**ASUMBI GIRLS’ HIGH SCHOOL**

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**THE NATIONAL LONGHORN CHEMISTRY CONTEST**

**7th EDITION 2019**

**Junior Category**

**NAME** ……………………………………..**SCHOOL**……….……………….**CODE**………….

**School Category: Girls [ ] Boys [ ] Mixed [ ]**

**Kenya Certificate of Secondary Education**

**CHEMISTRY**

**SUNDAY 2nd June, 2019**

**2 Hours**

**Instructions to candidates’**

* Write your name, school and school code in the spaces provided above
* This paper consists of ***three*** sections, answer **ALL** the questions in each section in the spaces provided
* Mathematical tables and electronic calculators may be used.
* All workings **MUST** be clearly shown where necessary
* This paper consists of ***12 printed pages***, candidates should check to ascertain that all pages are printed as indicated and that no questions are missing

**For Examiner’s use only**

|  |  |  |
| --- | --- | --- |
| **Questions** | **Max. Score** | **Candidate’s Score** |
| **1 - 22** | **80** |  |

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**JUNIOR CHEMISTRY CONTEST 2019**

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**SECTION A (45 MARKS)**

1. a) State Charles’ law. (1mk)

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b)A fixed mass of a gas occupies a volume of 250cm3 at room temperature and pressure. What volume would the gas occupy if the temperature of the gas doubles at 720 mmHg? (2mks)

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1. An ion of phosphorous can be represented as **31 P3-**. Draw a diagram to show the distribution

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of the electrons and the composition of the nucleus of the ion of phosphorous. (2mks)

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1. In preparation of hydrogen gas, a student used zinc chloride and dilute hydrochloric acid and added a few crystals to the mixture and collected the gas over water.
2. What is the name of the crystals added? State its function. (1mk)

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1. What observation would be made if dilute nitric (V) acid was used in place of hydrochloric acid? Explain. (2mks)

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1. A form two student, during salts preparation, accidentally mixed lead (II) chloride, ammonium chloride and silver chloride salts. Describe how each sample of the salts can be obtained from the mixture. (3mks)

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1. The set up below illustrates a technique for separating mixtures.



1. What method of separation is illustrated above? (1mk)

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1. State the possible nature of mixture M. (1mk)

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1. Name **one** application of the above method of separation. (1mk)

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1. A homologous series of hydrocarbons has the general formula CnH2n-2.
2. What is meant by “homologous series?” (1mk)

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1. Draw and name the structural formula of the third member of the series. (1mk)

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1. When a solution containing 14.2 g of a salt X2SO4 was mixed with excess barium nitrate solution 23.3g of precipitate was formed. Calculate the relative atomic mass of metal X.

(Ba = 137.0, O = 16.0, S = 32.0 N = 14.0 and X is not the actual chemical symbol of the metal) (3mks)

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1. a) Describe briefly how you can prepare an acid – base indicator from coloured hibiscus flowers. (2mks)

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b) State and explain the observation that you would expect when lemon juice is added into a test tube containing copper turnings. (1mk)

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1. Below is an apparatus found in the school laboratory?



State the name of the apparatus and give its function. (1mk)

Name

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Function

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1. Concentrated nitric (V) acid was added to acidified iron (II) sulphate solution and the mixture heated. The solution turned from pale green to yellow with evolution of a brown gas. Explain these observations. (3mks)

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1. Explain how hydrated cobalt (II) chloride can be used to demonstrate a physical chemical change. (2mks)

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1. Study the following equations and answer the questions that follow.

Na Na+ + e- Energy change = 496 kJ/mol

K K+ + e- Energy change = 419 kJ/mol

1. State the collective name for the energy change in the above equations. (1mk)

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1. Explain the difference in the energy changes above. (2mks)

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1. An element X exists as two isotopes, 35X and 37X. Its relative atomic mass is 35.5. Which is the least abundant isotope of element X? Explain. (2mks)

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1. Helium (4He) is the second element in the periodic table and tritium (3H) is an isotope of hydrogen. State what is common in both atoms. (1mk)

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1. Magnesium was burnt in air forming a white residue R. When put in a boiling tube with water effervescence was noticed and a colourless gas Y with a characteristic pungent smell was evolved. The gas turned a wet red litmus paper blue.
2. Identify

(i) Residue R………………………………………………………….. (1mk)

 (ii) Gas Y…………………………………………………………….… (1mk)

1. Write an equation for the liberation of gas Y. (1mk)

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1. Starting with 25cm3 of 0.2M potassium hydroxide solution, describe how you would prepare potassium sulphate crystals. (3mks)

