

## Examiners' Report – Paper B (Chemistry)

1. The paper relates to certain fluorinated hydrocarbons of the formula

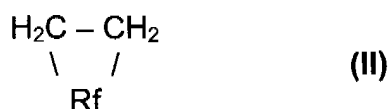


wherein Rf is a monovalent fluorinated hydrocarbon radical or the two Rf groups taken together are a divalent fluorinated hydrocarbon radical.

The set of claims given included a claim directed to the compounds as such and one directed to the process for their preparation and a dependent process claim.

The candidates should have realised that the subject-matter of these claims was not novel in view of either of the documents **DI** and **DII**.

2. **DI** discloses a process for making  $\text{F}_3\text{C-CH}_2\text{-CH}_2\text{-CF}_3$  (i.e. where Rf means  $-\text{CF}_3$ ) and **DII** one for preparing a compound of the formula



where Rf is  $-\text{CF}_2\text{-CF}_2\text{-CF}_2-$ .

Both processes involve catalytic hydrogenation of a compound of the formula depicted in given claim 2 using the starting materials listed in given claim 3.

3. Neither **DI** nor **DII** discloses the product of example 3, i.e. 1,1,2,2-tetrafluorocyclobutane (i.e. the compound of formula **(I)** wherein the two Rf groups taken together are a divalent fluorinated hydrocarbon radical of the formula  $-\text{CF}_2\text{-CF}_2-$ ). This compound has a four-membered ring, differs from the compounds disclosed in **DI** and **DII** and boils at a lower temperature than the known compounds.

Therefore, a claim should have been directed to this compound.

It was, however, not appropriate to amend given claim 1 simply by disclaiming the compounds disclosed in **DI** and **DII**. Although such a disclaimer could serve to render the subject-matter novel, there was no reasonable argument in favour of the inventive step of the remaining compounds.

4. It was clear from the description that the process of given claim 2 (i.e. the catalytic hydrogenation) could be performed in the presence of a base in order to avoid chlorinated by-products when chlorinated starting materials are used. This problem and its solution are neither disclosed nor suggested in documents **DI** and **DII** and could justify an inventive step.

A claim directed to this process had to be limited to chlorinated starting materials because only in this case does the problem arise, which is solved by the presence of the base.

There was no reason to restrict such a claim to a certain temperature or pressure range. Candidates who filed such restricted claims lost marks.

Suitable dependent claims specified the type and the amount of base to be added.

The subject-matter of claims directed to the products obtained by this new and inventive process were not considered to be novel as far as the products were known from **DI** or **DII**. The fact that these products contain less impurities cannot render them novel as the method for purifying them by HPLC was known (see **DI**); T 990/96, OJ EPO 10/1998, 489-498.

5. In the description it was mentioned that the boiling point of the compound disclosed in **DII** (1,1,2,2,3,3-hexafluorocyclopentane) was too high for many applications. The azeotropic mixtures of this compound with C<sub>1</sub>-C<sub>4</sub>-alkanols were shown to have a much lower boiling point. Neither **DI** nor **DII** discloses or suggests mixing the fluorinated compounds with further compounds in order to lower the boiling point. Therefore, claims directed to these azeotropic mixtures were also expected.

The claims were expected for reasons of clarity to refer to "C<sub>1</sub>-C<sub>4</sub>-alkanols" rather than the equivalent expression "lower alkanol".

A few candidates presented a claim directed to azeotropic mixtures in which the fluorinated component was not restricted to 1,1,2,2,3,3-hexafluorocyclopentane. Such a claim had no basis in the application and thus contravened the requirements of Art. 123 (2) EPC.

Suitable dependent claims specified the type of alkanol (methanol, ethanol) and the relative proportion of the components of the mixtures.

6. It was evident that these three aspects – the compound 1,1,2,2-tetrafluorocyclobutane, the process in the presence of a base and the azeotropic mixtures containing – lacked unity of invention.
7. Further claims could be directed to cleaning fluids and working fluids containing 1,1,2,2-tetrafluorocyclobutane or the azeotropic mixtures mentioned above and/or to their respective uses.
8. The marks to be awarded for dependent claims were very limited, as usual in Paper B. So, candidates who filed many dependent claims lost valuable time both in drafting these claims and in indicating the basis therefore in the original application.

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9. **Arguments:** Most candidates properly indicated the basis in the application filed for each feature of the newly filed claims. Most candidates also properly applied the problem-solution approach when assessing inventive step.
  
  10. The error in the French text (see page 5, line 6: "-CF" instead of "-CF<sub>3</sub>") had no adverse effect on the results.

**EXAMINATION COMMITTEE I**

Candidate No. ....

## Paper B (Chemistry) 2001 - Schedule of marks

Category	Maximum possible	Marks awarded		Marking by further examiners if any	
		Marker .....	Marker .....	Marker .....	Marker .....
Claims	10				
Argumentation	50				
Total	100				

Sub-Committee for Chemistry agrees on .....marks and recommends the following grade to the Examination Board:

**PASS**  
(50-100)

**FAIL**  
(0-49)  
**COMPENSABLE FAIL**  
(45-49, in case the candidate sits the examination for the first time)

Paris, 24 August 2001

J. Combeau - Chairman of Examination Committee I