IV.2. Nomenclature of functional compounds :

Polyfunctional compounds are compounds which contain two or more than two functional groups in an organic compound. Some of the examples of polyfunctional compounds are : $CH_3{-}CO{-}CH_2{-}COOH$, NH_2-$(CH2)_3$-NH_2, CCl_4.

Whenever we do the IUPAC naming of polyfunctional group, we categorise the functional group as primary and secondary functional group according to their priority.

Procedure for naming functional groups :

- Rule 1 : Select of pricipel functional group :

In the IUPAC nomenclature system, organic molecules are grouped into specific classes of compounds determined by the main functional group present in the structure. A system of priorities is used to determine the main functional group, which determines the identity of the compound. All other functional groups are treated as substituents. n, the

Whenever we select the principal group, we select it according to the priority. In a polyfunctional compound, the functional group which has the highest priority is selected as the principal functional group.

Order of Priority of Functional Groups in Polyfunctional Compound

The order of decreasing priority for some functional groups is given below:

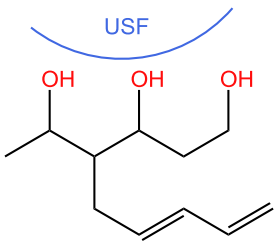
-COOH, $–SO_3H$, -COOR (R=alkyl group), COCl, $-CONH_2$, -CN, -HC = O, > C = O, -OH, $-NH_2$, > C = C > -C ≡ C- > R-O-R’ > -X > $-NO_2$.

The functional groups other than the principal functional groups in a polyfunctional compound are called substituent or secondary functional groups. Example *OH−CH2−CH2−COOH*

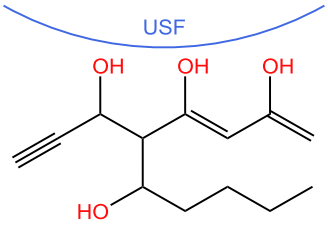
In this polyfunctional compound OH is substituent and COOH is the principal functional group.

Rule 2 : Select the principal carbon chain

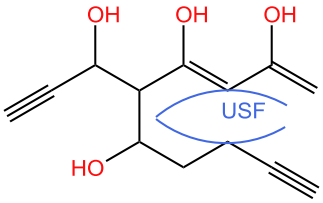
- The chain must contain the maximum number of the principal functional groups, then :



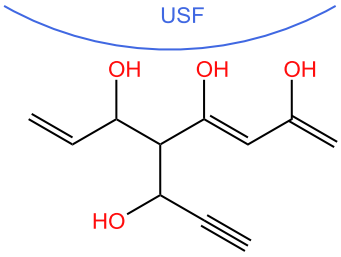
- It must must contain the maximum number of the multiple bonds, then



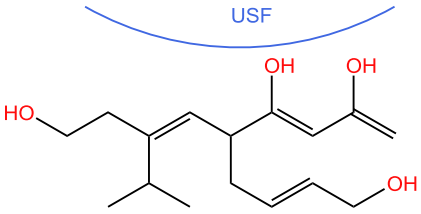
- It must must contain the maximum number of carbon atoms, then



- It must must contain the maximum number of the double bonds, then

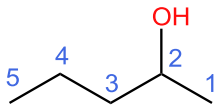


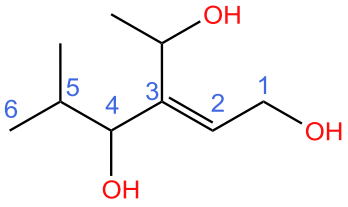
- It must must contain the maximum number of substituents



Rule 3 : numbering the principal chain :

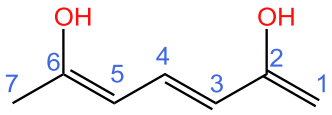
- The principle functional groups must be given the lowest possible number,

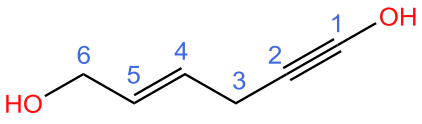




then :

