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

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

DATE \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**233/3**

**CHEMISTRY**

**PAPER 3**

**(PRACTICAL)**

JUNE/JULY, 2015

**TIME: 2 HOURS**

233/3

CHEMISTRY

PAPER 3

(PRACTICAL)

TIME: 2 HOURS

**INSTRUCTIONS**

* + - * Write your name, school and index number 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.
* Candidates may be penalized for not following the instructions in this paper.

For Examiner’s use only

|  |  |  |  |
| --- | --- | --- | --- |
| Question | | Maximum score | Candidate’s score |
| 1 | A | 19 |  |
| B | 07 |  |
| 2 | A | 08 |  |
| B | 06 |  |
| 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. **A)** You are provided with:

* Solution D1 ethanoic acid
* Solution D2 aqueous potassium permanganate (VII)
* Solution D3 0.1M Ammonium iron (II) sulphate
* 1M sulphuric acid

You are required to:

* Standardize D2 and D3
* Determine the solubility of D1 at room temperature.

**Procedure I**

Fill the burette with solution D2. Pipette 25cm3 of D3 into a conical flask. Add 2.0cm3 of 1M sulphuric acid using a measuring cylinder. Titrate solution D3 with solution D2 until a permanent pink colour just appears. Repeat the procedure and complete the table A below.

**Table A**  (4 marks)

|  |  |  |  |
| --- | --- | --- | --- |
| Experiment | I | II | III |
| Final burette reading (cm3) |  |  |  |
| Initial burette reading (cm3) |  |  |  |
| Volume of D2 used (cm3) |  |  |  |

1. Calculate the average volume of D2 used. (1 mark)

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1. Given MnO−(aq) + 5Fe2+(aq) + 8H+(aq) Mn2+(aq) + 5Fe3+(aq) + 4H2O(l)
2. Calculate the number of moles of D3 used. (1 mark)

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

1. Calculate the number of moles of D2 used. (1 mark)

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

1. Calculate the number of moles of D2 per litre. (1 mark)

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**Procedure II**

Measure 25cm3 of solution D1. Pour it into a conical flask and dilute it by adding 75cm3 of distilled water, label the solution D4. Fill the burette with D2. Pipette D4 into a conical flask. Add 2.0cm3 of 1M sulphuric acid using a measuring cylinder. Heat the solution to about 70°C and titrate while hot with D2 until a permanent pink colour just appears. Record your results in table B below. Repeat the procedure to fill the table.

**Table B**  (4 marks)

|  |  |  |  |
| --- | --- | --- | --- |
| Experiment | I | II | III |
| Final burette reading (cm3) |  |  |  |
| Initial burette reading (cm3) |  |  |  |
| Volume of D2 used (cm3) |  |  |  |

c) i) Calculate the average volume of D2 used (1 mark)

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

ii) Given the reaction between manganese (VII) ions and ethanedioate is

2MnO-4(aq) + 5C2O42-(aq) + 16H+(aq) 2Mn2+(aq) + 10CO2(g) + 8H2O((l)

Calculate the number of moles of MnO-4 ions in the average volume of D2 used. (1 mark)

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

iii) Calculate number of moles of ethanedioate ions in 25cm3 of solution D4. (1 mark)

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1. Calculate number of moles of ethanedioate ions in 100cm3 of solution D4 (1 mark)

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1. How many moles of ethanedioate ions were in 25cm3 of solution D1 used (1 mark)

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

1. Given molecular formula of ethanedioic is H2C2O4. Calculate its solubility in grams

per 100g of water at room temperature. (2 marks)

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

**B)** You are required to find out the effect of concentration of solution D2 on rate of reaction.

**Procedure II**

Using a burette, place 5cm3 of solution D2 into a boiling tube. To this solution add 5cm3 of solution D1 using a measuring cylinder and immediately start a stopwatch. Shake the mixture and place the boiling tube on a test tube rack. Note and record time taken for the purple colour of mixture to disappear. Repeat the procedure using volumes of solution D2 and distilled water as indicated in table III below. (4 marks)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Volume of D2 in cm3 | Volume of water added in cm3 | Volume of D1 in cm3 | Concentration of D2 in moles/cm3 | Time for colour change in seconds |
| 5.0 | 0.0 | 5.0 |  |  |
| 4.0 | 1.0 | 5.0 |  |  |
| 3.0 | 2.0 | 5.0 |  |  |
| 2.0 | 3.0 | 5.0 |  |  |
| 1.0 | 4.0 | 5.0 |  |  |

Use the results to plot a graph of concentration in moles per litre of D2 used against time taken for colour

change. (3 marks)



1. **A)** You are provided with solid P. carry out the tests below and record your observations and inferences in the spaces provided.

Test for any gases produced.

1. Put half spatula endful of solid P into a test-tube, heat gently and then strongly.

|  |  |
| --- | --- |
| Observations | Inferences |
| (1 mark) | (1 mark) |

1. Put the remaining solid P into a test-tube, add about 5cm3 of distilled water and shake thoroughly and divide it into three portions.
2. To the first portion add ammonium hydroxide solution dropwise till in excess.

|  |  |
| --- | --- |
| Observations | Inferences |
| (1 mark) | (1 mark) |

1. To the second portion add about 2cm3 of barium nitrate solution followed by about 1cm3 of dilute nitric acid.

|  |  |
| --- | --- |
| Observations | Inferences |
| (1 mark) | (1 mark) |

1. To the third portion add 1cm3 of sodium chloride solution. Heat the product formed and allow it to cool.

|  |  |
| --- | --- |
| Observations | Inferences |
| (1 mark) | (1 mark) |

**B)** You are provided with 2cm3 of liquid Q.

1. Dip 2cm long strip of paper into the fluid and hold the strip of paper against a flame.

|  |  |
| --- | --- |
| Observations | Inferences |
| (1 mark) | (1 mark) |

1. Divide liquid Q into two portions.
2. To the first portion add 2-3 drops of bromine water.

|  |  |
| --- | --- |
| Observations | Inferences |
| (1 mark) | (1 mark) |

1. To the second portion add 2-3 drops of acidified potassium manganate (VII) solution.

|  |  |
| --- | --- |
| Observations | Inferences |
| (1 mark) | (1 mark) |