**Name:…………………………………………….. Index no ….......................** Candidate’s sign …………...

**233/1** Date**: ……………………**

**CHEMISTRY**

**PAPER 1**

**MARCH 2019**

**TIME: 2 HOURS**

**CHAMPIONS JET EXAMINATION SERIES**

***Kenya Certificate of Secondary Education (K.C.S.E.)***

**INSTRUCTIONS TO CANDIDATES:**

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

**For Examiner’s Use Only**

|  |  |  |
| --- | --- | --- |
| **Question** | **Maximum score** | **Candidate’s score** |
| 1-27 | 80 |  |

*This paper consists of 15 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing*

1. a) Distinguish between a covalent bond a dative bond. (1mk)

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b) Element D has atomic number 6 and element C has atomic number 8. Using dot (**.**) and cross (**x**) diagrams, show bonding between D and C to produce a compound of the formula DC. (2mks)

1. The table below shows pH values of substances P, Q, R and S.

|  |  |
| --- | --- |
| **Substance** | **pH value** |
| P | 8 |
| Q | 7 |
| R | 4 |
| S | 13 |

1. What is pH? (1mk)

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1. Comment the nature of substance P in terms of its pH value. (1mk)

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1. Give an example of a chloride salt solution that has same pH value as substance R.(1mk)

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1. You are provided with boiling tube, thermometer, distilled water, beaker, source of heat and substance **N**. Draw a diagram of a setup of apparatus that can be used to determine the solubility of substance **N**. (3mks)
2. a) State Gay Lussac’s law. (1mk)

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b) 50cm3 of Sulphur (IV) oxide gas was passed over a heated catalyst with 25cm3 of oxygen gas. At the end of the reaction, it was found out that 50cm3 of a new oxide of sulphur had been formed, and none of the original gases remained. Work out the formula of the new oxide. (3mk)

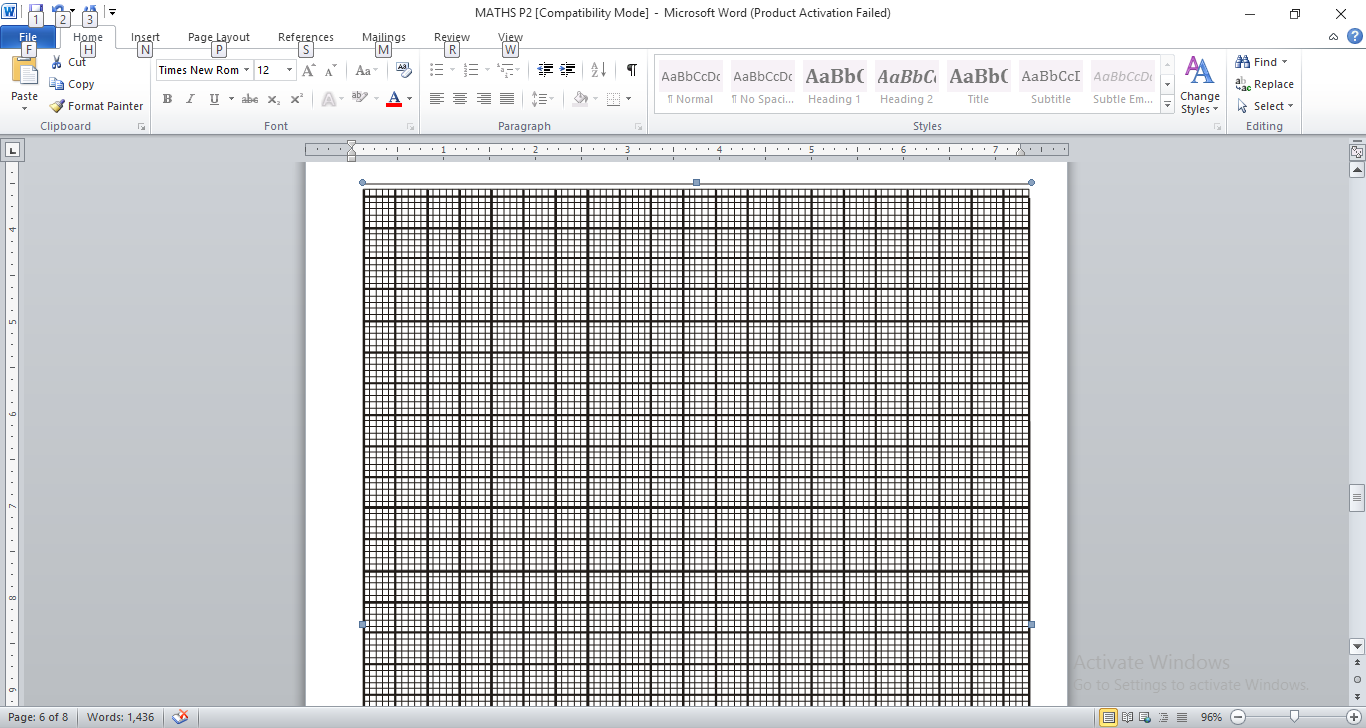
1. A mixture contains iron (III) oxide, iron (II) sulphate and iron (III) chloride. Describe the procedure that can be used to obtain a solid sample of iron (II) sulphate from the mixture. (3mks)

