Synthesis of chemical species and characterization

Thème du programme : Health	
Understand the role of a chemical synthesis.	
Know the stages of a chemical synthesis.	
Know the assembly used in a synthesis and know the role of each element.	
Identification of a species by CCM (principle and application).	

I. Why realize a synthesis ?

Documentary activity : the chemical synthesis to help nature !

Definition : we call synthesis the preparation of a chemical species from other chemical species.

Synthetic products contribute to the improvement of the comfort of the daily life. And this in every domains : food (farming), health (antibiotics), clothes, cosmetics...

- Synthesize natural products :

All the chemical species which are necessary for the man cannot be taken in the nature because the quantities which we need are enormous. Furthermore, generally, the cost of the synthesis is lower than the extraction of the natural product.

Example : it would be necessary to cut down 2000 willows per hour to meet the needs in aspirin.

- Synthesize artificial chemical species :

Some of these species present advantageous physical characteristics which contribute for example to the manufacturing of new meterials or new medicines (without side effects). There are several sectors of chemical synthesis : heavy chemistry, fine chemistry, pharmacy. All of them require several stages of synthesis.

II. How to realize a synthesis ?

The synthesis of a molecule takes place according to 3 stages : the transformation, the separation and the identification of the obtained product.

The chemist possesses a protocol which is a kind of "recipe" to be followed. It specifies the nature and the quantities of necessary reactives, the appropriate solvent, safety instructions to be respected, the assembly used...

During the transformation reactives combine to form products. It can be done under hot or cold conditions. Usually, heating under reflux is used. It allows to accelerate the transformation by maintaining the reactional mixture at the boiling point of the mixture, a cooler with cold water serves to condense the vapors which fall again into the balloon. It avoids any loss.

The species obtained by synthesis is generally mixed with the solvent, it is then necessary to get it back. It is the stage of separation. Seen in the previous chapter :

- If it is a solid we get back it by filtration
- if it is a dissolved specie we get back it by extraction or evaporation of the solvent.

III. How to characterize and check the synthesized species ?

The characterization constitutes the last stage, it is necessary to know whether we have synthetized the wanted product and if it is pure.

We can use its specific physical characteristics : aspect, temperature of change of state...

We can also realize a thin-layer chromatography. The chromatography allows the separation of the constituents of a mixture and their identification, it is an analysis technique. We use a support constituted by a thin layer of absorbing material and an eluent which helps the various constituents of the mixture to ascend along the plate. The obtained plate is called a chromatogram.