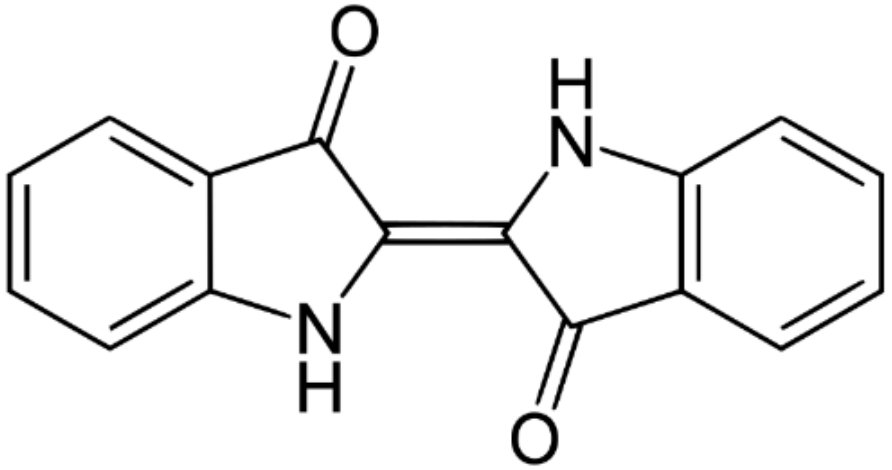
LC12 : Caractérisations par spectroscopie en synthèse organique