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1. The table below shows the results obtained during an experiment in which solid Q was added to a solution of 50cm3 of 0.5M copper (II) sulphate solution.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time (minutes) | 0 | 1/2 | 1 | 11/2 | 2 | 21/2 | 3 | 31/2 | 4 |
| Temperature (0C) | 21 | 21 | 21 | 21 | xxx | 33 | 31 | 29 | 28 |

1. On the grid provided, draw a graph of temperature against time. (2mks)



b) Use your graph to determine the highest temperature change during the reaction. (1mk)

1. a) Illustrate the giant atomic structure using diamond. (2mks)

b) Explain one use of diamond. (1mk)

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1. The Grid below shows part of a periodic table. Study it and answer the questions that follow: ( The letters are not actual symbols of the elements)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | | | | | |  |
|  |  |  |  |  | Z |  | X |  |
| W |  |  |  |  | Y |  |  |  |
|  |  |  | | | | | | |

a) Select an element that is stored under water in the laboratory. (1mk)

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b) Explain why element Y is a solid at room temperature. (1mks)

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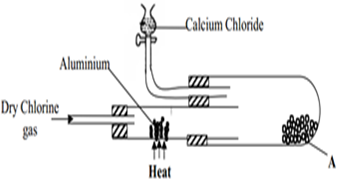
c) Give one use of element W. (1mk)

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1. a) Define sublimation. (1mk)

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b) In an experiment, dry chlorine gas was reacted with aluminium as shown in the diagram below:



i) Name substance A. (1mk)

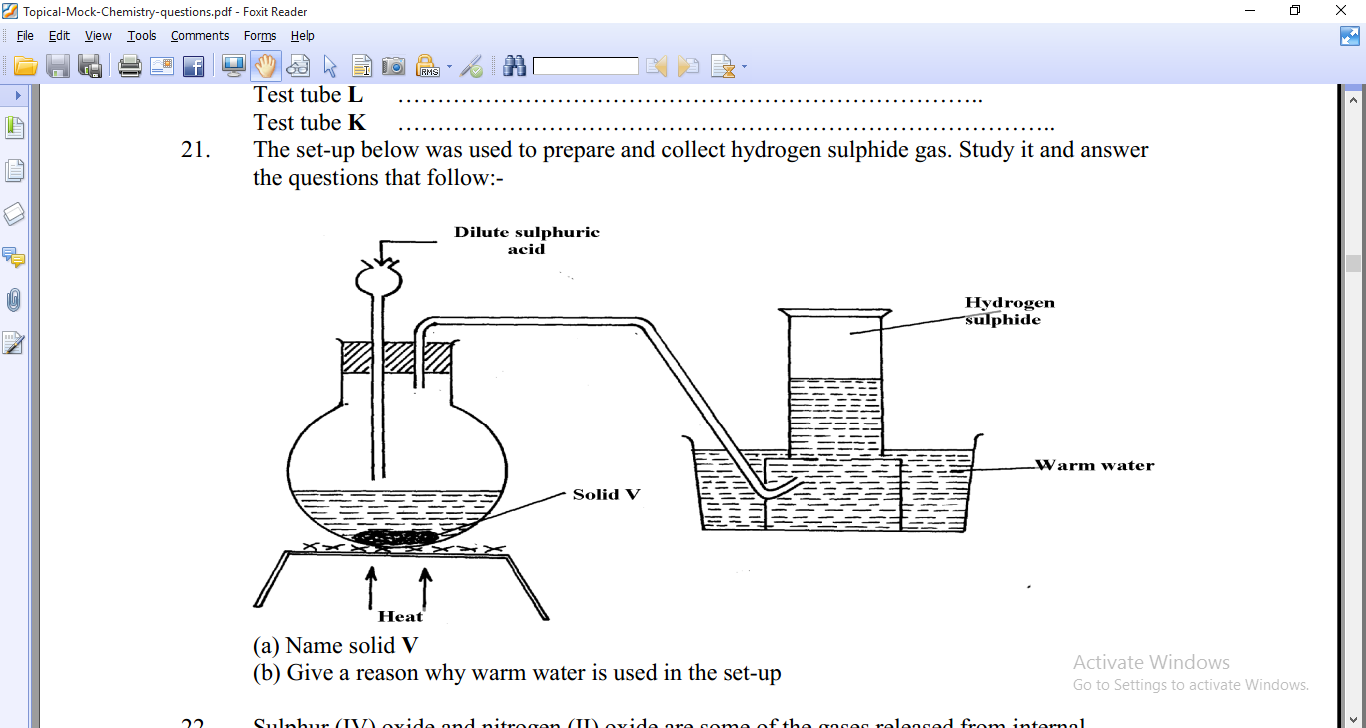
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ii) State another substance that can be used instead of Calcium chloride. (1mk)

