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Organization of a spectroscopy tournament to engage students with structural identification of organic compounds

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Introduction : The teaching of **chemical analysis** in organic chemistry is a **key learning** for students since it is closely linked to theoretical and experimental approaches. It involves several **complementary techniques** (mass spectrometry, Infrared spectroscopy and Nuclear Magnetic Resonance spectroscopy) whose complexity requires a **reinforced methodological approach** and a **sustained effort** from the students. In order to encourage student to get **more involved** in structural identification courses, a **spectroscopy tournament** between **3 Universities** of the north of France was organized. Among the **61 students** who took place in the tournament, 18 were from Lens, 11 from Dunkerque and 32 from Amiens.

I) Tournament's Rules

- Tournament is played in **teams** of 3-4 players from the **same university**.
- The time limit is fixed to 1h30
- One structure at a time.
- Each **correct structure** worth 1 point.
- You have **2 attempts** to elucidate a structure
- If the structure is not correct, **you lose 2 points** and are allowed to work on the next structure.
- The team with the more points **wins the trophy** (and the glory!)



II) Teams at work 😊



Each time students have a structure to propose, they call a Judge (teacher). The next set of data is provided in case of success (+1 point) or if 2 unsuccessful tries were made (-2 points).

IV) Tournament evaluation from students (questionnaire)

The tournament was evaluated by students with a Likert 5-point scale. Mean are given below. (5 = fully agree / 1 = fully disagree)

Most of the students agreed on the following sentences :

- The tournament took place in a good atmosphere (4.71)
- The rules were clear (4.49)
- The teachers were impartial (4.54)
- This type of tournament should be repeated in the coming years (4.78)
- This tournament allowed you to progress in spectroscopy (4.16)
- This tournament made you want to progress in spectroscopy (4.46)
- If you had to do it over again, you would have invested more in spectroscopic analysis before the tournament (4.08)
- This tournament required an intense intellectual effort (3.95)
- The formation of groups (from the same university) was perfectly adapted to the competition (4.35)

III) Examples of structures and data provided

Entry	Structure	Molecular formula	¹ H NMR	¹³ C NMR	DEPT	MS	IR
1		C ₆ H ₁₀	X	X		X	X
2		C ₉ H ₁₁ N	X	X	X	X	X
3		C ₆ H ₂ F ₄	X	X		X	X
4		C ₄ H ₇ NO ₂	X	X		X	X

Every teams have the same molecules in the same order. They have one copy of all the necessary spectra to elucidate the structure. Not all the data were provided (see table above)

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Conclusion:

The first spectroscopy tournament of the North of France held in Lens in 2022 and has gathered 60+ students from 3 universities.

It was found that this kind of event can **allow students to progress** in spectroscopy and it can **motivate students** to engage more in spectroscopic analysis of unknown compounds.

To our delight, all the students indicated that the tournament should be repeated in future years.

The next edition of the tournament will be held at ULCO in 2023

