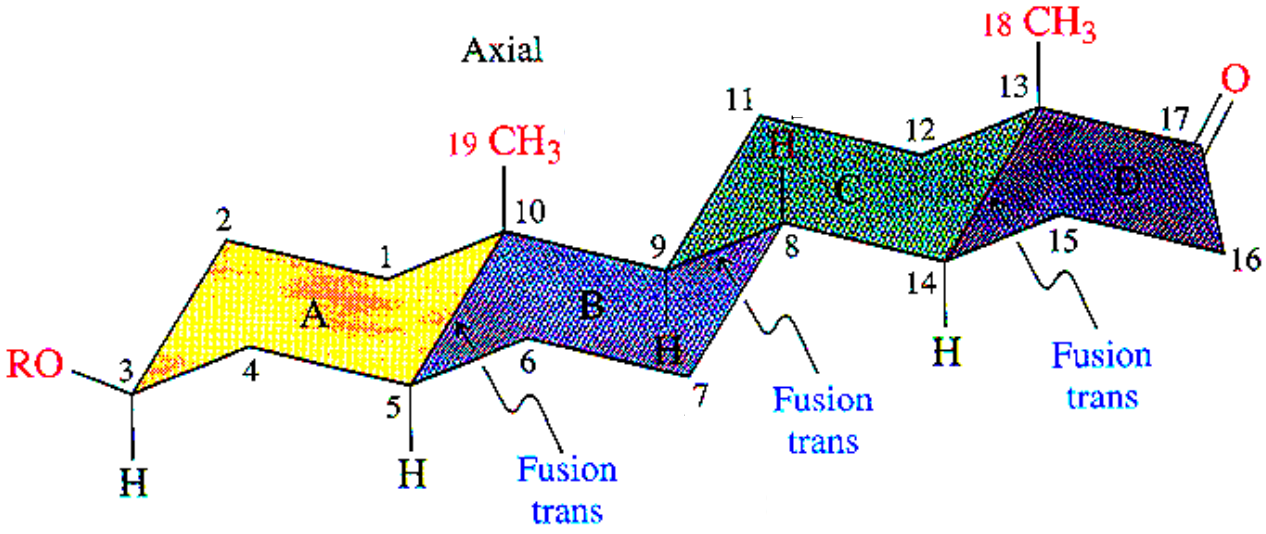
Vitamin C
Nutrient

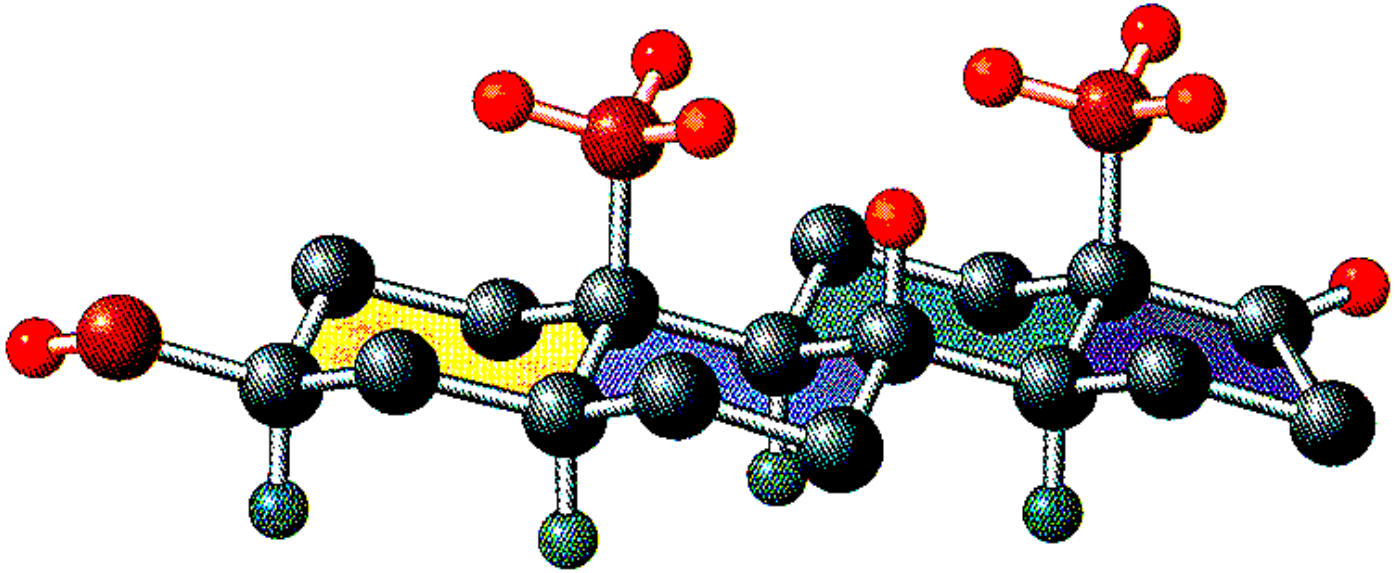


Thyroxine
Hormone
(Hypothyroidism)

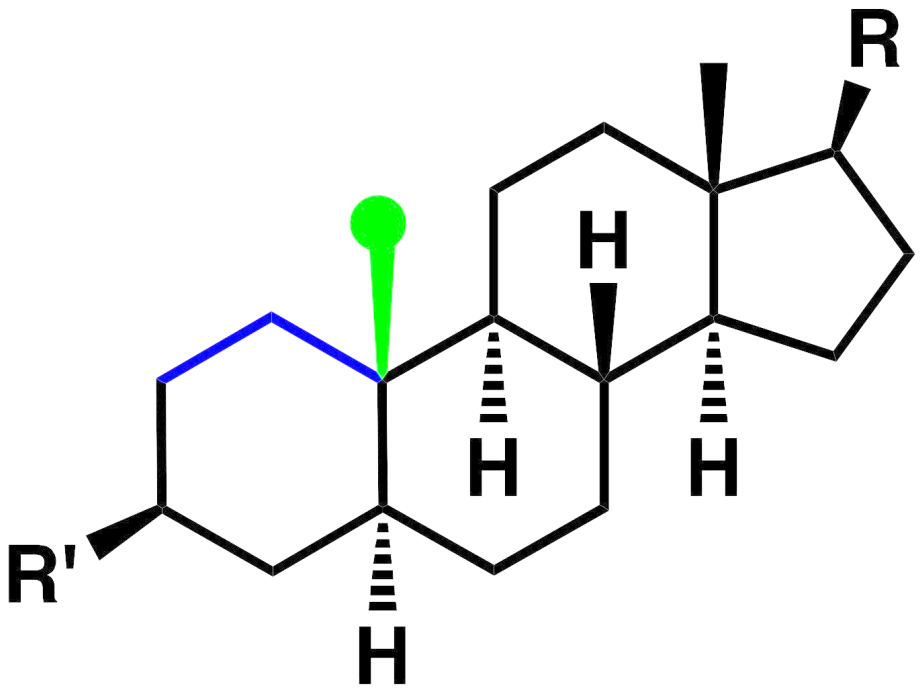
Stéroïdes

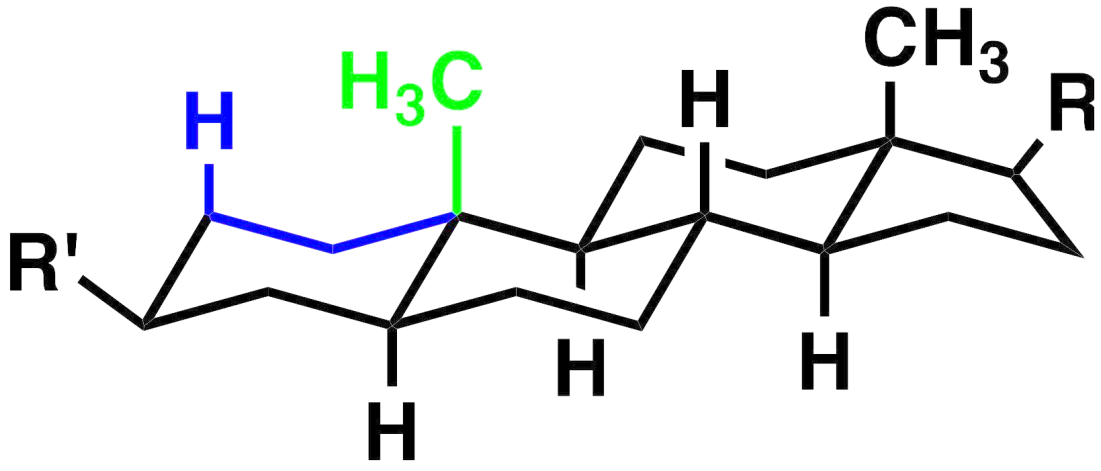

18 CH3
O
19 H3C
RO
A
B
C
D
H


Axial
Axial
18 CH3
19 CH3
RO
A
B
C
D
H
Fusion trans
Fusion trans
Fusion trans



Interactions 1,3-diaxiales ?





A 1

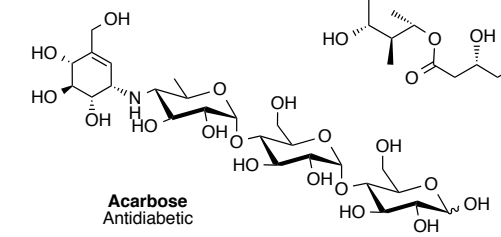
B 2

C 3

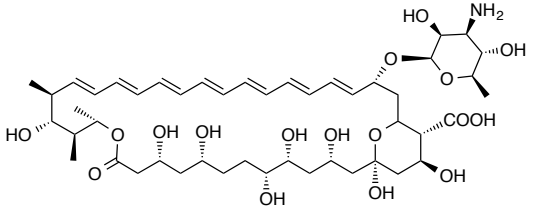
D 5

E 6

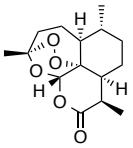
Molécules qui ont changé notre monde...



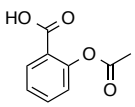
Acarbose
Antidiabetic



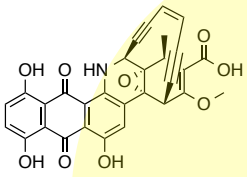
Amphotericin B
Antifungal



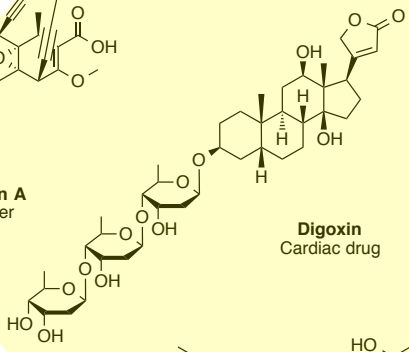
Artemisinin
Antimalarial



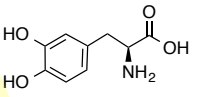
Aspirin
Analgesic



Dynemicin A
Anticancer

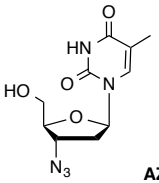


Digoxin
Cardiac drug

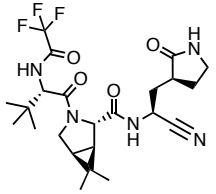


L-Dopa
Antiparkinson

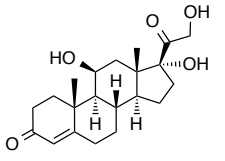
6-Mercaptopurine
Anticancer



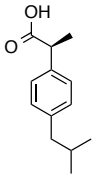
AZT
Antiviral (AIDS)



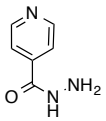
Paxlovid
Antiviral
(SARS-CoV-2)



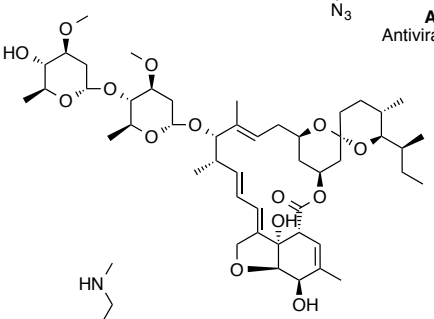
Hydrocortisone
Hormone



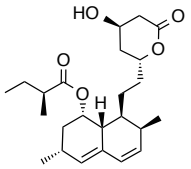
Ibuprofen
Analgesic



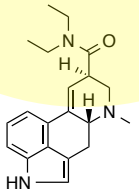
Isoniacid
Antibacterial
(Tuberculosis)



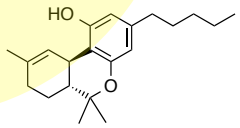
Ivermectin
Antiparasitic
(Onchocerciasis)