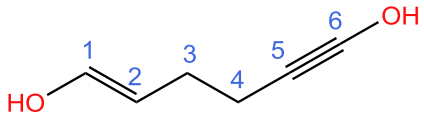
- The multiple bonds must be given the lowest possible number,





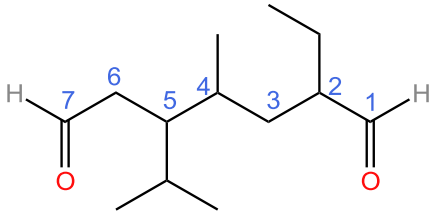
then :

- The bouble bonds must be given the lowest possible number,



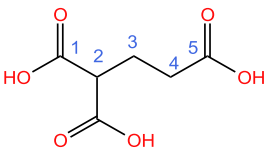
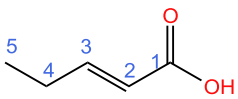
then :

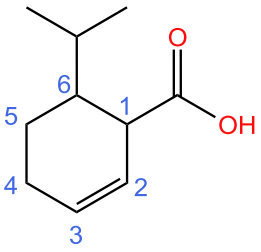
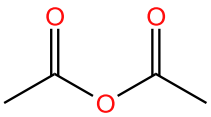
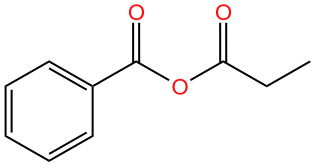
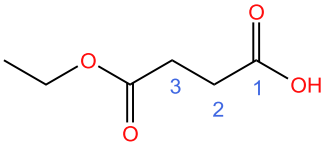
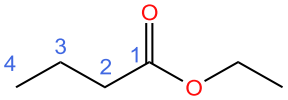
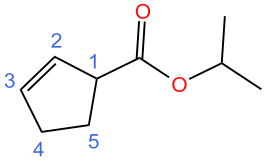
- The substituents must be given the lowest possible number.

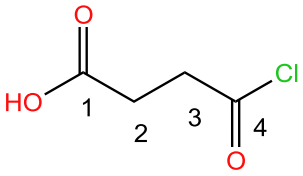
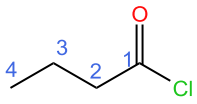
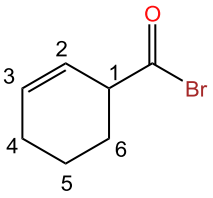
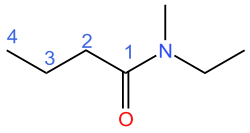
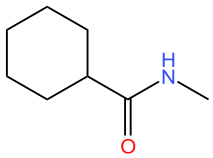
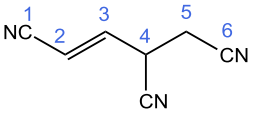
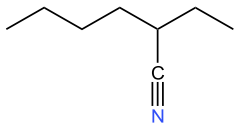


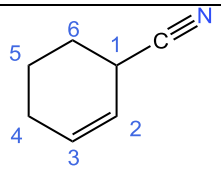
- Rule 4 : Write the name
  - prefixe prefixe PCC suffixe1 suffixe2
- Prefixe1 : substitutents and secondary functionals (remaning funtional)
- Prefixe : cyclo
- PCC : priciple carbon chain
- Suffixe1 : multiple bonds
- Suffixe2 : principle functional group

Highest priority groups : 1- carboxylic acids
2- anhydride acids
3- esters
4- acide halides
5- amides
6- nitriles

N°	group	Prefixe	suffixe
1- carboxylic acids	**-COOH**	Carboxy :  2-carboxy pentan-1,5-dioic acid	-oic acid :  pent-2-enoic acid *The carbon atom of the -COOH group always has the number 1.*

