NAME \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ INDEX NO. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

SCHOOL \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ SIGNATURE \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DATE \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**233/3**

**CHEMISTRY**

**PAPER 3**

**(PRACTICAL)**

July/August 2015

**TIME: 2 HOURS**

233/3

CHEMISTRY

PAPER 3

(PRACTICAL)

TIME: 2 HOURS

**INSTRUCTIONS TO CANDIDATES**

* Write your name, school and index number in the spaces provided above.
* Sign and write the date of the examination in the spaces provided above.
* Answer **ALL** questions in the spaces provided.
* You are **NOT** allowed to start working with the apparatus for the first 15minutes of the 2 hours allowed for this paper. This time will enable you read through the question paper and make sure you have all the chemicals and apparatus required.
* Mathematical tables and electronic calculators may be used.
* All working **must be** clearly shown where necessary.

For Examiner’s use only

|  |  |  |
| --- | --- | --- |
| QUESTION | MAXIMUM SCORE | CANDIDATE’S SCORE |
| 1 | 17 |  |
| 2 | 12 |  |
| 3 | 11 |  |
| TOTAL SCORE | 40 |  |

*This paper consists of 8 printed pages*

*Candidates should check to ensure that all pages are printed as indicated and no questions are missing*

1. You are provided with:

* Aqueous sulphuric (VI) acid labelled solution A.
* Solution B containing 10.4g per litre of potassium carbonate.
* A clean piece of magnesium ribbon.
* Methyl orange indicator.

You are required to determine the:

1. Concentration of solution A
2. Rate of reaction between magnesium and sulphuric (VI) acid – solution A, at different concentration.

**Procedure A**

* Using a measuring cylinder, place 25.0cm3 of solution A into a 250ml volumetric flask.

Add distilled water to make 250cm3 of solution. Label this solution C.

* Place solution C in a burette.
* Using a pipette and pipette filler place 25.0cm3 of solution B into a conical flask.
* Add 2 drops of methyl orange indicator provided and titrate with solution C.
* Record your results in table I below.
* Repeat the titration two more times and complete table I.

**Table I.**

|  |  |  |  |
| --- | --- | --- | --- |
|  | I | II | III |
| Final burette reading (cm3) |  |  |  |
| Initial burette reading (cm3) |  |  |  |
| Volume of solution C used (cm3) |  |  |  |

(3 marks)

a) Calculate:

i) Average volume of solution C used . (1 mark)

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ii) Concentration of potassium carbonate in solution B (C = 12.0, O = 16.0, K = 39.0) (1 mark)

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iii) Concentration of sulphuric (VI) acid in solution C. (1½ marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

iv) Concentration of sulphuric (VI) acid in solution A (1½ marks)

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**Procedure B**

* Label five test tubes 1, 2, 3, 4 and 5.
* Empty the burette and fill it with solution A.
* From the burette, place 10cm3 of solution A into test tube number 1. From the same burette, place 9cm3 of solution A into test tube number 2. Repeat the process for test tube numbers 3, 4 and 5 as shown in table II below.
* Using a 10ml measuring cylinder, measure 1cm3 of distilled water and add it to test tube number 2. Repeat The process for test-tube numbers 3, 4 and 5 as shown below.
* Cut out five pieces exactly 1cm long of the magnesium ribbon.
* Transfer all the solution in test tube number 1 into a clean 100ml beaker provided. Put one piece of the magnesium ribbon provided. Put one piece of the magnesium ribbon into the beaker and immediately start a stopwatch.
* Swirl the beaker gently to ensure the magnesium is always inside the solution.
* Record in table II below the time taken in seconds for magnesium ribbon to disappear.
* Pour away the final contents of the beaker and rinse it with water.
* Repeat the procedure from (iv) for each of the remaining test tube numbers 2, 3, 4 and 5 and complete the table II

b) **Table II**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Test tube number | 1 | 2 | 3 | 4 | 5 |
| Volume of solution A added cm3 | 10 | 9 | 8 | 7 | 6 |
| Volume of water added cm3 | 0 | 1 | 2 | 3 | 4 |
| Time taken (seconds) |  |  |  |  |  |
| Rate of reaction ) |  |  |  |  |  |

(4 marks)

i) Plot a graph of volume of solution A added (y –axis) against rate of reaction (3 marks)



ii) What is the relationship between the concentration of solution A and the rate of reaction? Explain. (2 marks)

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1. You are provided with solid Z carry out the test below to identify the anion and cation present

a) Put a spatula endful of solid Z in the boiling tube. Add about 10cm3 of distilled water.

Divide the solution into 3 portions.

|  |  |
| --- | --- |
| Observation | Inferences |
| (1 mark) | (1 mark) |

i) To the first portion add NaOH until in excess

|  |  |
| --- | --- |
| Observation | Inferences |
| (1 mark) | (1 mark) |

ii) To the second portion add NH4OH drop wise until in excess.

|  |  |
| --- | --- |
| Observation | Inferences |
| (1 mark) | (1 mark) |

b) Using a metallic spatula, scoop a little of solid Z. Place it in a non-luminous flame of a Bunsen burner.

|  |  |
| --- | --- |
| Observation | Inferences |
| (1 mark) | (1 mark) |

c)

i) To the third portion add acidified Ba(NO3)2(aq)

|  |  |
| --- | --- |
| Observation | Inferences |
| (1 mark) | (1 mark) |

ii) To a spatula endful of solid Z add 2M HCl(aq) and warm place a chromate paper at the mouth of the test tube

|  |  |
| --- | --- |
| Observation | Inferences |
| (1 mark) | (1 mark) |

1. You are provided with substance K. Carry out the test below and record your observations and inferences in the table below.

a) Scoop a little of substance K with a clean spatula and place it at the hottest part of the non – luminous flame.

|  |  |
| --- | --- |
| Observation | Inferences |
| (1 mark) | (1 mark) |

b)

i) Add about 10cm3 of distilled water to the remaining solid K and divide it into 4 portions.

|  |  |
| --- | --- |
| Observation | Inferences |
| (1 mark) | (1 mark) |

i) To the first portion add 3 drops of acidified potassium dichromate (VI).

|  |  |
| --- | --- |
| Observation | Inferences |
| (1 mark) | (1 mark) |

ii) To the second portion add 3 drops of bromine water.

|  |  |
| --- | --- |
| Observation | Inferences |
| (1 mark) | (1 mark) |

iii) To the third portion add 2 – 3 drops of universal indicator and determine the pH of the solution.

|  |  |
| --- | --- |
| Observation | Inferences |
| (½ mark) | (½ mark) |

iv) To the fourth portion add a spatulaful of sodium carbonate.

|  |  |
| --- | --- |
| Observation | Inferences |
| (1 mark) | (1 mark) |