Examiners' Report – Paper A (Chemistry)

1. The paper deals with the extraction of sulphur compounds from certain hydrocarbon distillate fractions boiling below 200 °C.

Prior art document **DI** discloses such a process where the distillate is

- extracted with an aqueous alkaline solution containing a carboxylic acid as a co-solvent,
- separation of the aqueous phase,
- oxidation of the sulphur compounds in the aqueous phase to yield disulfides, and
- removal of the disulfides.

Prior art document **DII** discloses the separation of pyridines from distillate fractions boiling in the range 200-250 °C by

- extraction of the distillates with an aqueous alkaline solution containing an alcohol as a co-solvent,
- separation of the aqueous phase,
- extraction of olefins from the aqueous phase with a flow of saturated hydrocarbons, and
- distillation of the pyridines from the aqueous phase.

The aqueous alkaline solution employed in the first extraction step contains from 1 to 50 weight-% of an alkali metal hydroxide (e.g. NaOH) and an alcohol in a weight ratio of alkali metal hydroxide to alcohol of from 5:1 to 1:2. Aliphatic alcohols are not mentioned.

2. The following types of independent claims were regarded as acceptable in Paper A:

1. A claim to the process for the removal of mercaptans from hydrocarbons having a boiling point below 200°C, said process comprising

   (a) extraction with an aqueous alkaline solution (pH>7) containing NaOH or KOH and an alcohol or a carboxylic acid as a co-solvent in a weight ratio hydroxide: co-solvent of 5:1 to 1:2,
   (b) extraction of the olefins from the aqueous phase with a stream of saturated hydrocarbons, and
   (c) oxidation of the mercaptides in the aqueous phase to yield disulfides.

2. A process claim similar to claim 1 but where step (b) is missing and where the co-solvent is specified to be an alcohol.

3. A claim directed to the aqueous alkaline solution employed in step (a) of the above-mentioned second process (containing an aliphatic alcohol).

4. A concentrate of the aqueous alkaline solution.

5. A claim to the use of the aqueous alkaline solution employed in step (a) where the co-solvent is an alcohol (which is not necessarily aliphatic) for the extraction of mercaptans from hydrocarbons having a boiling point below 200 °C.

3. The candidates should have seen that process claims 1 and 2 lack unity.

4. The candidates should have realised that the aqueous solution has to be alkaline and that the co-solvent has to be specified. It was not however necessary to restrict the co-solvent to methanol or ethanol. Candidates with claims, which were too narrow in scope, lost marks.

5. Several candidates presented a process claim comprising steps (a) to (c) in the two-part form describing step (b) in the characterising portion without specifying that step (b) is to be performed after step (a) and before step (c). These candidates lost marks. It was clear that a process where step (b) was performed after step (c) did not solve the problem posed.

6. The candidates should have realised that sodium and potassium hydroxides were the only alkali hydroxides to be employed in the process (see p. 4, 2nd paragraph of the English version of the paper). So fewer marks were awarded for process claims referring to alkali hydroxides in general.

7. It is clear from the text of the paper that the concentrations of 1 to 50 wt-% or 5 to 25 wt.-% referred to sodium hydroxide only and not to potassium hydroxide.

8. Several candidates presented claims directed to the hydrocarbon fractions obtainable by the process mentioned above. However, the subject-matter of such a claim cannot be considered to be novel in the absence of special circumstances (see T 0990/96, OJ EPO 10/1998, 489-498; T 0205/83, OJ EPO 12/1985, 363-372).

9. Candidates who drafted a high number of dependent claims lost marks.

EXAMINATION COMMITTEE I Candidate No. .....

Paper A (Chemistry) 2001 - Schedule of marks

Category	Maximum possible	Marks awarded		Marking by further examiners if any	
		Marker	Marker	Marker	Marker .....
Independent claims	65				
Dependent claims	15				
Description	20				
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