Six markers: modelling alternative approaches

Education in Chemistry
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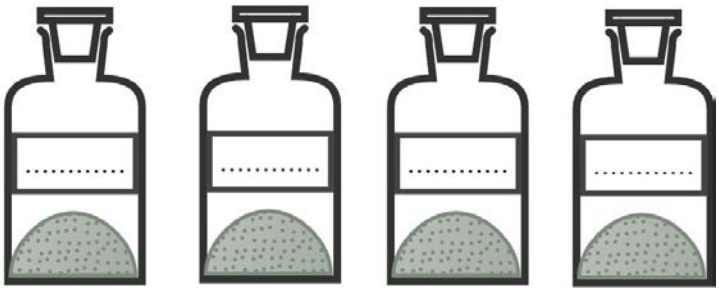
Try this sample question with your students. You could model how you would answer it, using prose (example A) or with a flow chart (example B). You could also give them the indicative content so they can concentrate on answering the question in the time, then move onto answering it completely.

Question



In the back of the chemical store the technician finds four bottles of white solids. Their labels have faded but the list of stock chemicals suggests they may contain the following substances:

- aluminium chloride
- magnesium chloride
- potassium carbonate
- potassium sulfate
- copper sulfate

Describe how you would analyse the solids to determine their identity. You can use standard laboratory reagents and you may also use flame tests. There is more than one way to carry out this analysis but you should try to minimise the number of different tests being used.

Give the results of any tests you would carry out.

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Example A: written in prose

Firstly, add water to all the samples. If one is a blue solution then this is copper sulfate. All the others give colourless solutions.

Then add barium chloride solution to the samples. This is the test for the sulfate ion so if a white solid is formed then the sample would be potassium sulfate. All other substances would show no change.

Then you can test for the carbonate ion using acid. Bubbles of CO_2 would be seen if the sample is potassium carbonate. The others would stay the same.

This leaves us with 2 substances to distinguish between, aluminium chloride and magnesium chloride. These give the same flame test result so you should use dilute sodium sodium hydroxide. Both give white solids but if a sample has aluminium in it then the solid would redissolve when an excess is added. So if the white solid remains then the sample is magnesium chloride.

Example B: a flow diagram approach