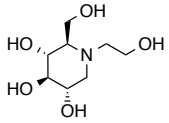
Lovastatin
Anti-cholesterol



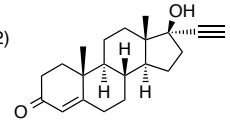
LSD
Psychedelic



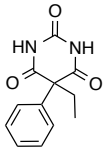
Marijuana
Antiemetic



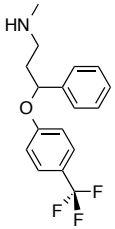
Miglitol
Antidiabetic



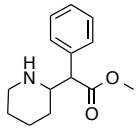
Norethindrone
Hormone
(oral contraceptive)



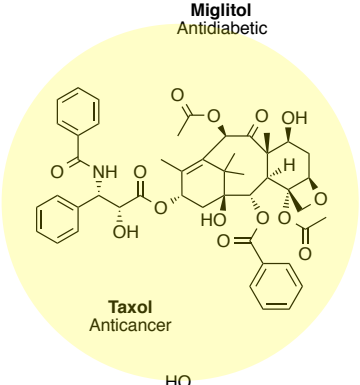
Phenobarbital
Anticonvulsant



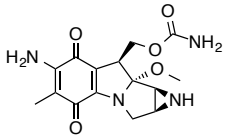
Prozac
Antidepressant



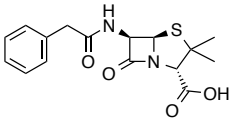
Ritalin
Stimulant



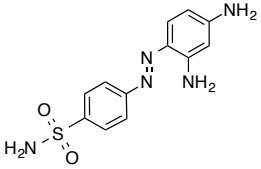
Taxol
Anticancer



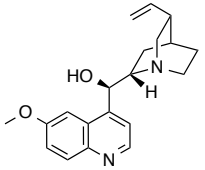
Mitomycin C
Anticancer



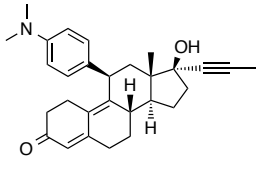
Penicillin
Antibacterial



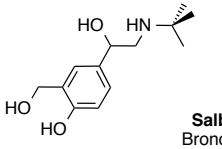
Prontosil
Antibacterial



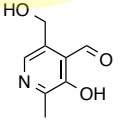
Quinine
Antimalarial



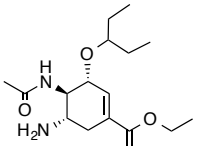
RU-486
Hormone
("abortion pill")



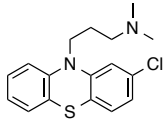
Salbutamol
Bronchodilator
(Asthma)



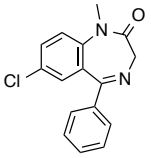
Vitamin B_6
Nutrient



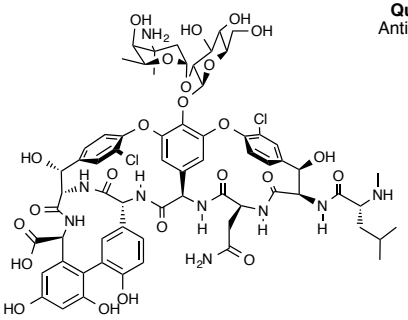
Tamiflu
Antiviral



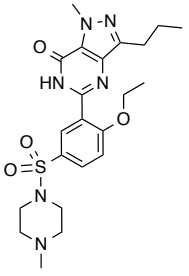
Thorazine
Antipsychotic
(Schizophrenia)



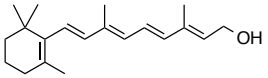
Valium
Tranquilizer



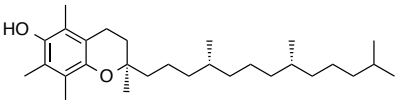
Vancomycin
Antibacterial



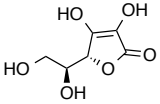
Viagra
Vasodilator



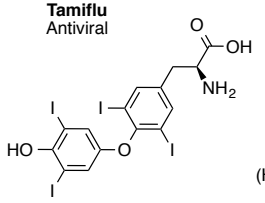
Vitamin A
Nutrient



Vitamin E
Nutrient

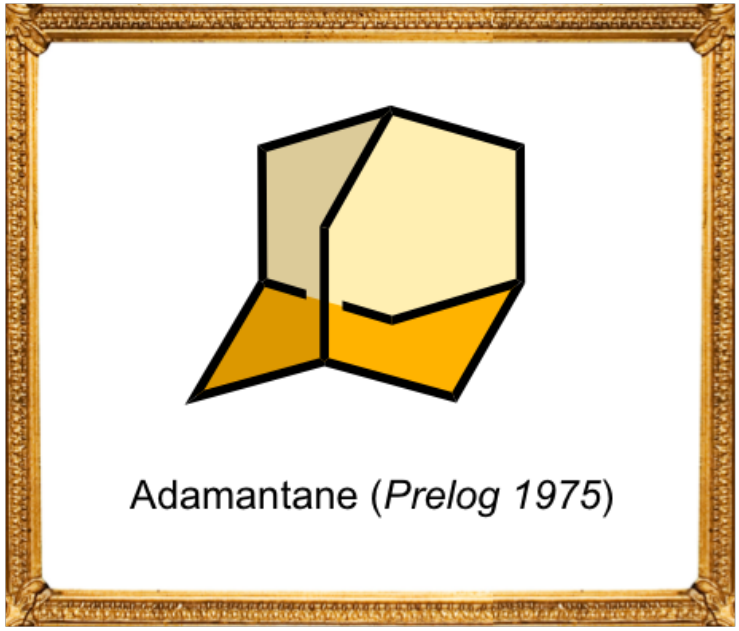


Vitamin C
Nutrient

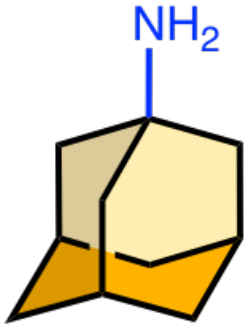


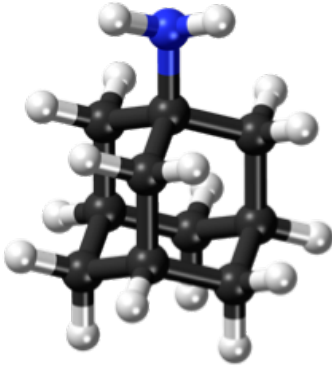
Thyroxine
Hormone
(Hypothyroidism)

Gallery of Swiss Classics

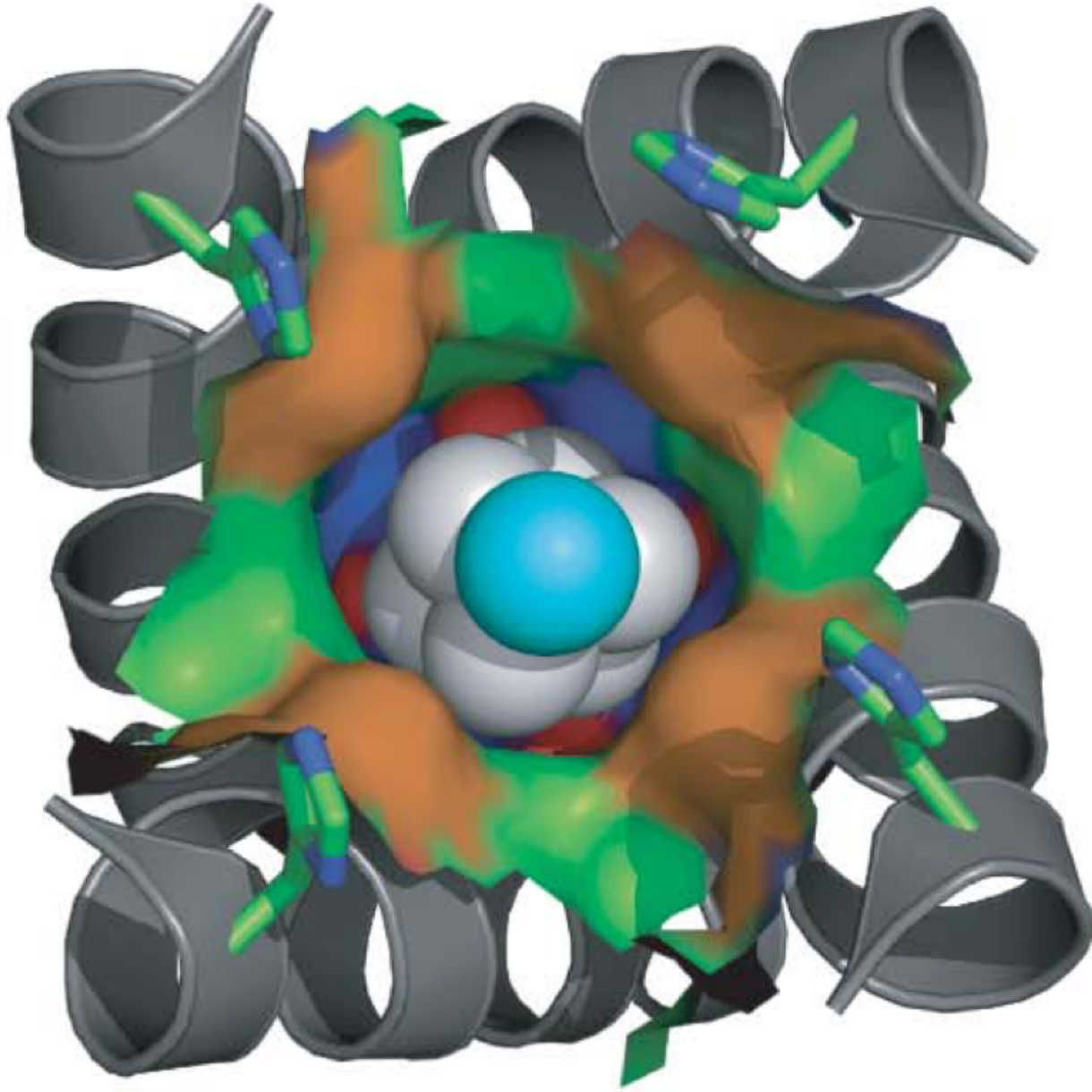


Adamantane (*Prelog 1975*)





Adamantadine
(antiviral, anti-Parkinson)



Liaison axiale

A

Conformation tridimensionnelle d'un cycle avec 6 atomes sp^3 qui présente moins de tension d'angle et d'éclipse

B

Forme tridimensionnelle exacte d'une molécule à un instant donné, en admettant que la rotation autour des liaisons simples est bloquée

C

Mouvement moléculaire transformant une conformation chaise en l'autre, interconvertissant ainsi les liaisons axiales et équatoriales

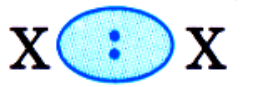
D

Interaction spatiale entre deux substituants axiaux, séparés par trois atomes dans une conformation chaise

E

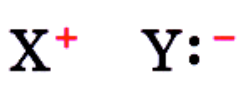
Liaison de la conformation chaise qui est perpendiculaire au plan moyen du cycle