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1. a) What is an electrode? (1mk)

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b) Molten lead (II) bromide was electrolyzed using an graphite electrode. State and explain the observation made at the anode. (2mks)

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1. Metallic sheet roofs of buildings in industrial towns undergo rusting much faster than those in rural areas. Explain. (2mks)

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**SECTION B (25 MARKS)**

1. The table below shows elements with their atomic numbers, mass numbers and their melting points. Study it and answer the questions that follow. Letters do not represent the actual symbols of the elements

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Element** | **F** | **G** | **H** | **I** | **J** | **K** | **L** | **M** | **N** | **Q** |
| Atomic number | 7 | 13 | 19 | 15 | 2 | 9 | 6 | 16 | 12 | 11 |
| Melting point (oC) | - | 660 | 637 | 44 | -272 | -223 | vary | 113 | 650 | 98 |

1. Select two elements that belong to the same chemical family hence name the family. (1mk)

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1. Explain why element **L** has a varying melting point. (1mk)

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1. Distilled water was added to a solid sample of a chloride of **G** and the pH of the resulting solution was found to be less than 4. Explain this observation. (1mk)

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1. Compare and explain the difference in the atomic radii of elements **I** and **N**. (2mks)

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1. A small piece of element **Q** was placed in a trough containing cold water. State and explain **two** observations made during the experiment. (2mks)

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f) What type of bond exists in a molecule of element **K**? Give a reason for your answer. (2mks)

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1. a) Distinguish between efflorescent and hygroscopic salts. (2mks)

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b) Study the flow chart below and answer the questions that follow.

White solid P

Colourless gas X

Colourless solution S

White precipitate W

White precipitate T

H2SO4 (aq)

Dil. HNO3 (aq)

Step 1

Step 2

Step 3

NaCl (aq)

1. Identify the anion present in white solid P. (1mk)

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1. Write a balanced stochiometric equation for step 3 and ionic equation for step 2.

Step 3 (1mk)

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 Step 2 (1mk)

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1. State and explain the observation that would be made in step 3 if sodium iodide solution was used in place of sodium chloride. (2mks)

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1. a) Other than carbon, state two other elements that exhibit allotropy. (2mks)

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b) A student set up the apparatus below to prepare and collect a dry sample of carbon (IV) oxide.

Giving reasons, state any three mistakes made in the set up above. (3mks)

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c) Carbon (II) oxide can be prepared in the laboratory by dehydration of methanoic acid.

1. What is meant by dehydration? (1mk)

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1. Write an equation for the production of carbon (II) oxide. (1mk)

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1. Give two uses that are for both carbon (II) oxide and hydrogen gases (2mks)

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**SECTION C (10 MARKS)**

1. During a titration experiment the following results were recorded. Study the procedure and answer the questions that follow.

You are provided with:

* Metal carbonate MCO3, solid **Q**
* 2 M HCl, solution **L**
* Sodium hydroxide solution **W** containing 40g/litre solution

You are required to determine the RAM of metal M.

**Procedure:**

Measure accurately 100 cm3 of solution **L** into a clean 250 cm3 conical flask and add the 4.69g of solid **Q**. Shake well and wait for effervescence to stop. Label the resulting solution as **K1**. Pipette 25 cm3 of solution **W** into a conical flask and add 2-3 drops of phenolphthalein indicator. Fill the burette with solution **K1** and titrate against solution **W** until the end point. Record your results in the table. Repeat the procedure and fill the table.

**Table**

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|  | **I** | **II** | **III** |
| Final burette reading (cm3) | 24.5 | 48.7 | 24.7 |
| Initial burette reading (cm3) | 0.0 | 24.5 | 0.0 |
| Volume of solution **K1** used(cm3) | 24.5 | 24.2 | 24.7 |

1. Calculate the average volume of solution **K1** used. (1mk)

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1. Calculate the:
2. Moles of sodium hydroxide solution **W** used. (Na = 23, O = 16, H = 1) (2mks)

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1. Moles of HCl solution **K1** in the average volume used. (1mk)

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1. Moles of HCl solution **K1** in 100 cm3 of solution. (1mk)

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1. Moles of HCl in the 100 cm3 of the original solution **L**. (1mk)

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1. Moles of HCl solution L that reacted with solid Q. (1mk)

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1. Moles of MCO3 that reacted. (1mk)

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1. The relative formula mass of MCO3. (1mk)

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1. The relative atomic mass of metal M. (1mk)

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