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iii) Write an equation for the reaction taking place between dry chlorine gas and aluminium metal. (1mk)

1. The diagram below shows the setup of apparatus that can be used to prepare a sample of hydrogen sulphide gas. Study it and answer the questions that follow.



a) Complete and label the diagram to show how hydrogen sulphide gas is collected. (11/2 mks)

b) Write an equation for the reaction that occurs in the round bottomed flask. (1mk)

c) State the observation made when hydrogen sulphide gas is passed over a filter paper dipped in Lead (II) acetate solution. (1/2 mk)

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1. The table below shows solubility values of Sodium hydroxide at different temperatures.

|  |  |
| --- | --- |
| **Temperature** | **Solubility of sodium hydroxide ( g/100g of water)** |
| 250C | 1.8 |
| 300C | 2.4 |

a) 25cm3 of a solution of sodium hydroxide at 250C was reacted with 20cm3 of **X**M oxallic acid. Determine the value of X.( Na= 23, O=16, H=1) (2mks)

b) State one use of sodium hydroxide. (1mk)

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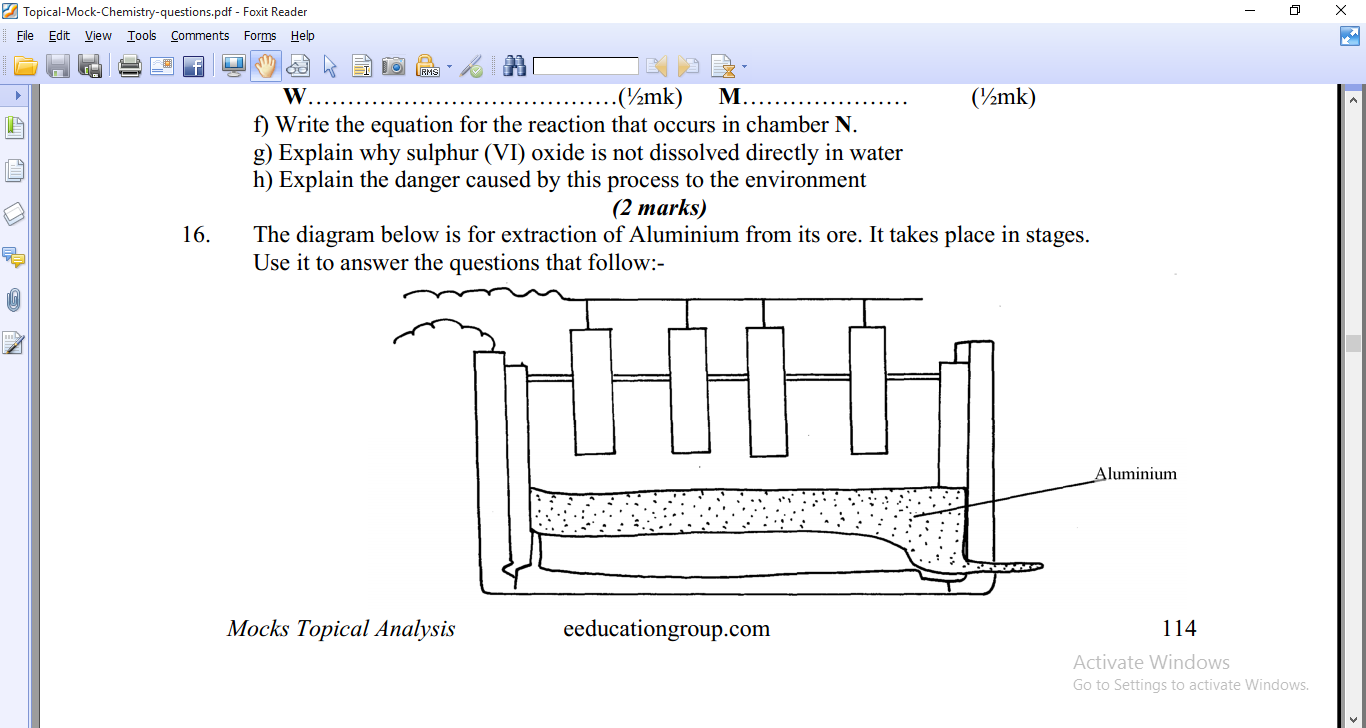
1. a) Complete the table below to show the compounds formed when the elements given combine: (2mks)