			-carboxylic acid :  6-isopropylcyclohex-2-ene-1-carboxylic acid *the carbon of the cycle bearing the -COOH group is numbered 1*
2-anhydride acid	R-CO-O-CO-R'		R = R' : alkanoic anhydride :  Ethanoic anhydride R ≠ R' ; alkanoic alkanoic anhydride :  benzoic propanoic anhydride
3-esters	R-CO-OR'	Alkoxy carbony :  Ethoxy carbonyl propanoic acid	-alkyl alkanoat :  Ethyl butanoat -alkyl alkyl carboxylate :  Isopropyl cyclopent-2-ene

			carboxylate
4-acid halide	**R-CO-X** (**X : F, Cl, Br, I**)	Halide carbonyl :  3-(chlorid carbonyl) prpanoic acid	-oyl halide :  Chlorure de butanoyle -carbony halide :  Bromure de cyclohe-2-ènoyle
5-amides			N-alkyl-N-alkyl alkan amide :  N-ethyl-N-methylbutane amide N-alkyl-N-alkyl alkan carboxamide :  N-methylcyclohexane carboxamide
6-nitrile		Cyano  4-cyano hex-2-enedinitril	-nitrile :  2-ethylhexane nitril -carbonitrile :

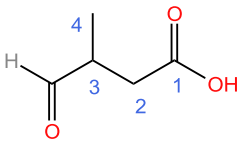
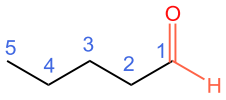
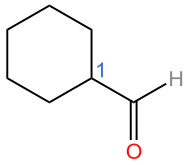
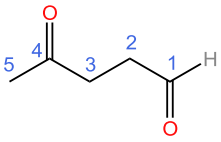
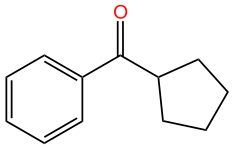
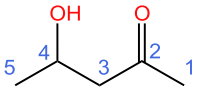
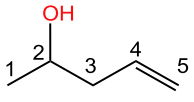
Nexte line : 7-aldehyde

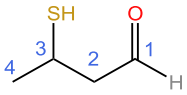
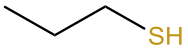
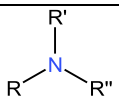
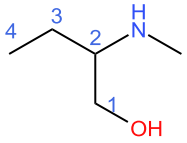
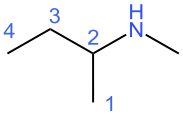
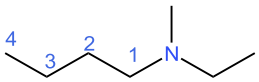
8-ketone

9-alkohol

10- thiol

11-amine

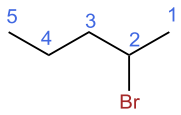
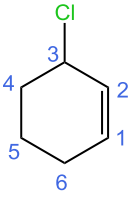
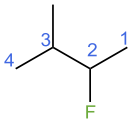
N°	Group	Prefixe	suffixe
7- aldehyde	**-CHO**	Formyl- :  3-formylbutanoic acid	-al :  pentanal -carbaldehyd :  Cyclohexane carbaldehyde
8-ketone	**R-CO-R'**	Oxo- :  4-oxo pentanal	-one  Propanone (acetone) Alkyl alkyl ketone  Cyclopentyl phenyl ketone
9-alkohols	-OH	Hydroxy- : 	-ol 

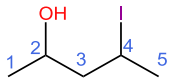
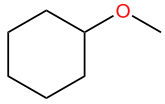
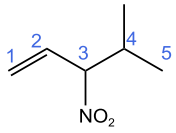
		4-hydroxypentan-2-one	Pent-4-en-2-ol
10-thiols	**-SH**	Mercapto- :  3-mercaptobutanal	 propanthiol
11-amines	 	N-alkyl-N-alkyl amino-  2-(N-methylamino)butan-1-ol	N-alkyl-N-alkyl alkan amine :  N-methyl- butan-2-amine  N-ethyl-Nmethyl butane amine

