**NAME:…………………………………………………………… ADM. NO…………………………..…..…..**

**SCHOOL:……………………………………………………SIGNATURE………………………………DATE…………….……………………………….**

**233**

**CHEMISTRY**

 **(Theory)**

**TIME: 2HOURS**

**FORM TWO**

**INSTRUCTIONS TO CANDIDATES**

* Write your name and Adm. number in the spaces provided.
* Answer ALL the questions in the spaces provided,

**FOR EXAMINERS USE ONLY**

|  |  |  |
| --- | --- | --- |
| Question | Maximum score | Candidates score |
| 1-17 | 70 |  |

***This paper consists of 8 printed pages.Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.***

1. Chebet, Mutua and Waweru are international athletes. Paper chromatography was used to test for the presence of illegal drugs in their blood which enhance the performance. The diagram below shows the chromatogram with the illegal drug labeled N.



**(a)** Who among them tested positive for the illegal drug? Explain. **(2marks)**

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**(b)** Explain what is meant by ‘solvent front’ **(1mark)**

 ………………………………………………………………………………………………………………

**2. a)** describe how oxygen gas can be tested in the laboratory **(2marks)**

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 **b)** State two uses of oxygen gas. **(2marks)**

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3. The diagram below represents the apparatus used to react steam with magnesium.



Wet cotton

1. State the observation made in the boiling tube. **(1 mark)**

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1. Write an equation for the reaction that takes place in the tube. **(1 mark)**

 …………………………………………………………………………………………………………….

 **c)** State and explain one precaution required before the heating is stopped **(2marks)**

 ……………………………………………………………………………………………………………………………………………………………………………………………………………………………..

 **d)** Identify gas C **(1mark)**

4. Both chloride and iodine are halogens

 **(a)** What are halogens **(1mark)**

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5. Oxygen exists naturally as isotopes of mass number 16, 17 and 18 in the ratio 96:2:2 respectively. Calculate its R.A.M**. (3 marks)**

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 …………………………………………………………………………………………………………….

**6.** Elements **X** and **Y** have the atomic masses of 39 and 23 respectively.

 **(a)** Complete the table below by filling the blank spaces **(2marks)**

|  |  |  |
| --- | --- | --- |
| **Elements** | **X** | **Y** |
| Atomic mass | 39 | 23 |
| Number of neutrons | 20 | 12 |
| Electronic configuration |  |  |

**(b)** Which element has a higher ionization energy? **(1mark)**

 **(c)** Explain your answer in (b) above. **(2marks)**

 **………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………….**

7. The following two tests were carried out on chlorine water contained in two test tubes:

a) A piece of blue flower was dropped into the first test tube. Explain why the flower was bleached. **(2marks)**

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1. The second test-tube was corked and exposed to sunlight. After a few days, it was found to contain a gas that rekindles a glowing splint. Write an equation for the reaction which produced the gas. **(1 mark)**

**…………………………………………………………………………………………………………**

**8.** State and explain the changes in mass that occurs when the following substances are separately heated in open crucibles. **(4marks)**

 **a)** Copper metal.

 ……………………………………………………………………………………………………………………………………………………………………………………………………………………………..

 **b)** Copper (II) nitrate

 ……………………………………………………………………………………………………………………………………………………………………………………………………………………………..

**9.** Air was passed through several reagents as shown in the flow chart below.

Air

Concentrated potassium hydroxide solution

Excess hot copper turnings

Excess heated magnesium powder

Escaping gases

1. Write an equation for the reaction that took place in the chamber with the magnesium powder. **(1mark) ……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**………………………………………………………………………………..
2. Name **one** gas that escapes from the chamber containing magnesium powder. Give a reason for your answer. **(2marks)**

 **………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..**

**10.** Give **two** reasons why helium is used in weather balloons. **(2marks)**

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11. Name another gas which is used together with oxygen in welding. **(1 mark)**

 ………………………………………………………………………………………………………………

12. When extinguishing a fire caused by burning kerosene, carbon dioxide is used in preference to water. Explain **(2marks)**

 ………………………………………………………………………………………………………………………………………………………………………………………………………………………………

14. The grid given below represents part of the periodic table. Study it and answer the questions that follow. The letters are not the actual symbols of the elements.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  | **A** |
| **B** |  |  | **G** |  | **H** | **E** |  |
|  | **J** | **I** | **L** |  |  |  | **C** |
| **D** |  |  |  |  |  | **M** |  |
| **Y** |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

(i) What name is given to the family of elements to which A and C belong? **(1 mark)**

……………………………………………………………………………………………………………………

(ii) Write the chemical formula of the sulphate of element D. **(1 mark)**

 (iii ) Which letter represents the most reactive **(2 marks)**

 (a) Metal ……………………………………………………………………………………

 (b) Non-metal ………………………………………………………………………………

(iv) Select one element that belongs to period 4. **(1mark)**

………………………………………………………………………………………………………………

(v) Explain why the Ionic radius of element E is bigger than the atomic radius. **(2marks)**

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(vi) The electron configuration of a divalent anion of element N is 2.8.8. Indicate the position of element N on the periodic table drawn above. **(1mark)**

(vii) How do the atomic radii of I and C compare. Explain. **(2 marks)**

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(vii) Explain the trend in the 1st ionization energies of the elements J, I and L. **(1 mark)**

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**15.** For each of the following experiments, give the observations and the type of change that Occurs (Physical or chemical) **(3 marks)**

|  |  |  |
| --- | --- | --- |
| Experiment | Observation | Type of change |
| A few drops of water are added to small amount of anhydrous Copper (II) Sulphate |  |  |
| A few crystals of Iodine are heated gently in a test tube |  |  |
| A few crystals of copper (II) Nitrate are heated strongly in a test tube. |  |  |

1. A form one teacher cut small pieces of sodium and performed different experiments. In each of the

experiments below, state the observations and write an equation of the reaction.

