Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Index No. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Candidate’s Signature \_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



[**SERIES 6 EXAMS**](https://teacher.co.ke/notes/)

**Kenya Certificate of Secondary Education**

**CHEMISTRY**

**PAPER 3**

**2 ¼ HOURS**

**INSTRUCTIONS TO CANDIDATES**

- Answer all questions in the spaces provided.

- You are not allowed to start working with apparatus for the first 15 minutes of the 2 ¼ hrs allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemicals and apparatus you need.

- All working must be shown clearly.

Calculators and mathematical tables may be used.

**FOR EXAMINER’SUSE ONLY**

|  |  |  |
| --- | --- | --- |
| **QUESTION**  | **MAXIMUM SCORE**  | **CANDIDATE’S SCORE** |
| 1 | 18 |  |
| 2 | 10 |  |
| 3 | 12 |  |
| **TOTAL SCORE** | **40** |  |

1. You are provided with:

 - Solid Q a metal carbonate X2CO3

 - Solution P hydrochloric acid

 - Solution R, 0.3M sodium hydroxide

*You are required to:-*

1. Prepare a dilute solution of hydrochloric acid and determine its concentration.
2. Determine the solubility of solid Q in water.

**Procedure**

1. Place all solid Q in 250ml dry beaker. Add 100cm3 of distilled water. Using a glass rod, stir the mixture thoroughly for about two minutes. Leave the mixture to stand and proceed with steps (b) and (c )
2. Using a pipette place 25cm3 of solution P in 250ml volumetric flask. Add about 200cm3 of distilled water to make upto the mark. Label this as solution S.
3. Fill a burette with solution R. Using a pipette place 25cm3 of solution S into 250cm3 conical flask. Add two drops of the indicator provided and titrate solution S against solution R. Record your results in table I. Repeat the titration two more times and complete table I. (Retain the remaining solution S for use in step (e).
4. Filter the mixture obtained in step I using a dry filter funnel into a dry conical flask. Label the filtrate as solution Q.
5. Clean the burette and fill it with solution S. Using a pipette transfer 25cm3 of solution Q into a 250cm3 conical flask. Add two drops of the indicator provided and filtrate solution Q with solution S. Record your results in table II. Repeat the titration two more times and complete table II.

Table I

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

 (4 marks )

(a) Calculate:

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

1. Moles of sodium hydroxide in the average volume of solution R used. (1 mark)
2. Moles of hydrochloric acid in 25.0cm3 of solution S . ( 1 mark )
3. The molarity of hydrochloric acid solution S. ( 1 mark)

Table II

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

 (4 marks )

(b) Calculate

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

 (ii) Moles of hydrochloric acid in the average volume of solution S used. (1 mark )

 (iii) Moles of the metal carbonate; solid Q in 25cm3 of solution Q. (2 marks )

 (iv) The solubility of the metal carbonate solid Q in water (Relative formula mass of

 metal carbonate = 74 assume density of solution is 1g/cm3 ) (2 marks )

2. You are provided with a solid E. Carry out the following tests and write down your

observations and inferences in the spaces provided.

(a) Place half of the solid E in a dry test tube and heat. Test any gases produced using litmus papers.

|  |  |
| --- | --- |
| Observation  | Inference  |
| (2 marks ) | ( 1 mark ) |

(b) Add about 10cm3 of distilled water to the remaining solid in a test tube and shake.

Divide the solution into 3 portions.

(i) To the first portion, add barium nitrate about 1cm3 and about 2cm3 of dilute nitric (V) acid.

|  |  |
| --- | --- |
| Observation  | Inference  |
| (1 ½ marks ) | ( 1 mark ) |

 (ii) To the 2nd portion, add ammonia solution dropwise till in excess.

|  |  |
| --- | --- |
| Observation  | Inference  |
| (1 ½ marks ) | ( 1 mark ) |

 (iii) To the 3rd portion, add 3 drops of potassium iodide solution.

|  |  |
| --- | --- |
| Observation  | Inference  |
| (1 mark ) | ( 1 mark ) |

3. You are provided with solid F. You are required to carry out the test below.

(a) Divide solid F into two equal parts. To the first portion, ignite using a metallic spatula

and a blue Bunsen burner flame

|  |  |
| --- | --- |
| Observation  | Inference  |
| (1 mark ) | ( 1 mark ) |

(b) Place the remaining portion of solid F in a test tube and add 10cm3 of distilled water

|  |  |
| --- | --- |
| Observation  | Inference  |
| (1 mark ) | ( 1 mark ) |

 (c ) (i) To 2cm3 of solution F above add 3 drops of bromine water

|  |  |
| --- | --- |
| Observation  | Inference  |
| (1 mark ) | ( 1 mark ) |

(ii) To 2cm3 of solution F add 3 drops of acidified K2Cr2O7.

|  |  |
| --- | --- |
| Observation  | Inference  |
| (1 mark ) | ( 1 mark ) |

(iii) To 2cm3 of solution add 0.1g of sodium hydrogen carbonate provided

|  |  |
| --- | --- |
| Observation  | Inference  |
| (1 mark ) | ( 1 mark ) |

 (iv) To 2cm3 of solution F add 3 drops of universal indicator and determine the pH.

|  |  |
| --- | --- |
| Observation  | Inference  |
| (1 mark ) | ( 1 mark ) |