AQA

General Certificate of Education
Advanced Subsidiary Examination
June 2011

Chemistry CHM3T/Q11/task

Unit 3T   AS Investigative Skills Assignment

Task Sheet

Determination of the enthalpy change for the reaction between copper(II) sulfate solution and iron.

The first step in a method used to extract copper from low grade ores involves the use of bacteria and sulfuric acid. A solution of copper(II) sulfate is formed from the copper compounds in these ores. Copper is obtained from this solution by a displacement reaction using scrap iron.

In this experiment you will determine the temperature rise for the displacement reaction between copper(II) sulfate solution and iron. You are provided with a 0.400 $mol\,dm^{-3}$ copper(II) sulfate solution and 4.00 g of iron powder.

Wear eye protection at all times.
Assume that all solutions are toxic and corrosive.

Procedure

1   Draw a table of your own design on your Candidate Results Sheet to record time and temperature readings for this experiment.

2   Use a measuring cylinder to transfer 50.0 cm^3 of the copper(II) sulfate solution to a clean, dry plastic cup. Place the plastic cup containing the copper(II) sulfate solution in a clean, dry beaker to provide support and additional insulation.

3   Mount the thermometer in the cup using a clamp and stand. The bulb of the thermometer must be fully immersed in the solution. Place a stirrer in the cup.

4   **When your teacher is ready to check your temperature reading,** stir the copper(II) sulfate solution in the cup. Measure the temperature of this solution to one decimal place. Record this temperature in the space provided, labelled 'Sample temperature', on your Candidate Results Sheet.

5   When you are ready to start your experiment, stir the solution again, measure the temperature to one decimal place and start the timer. Record this temperature in your table.

6   Measure and record the temperature in the same way at the first, second and third minutes.

7   At the fourth minute, add the 4.00 g of iron powder. Stir the mixture but do **not** record the temperature.

8   Stir the mixture **continuously** throughout the experiment. Measure the temperature at the fifth minute, and then at every subsequent minute until five readings have been taken after the maximum temperature. Record each result in your table.

You will use your results to determine the temperature rise for the displacement reaction between copper(II) sulfate solution and iron in **Section A** of the Written Test.

ISA CHM3T/Q11 Candidate Results Sheet

Centre Number ☐☐☐☐☐   Teacher Group ....

Candidate Name .... Candidate Number ☐☐☐☐

Results

Sample temperature / °C	

Record your results in an appropriate table in the space below.

For Teacher's use only			
T		R	
P		A	