**Name...................................................................................Adm no.................................... Candidate’s signature...........................**

** Date.......................................**

**233/1**

**Chemistry**

**Paper 1**

**Theory**

**Kenya Certificate of Secondary Education 2017**

**Form four evaluation examination**

**233/1**

**Chemistry**

**Paper 1**

**Theory**

**INSTRUCTIONS TO CANDIDATES**

* Write your name and Adm number in the spaces provided above .
* Sign and write the date of examination in the spaces provided above.
* (c ) Answer ALL the questions in the spaces provided.
* Mathematical tables and silent calculators may be used.
* All working **MUST** be clearly shown where necessary
* Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
* (h) This paper consists of 14 printed pages
* ***This paper consists of 14 printed pages.. Candidates should check the question paper to ensure that all the Pages are printed as indicated and no questions are missing.***

**FOR EXAMINER’S USE ONLY**

|  |  |  |
| --- | --- | --- |
| **Questions**  | **Maximum Score**  | **Candidate’s Score** |
| 1 – 29 | 80 |  |

1. State one use of iodine. (1mark)

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2. (a) State a simple method you can use to separate a mixture of sulphur powder and iron fillings (1mark)

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(b) A mixture of iron and sulphur was heated strongly until it glowed red throughout andthen left to cool. Explain why you can not obtain sulphur and iron from the product using the method you stated in (a) above (1mark)

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3. Suggest the approximate PH values of the following solutions: (2marks)

|  |  |
| --- | --- |
| Solution | PH  Value |
| Distilled water |  |
| Wood ash |  |

(b) Explain why the PH  value of rain water is less than 7 (1mark)

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4. Explain why the following substances are good conductors of electricity:

 (a) molten lead II bromide (1mark)

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(b) copper wire (1mark)

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5. (a) Define the term saturated hydrocarbon. (1mark)

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 (b) Complete the following equation for the cracking of propane. (1mark)

600 700 ̊C

2 CH3 CH2 CH3

 (c) Name one importance of cracking of petroleum. (1mark)

……………………………………………….



6. Study the flow chart below and answer the question that follow:

Zn(s)

 Step 2

Colourless gas F

Brown gas E

H2 S

Sulphur

Step I

Substance D

Nitric V acid

Heat

(a) Write the chemical equation leading to the formation of :

(i) substance D (1mark)

 ………………………………………….

(ii) Brown gas E (1mark)

………………………………………….

(b) Explain the observations made in the reaction in step 2 (1mark)

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7. In an experiment carried out at room temperature, it was found out that 0.08g of 0xygen diffused through a pinhole in 10 seconds and 100cm3  of chlorine diffused through the same pinhole in 30 seconds under the same conditions. If the density of oxygen is 1.25 g/ cm3 , calculate the density of chlorine. (O= 16 , molar gas volume at r.t.p =24 dm3 ) ( 3marks)

8. Sodium carbonate is added to a solution containing zinc (II) ions.

 (a) Write an ionic equation for the reaction that occurs. (1mark)

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 (b) Give the name of this type of reaction. (1mark)

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 (c ) How would you separate the contents of the reaction mixture?. (1mark)

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9.(a) Define the term non-electrolyte (1mark)

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 (b) Give an example of a material that is a non-electrolyte and state its use. (2marks).

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10. Calculate the pressure required to compress 4.24 dm3 of a gas at 5.4299 X 104  Pascals to 1.56 dm3  at constant temperature. ( 2marks)11. Other than nickel name **two** other catalysts that can be used in hydrogenation of alkenes. (1mark)

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(b) Study the table below that contains some physical properties of a group of hydrocarbons. Use the information to answer the questions that follow:

|  |  |  |
| --- | --- | --- |
| Molecular formula | Molecular mass | Boiling point ( K) |
| C2 H2 | 26 | 189 |
| C3 H4 | 40 | 250 |
| C4 H6 | 54 | 289 |
| C H |  | 312 |

(i) Complete the table for the fourth member of this group. (2marks)

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(ii) Explain the trend in the boiling points of these compounds. (2marks)

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12. The table below shows some propertiesof substances A-E . Study it and answer the questions that follow.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| substance | Solubility in water | Solubility in chloroform | m.p.(® C) | b.p .(® C)  |
| A | soluble | soluble | -22 | 141 |
| B | insoluble | soluble | 115 | 444 |
| C | soluble | insoluble | 801 | 1465 |
| D | insoluble | soluble | -188 | -42 |
| E | insoluble | insoluble | 1083 | 2600 |

(a) Which of the substances is a gas at room temperature of 25 ® C? . (1mark)

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(b) What is the physical state of substance A at room temperature of 25 ® C? . (1mark)

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(c ) How canyou separate the mixture of substances B , C and E ? (2marks)

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13. What volume of acidified potassium manganate VII of concentration 0.02 moles per dm3  is decolourised by 200 dm3  of hydrogen peroxide of concentration 0.02 moles per dm3 ?. (2marks)

 Use the following ionic equation

2MnO4- (aq) + 6H+ (aq) + 5H2 O2(aq) 2Mn2+ (aq) + 8H2 O(l) + 5O2(g)

14. A mass of 3.6 g magnesium reacts in excess chlorine to form a chloride . If the mass of the chloride formed is 14.25 g, find the formula of the chloride formed. (2marks)

 (Mg = 24, Cl =35.5 ).

