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A Level Chemistry B (Salters)

H433/03 Practical skills in chemistry

Insert

Practice paper – Set 1

Time allowed: 1 hour 30 minutes

INSTRUCTIONS

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INFORMATION

- This document consists of **4** pages. Any blank pages are indicated.

Finding the formula of a complex ion

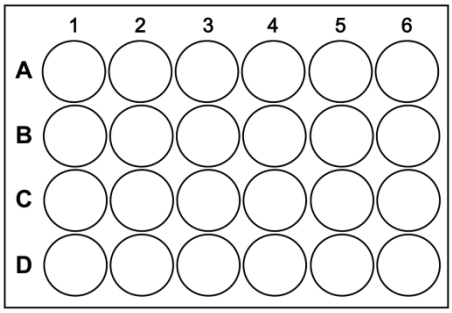
A student describes below an investigation to find the formula of a complex ion.

- Research told me it was possible to work out the formula of the complex ion formed from copper(II) ions and ammonia by mixing different proportions of them. The mixture with the most intense deep blue colour indicates the proportions of Cu^{2+} and NH_3 in the complex ion.

- After a preliminary experiment using well plates I then did a more accurate larger scale version, as my main experiment, using a colorimeter.

Preliminary experiment
Method

- Using a well plate (see diagram), place 4 drops of 0.1 M copper sulfate solution into each of wells A1 to A6.



well plate

- Add 1 drop of 0.1 M ammonia solution (ammonium hydroxide solution) to well A2, 2 drops to well A3, and so on until 5 drops are added to well 6. See table below.

- Add 6 drops of distilled water to well 1, 5 drops to well 2, and so on ending with 1 drop added to well 6. See table below.

Well	Drops of copper sulfate soln.	Drops of ammonia soln.	Drops of distilled water
A1	4	0	6
A2	4	1	5
A3	4	2	4
A4	4	3	3
A5	4	4	2
A6	4	5	1

- Stir each well.

- Note and record the observations for the reaction in each well.

Observations

Well	Observations
A1	blue solution
A2	slightly cloudy pale blue solution
A3	pale blue precipitate
A4	pale blue precipitate
A5	deep blue solution
A6	deep blue solution

Main experiment
Method

Chemical requirements
2.0 mol dm^{-3} ammonium sulfate solution
0.1 mol dm^{-3} copper sulfate solution
0.1 mol dm^{-3} ammonia solution

1. Prepare a different mixture in 8 test-tubes by adding the volumes of the three solutions shown in the table below.
2. Cork each tube and shake to mix thoroughly.
3. Transfer the solution to the cuvettes fitting into the colorimeter.

Test-tube number	1	2	3	4	5	6	7	8
Volume of ammonium sulfate solution/cm^3	5	5	5	5	5	5	5	5
Volume of copper sulfate solution/cm^3	0.0	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Volume of ammonia solution/cm^3	10.0	9.0	8.5	8.0	7.5	7.0	6.0	5.0
Colorimeter absorbance reading(arbitrary units)	0.0							

4. Choose a suitable filter for this experiment.

5. Zero the colorimeter using tube 1.

6. Immediately after setting the colorimeter to zero with tube 1, replace it with tube 2 and take a reading of the absorbance.

7. Repeat step 3 before taking further colorimeter readings for each of the remaining test-tubes in turn.

Results from main experiment

Test-tube number	1	2	3	4	5	6	7	8
Volume of ammonium sulfate solution/cm^3	5	5	5	5	5	5	5	5
Volume of copper sulfate solution/cm^3	0.0	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Volume of ammonia solution/cm^3	10.0	9.0	8.5	8.0	7.5	7.0	6.0	5.0
Colorimeter absorbance reading(arbitrary units)	0.0	0.20	0.29	0.34	0.32	0.28	0.22	0.15

END OF PRACTICAL INSERT