Mathieu Markovitch

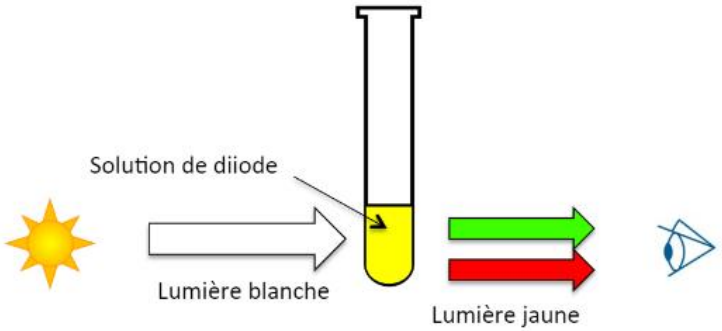
L'indigo

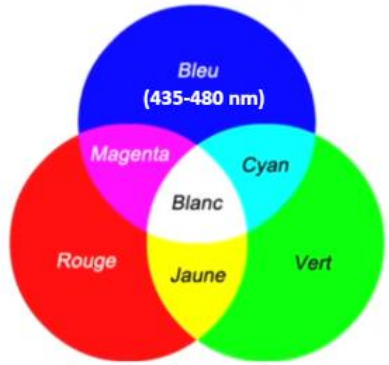
Indigo en poudre



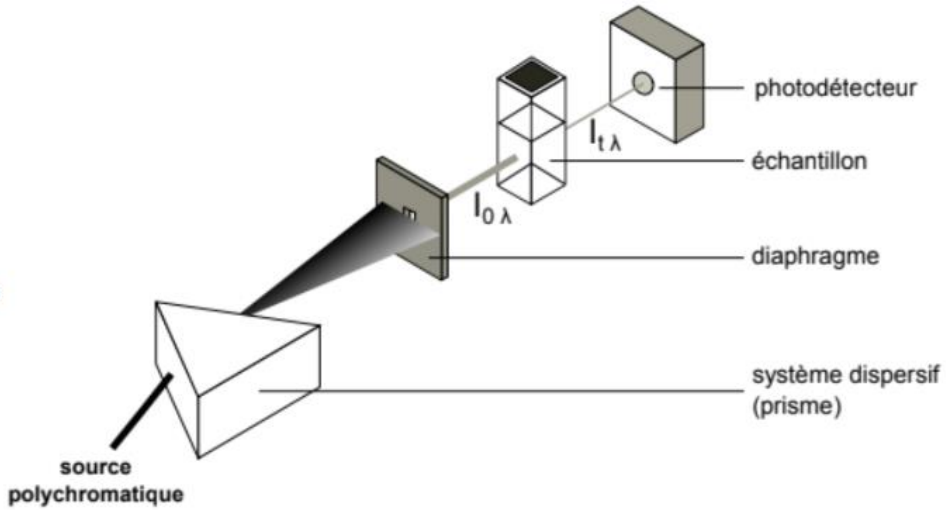
Représentation de la Molécule

Spectrophotomètre



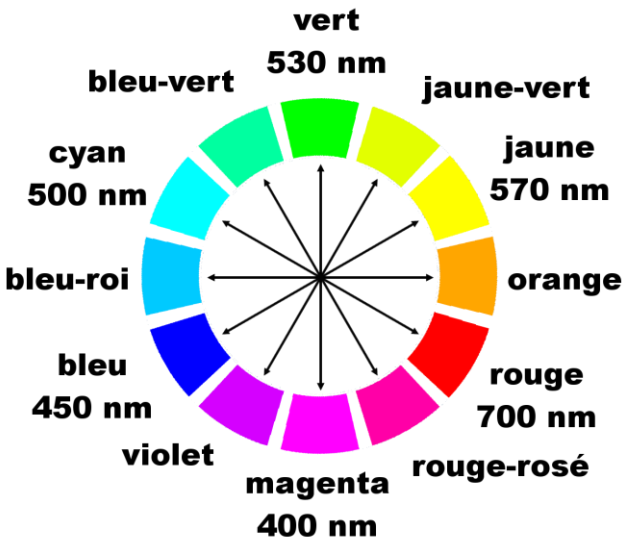