|  |  |
| --- | --- |
| **Combining elements** | **Name of compound formed** |
| Iron and sulphur |  |
| Magnesium and nitrogen |  |
| Calcium and phosphorus |  |
| Calcium and carbon |  |

b) Give one difference between a physical change and a chemical change. (1mk)

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1. The diagram below shows a cell in which molten aluminium oxide is electrolyzed to produce aluminium metal.



a) What is the name of the above cell. (1mk)

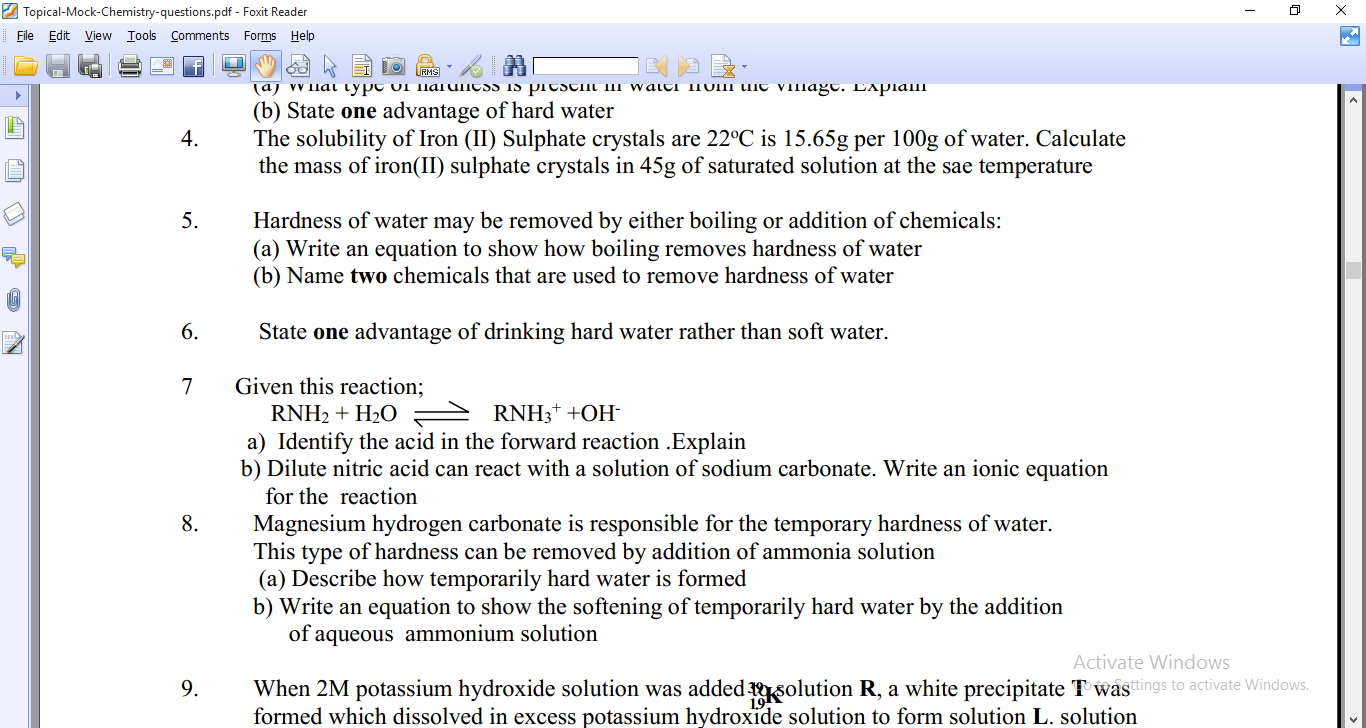
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b) On a certain day, a steady current of **X** Amperes was passed through the molten aluminium oxide for 10 hours. Determine the mass of aluminium that was deposited at the cathode. (Al = 27, 1F= 96,500C.) (2mks)