Functional groups that are always prefixes : 12-halides

13-alkoxy

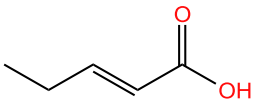
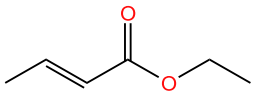
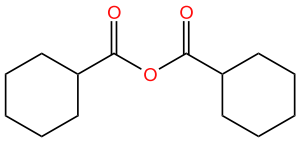
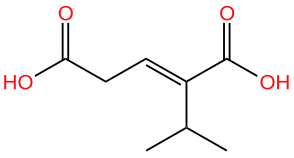
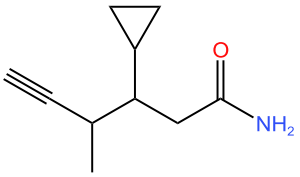
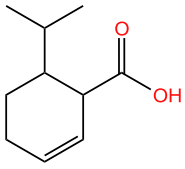
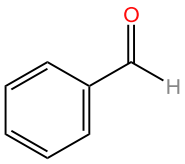
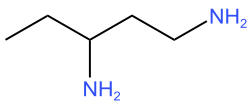
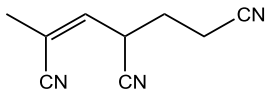
14-nitro

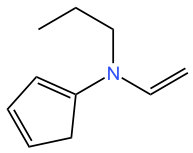
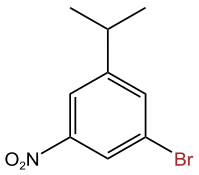
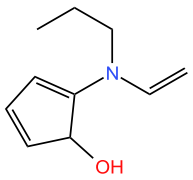
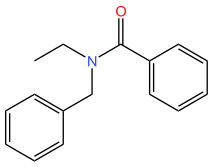
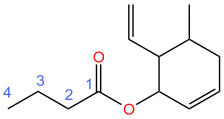
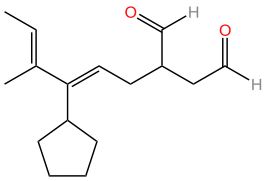
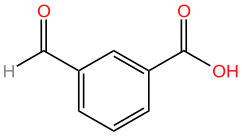
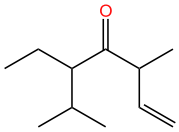
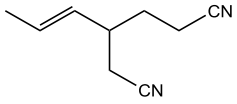
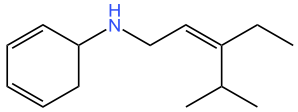
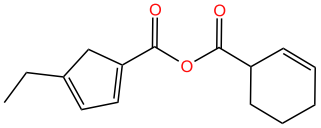
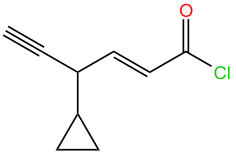
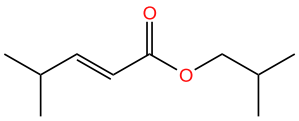
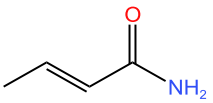
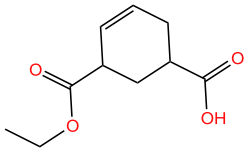
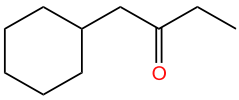
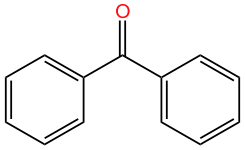
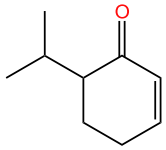
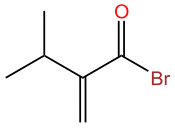
N°	Group	prefixe
12- halide	**-X** **X : F, Cl, Br , I**	bromo- :  2-bromo pentane Chloro :  3-chloro cyclohexene Fluoro : 