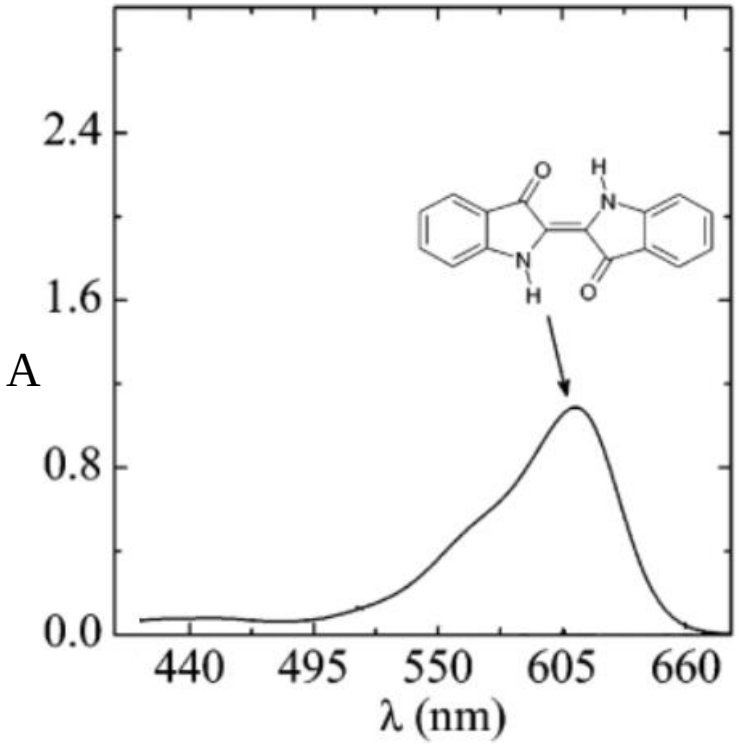
Triangle des couleurs



Principe de fonctionnement d'un spectrophotomètre mono-faisceau.

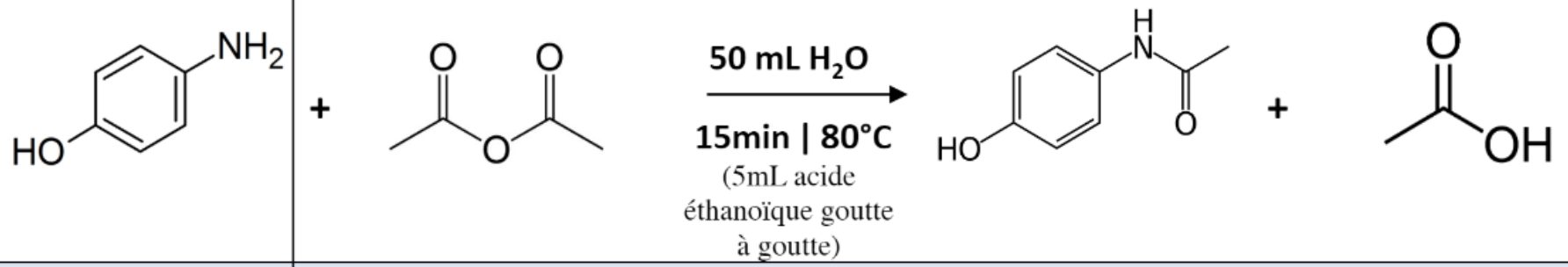
Spectre de l'indigo





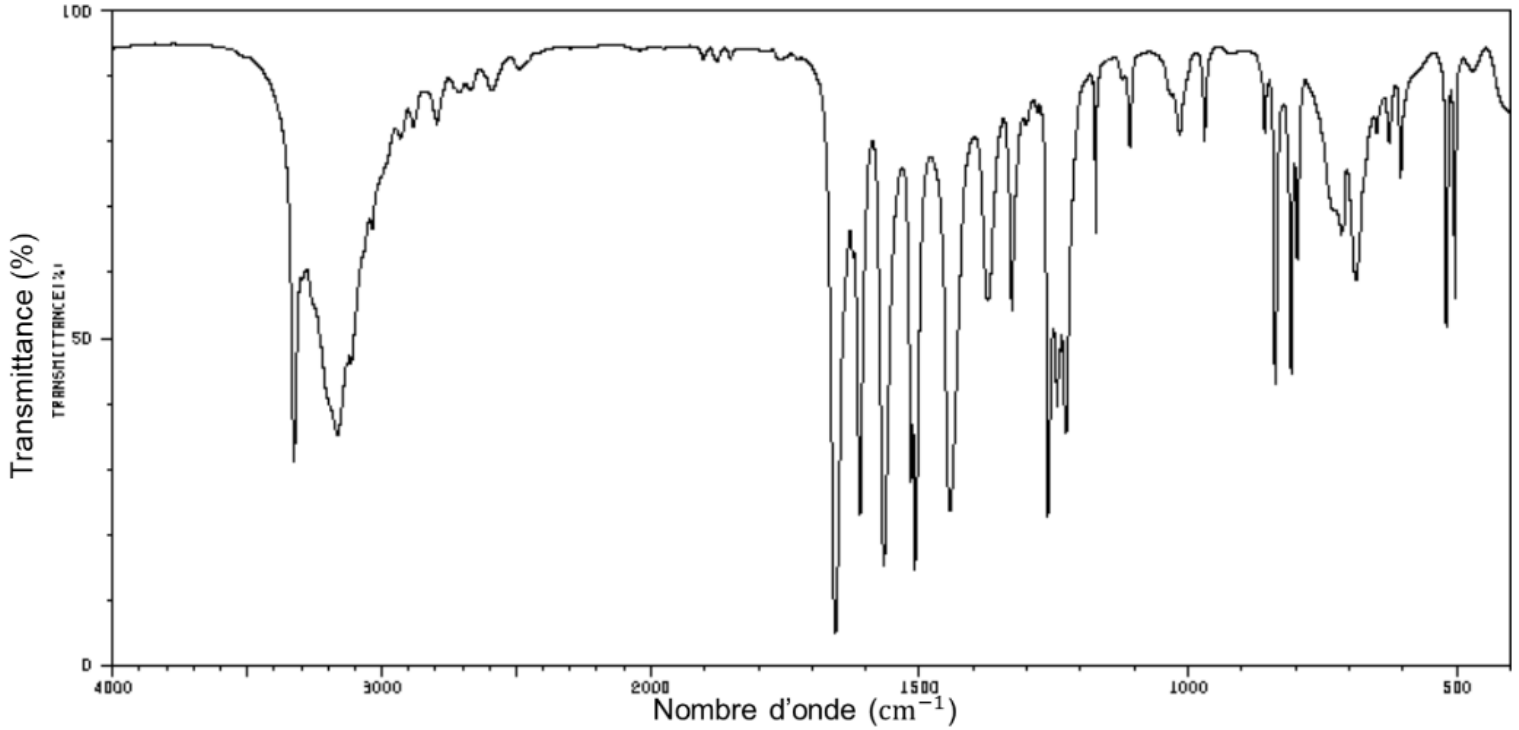
(J. Phys. Chem. A, 2004, n°108, pp. 6975-6981)

