**NAME …………………………..……………….. DATE …………………………**

**INDEX NO. ……….……….…………………...…..… SIGNATURE ……………..…………..**

**233/2**

**CHEMISTRY**

**PAPER 2**

**(THEORY)**

**TIME: 2 HOURS.**

**SET 5**

*Kenya Certificate of Secondary Education.*

**INSTRUCTIONS TO CANDIDATES.**

* Write your name and index number in the spaces provided above.
* Sign and write the date of exam in the spaces provided above.
* Answer **ALL** the questions in the spaces provided.
* Mathematical tables and silent electronic calculators may be used.
* All working **MUST** be clearly shown where necessary.

**FOR EXAMINER’S USE ONLY.**

|  |  |  |
| --- | --- | --- |
| **Questions** | **Maximum score** | **Candidates score** |
| 1 | 12 |  |
| 2 | 10 |  |
| 3 | 10 |  |
| 4 | 10 |  |
| 5 | 12 |  |
| 6 | 13 |  |
| 7 | 13 |  |
| **Total score** | **80** |  |

*This paper consists of 11printed pages.*

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

1. The table below has information about elements. A,B,C,D,E,F,G,H,I and J. the letters do not represent the actual symbols of the elements. Study the table and answer the questions that follow.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element  | Ion | Electron arrangement of ion | Atomic radii | Ionic radii |
| A | A- | 2.8.8 | 0.109 | 0.120 |
| B | B2- | 2.8 | 0.105 | 0.109 |
| C | C2+ | 2.8 | 0.126 | 0.124 |
| D | D3+ | 2.8 | 0.125 | 0.120 |
| E | E+ | 2.8 | 0.135 | 0.132 |
| F | F+ | 2 | 0.108 | 0.100 |
| G | G3+ | 2.8.8 | 0.111 | 0.119 |
| H | H+ | 2.8.8 | 0.167 | 0.160 |
| I | I- | 2.8 | 0.101 | 0.105 |
| J | J2- | 2.8.8 | 0.103 | 0.109 |

1. Write the electronic configuration of elements G and F. (2marks)

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1. Write an equation for the formation of an ion of D. (1mark)

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1. Select element that belong to alkali metals family. (1½ mark)

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1. Select elements that belong to period 2. (1 ½ mark)

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

1. Compare atomic radii of elements in d (i) above (1mark)

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

1. Explain why the atomic radius of C of greater than its ionic radius. (1mark)

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

1. Compare reactivity of element F and H. Explain your answer. (2marks)

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

1. Using dot (.) and cross (x) to represent electrons in the outermost energy level draw a diagram to illustrate bonding in the compound formed between H and A. (2marks)

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

2. a) Give one reason why air is classified as a mixture and not a compound. (1mark)

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1. An experiment was set up as shown below.



1. Why did the candle go off after some time? (1mark)

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1. Why was potassium hydroxide used and not tap water? (1mark)

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

1. What volume of air was used up by the burning candle, given that the bell jar contained 800cm3 of

 air at the start of the experiment? Show your working. (2marks)

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

1. What is the main component of air in the bell jar at end of experiment? (1mark)

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

1. An experiment to produce and collect oxygen was set up as shown below.

 

* 1. Identify solid X ………………………………..………………………….. (1mark)
	2. Write a chemical equation for the reaction that produces oxygen above. (1mark)

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

* 1. State the physical property of oxygen gas that makes it possible to collect the gas as shown.

 (1mark)

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* 1. Give two chemical properties of oxygen. (2marks )

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

1. Study the flow chart below and answer the questions that follow.

Ammonia

Nitrogen

Copper

Water

Copper (II)oxide

Step (VI) Heat

Gas J

Step I

Air

Platinum – Rhodium

High Temperature

Nitrogen (IV) Oxide

Step II

Air

Nitric (v) Acid

Ammonium Nitrate

Products

Water, Air

Step III

Ammonia

Step (IV)

Step (V)

Heat

1. Identify gas J. ……………………………………………………. (½ marks)
2. Name the process represented by step (VI) (1mark)

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

1. Write a balanced chemical equation for the reaction in step (VI) (2marks)

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1. Write the equation of the reaction that occurs in step V. (2marks)

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1. Give one use of ammonium nitrate. (½ mark)

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1. Which is the best nitrogenous fertilizer between ammonium nitrate (NH4NO3) and Urea CO(NH2)2? (N= 14, H=1, O=16, C = 12, 4 = 1) (2marks)

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

b). The table below shows the observation made when aqueous ammonia was added to cations of

 elements E, F and G until in excess.

|  |  |  |
| --- | --- | --- |
| **Caution** | **Addition of a few drops aqueous ammonia**  | **Addition of excess aqueous ammonia**  |
| E | White precipitate  | Insoluble  |
| F | No white precipitate  | No white precipitate  |
| G |  White precipitate  | Dissolves  |