Caractère ionique → **Electronégativité**

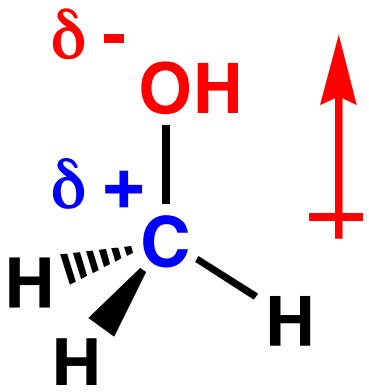


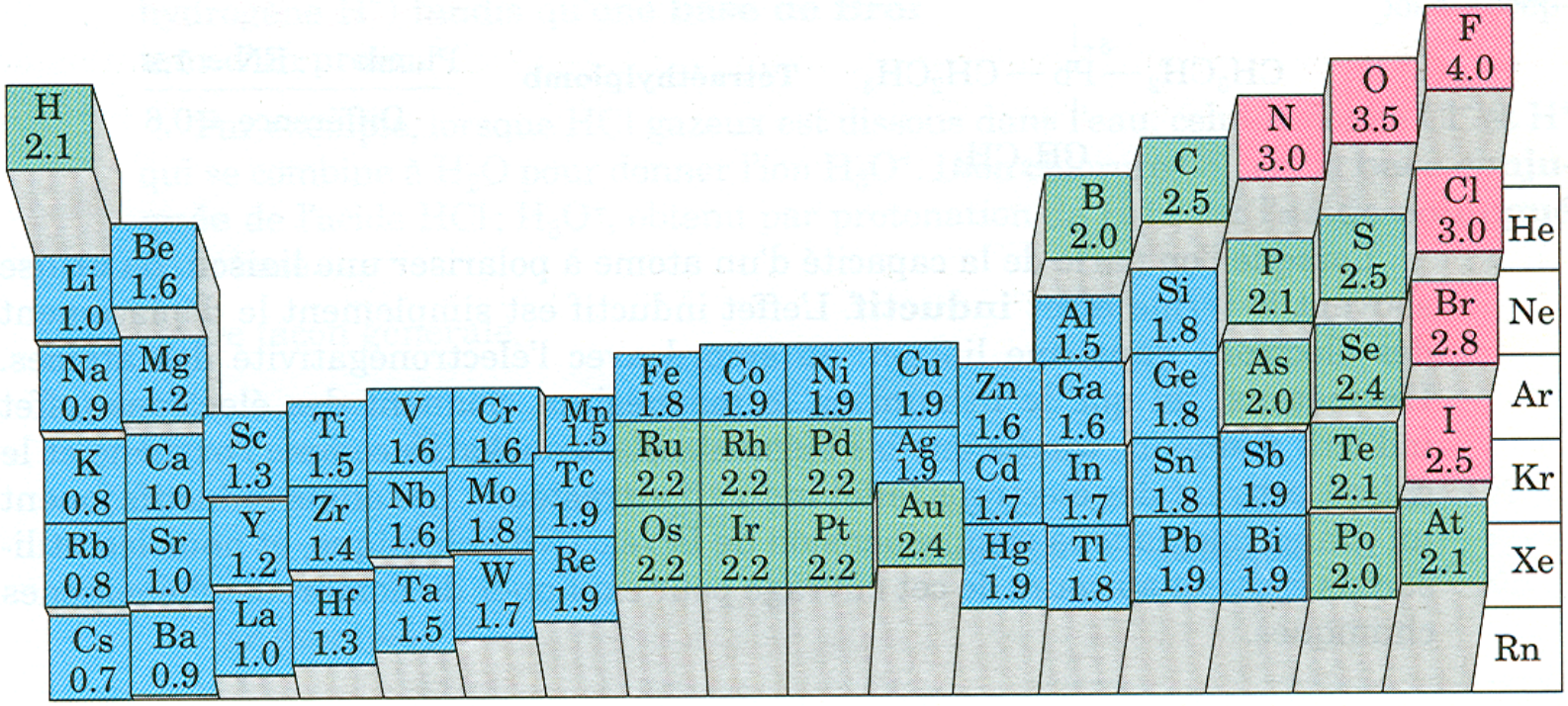
Liaison covalente symétrique

Liaison covalente polaire



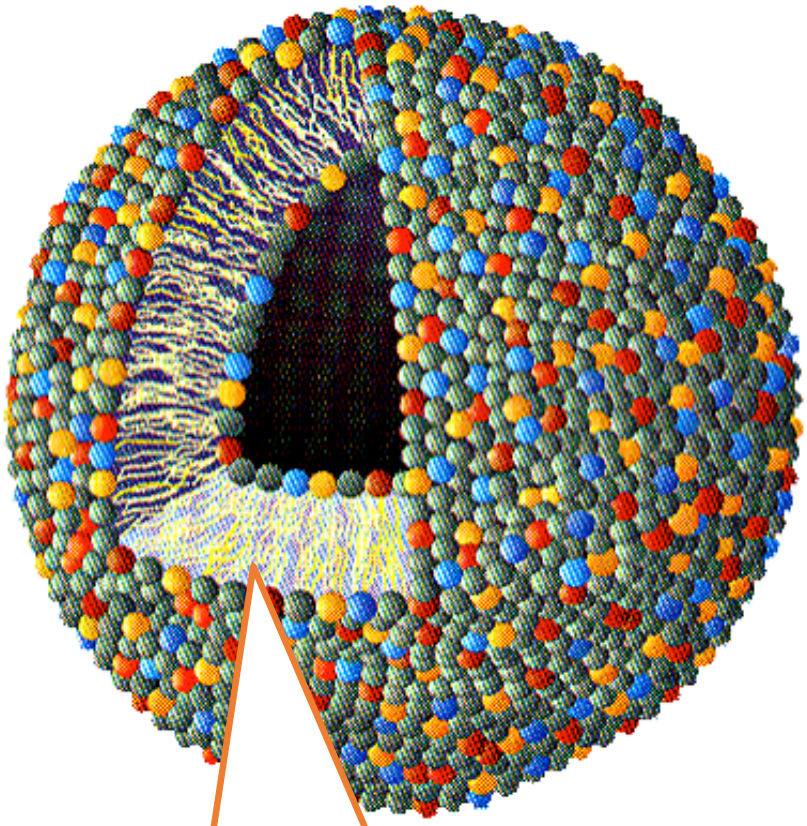
Liaison ionique

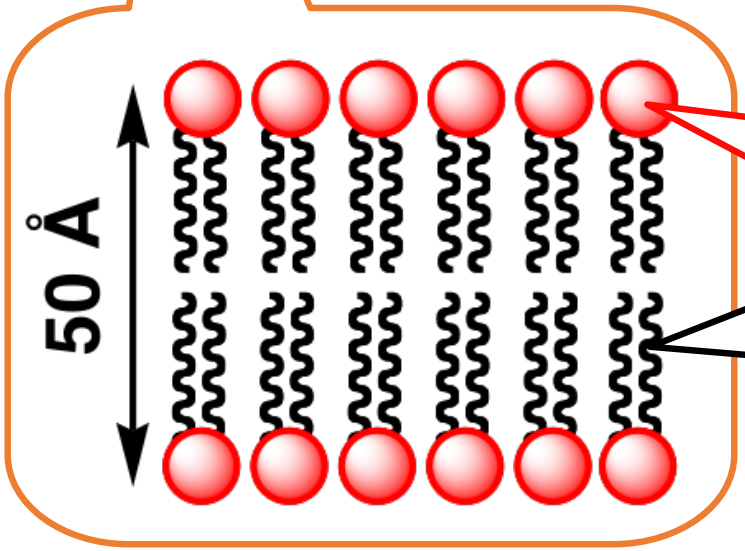




dipôle électrique

Acides gras saturés - phospholipides - biomembranes

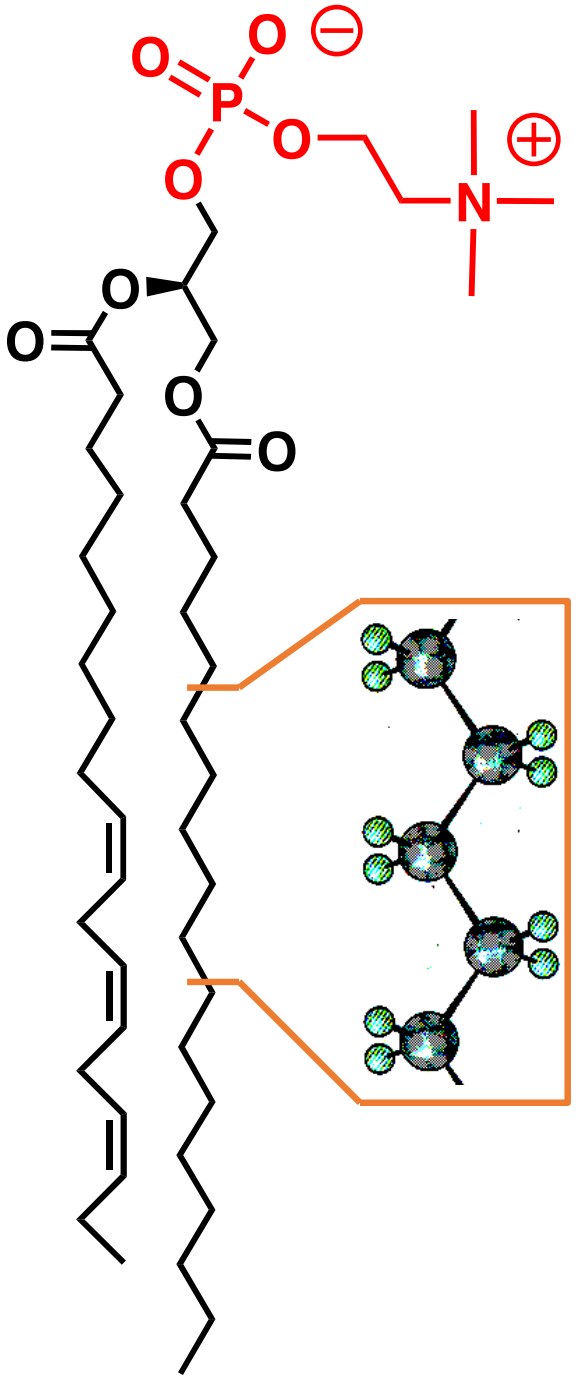




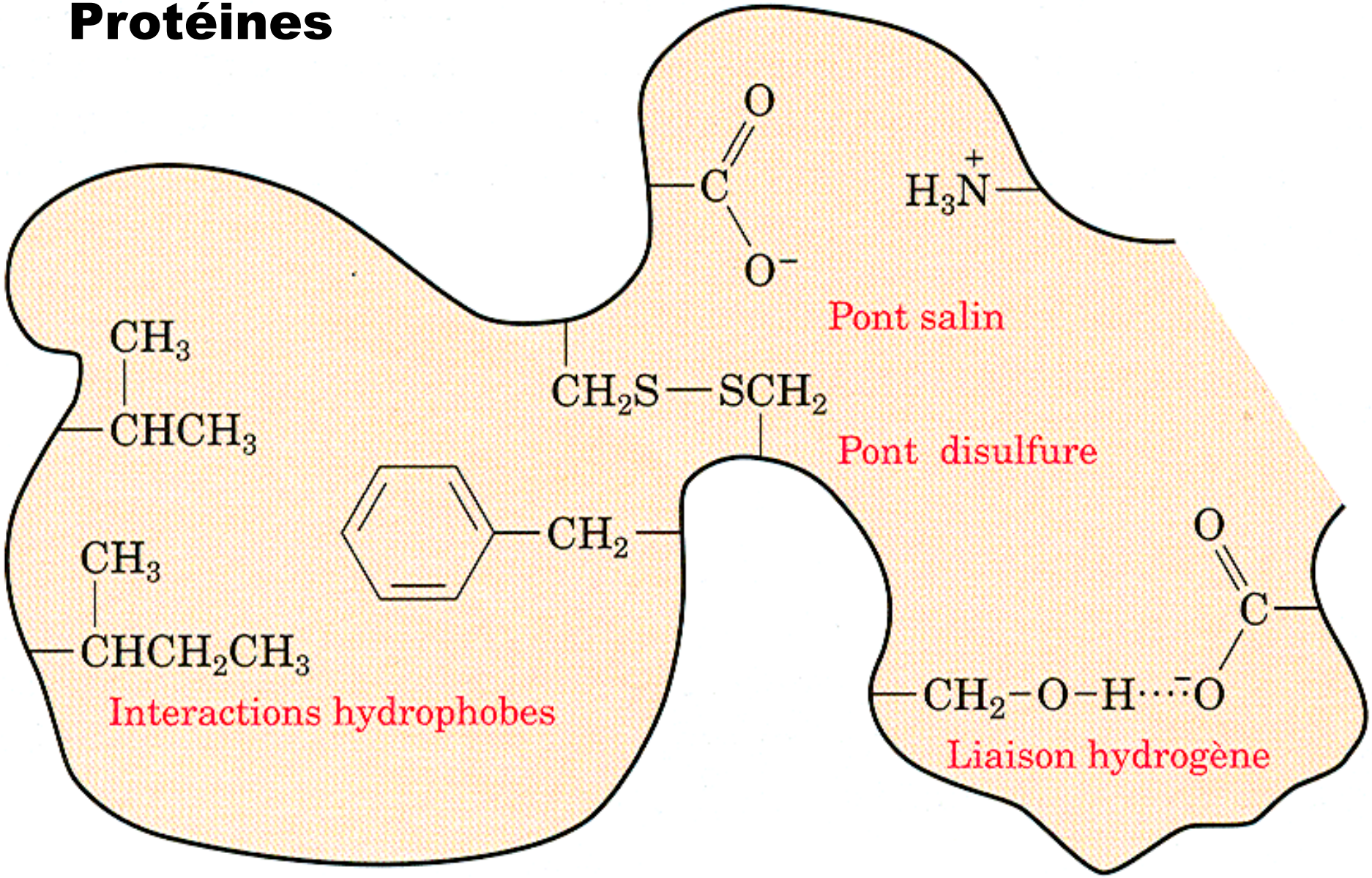
Amphiphiles

Têtes hydrophiles

Queues hydrophobes



Protéines


O
C
O⁻
H₃N⁺
Pont salin
CH₃
CHCH₃
CH₂S—SCH₂
Pont disulfure
CH₂
CH₃
CHCH₂CH₃
Interactions hydrophobes
O
C
CH₂—O—H···⁻O
Liaison hydrogène

$$C_4H_{10} + 6{,}5\ O_2 \longrightarrow 4\ CO_2 + 5\ H_2O + 688\ \text{kcal/mol}$$