Synthèse du paracétamol



4-aminophénol	+	Anhydride acétique	Paracétamol	+	Acide acétique
5,50 g $5{,}04.10^{-2}$ mol		≈ 7,0 mL $7{,}4.10^{-2}$ mol			

Spectre du paracétamol

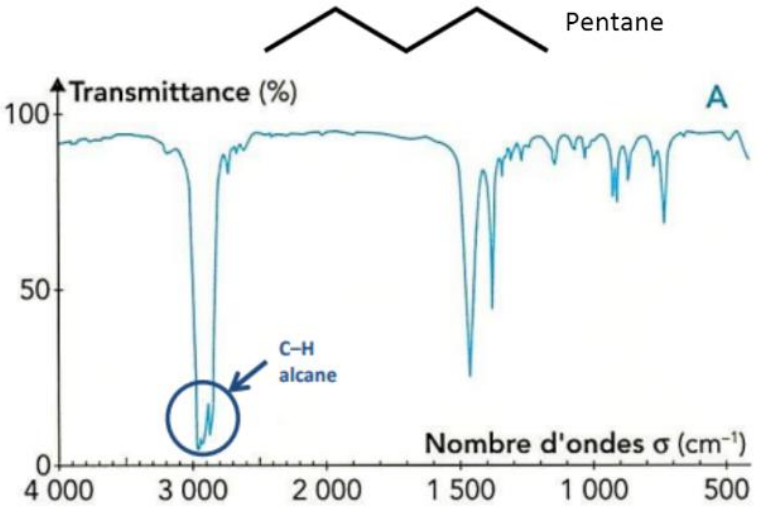


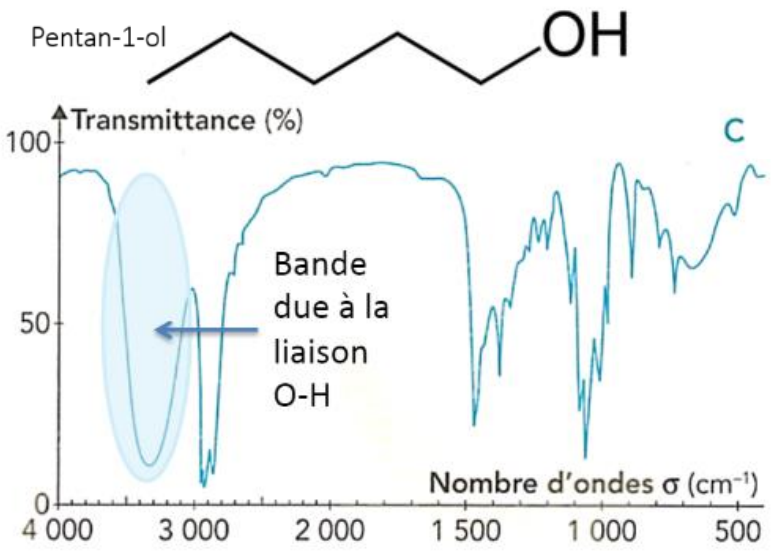
https://www.youtube.com/watch?v=1PQqDfJKXvA

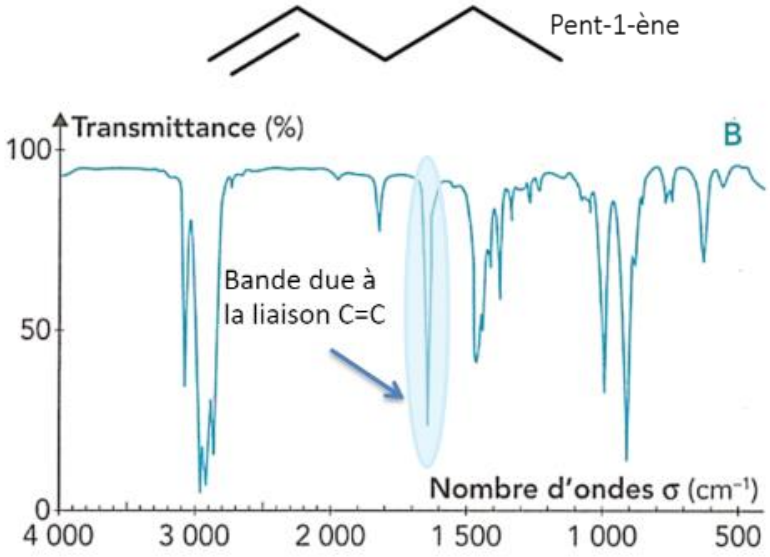
Table infrarouge

Type de liaison		σ (en cm-1)	Largeur de la bande	Intensité d'absorption	Remarques
O-H hydroxyle	phase gazeuse	3600 – 3700	Fine	Moyenne	
	phase condensée	3200 - 3400	Large	Forte	se superpose à la précédente
N-H		3100 - 3500	Fine	Moyenne (amine) à forte (amide)	double bande si NH_2
C-H		2900 - 3100	Variable	Moyenne à forte	peut descendre à 2700 cm^{-1} pour un aldéhyde
O-H carboxyle		2500 - 3200	Large	Moyenne à forte	se superpose aux C-H
C=O		1650 - 1750	Fine	Forte	
C=C		1600 - 1700	Variable	Moyenne	
N-H		1560 - 1640	Fine	Forte	se superpose à C=O pour un amide