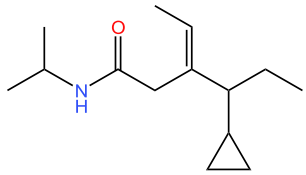
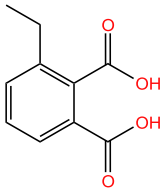
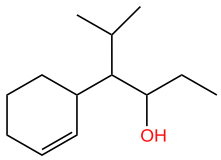
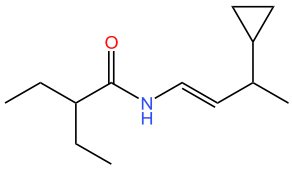
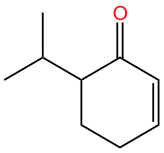
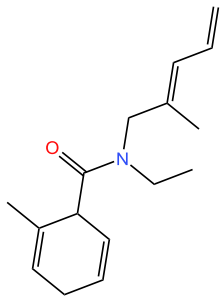
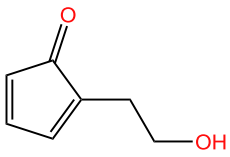
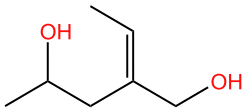
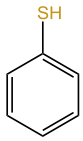
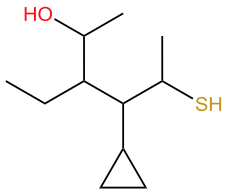
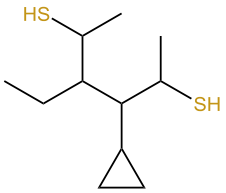
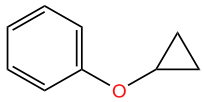
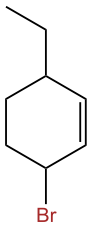
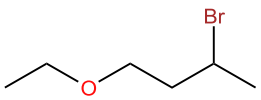
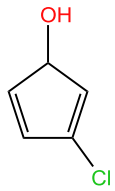
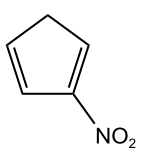
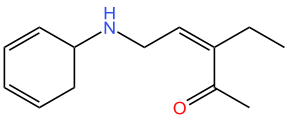
		2-fluoro-3-methylbutane Iodo :  4-iodo pentanol
13-alkoxy	**-O-R**	alkoxy :  Methoxy cyclohexane
14-nitro	-NO_2	nitro- :  4-methyl-3-nitropentene

Exercise :

Naming th following compounds :

1.  	2.  	3. 
4.  	5.  	6. 
7.  	8.  	9. 

10. 	11. 	12. 
13. 	14. 	15. 
16. 	17. 	18. 
19. 	20. 	21. 
22. 	23. 	24. 
25. 	26. 	27. 
28.	29. 	30.