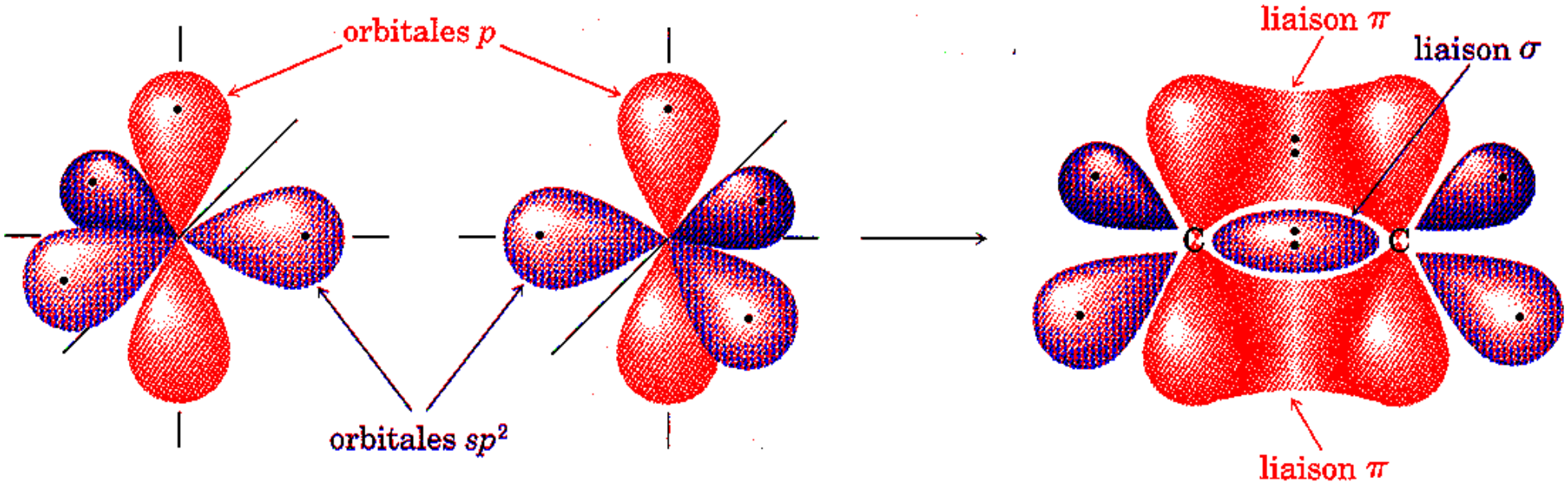
Propriétés chimiques

Activation enzymatique des alcanes

$$\underset{\text{Alcanes}\ (C_1 \text{ à } C_8)}{R\text{-}H} \xrightarrow{\text{Enzyme, } O_2} \underset{\text{Alcools}}{R\text{-}OH}$$

Alcènes

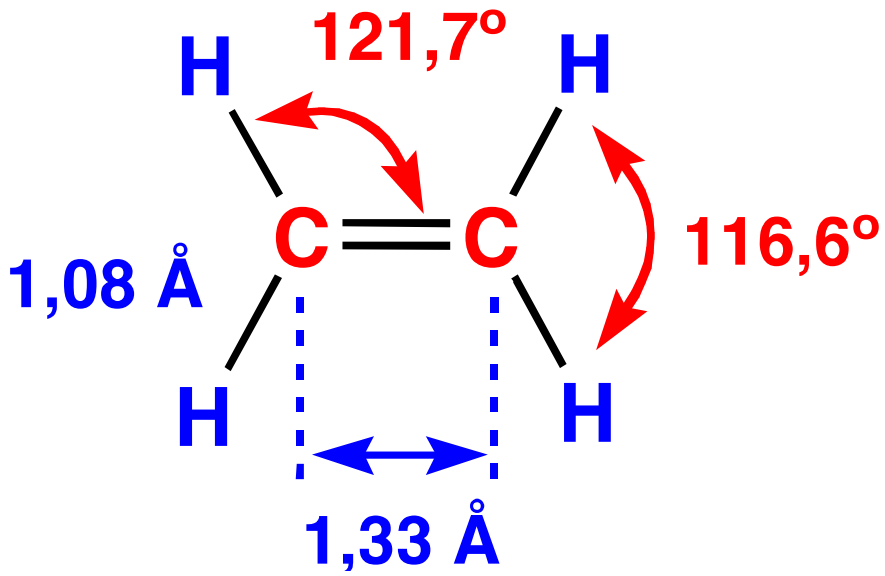
carbones sp^2

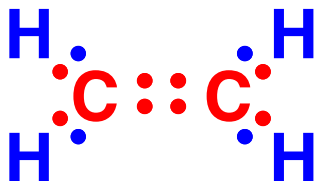


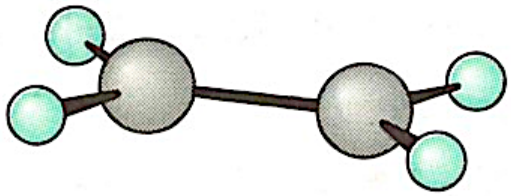
Double liaison :

liaison σ du type sp^2-sp^2

liaison π du type *p*-*p*



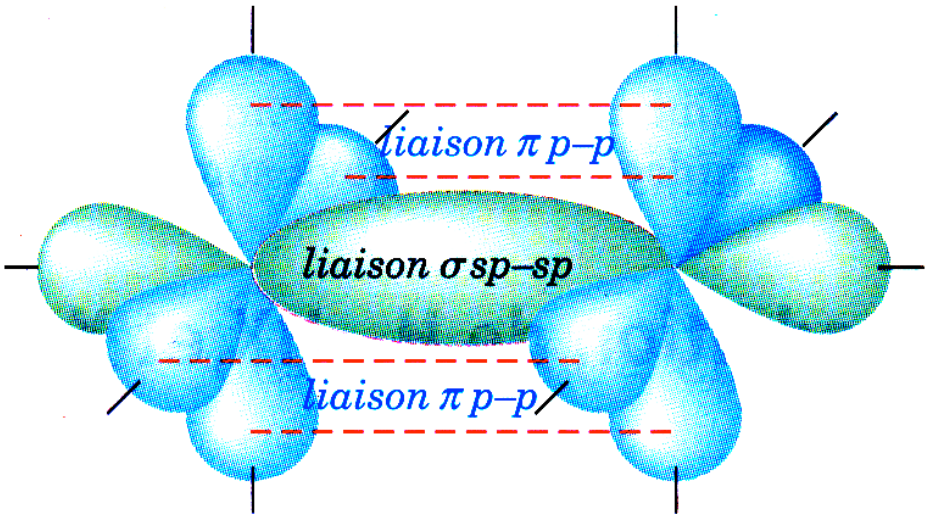


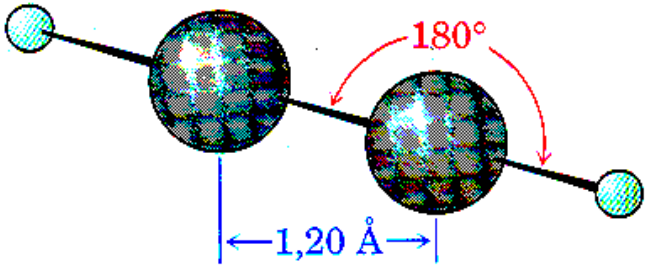


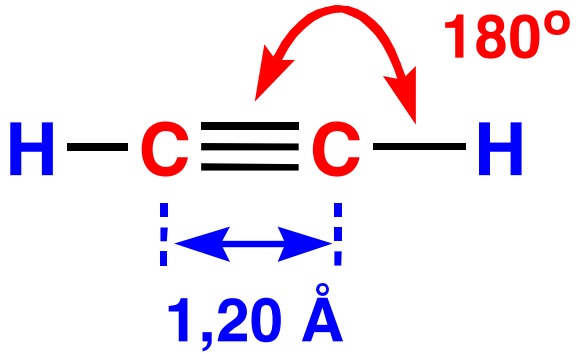
C_nH_{2n}

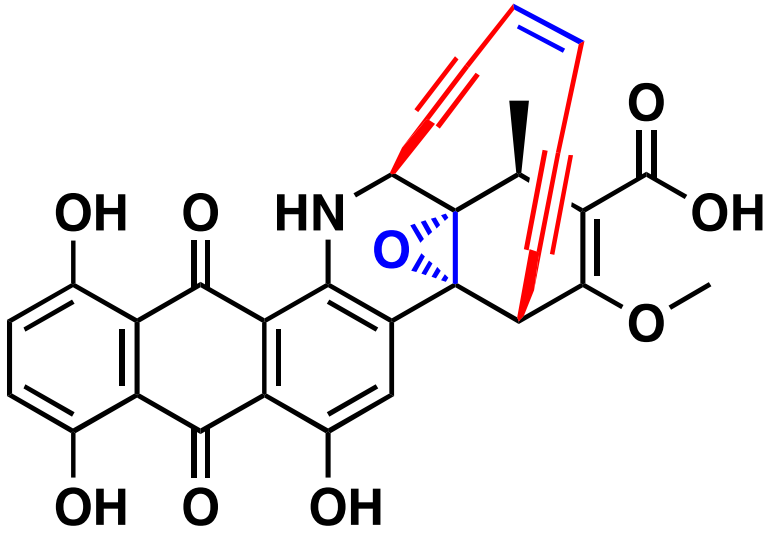
(14-9, 135)

Alcynes





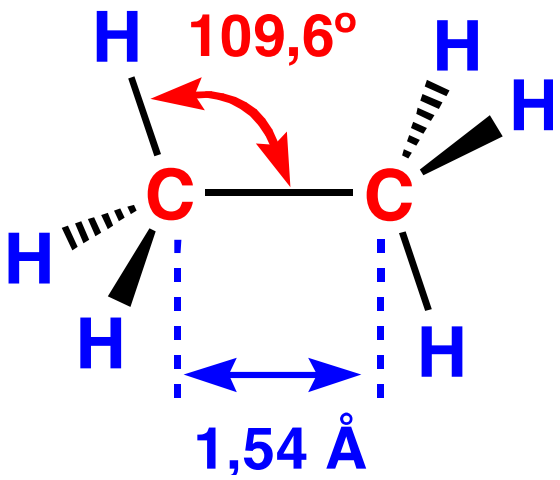


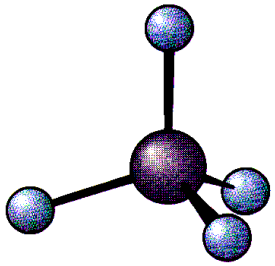


Dynémicine A
(anticancéreux)