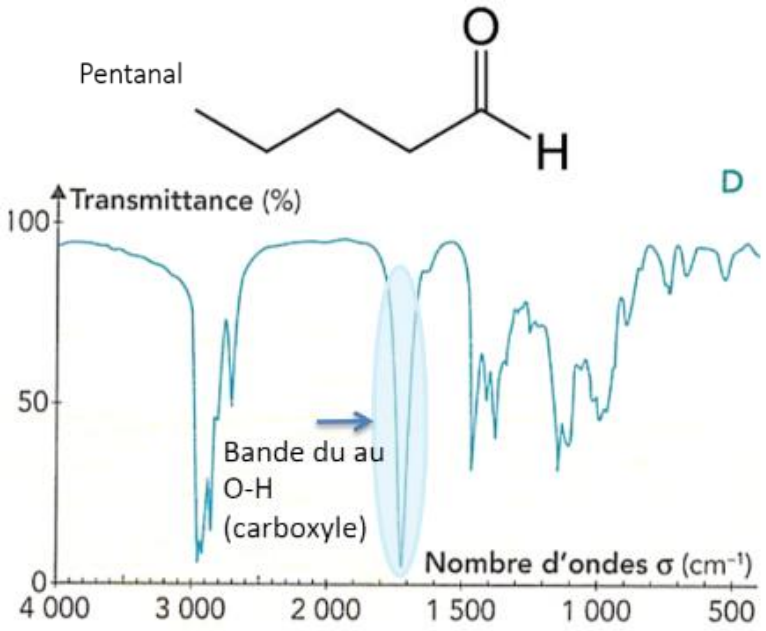
Bandes caractéristiques



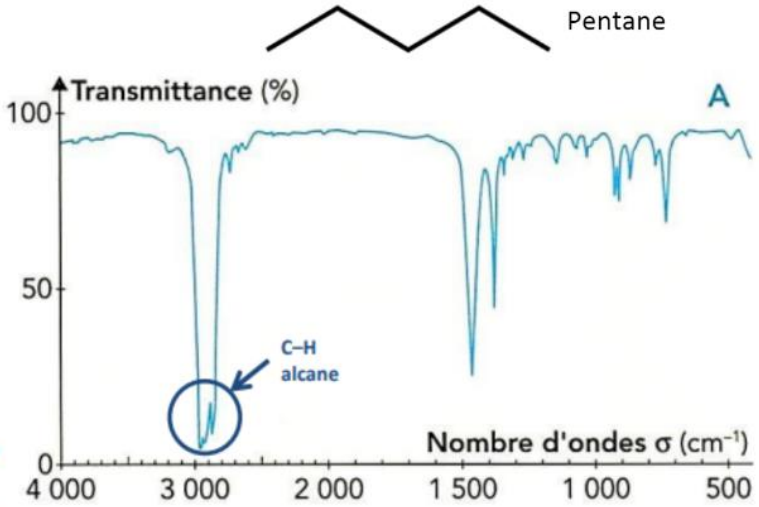




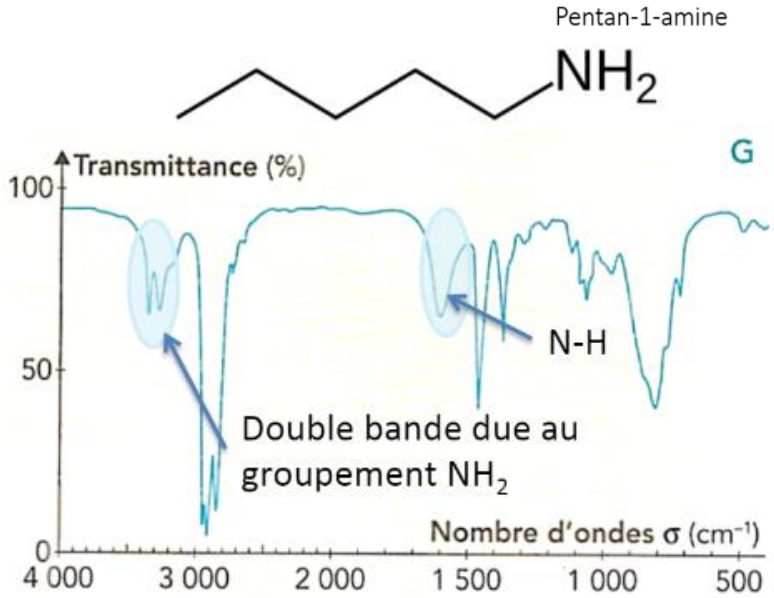
Bandes caractéristiques



D

