Glenalmond College
let your story begin

SCHOLARSHIP EXAMINATION

CHEMISTRY

2018

Time: 30 minutes

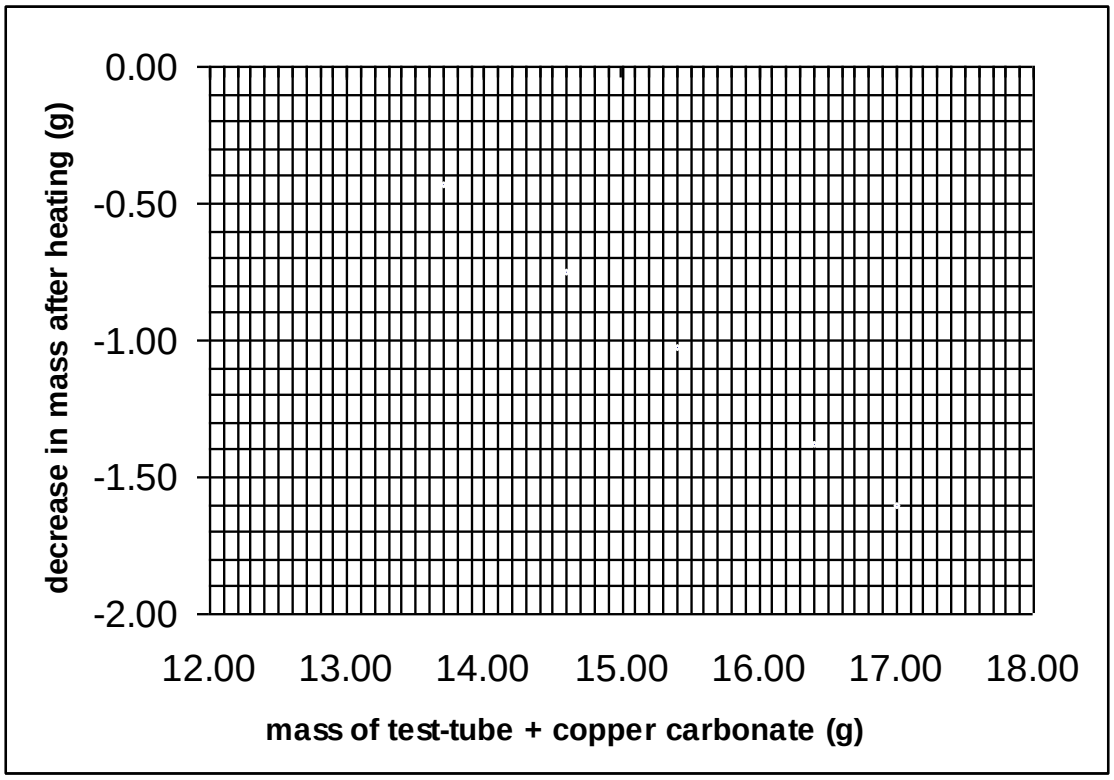
Name: _____

School: _____

1. Fergus and Amelia did an experiment to investigate the change in mass which occurs when green copper carbonate is heated. They found the masses of 5 identical test-tubes each containing a different sample of copper carbonate. Each test-tube was heated until no further reaction took place. The tubes and contents were allowed to cool, their masses found again and the decreases in mass calculated. The results of their experiments are shown in the table below

Mass of test-tube + copper carbonate(g)	13.70	14.60	15.90	16.40	17.00
Decrease in mass after heating (g)	0.43	0.75	1.03	1.38	1.60

a. Plot these results in the grid below (5)



b. One of the results was written down wrongly. Identify the wrong mass of copper carbonate (1)

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c. How does the decrease in mass depend on the mass of copper carbonate heated? (1)

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d. Explain how the mass of the identical test-tubes used in the experiments can be obtained **from the graph** (2)

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e. Find the mass of the test-tube (2)

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f. What decrease in mass occurs when 2.50 grams of copper carbonate is heated? (2)

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g. Fergus was unsure whether all of the copper carbonate has reacted. Describe what he could do to check whether it all had reacted. (2)

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h. What must have been happening for the mass of copper carbonate to decrease during the experiment? (1)

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i. Write a word equation for the reaction which took place (2)

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j. What colour change would have been observed as the experiment took place

From …… to …… (1)

k. What type of reaction is this? (1)

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(20)

2. Given a solution of copper sulphate solution, samples of iron, lead, magnesium and zinc powders, a thermometer, a balance, a 25 cm^3 measuring cylinder and polystyrene cups describe how it would be possible to obtain data to place the metals, copper, iron, lead, magnesium and zinc in order of reactivity. (10)

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3. The information in the box is about the preparation of copper sulphate crystals.