15. Starting with copper metal describe how a dry sample of copper II carbonate can be prepared in the laboratory. (3 marks).

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16. . Study the flow chart below and answer the question that follow:

Excess

Brown precipitate

Aqueous W

NaOH solution

Gas T

Excess

Aqueous

Solution S

Water

Green precipitate

Chloride of Solid S

NaOH solution

(a) Identify

 (ii) solid S (1mark)

 (ii) Gas T. (1mark)

 (iii) Aqueous W (1mark).

( b) Write a down an ionic equation for the reaction between sodium hydroxide and aqueous W (1mark)

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17. The table below shows the first ionization energies of metals Ato D (not their actual chemical symbols) in the same group of the periodic table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Metal** | **A** | **B** | **C** | **D** |
| **First ionization energy (kJmol-1 )** | **402** | **496** | **520** | **419** |

 (a) Arrange the metals in order of that they occur in the periodic table starting from the topmost to the lowest. Give a reason to support your answer . (3marks)

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(b) Which of the metals has the largest atomic radius ? (1mark)

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18. When a piece of calcium is dropped into a beaker of water, it sinks to the bottom and bubbles of a gas are observed on the surface of the metal.

 (a) Why does calcium sink to bottom of the beaker ? (1mark)

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 (b) Name the gas that is formed in the reaction. (1mark)

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 (c ) Besides effervescence,what else is observed in the beaker as the reaction progresses ?. Explain this observation. (2marks)

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19. (a) Explain the effect of CFC’s to the environment ? (2marks)

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(b) Write an equation for the reaction between hot concentrated potassium hydroxide and chlorine. (1mark)

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20. The set up below was used to study rate of diffusion of ammonia gas and hydrogen chloride gas at room temperature (25 ®C) . Study it and answer the questions that follow :

Cotton woolsoakedin

Conc. Ammonia solution

Cotton wool soaked in

Conc. HCl acid

(a) After six minutes a white ring was formed in the glass tube. If the distance between the white ring and the piece of cotton wool soaked in ammonia solution is 59.5 cm, calculate the distance between the white ring and the cotton wool soaked in concentrated hydrochloric acid. (3marks)

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(b) If the experiment was conducted at 40 ®C would you expect the white ring to be formed earlier or later. Explain your answer. (2marks)

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21. Explain the following statements:

 (a) Following a bee’s sting , application of sodium hydrogen carbonate to the affected area of the skin reliefs the irritation. (2marks)

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 (b) It is not advisable to clean aluminium utensils using wood ash . (2marks)

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22. The set-up below was used to investigate some properties of hydrogen gas. Study it and answer the questions that follow:

 Tube Y

LeadII oxide

Moist hydrogen gas in

Anhydrous copper II sulphate

Drying agent

(a) Name a suitable liquid that can serve as a drying agent. (1mark)

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 (b) State the observations you would expect in the combustion tube as the experiment progresses.

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23. The set-up below shows the reaction between hydrogen chloride gas and aluminium turnings. Study it and answer the questions that follow.

 Aluminium turnings

 Gas T

dry hdrogen

chloride gas Heat

 solid P Liquid R

(a) What is therole of liquid R? (1mark)

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(b) Write an equation for the reaction in the combustion tube (1mark)

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( c) Explain why it is possible to collect solid P using the method shown above. (1mark)

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(d) What would happen if copper metal replaced aluminium in the combustion tube ?. (1mark)

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24. Explain the following terms :

 (a) water of crystallization (1mark)

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 (b) hygroscopy (1mark)

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25. Study the flow chart below and answer the question that follow

Heat Solution of ammonium chloride +

 solution A

Anhydrous calcium chloride

Gas B

Burning sodium metal

Sodium nitride

 (a) (i) Identify solution A (1mark)

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 (ii) Write an equation for the production of gas B (1mark)

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 (b) Write an equation for the reaction that produces sodium nitride. (1mark)

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26. Explain the role of helium in the welding of metals. (2marks)

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27. Whereas hydrogen was commonly used in airships and weather balloons earlier on it is no longer used nowadays. Give a reason for this. (1mark)

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28. A sample of 2.34 g of a metal T displaces 3.20 g of copper from excess aqueous copper II sulphate.

 (T=69 , Cu= 63.5) Determine the valency of metal T . (2marks)

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29. State one application of electrolysis. (1mark).

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