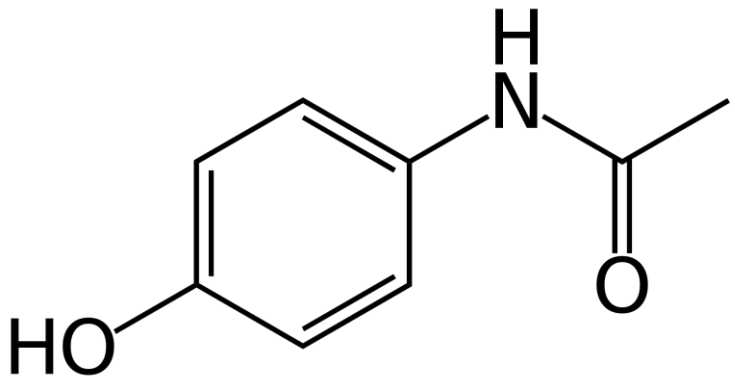


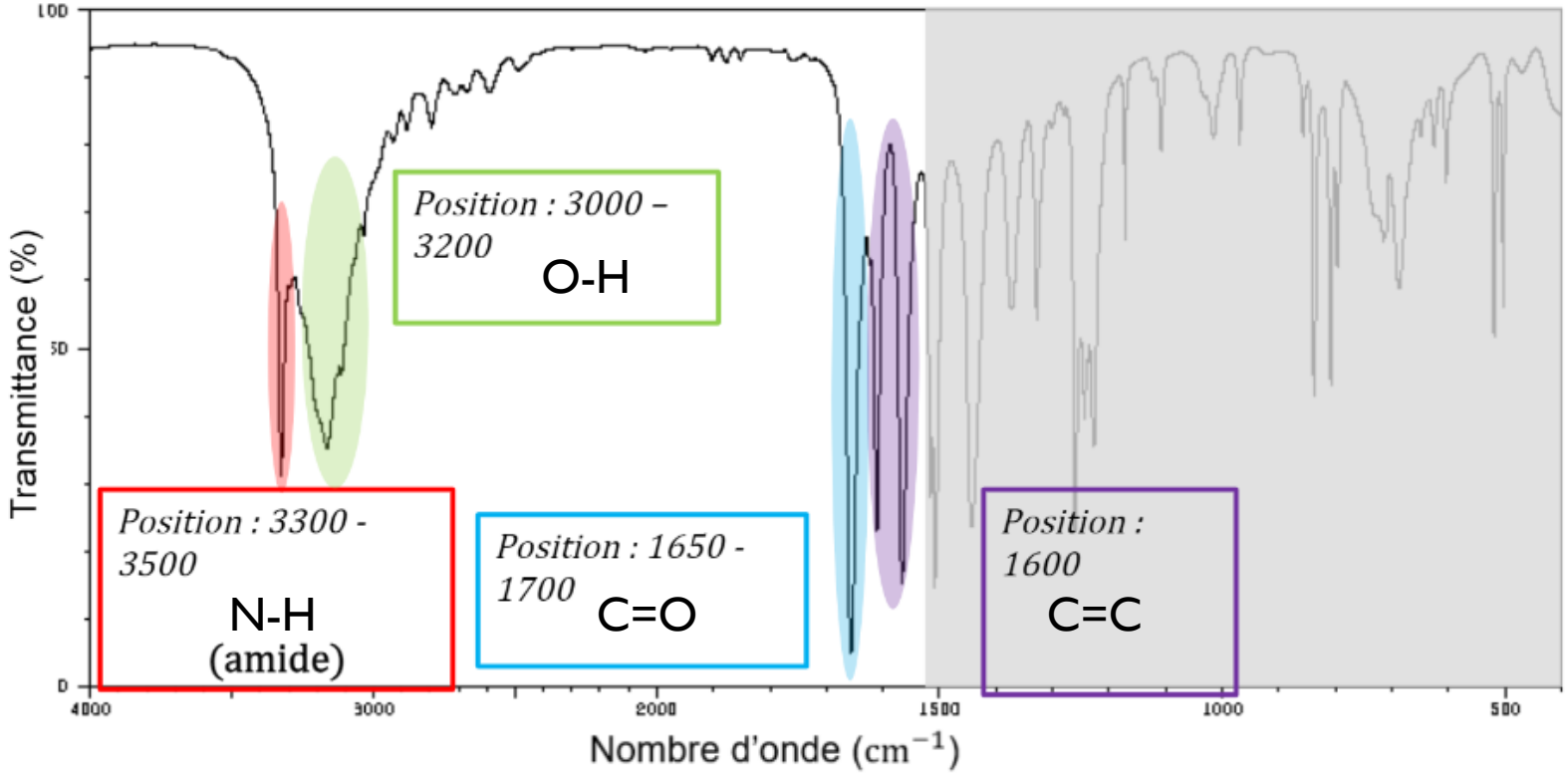
A



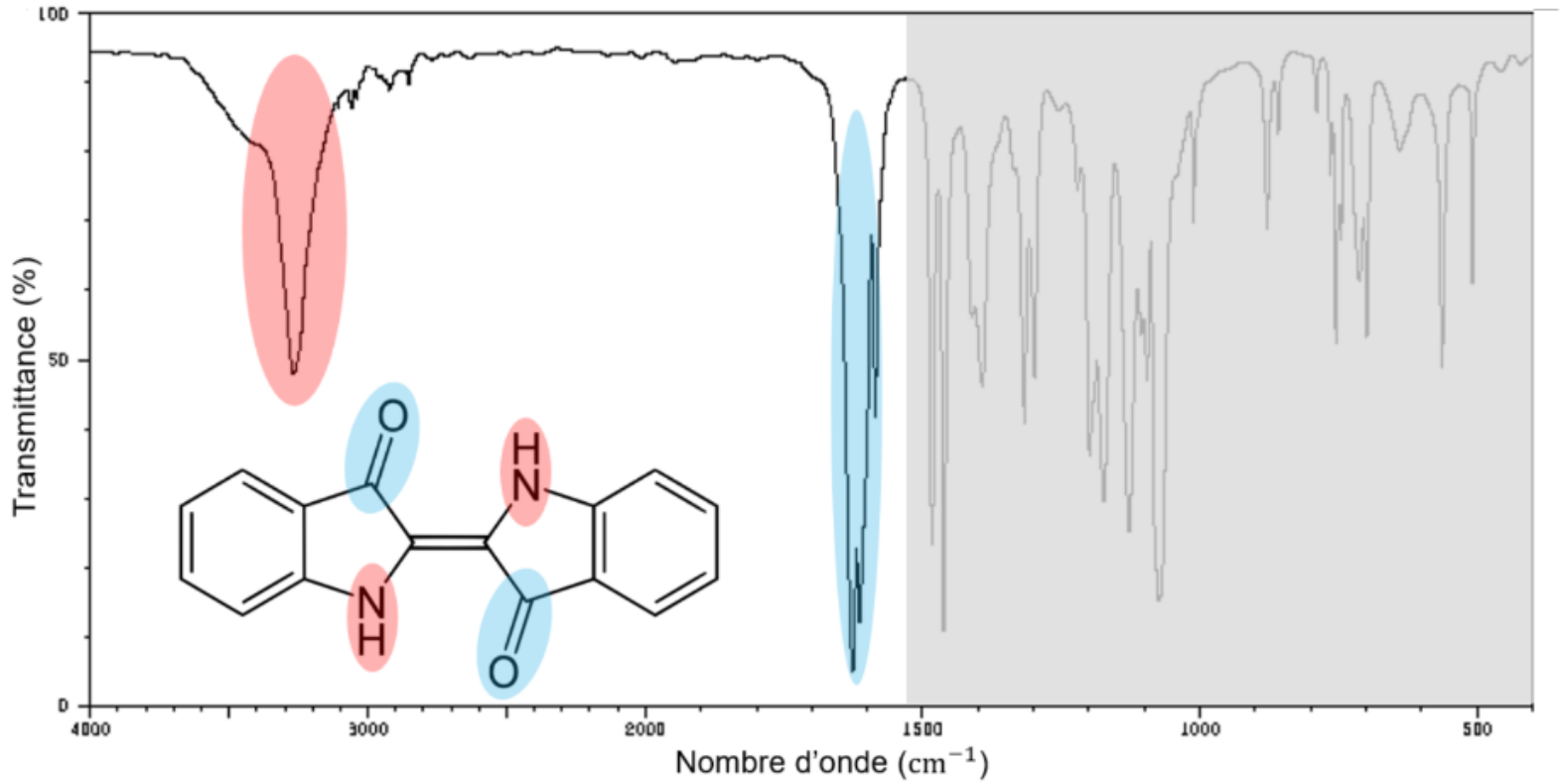
G

Identification du paracétamol

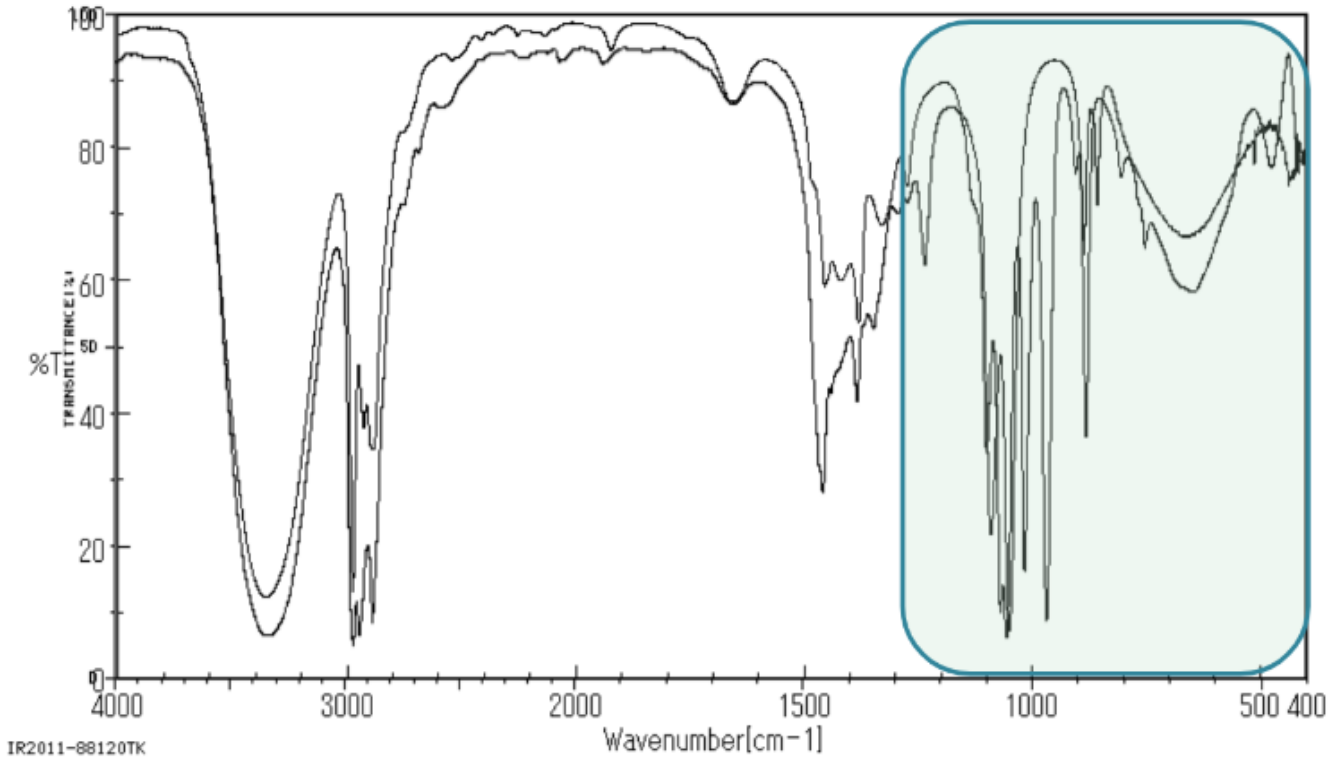