Alcanes

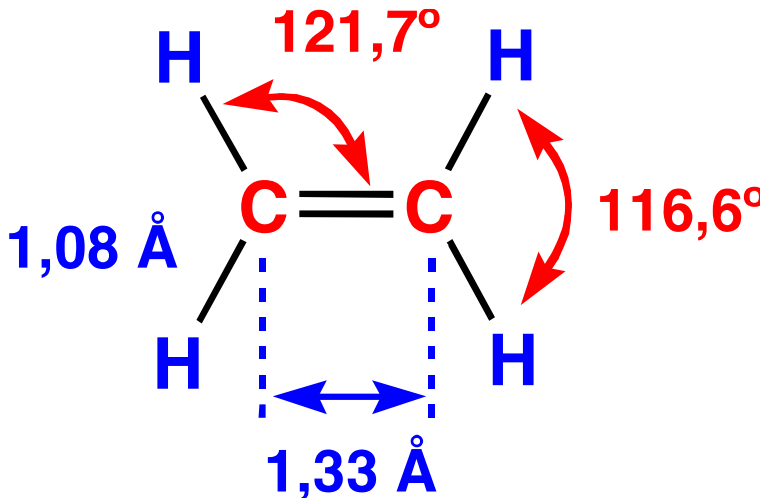
Carbones *sp*³

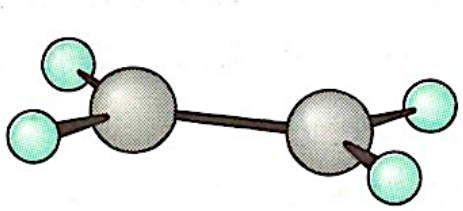




Alcènes

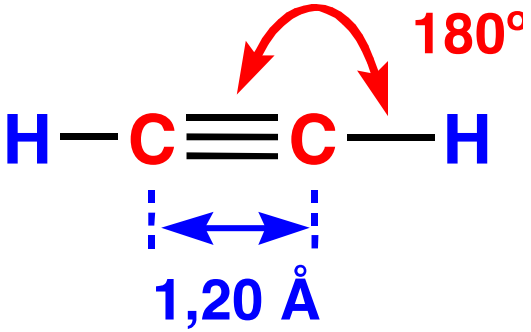
Carbones *sp*²

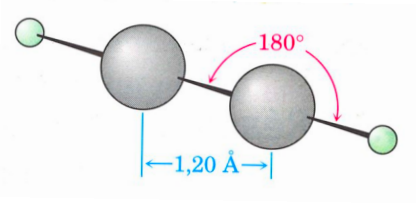




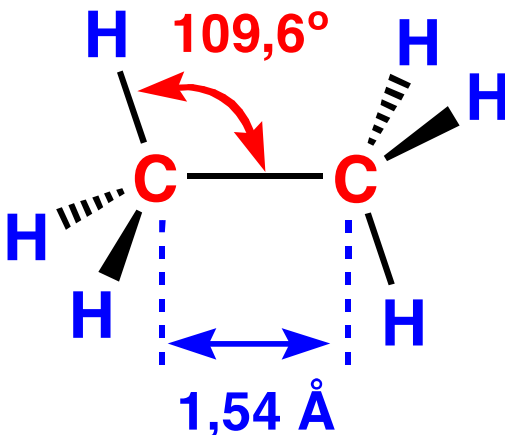
Alcynes

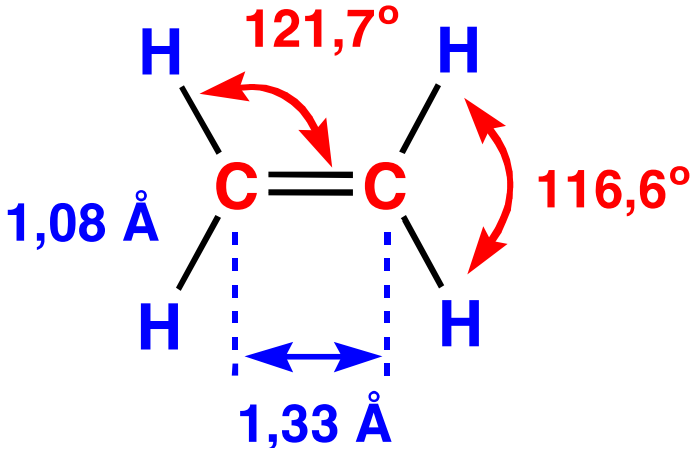
Carbones *sp*

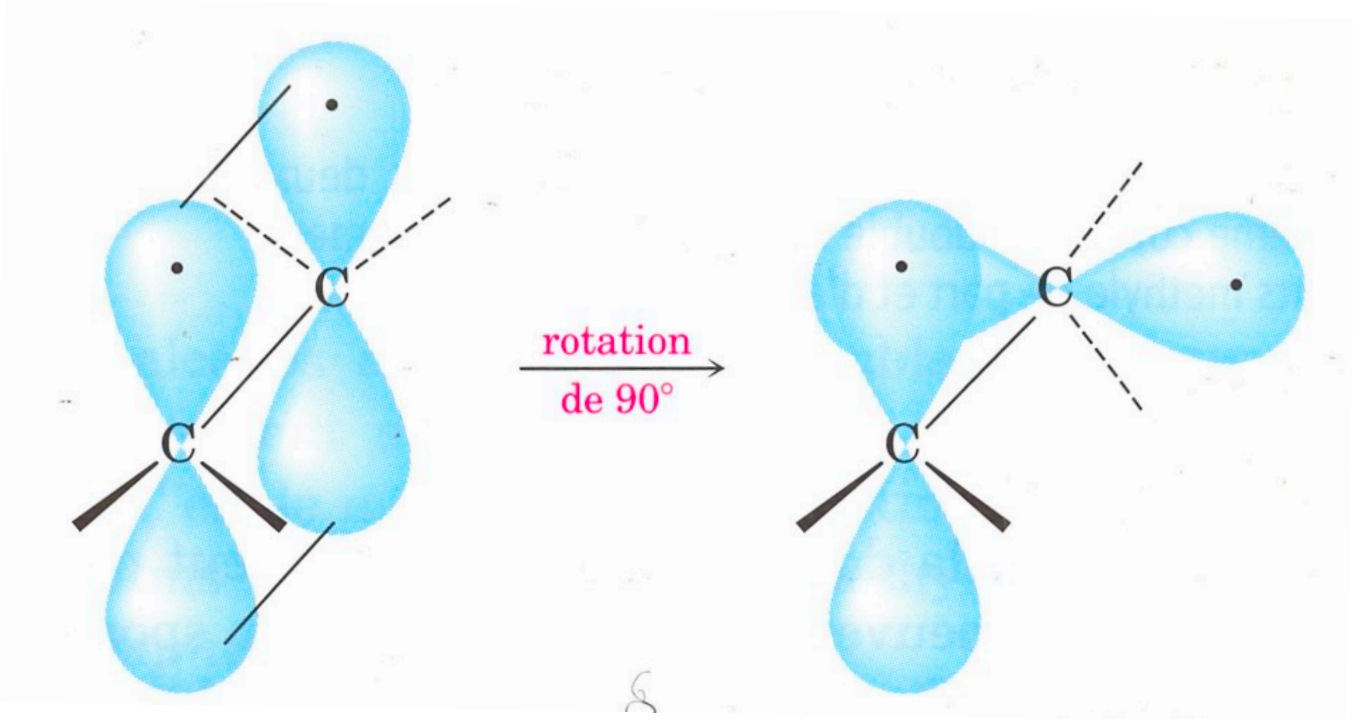




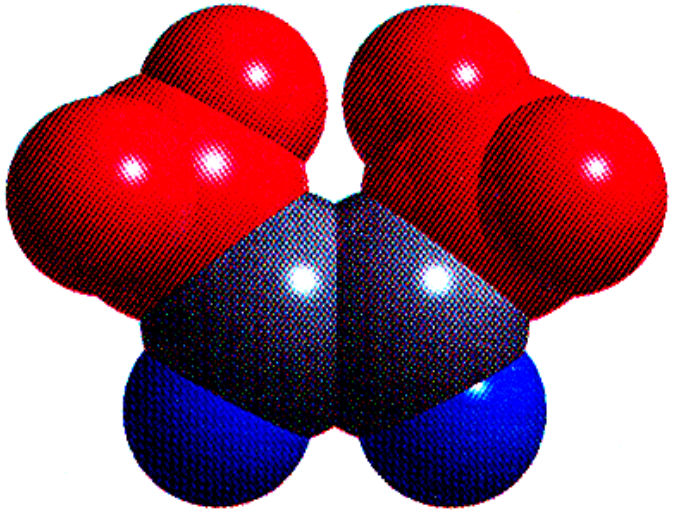
Isomérie *cis* - *trans*

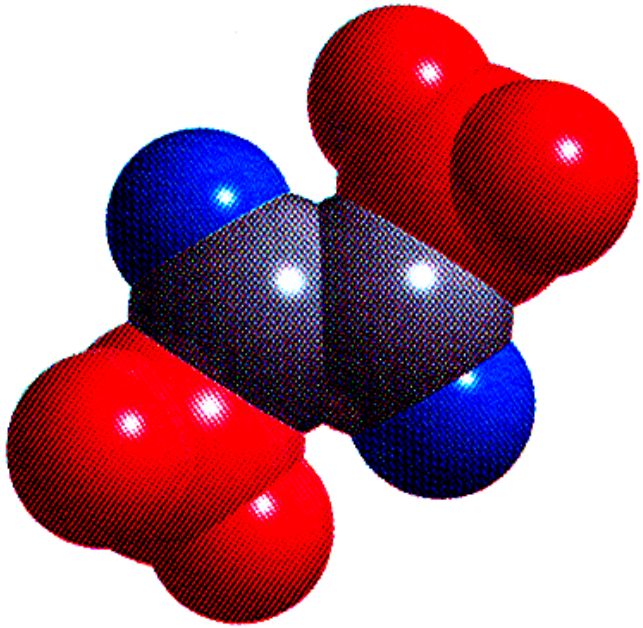


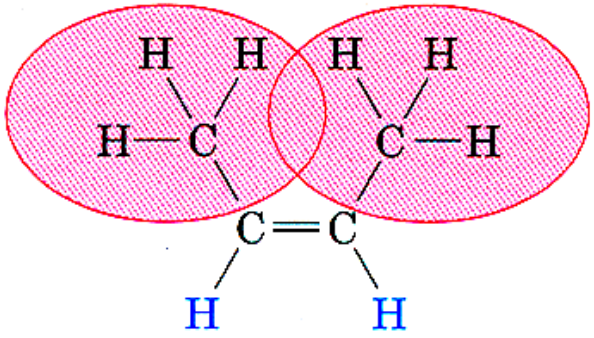


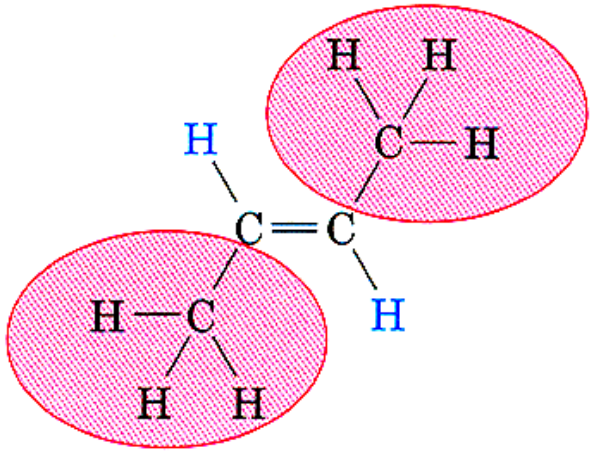


Isomérie *cis* - *trans*







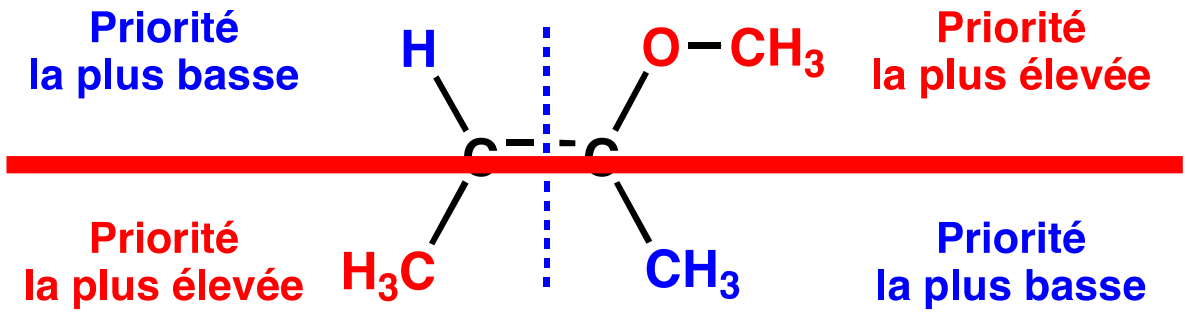


***cis*-alcène (24%)**

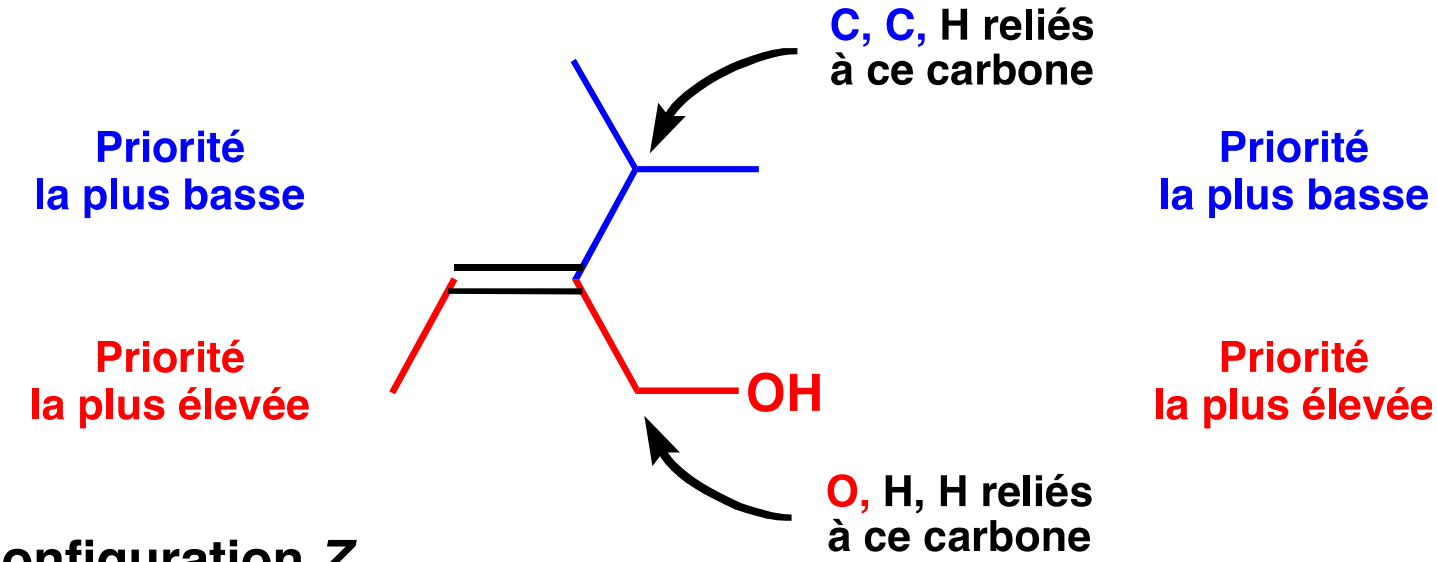