1. Select the cation that is likely to be Zn2+ (1mark)

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

1. Given that the formula of the cation of element E is E2+, write the ionic equation for the reaction between E2+(aq) and aqueous ammonia. (1mark)

**4.**

1. Give the IUPAC names for the following compounds. (1 mark)
2. CH3(CH2)5CH3

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

1. CH3CH2CCCH3

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

1. Petroleum (crude oil) is a source of many hydrocarbons.
	1. Name the process used to separate the components of crude oil. (½ mark)

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

* 1. State two physical properties upon which the separation of the components of crude oil is based. (1mark)

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1. Pentane can be converted into two products by cracking one of the products formed has the formula C2H6.
	1. Write the formula of the second product and name it (1 mark)
		1. Formula

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

* + 1. Name

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

* 1. Describe a simple chemical test that can be used to distinguish between the two products. (2marks)

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1. Ethyne has the formula C2H2. One mole of ethyne was reacted with hydrogen gas.
	1. How many moles of hydrogen were required to saturate ethyne? (1mark)

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* 1. When ethyne is reacted excess hydrogen bromide gas it forms two products P1and P2. Draw and name the two products P1and P2 (2marks)

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1. The set up below was used to prepare ethene gas.

 Conc. Sulphuric acid Ethene

 Substance

 S

 Water

 Heat

* 1. Name substance S……………………………………………………… (½ mark)
	2. What property of ethene allows it to be collected by the method shown? (1mark)

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

**5.**

1. The set up below was used to obtain a sample of copper.



* 1. Write two chemical equations to represent the reactions taking place in the combustion tube. (2marks)

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* 1. Explain the observation made in the beaker containing lime water. (2marks)

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1. The flow chart below shows how sodium carbonate is manufactured by solvay process. Study it and answer the questions that follow.

Solid B

Chamber

Limestone

Solid A, Air

Water

Ca(OH)2(aq)

Chamber

Chamber

Gas P

Gas X

CaCl2(aq)

Ammoniacal

Brine

Solid R

Chamber

Chamber

Filtrate D

1. i )Name the following substance. (3marks)
	1. Gas P ……………………………………………………………………
	2. Gas X……………………………………………………………………
	3. Solid A………………………………………………………………….
	4. Solid B………………………………………………………………….
	5. Filtrate D………………………………………………………………..
	6. Solid R………………………………………………………………….
		* + 1. Explain how sodium chloride required for this process is obtained from sea water. (3marks)

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* + - * 1. Name one industrial uses of sodium carbonate (1mark)

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* + - * 1. Write a chemical equation for the reaction that occurs in chamber (II). (1mark)

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

**6.** The diagram below illustrates how sulphur is extracted by the Frasch process.



* 1. Name the substances and the conditions they are in when passing through pipes, A,B and C. (3 marks)

A ………………………………………………………………………………

 B ………………………………………………………………………………

 C ………………………………………………………………………………

* 1. The equation below show the oxidation of sulphur (iv) oxide to sulphur (vi) oxide.

2SO2(g) + O2(g) 2SO3(g)

1. Name the catalyst used in this reaction (1mark)

 ……………………………………………………………………………..

1. Give one use of sulphur (VI) oxide (1mark)

 …………………………………………………………………………….

* 1. Two samples of sulphur (IV) gas in water, K and L were treated as follows:-

I SAMPLE K was mixed with a few drops of acidified Barium Chloride solution soon after preparation.

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

II Sample L was mixed with a few drops of acidified Barium Chloride solution 48hrs later.

Explain the difference in observation that would be made between solution K and L (1½ mark)

* + 1. Solution k

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

1. Solution L (1 ½ mark)

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

1. State what is observed when sulphur (IV) oxide gas is passed through a solution of iron (iii) sulphate (2marks)

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

1. State the different between the bleaching action of sulphur (IV) gas and chlorine gas. (2marks)

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

1. Write an equation showing the bleaching action of sulphur (IV) oxide on moist coloured dye.

 (1mark)

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**7.**

1. A sample of hydrogen chloride gas was dissolved in water to make 250cm3 of solution. 25cm3 of this solution required 46cm3 of 11.0M sodium hydroxide solution for complete neutralization.
	* 1. Calculate the number of moles of hydrochloric acid in 25cm3of solution (3marks) ………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………
		2. Determine the mass of hydrogen chloride gas that was dissolved to make 250cm3 of the solution

(Cl= 35.5, H = 1.0) (2marks)

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

* 1. Complete the diagram below to show how dry hydrogen chloride gas can be prepared and collected in the laboratory. (2marks)

 

* 1. Write an equation for the reaction that occur. (2marks)

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* 1. State and explain the observation that would be made when hydrogen chloride gas is bubbled through a solution of lead (II) nitrate (2marks)

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* 1. Concentrated hydrochloric acid is used to remove oxides from metal surfaces (prickling) while concentrated nitric acid is not. Explain (2marks)

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