1. a) Define an acid. (1mk)

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b) Given the equation below;



Identify the substance that acts as an acid in the backward reaction. (1mks)

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c) What is meant by equilibrium for a reversible reaction? (1mk)

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1. Aluminium oxide is said to be amphoteric in nature;

a) What is an amphoteric substance? (1mk)

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b) Explain why it is not advisable to clean utensils made of aluminium using wood ash solution. (2mks)

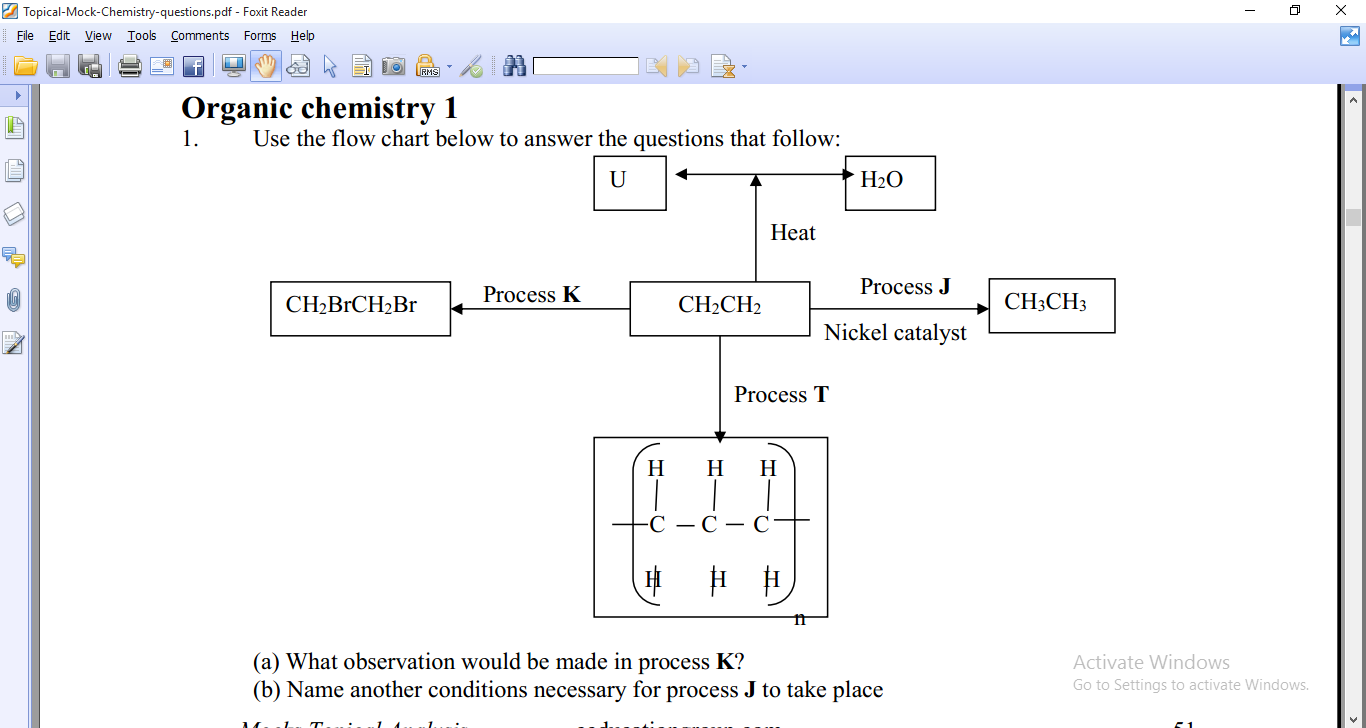
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1. Give two differences between the melting point of pure substance X and that of an impure substance X. (2mks)