***trans*-alcène (76%)**

Nomenclature *E* - *Z* : Règles séquentielles

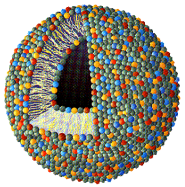
Br > Cl > O > N > C > H
35 17 8 7 6 1



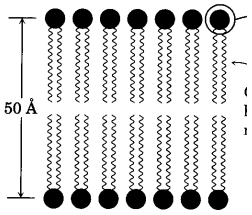
Configuration *E*

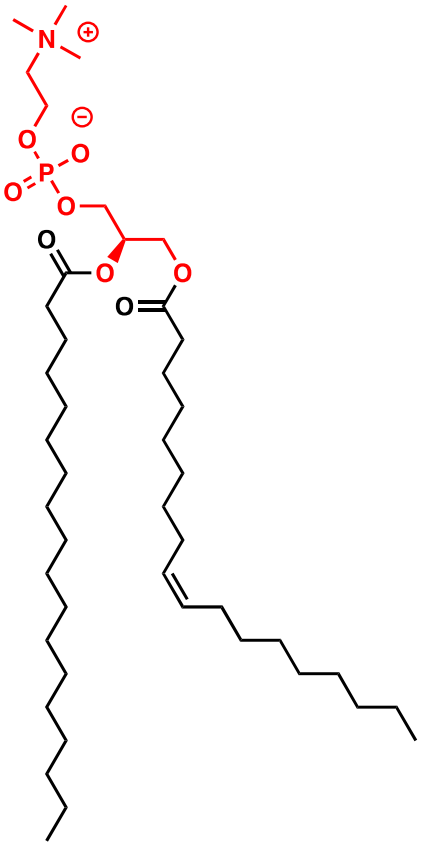


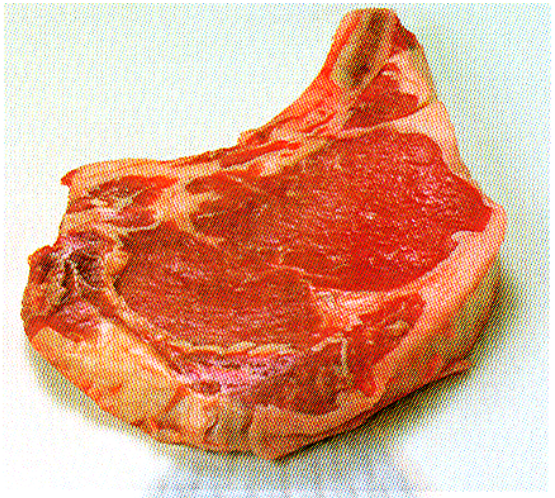
Configuration *Z*

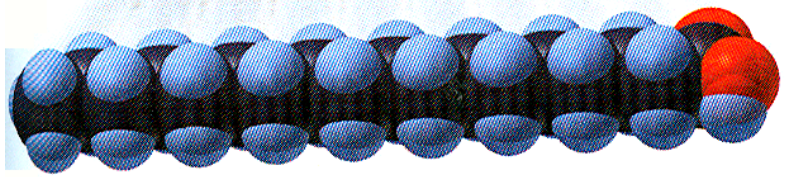


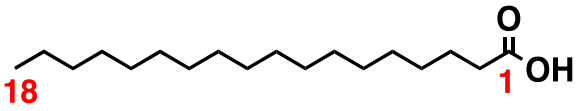
Acides gras insaturés





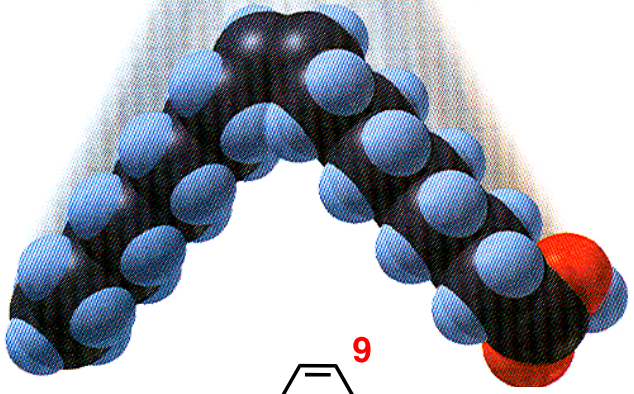


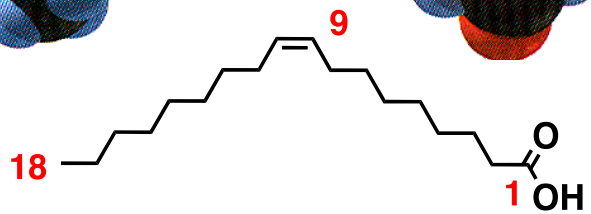




Acide stéarique

(Pf 69 °C)

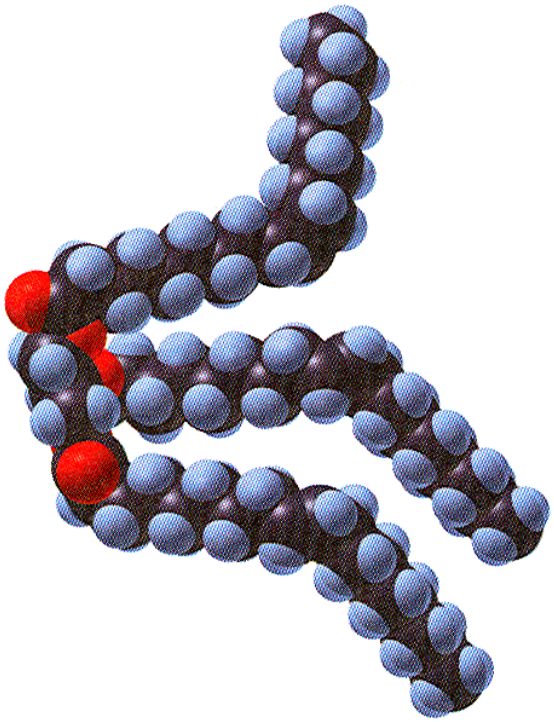


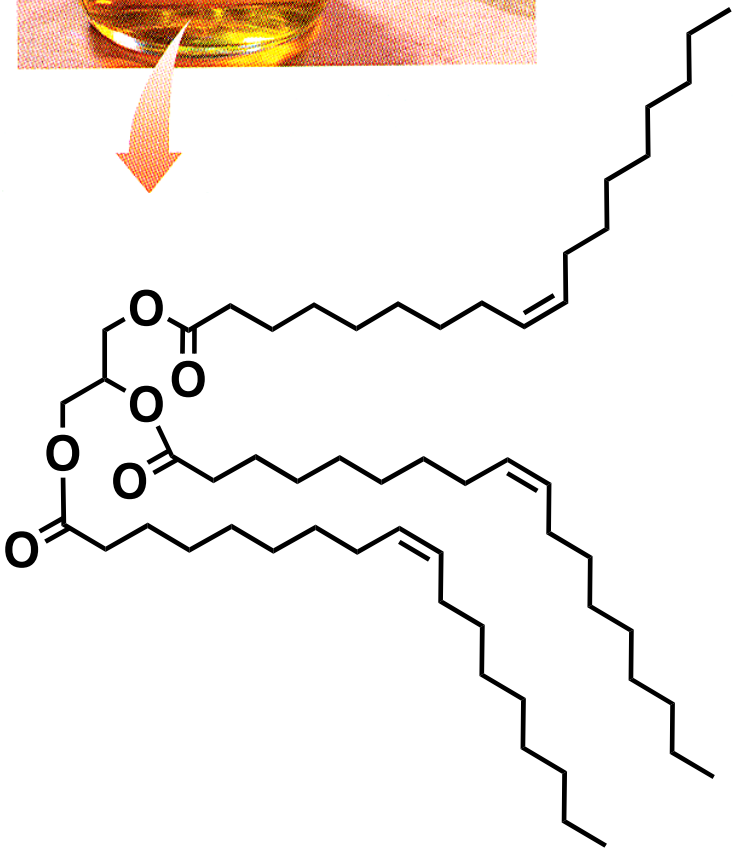


Acide oléique

(Pf 13 °C)