Step 1	Add a small amount of black copper oxide to some hot dilute sulphuric acid, and stir.
Step 2	Keep adding copper oxide until it is in excess.
Step 3	Remove the excess copper oxide to leave blue copper sulphate solution.
Step 4	Evaporate the copper sulphate solution until it is saturated.
Step 5	Leave the saturated solution of copper sulphate to cool. Blue copper sulphate crystals form on cooling.
Step 6	Remove the crystals from the solution remaining.
Step 7	Dry the blue crystals on a piece of filter paper.

(a) (i) Suggest a reason for using excess copper oxide in Step 2.

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(1)

(ii) Suggest how the excess copper oxide can be removed from the solution in Step 3.

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(1)

(iii) What is meant by the term *saturated solution*?

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(2)

(iv) Why do crystals form when a hot saturated solution cools?

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(1)

(v) Suggest why the blue crystals are dried in Step 7 using filter paper instead of by heating.

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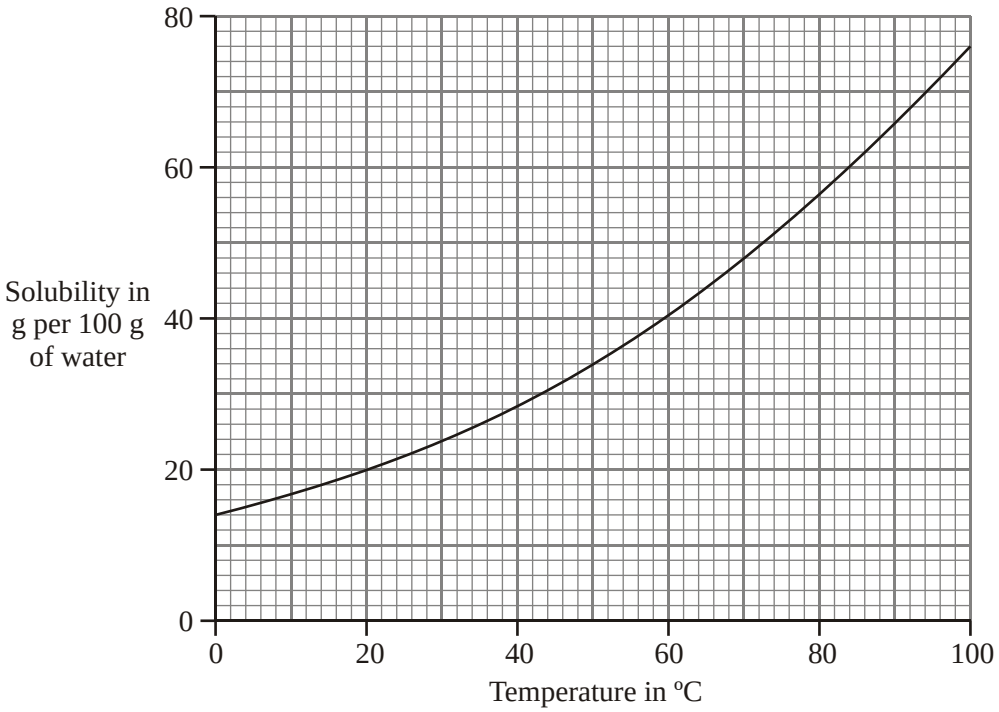
(1)

(b) The graph shows how the solubility of copper sulphate changes with temperature.



Use the graph to answer the following questions.

(i) What is the solubility of copper sulphate at 80 ºC?

Solubility = ... g per 100 g of water

(1)

(ii) What mass of copper sulphate would be formed if a saturated solution of copper sulphate, in 100 g of water, was cooled from 80 ºC to 20 ºC?

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Mass = ... g

(2)

(Total 9 marks)