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1. Use the flow chart to answer the question that follow.



a) Give the name of the reaction represented by process J. (1mk)

………………………………………………………………………………………………

b) Write the equation for the reaction represented by process K. (1mk)

c) State one disadvantage for the continued use of the product of process T. (1mk)

………………………………………………………………………………………………

1. Study the information represented in the table below and answers the questions that follows

|  |  |  |
| --- | --- | --- |
| Element | Atomic radii(nm) | Ionic radii(nm) |
| P  Q  R  S | 0.185  0.184  0.260  0.260 | 0.153  0.211  0.230  0.305 |

(a) Explain the difference in atomic radius and ionic radius for element P. (2mks)

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

(b) Which one is the most reactive non-metallic element? (1mk)

………………………………………………………………………………………………

1. When Na2Co3.XH2O is heated strongly it losses 63.20% of mass. Calculate the value of X. (Na=23.0, C=12.0,O=16.0,H=1.0) (3mks)
2. a) Define half-life (1mk)

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b) If 1g of Caesium – 137 decays to 1/32 in 100 days. What is the half-life of Caesium- 137?

(2mks)

1. An element K has relative atomic mass of 36.2. Given that the element has two isotopes A of atomic mass 35.0 and B 38.0. Calculate the relative percentage abundances of each of the isotopes. (3mks)
2. Study the flow chart below and answer the questions that follow.

**Brown Gas**

***Heat***

***Add excess NaOH(aq)***

***HCl***

**Solid X**

**Solution M**

**Colourless**

**solution**

***Add***

***dilute HNO3­­***

**Yellow solid**

**(Cold)**

a) Identify the cation and anion present in solid X. (1mk)

Cation …………………….

Anion ………………………

b) Write the ionic equation for the reaction that takes place during the formation of solution M (1 mk)

c) Give the name of the complex ion present in solution M (1mk)

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

23. The structure of water molecules can be represented as shown below.

**H**

**H**

**X**

**H**

**H**

**H**

**H**

**W**

**H**

**H**

* 1. Name the type of bond represented by the letter X and W. (1mks)

X…………………………………………………………………………………………..

W…………………………………………………………………………………………

* 1. Relative mass of methane and water are almost similar however the boiling point of water is 1000C while that of methane if -1610C. Explain. (2mks)

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24. The equation below represents a major reaction in the industrial process.

3H2(g) + N2(g) 2NH3(g)

a) Name the industrial process. (1mk)

……………………………………………………………………………………………

b) Name the catalyst used in the above process. (1mk)

……………………………………………………………………………………………..

c) Explain the following observations when ammonia gas mixed with oxygen is sparked out the catalyst in (b) above, brown fumes are evolved. (2mks)

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

25. The following are half-reactions for some half-cells and their respective reduction

potentials.

Zn2+(aq) + 2e- Zn(s) - 0.76V

Pb2+(aq) + 2e- Pb(s) - 0.13V

Ag+(aq) + e- Ag(s) + 0.80V

Cu2+(aq) + 2e- Cu(s) + 0.34V

(a) Write the overall cell equation for two half-cells which will give the highest e.m.f. (1mk)

(b) Draw the electrochemical cell diagram for the cell obtained when the two half cells in (a) above are connected.. (2mks)

26. A volume of 280cm3 of nitrogen gas diffuse through a membrane in 70 seconds, how long will it take 400cm3 of carbon(iv) oxide to diffuse through the same membrane?

(N=14, C=12, O=16) (3mks)

27. Starting with copper metal, describe a procedure that can be used to prepare copper (II) carbonate. (3mks)

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