Graisses - réduction des alcènes

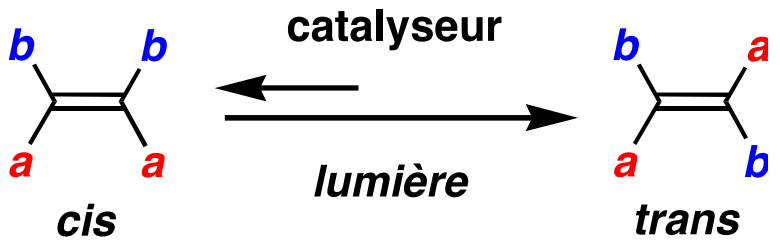


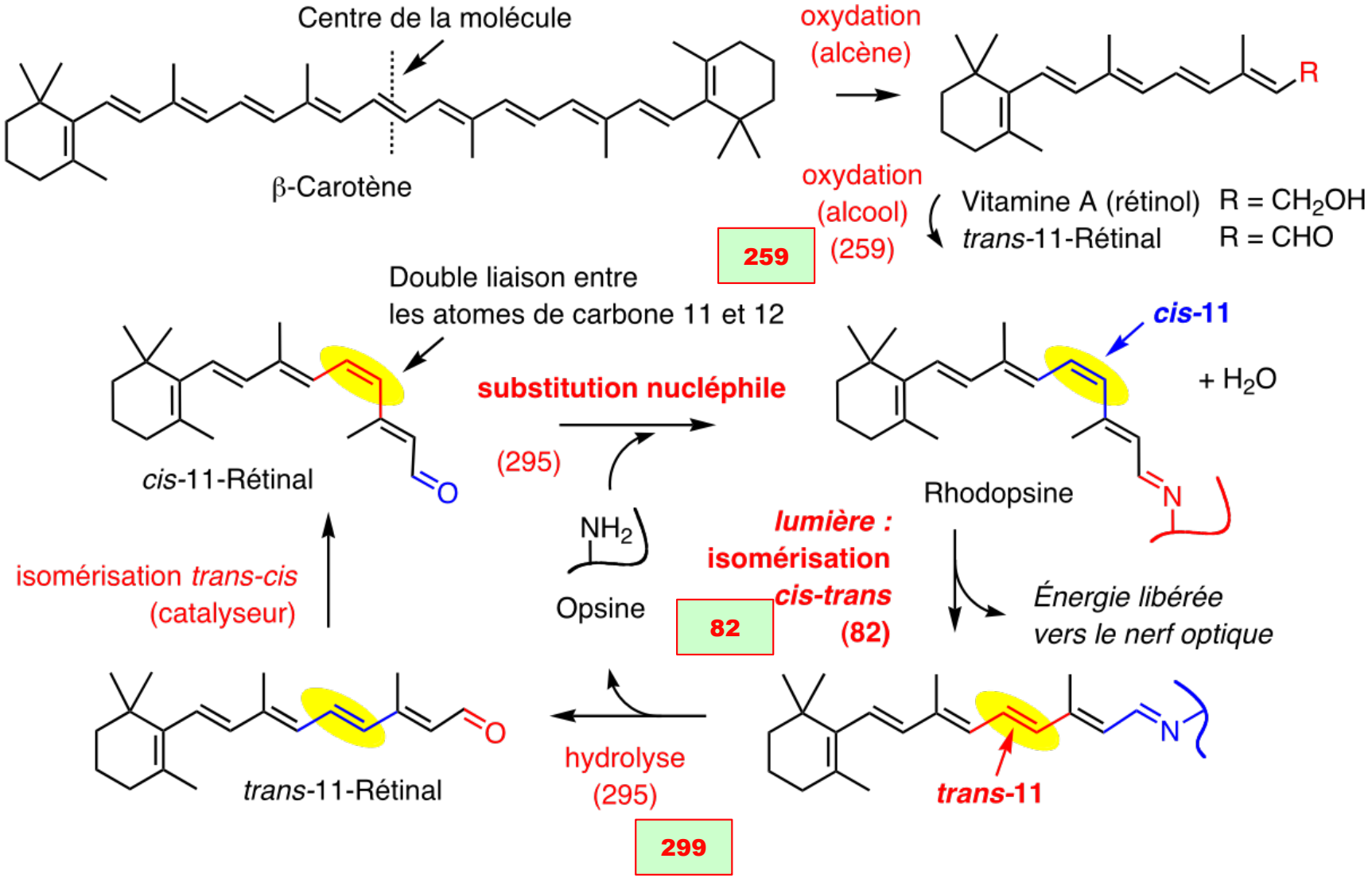


Hydrogénation

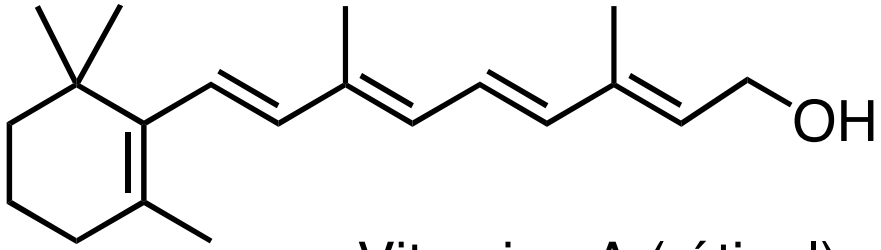
Alcène **Alcane**

La chimie de la vision

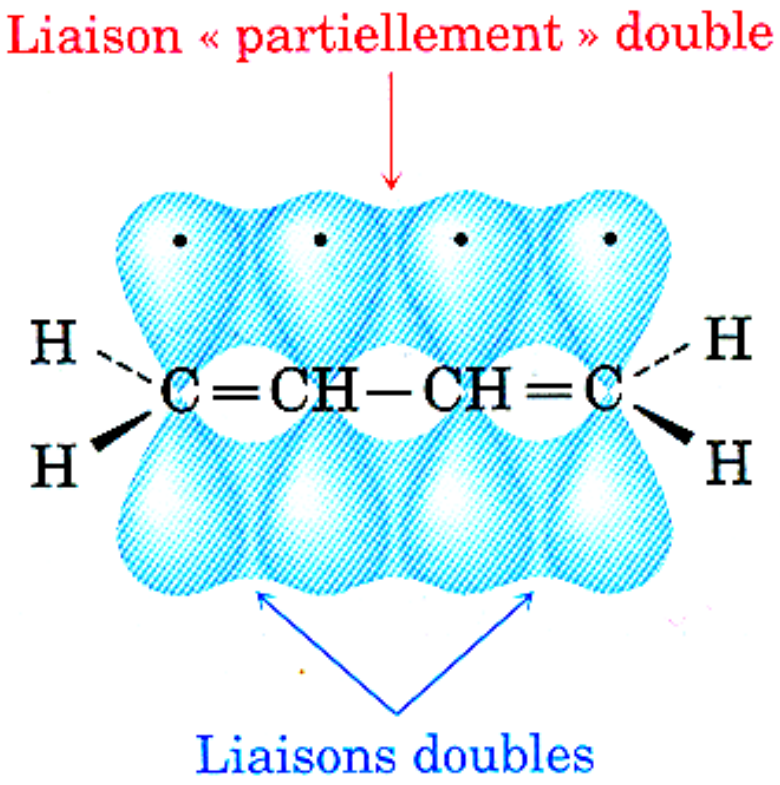




Alcènes conjugués

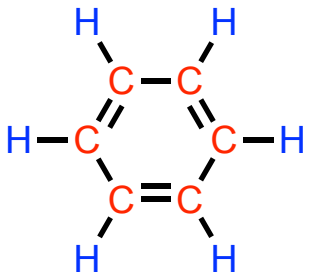


Vitamine A (rétinol)

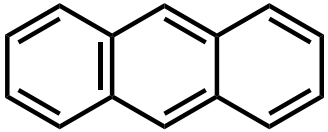


Alternance de liaisons simples et multiples avec recouvrement des orbitales *p*

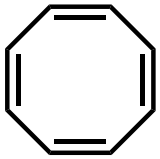
Les composés aromatiques



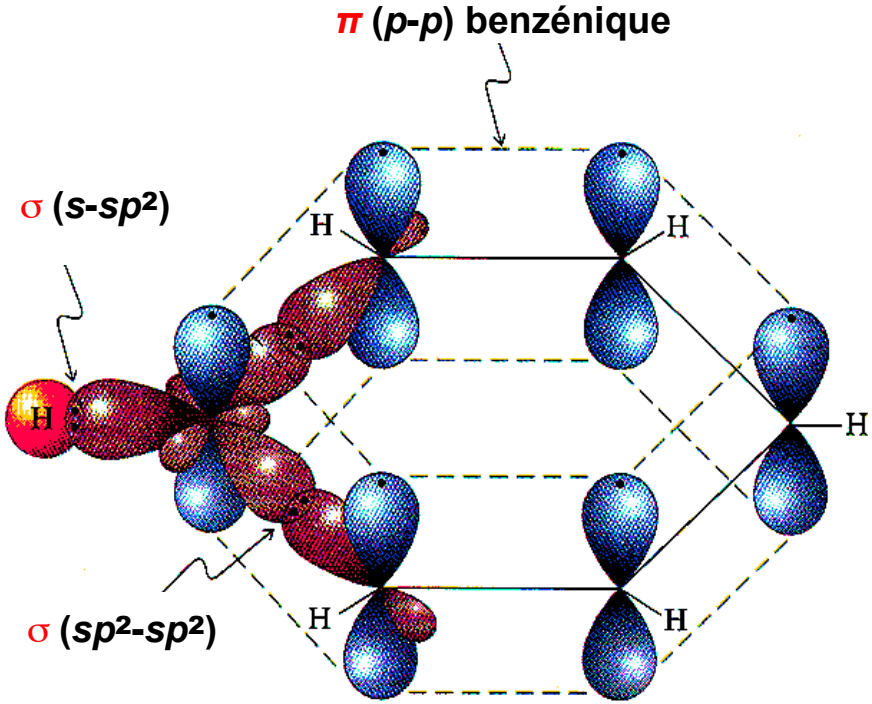
Benzène



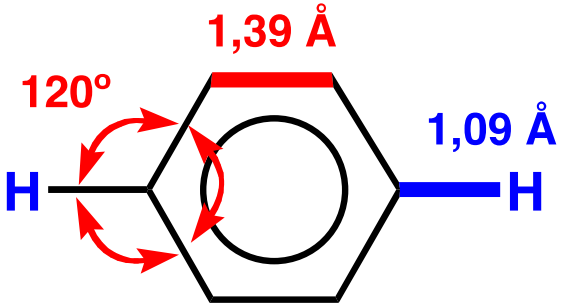
Aromatique
(n = 3)



Non pas aromatique
($n \neq 1 \neq 2$)



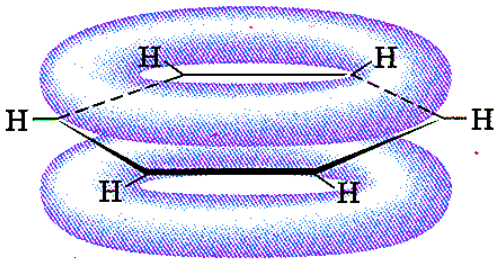
Un ou plusieurs cycles d'atomes
avec une orbitale *p* et
$4n + 2$ électrons délocalisés
(n = 1, 2, 3, ...)

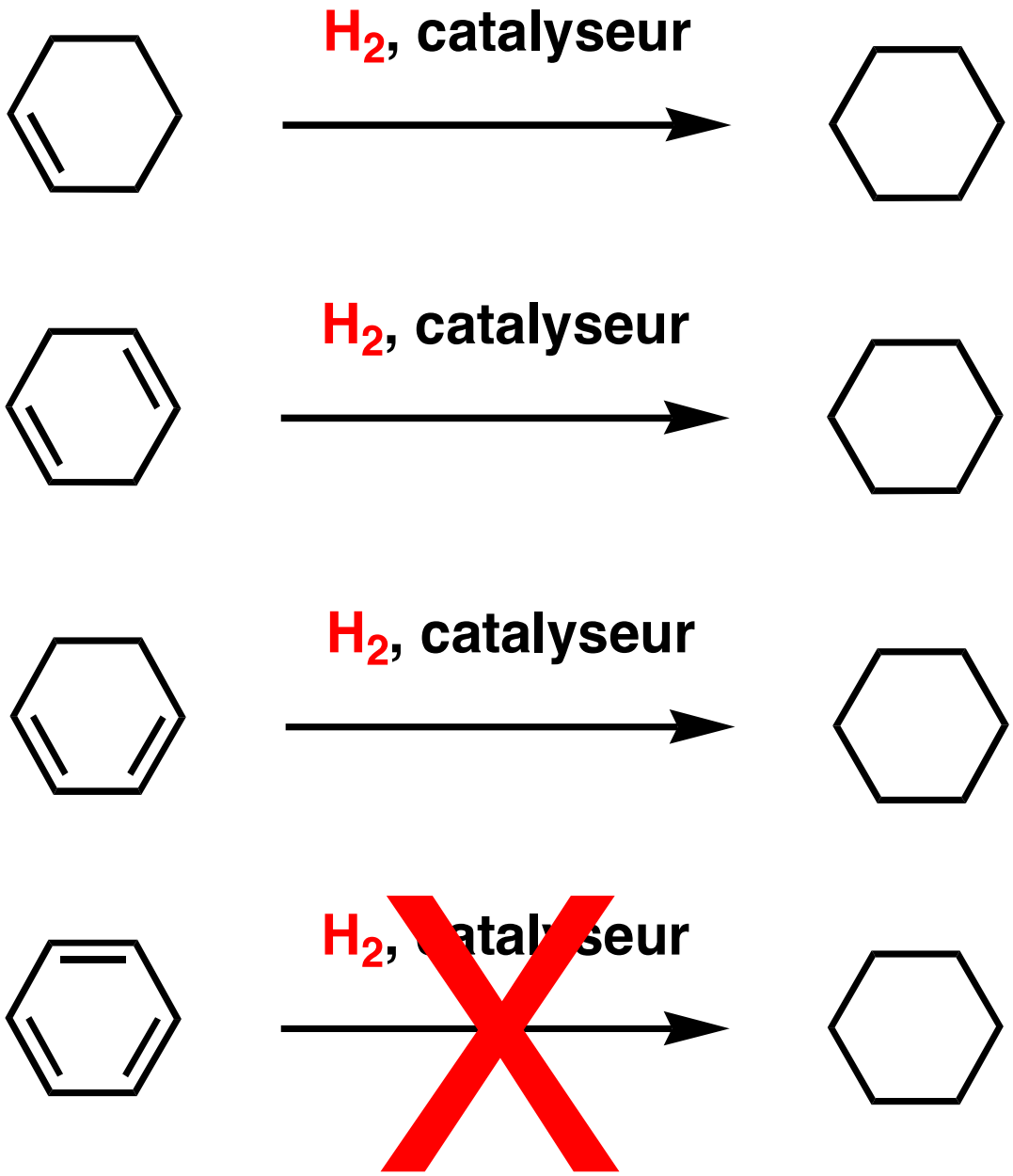


Aromatique : stable, planaire

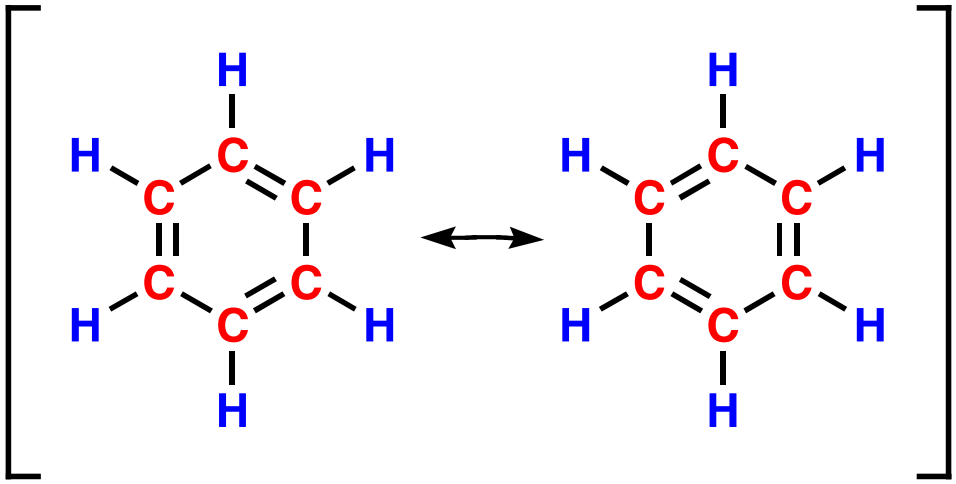
Aromaticité et stabilité

Hydrogénation (120)