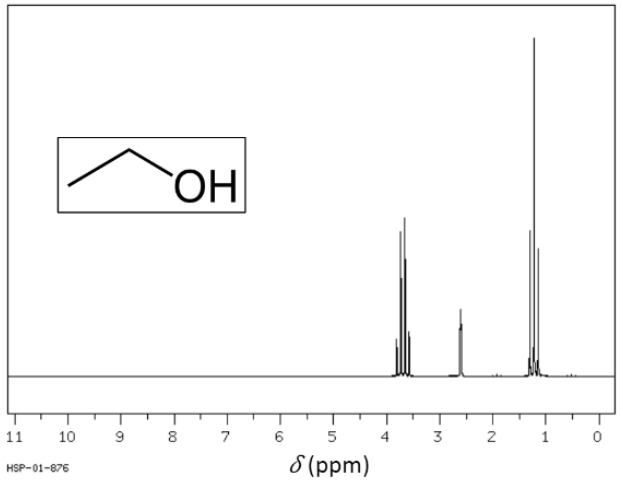
Identification de l'indigo



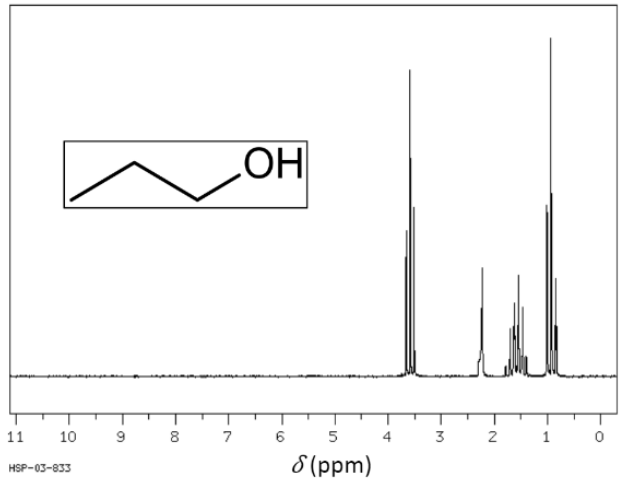
Superposition des spectres de l'éthanol et du propanol