		
31. 	32. 	33. 
34. 	35. 	36. 
37. 	38. 	39. 
40. 	41. 	42. 
43. 	44. 	45. 
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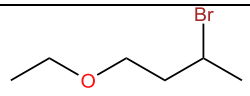
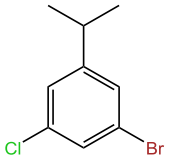
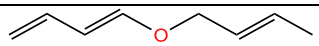
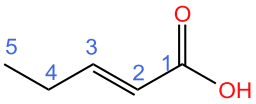
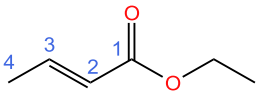
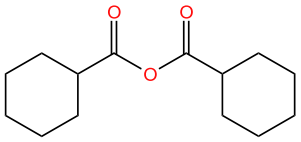
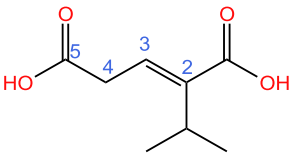
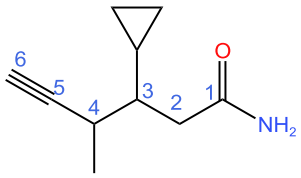
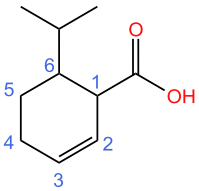
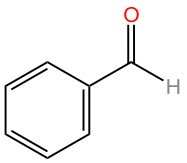
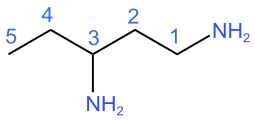
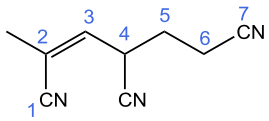
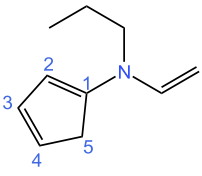
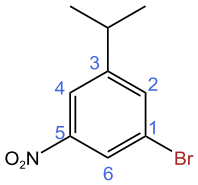
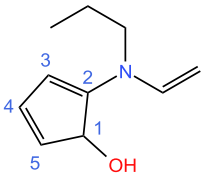
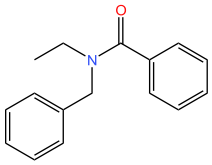
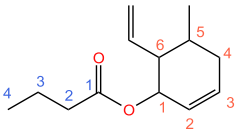
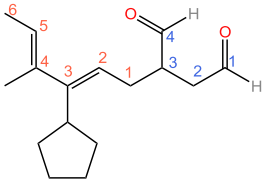
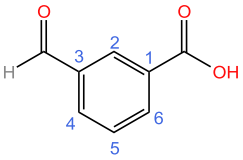
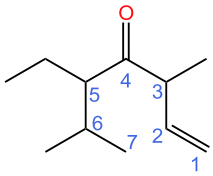
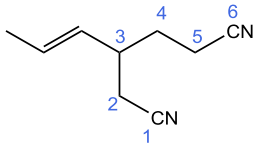
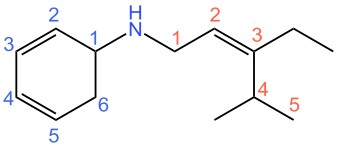
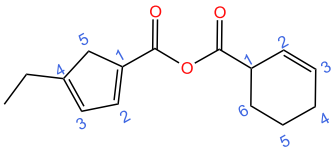
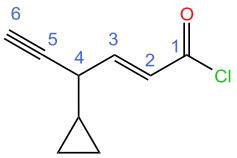
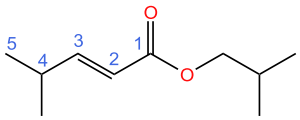
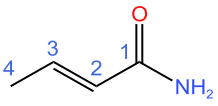
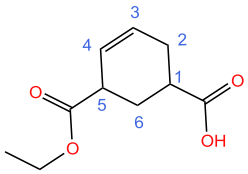
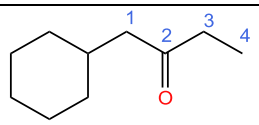
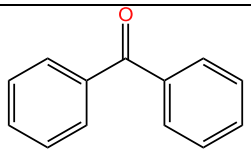
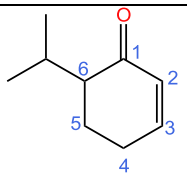
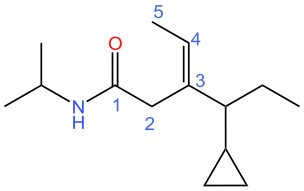
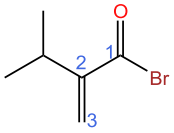
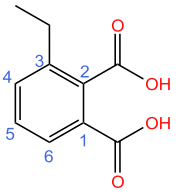
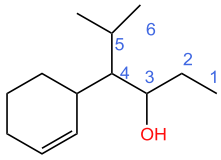
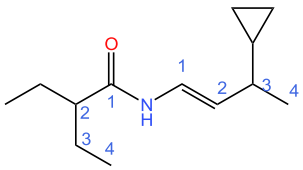
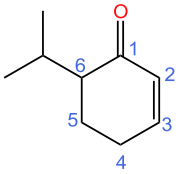
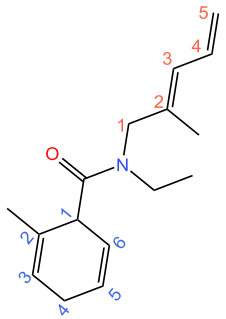
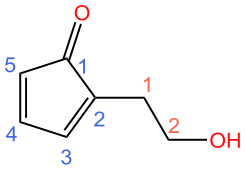
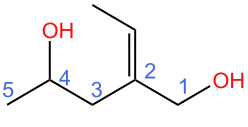
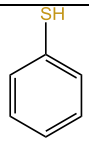
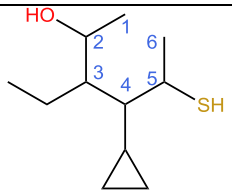
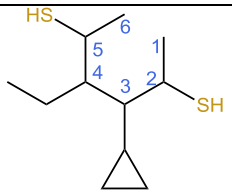
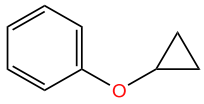
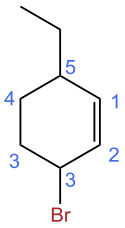
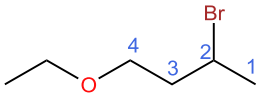
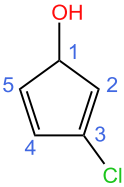
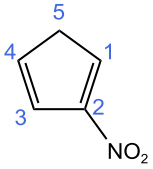
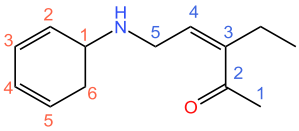
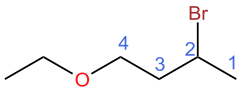
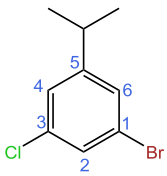
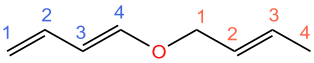
		