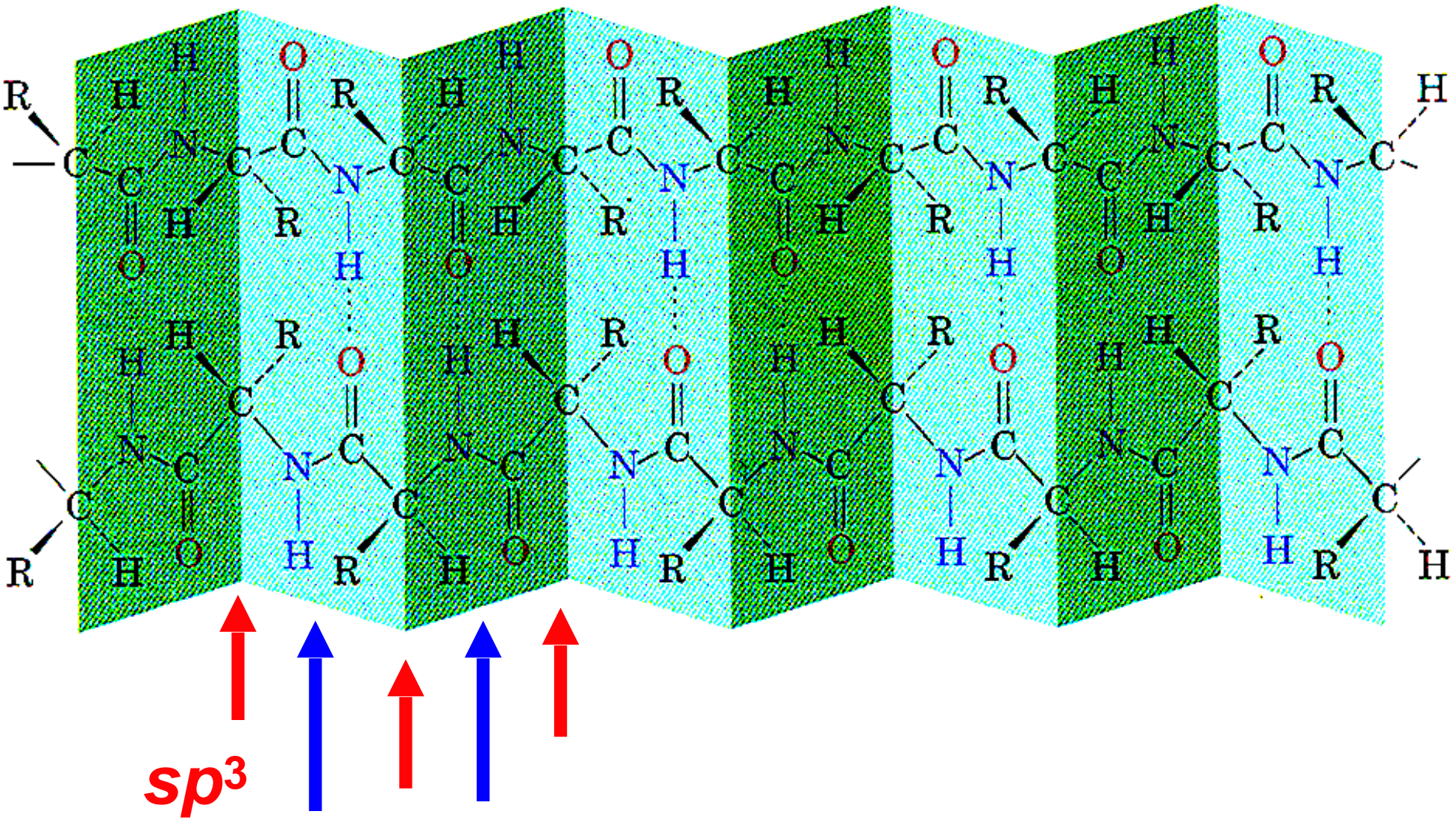
Mésomères (formes de résonance)



Benzène (deux formes de résonance)

Délocalisation d'électrons dans des molécules représenté par une combinaison virtuelle de structures aux électrons localisées différemment

Résonance : stable, planaire



sp^3

résonance

feuillet plissé β

Résumé 2 (Alcanes - Alcènes - Arènes -)

- *sp*, sp^2, sp^3 - ~180°, ~120°, ~109°

- isomères de constitution - linéaire / ramifié

- conformères - décalé / éclipsé / gauche / anti

  - projection de Newman

  - basculement conformationnel - chaise / axiale / équatoriale

- stéréoisomères - *cis* / *trans* - *E* / *Z*

- cycloalcanes : tension du cycle - interaction 1,3-diaxiale

- conjugaison, mésomères, aromaticité

- liaison covalente - symétrique / polaire - électronégativité - dipôle -

- hydrophobe / hydrophile / amphiphile

- réduction des alcènes (hydrogénation)

Mésomères

A
Alternance de liaisons simples et multiples avec recouvrement des orbitales *p*

B
Délocalisation d'électrons dans des molécules représenté par une combinaison virtuelle de structures aux électrons localisées différemment

C
Un cycle d'atomes avec une orbitale *p* et 4*n* + 2 électrons délocalisés
(= système π conjugué formé de liaisons doubles et de doublets non-liants)

D
Représentations d'une molécule ne différant que par la position des électrons de liaison

E
Stéréoisomères qui diffèrent par leur stéréochimie au niveau d'une double liaison ou d'un cycle

CONTENU	McMurry
1. Généralités	(1, 2, 15)
2. Lipides - stéroïdes - alcanes - alcènes - arènes -	(2 - 5, 16)
3. Glucides - stéréochimie -	(6, 14)
4. Alcools - éthers – phénols - hydroquinones - thiols - disulfures	(8, 16)
5. Glucides - aldéhydes - cétones - imines -	(9, 14)
6. Protéines - lipides - acides - esters - amides -	(10, 11, 15, 16)
7. Acides nucléiques - amines -	(12, 16)

Les glucides (carbohydrates, sucres)

$C_n(H_2O)_n$

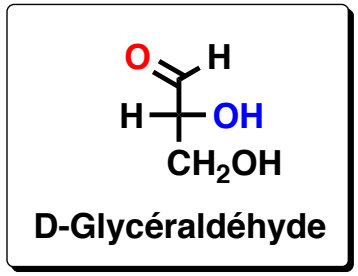
Aldoses (Cétoses)

Aldotriose

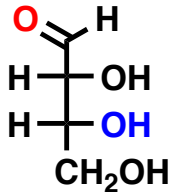
-tetroses

-pentoses

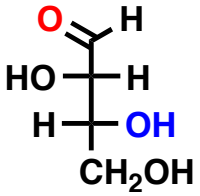
-hexoses



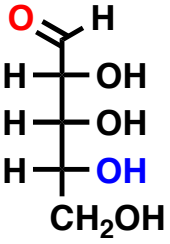
D-Glycéraldéhyde



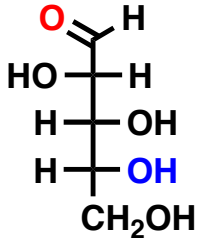
D-Érythrose



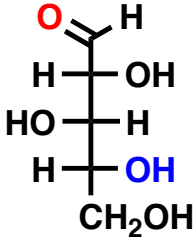
D-Thréose



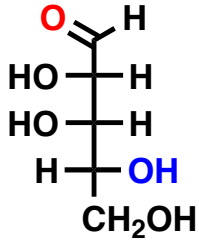
D-Ribose



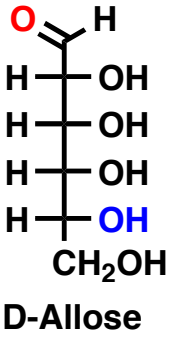
D-Arabinose



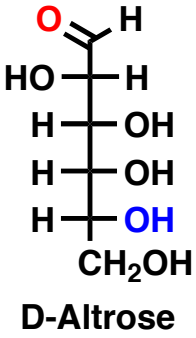
D-Xylose



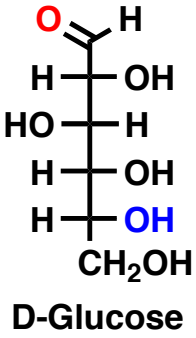
D-Lyxose



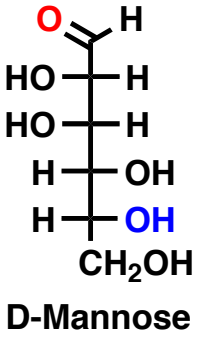
D-Allose



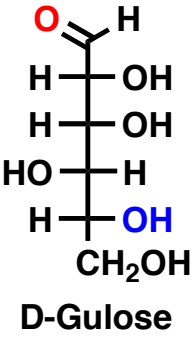
D-Altrose



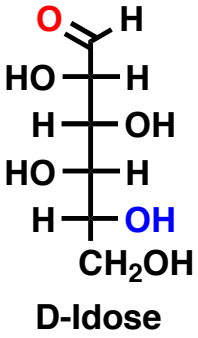
D-Glucose



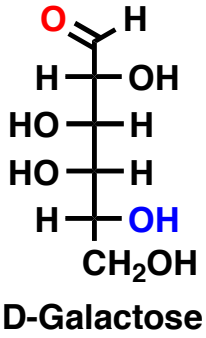
D-Mannose



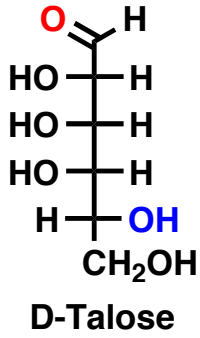
D-Gulose



D-Idose

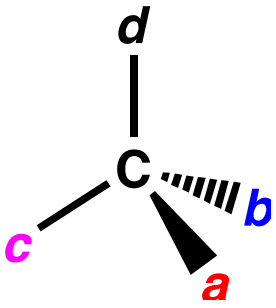


D-Galactose

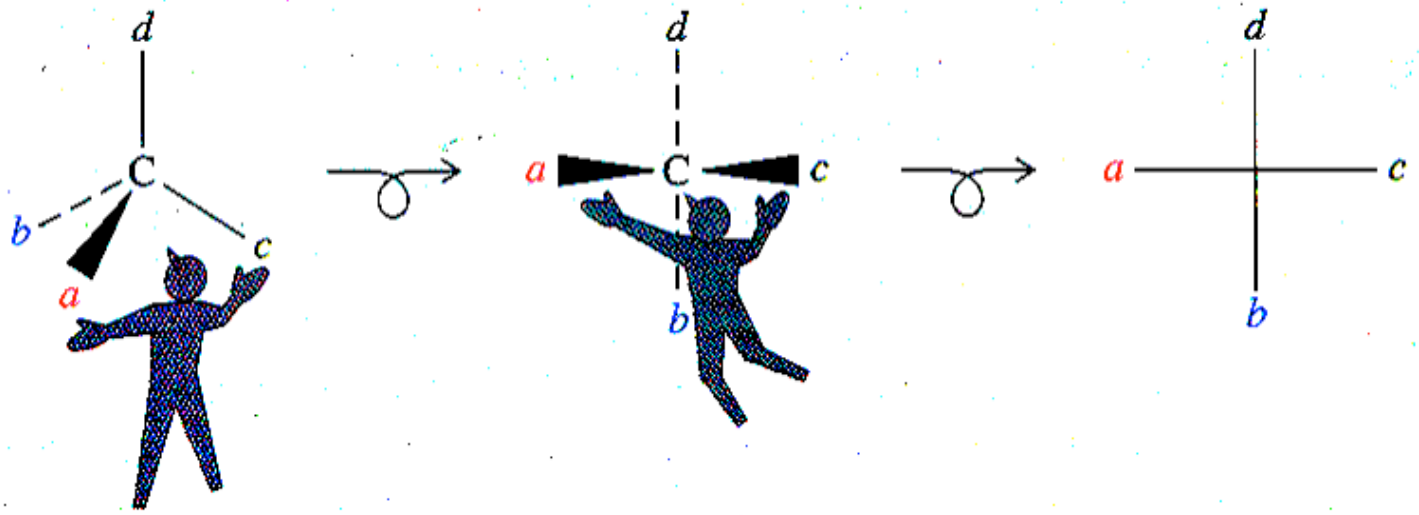


D-Talose

3. Stéréochimie - 4. Alcools - 5. Aldéhydes/cétones



Un exercice mental simple :
Convertir une structure perspective (avec tirets et coins) en projection de Fischer



Énantiomères