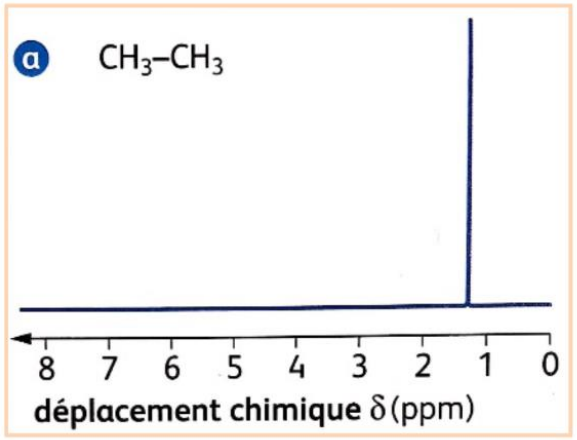
Spectres RMN

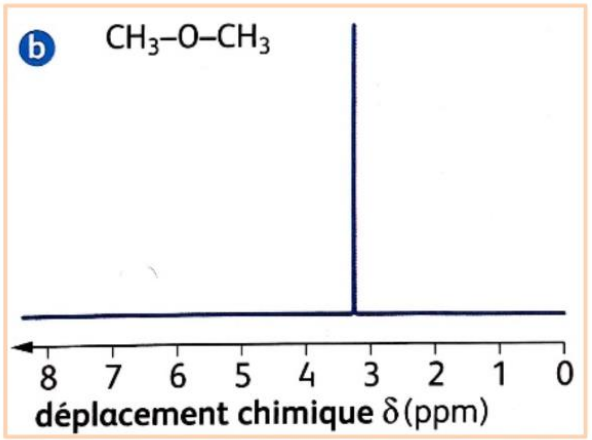


SPECTRE RMN DE L'ETHANE

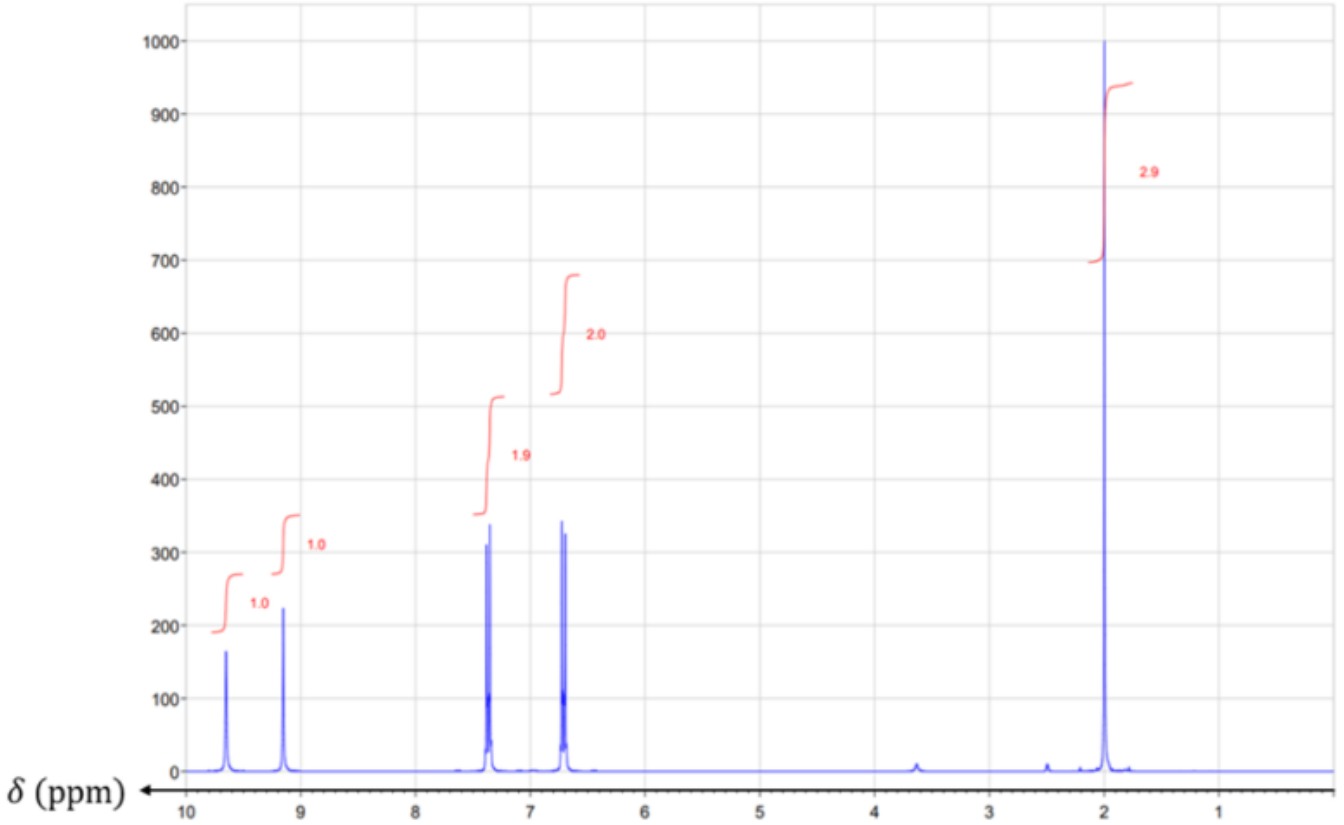


SPECTRE RMN DU METHOXYETHANE

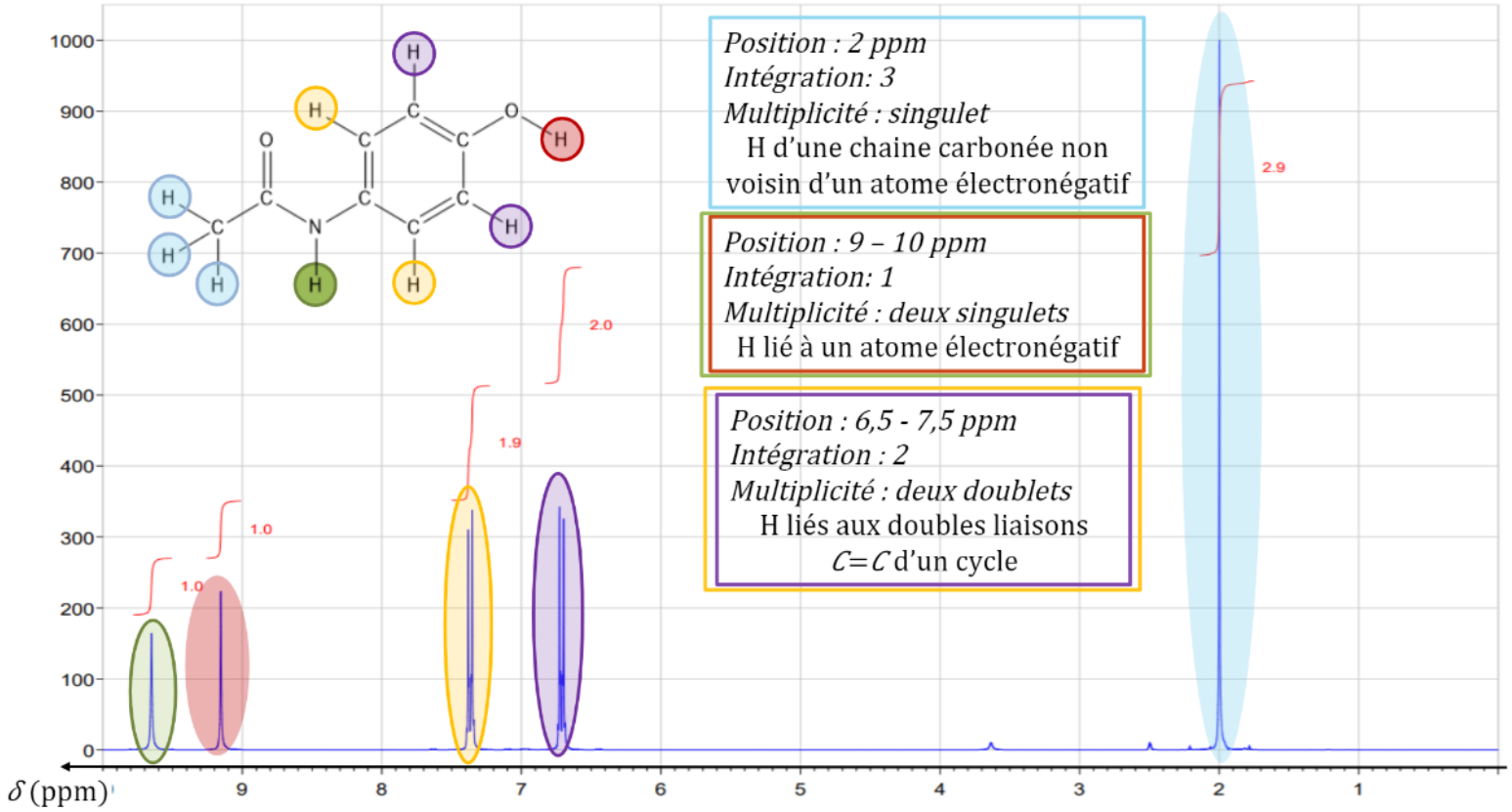




Spectre du paracétamol



Analyse


Position : 2 ppm
Intégration: 3
Multiplicité : singulet
H d'une chaine carbonée non voisin d'un atome électronégatif
Position : 9 – 10 ppm
Intégration: 1
Multiplicité : deux singulets
H lié à un atome électronégatif
Position : 6,5 - 7,5 ppm
Intégration : 2
Multiplicité : deux doublets
H liés aux doubles liaisons C=C d'un cycle
2.9
2.0
1.9
1.0
1.0
δ (ppm)

Conclusion

Spectroscopie	Principe	Informations	Limites
UV-visible	Transition électronique	Couleurs	Absorption UV-visible uniquement
IR	Vibrations de liaisons	Groupes fonctionnels	Pas d'information spatiale
RMN	Résonance magnétique	Répartition des protons	Appareillage sophistiqué