Solution :

1.  Pent-2-eneoic acid	2.  ethoxybut-2-enoate	3.  cyclohexane carboxylic anhydride
4.  2-isopropylpent-2-enedioic acid	5.  3-cyclopropyl-4-methylhex-5-yne amide	6.  6-isopropylcyclohex-2-ene carboxylic acid
7.  Benzene carbaldehyde (benzaldéhyde)	8.  Pentane-1,3-diamine	9.  4-cyano-2-methylhept-2-ene dinitrile
10.  N-ethenyl-N-propylcyclopenta-1,3-diene amine	11.  1-bromo-3-isopropyl-5-nitrobenzene	12.  2-(N-ethenyl-N-propyl amino)cyclopenta-2,4-dien-1-ol

13.  N-benzyl-N-ethyl benzamide	14.  5-methyl-6-ethenylcylohex-2-enyl Butanoate	15.  3-(3-cyclopentyl-4-methylhexa-2,4-dienyl)butandial
16.  3-formylbenzoic acid (3-formyl benzene carboxylic acid)	17.  5-ethyl-3,6-dimethylheptan-4-one	18.  3-prop-1-enylhexane dinitrile
19.  N-(3-ethyl-4-methylpentyl)cyclohexa-2,4-diene amine	20.  cyclohex-2-ene carboxylique-4-ethylcyclopenta-1,3-diene carboxylique anhydride	21.  4-cyclopropylhex-2-en-5-ynoyle chloride
22.  isobutyl 4-methyl pent-2-enoate	23.  but-2-ene amide	24.  5-(ethoxy carbonyl)cyclohex-3-ene carboxylique acid
25.	26.	27.

 1-cyclohexylbutan-2-one	 diphenyl ketone	 6-isopropyl cyclohex-2-en-1-one
28.  N-isopropyl -3-cyclopropylpent-3-ene amide	29.  2-isopropyl propnoyle Bromide	30.  3-ethyl benzene-1,2-dicarboxylic acide (2-carboxy-3-ethylbenzoique acide)
31.  4-cyclohex-2-enyl-5-methylhexan-3-ol	32.  N-(3-cyclopropylbut-1-enyl)-2-ethylbutane amide	33.  6-isopropyl cyclohex-2-en-1-one
34.  N-ethyl-N-(2-methylpenta-2,4-enyl) 2-methylcyclohexa-2,5-diene carboxamide	35.  2-(2-hydroxyethyl)cyclopenta-2,4-dien-1-one	36.  2-ethylidenepentane-1,4-diol
37.	38.	39.

 phenylthiol	 4-cyclopropyl-3-ethyl-5-mercaptanhexan-2-ol	 3-cyclopropyl-4-ethylhexa-2,5-dithiol
40.  cyclopropoxybenzène	41.  3-bromo-5ethyl cyclohex-1-ene	42.  4-ethoxy-2-bromobutane
43.  3-chloro cyclopenta-2,4-dien-1-ol	44.  2-nitro cyclopent-1,3-diene	45.  5-(N-cyclohexa-2,5-dienyl amino)-3-ethylpent-4-en-2-one
46.  4-ethoxy-2-bromobutane	47.  1-bromo-3-chloro-5-isopropyl benzene	48.  But-2-enoxy buta-1,3-diene