I. A piece of sodium metal is burnt in excess air.

 Observation **(1 mark)**

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..

Equation **(1 mark)**

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II. Product in (I)above is added to water.

 Observation  **(1 mark)**

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..

 Equation  **(1 mark)**

……………………………………………………………………………………………………………………………………………………………………………………………………………………………

III. Heated sodium is lowered into a gas jar of chlorine.

 Observation **(1 mark)**

………………………………………………………………………………………………………………………………………………………………………………………………………………………………

 Equation **(1 mark)**

………………………………………………………………………………………………………………

IV. A small piece of sodium is put in cold water in a beaker and resulting solution is tested with litmus paper.

**Observation**  **(1 mark)**

…………………………………………………………………………………………………………………..

……………………………………………………………………………………………………………………

**Equation**  **(1 mark)**

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……………………………………………………………………………………………………………………

**b)** Define the term ionization energy.  **(1 mark)**

……………………………………………………………………………………………………………………

17.Study the diagram below and answer the questions that follow. The diagram shows the method used to separate components of mixture Q.



**a)** Name X and Y. **(2 marks)**

X……………………………………………………………………………………………….

 Y……………………………………………………………………………………………………

b) What is the purpose of apparatus X?  **(1mark)**

……………………………………………………………………………………………………………………

…………………………………………………………………………………………………………………….

c) What name is given to the above method of separating mixtures? **(1mark)**

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…………………………………………………………………………………………………………………….

**SET 1**

*CHEMISTRY MARKING SCHEME*

1. a) K, contains the components of the illegal drug N

b) The extend to which the solvent reaches

1. a) insert a glowing wooden splint into a gas jar containing oxygen, the gas relights the splint

b) Welding

Hospital for patients with breathing difficulty

 Mountain climbers and sea divers

1. a) Grey magnesium forms white solid of magnesium oxide

 Steam is produced which reacts with magnesium

b) Mg(s) + H2O(l) MgO(s) + H2(g)

c) Remove the delivery tube from the water to avoid “sucking back”

d) Hydrogen

1. a) A brown gas is produced

b) Yellow(hot), orange (cold) solid as residue remains

 Colourless gas relights a glowing splint

 Cracking sound

1. (96×16) + (2×17) + (2×18)

 100

 = 16.06

1. Silicon (IV) oxide has giant atomic structure, each silicon atom is bonded covalently to four oxygen atoms

Sulphur (IV) oxide is a gas with simple molecular structure and van der waal’s forces between sulphur (IV)oxide molecules

1. a) Chlorine water contains chloric (I) acid which is unstable and decomposes to atomic (O) and hydrochloric acid, the atomic oxygen combines with the blue dye to form a colourless substance (bleached)

b) HOCl (aq) 2HCl(aq) + O2(g)

1. a) Brown copper metal turns to black copper (II) oxide, the mass increases, copper combines with oxygen

b) White copper nitrate decomposes into copper (II) oxide, nitrogen (IV) oxide and oxygen, the mass decreases

1. Add excess copper metal to dilute sulphuric acid

Filter the resulting solution

Evaporate the filtrate to saturation and cool to obtain the crystals of copper (II) sulphate

1. Lighter than oxygen

Unreactive

1. Acetylene
2. Denser than air and blankets the air rich in oxygen thus extinguishing the fire
3. Any nitrate

Sodium, potassium or ammonium carbonate

Any sulphate apart from lead and calcium

Any chloride apart from lead and silver

1. Noble/rare gases
2. D2SO4
3. a) Y

b) E

1. Ionic bond, B is a metal and H is non metal, B loses to form positive charge, H gains electrons to form negative charge
2. D OR M
3. E reacts by gaining electrons, the electron-electron repulsive force makes the ion bigger
4. Below element H
5. G has simple molecular structure, L has giant atomic structure
6. Atomic radius of C is smaller than that of I, across the period more electrons are added and so the positive nuclear charge attracts the outer electrons more and so the size decreases
7. First ionization energy of L, I and J increases fro J, the positive nuclear charge attracts the outer electrons with a greater force as atomic number increases across the period

|  |  |
| --- | --- |
| Observation | Type of change |
| White copper (II) sulphate turns blue | Temporary chemical change |
| Brown fumes condenses on cooler parts of the test tube | physical |
| Brown gas forms,yellow solid also forms | chemical |

1. a) i) Sodium burns vigorously in air with a yellow flame forming a pale yellow solid.

Equation

2Na(s) + O2 (g) Na2O2(s)

 ii) **Observation**

Effervescence is produced and a gas that relights a glowing splint is produced

The solution formed turns red litmus paper blue

Equation

2Na2O2(s) + 2H2O (l) 4NaOH (aq) + O2 (g)

iii) The heated sodium bursts into a bright yellow flame.

2Na(s) + Cl2  2NaCl(s)

iv) The sodium dats about on the surface of water, producing effervescence and melts into a ball.

The solution produced turns red litmus red litmus paper blue and blue litmus paper remains blue.

2Na(s) + 2H2O (l) 2NaOH (aq) + H2 (g)

b) This is the minimum energy required to remove an electron from an atom in the gaseous state.

17.a) X- fractionating column

 Y- Liebig condenser

b) to condense back the component of higher boiling point

c) fractional distillation