Name: .....Index No: .....

School: .....Candidate's Signature.....

Date: **14/08/2018.**

233/1
CHEMISTRY
PAPER 1
AUGUST
(THEORY)
TIME: 2 HOURS

YESMARK EDUCATION CENTRE-THIKA

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

Mock Examination 2018

INSTRUCTIONS TO CANDIDATES:

- *Answer **all** the questions in the spaces provided.*
- *Write your **name** and **index number** in the spaces provided above.*
- *Mathematical tables and electronic calculators may be used for calculations.*
- *All workings **must** be clearly shown where necessary*

For Examiner's Use only:

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1 – 30	**80**	

This paper consists of 10 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

1. Name the catalyst used in the laboratory preparation of hydrogen gas. (1mark)

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2 (a) State what causes striking back in a Bunsen burner. (1mark)

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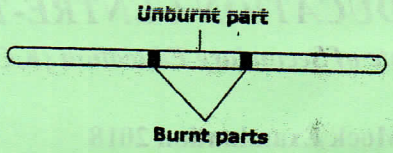
(b) A wooden splint was slipped through a region of a particular flame in the laboratory and was burnt as shown in the diagram below.



(i) Name the type of flame the splint was slipped through. (1mark)

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(ii) Stating the region explain why the splint was burnt the way it is shown in the diagram. (2 marks)

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(iii) State **one** disadvantage of using the above type of flame in the laboratory. (1mark)

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3. Explain the chemical test for hydrogen sulphide gas. (2 marks)

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4. In an investigation 0.144 g of an aluminium compound X react with an excess of water, to produce a gas. This gas burns completely in O_2 to form H_2O and 72 cm^3 of CO_2 only. The volume of CO_2 was measured at room temperature and pressure. What could be the formula of X? [C = 12.0, Al = 27.0; 1 mole of any gas occupies 24 dm^3 at room temperature and pressure] (3 marks)

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5. Explain why the boiling point of methane is higher than that of neon? (1mark)

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6. Over half a million tonnes of bromine are manufactured annually and are mainly used for making other compounds. One important use is for agricultural chemicals.
What is another important use for bromine? (1mark)

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7 (a) Name the ester formed when the alcohol CH_3CH_2OH is reacted with $CH_3CH_2CH_2CO_2H$?
(1mark)

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(b) 2-Methylbuta-1, 3-diene, $CH_2 = C(CH_3) - CH = CH_2$, is used as a monomer in the manufacture of synthetic rubbers.
(i) Name the compound that would produce this monomer on treatment with concentrated sulfuric acid at 170 °C? (1mark)

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(ii) Write the formula of the polymer derived from this monomer. (1mark)

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8. A household bleach contains sodium chlorate (I), NaClO, as its active ingredient. The concentration of NaClO in the bleach can be determined by reacting a known amount with aqueous hydrogen peroxide, H_2O_2; $NaClO_{(aq)} + H_2O_{2(aq)} \rightarrow NaCl_{(aq)} + O_{2(g)} + H_2O_{(l)}$.
When 25.0 cm^3 of bleach is treated with an excess of aqueous H_2O_2, 0.0350 mol of oxygen gas is given off. What is the concentration of NaClO in the bleach? (3 marks)

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9. Given the reagents: solid sodium carbonate, lead metal, dilute nitric (V) acid and all other necessary reagents and apparatus, describe how lead (II) carbonate could be prepared. (4 marks)

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10 (a) State the use of metal baffles in the Solvay tower. (1mark)

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(b) Write the equation for the overall reaction in the Solvay tower. (1mark)

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11 (a) Write an equation for the laboratory preparation of nitrogen (IV) oxide. (1mark)

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(b). Describe the laboratory preparation of carbon (II) oxide from ethanedioic acid. (3 marks)

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12 (a) What is Lattice enthalpy? (1mark)

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(b) The table below shows the enthalpy changes that are needed to determine the enthalpy change of hydration of magnesium ions.

Enthalpy change	Energy ($kJMol^{-1}$)
Lattice enthalpy of Magnesium chloride	-2493
Enthalpy change of solution of Magnesium chloride	-154
Enthalpy change of hydration of chloride ions	-363

Using the values in the table determine the enthalpy of hydration of magnesium ions. (2 marks)

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13 (a) Write the formula of ester which will form sodium ethanoate on hydrolysis with aqueous sodium hydroxide? (1mark)

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(b) State **two** ions that cause temporary water hardness. (1mark)

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(c) Write the ionic equation for the formation of scum in hard water given that the soap is made from stearic acid, $C_{17}H_{35}COOH$. (1mark)

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14 (a) What is relative atomic mass? (1mark)

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(b) Helium, He, is the second element in the Periodic Table. Tritium is the isotope of hydrogen ^3H. What is the same in an atom of ^4He and an atom of ^3H? (1mark)

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15. Under certain conditions ammonia gas reacts with aluminium chloride to form the complete compound $NH_3.AlCl_3$. Draw a dot and cross diagram to show bonding in this compound. (3 marks)

16. Account for the trend in melting and boiling points in the sequence hydrogen chloride, hydrogen bromide and hydrogen iodide. (2 marks)

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17(a) Write an equation, with state symbols, for the **second** ionization energy of magnesium. (1mark)

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(b) Compare the first and second ionization energies of magnesium. (2 marks)

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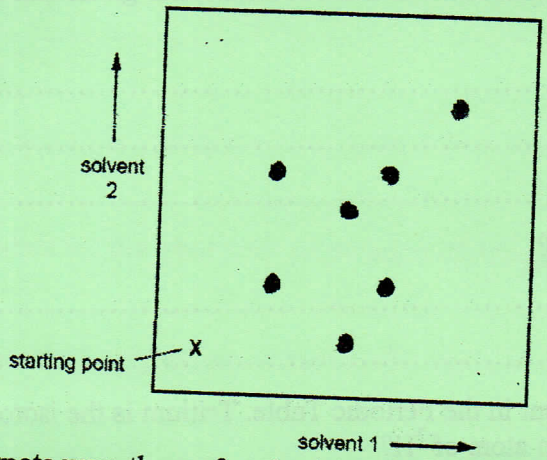
18. The diagram shows the result of two-way paper chromatography.



(i) How many spots were there after the first solvent had been used? (1mark)

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(ii) Circle the spot that moved very little in solvent 2, but moved a greater distance in solvent 1. (1mark)

(iii) Draw a square around the spot that could be separated from the rest by using only solvent 1. (1mark)

19. Magnesium burns in nitrogen to give magnesium nitride, a yellow solid which has the formula Mg_3N_2. Magnesium nitride reacts with water to give ammonia and magnesium hydroxide.

(i) Write an equation for the reaction of magnesium nitride with water. (1mark)

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(ii) Does a redox reaction occur when magnesium nitride reacts with water? Use the oxidation numbers of nitrogen to explain your answer. (1mark)

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20. $Na_2S_2O_3$ reacts with dilute HCl to give a pale yellow precipitate. If 1 cm^3 of 0.1 mol dm^{-3} HCl is added to 10 cm^3 of 0.02 mol dm^{-3} $Na_2S_2O_3$ the precipitate forms slowly.
If the experiment is repeated with 1 cm^3 of 0.1 mol dm^{-3} HCl and 10 cm^3 of 0.05 mol dm^{-3} $Na_2S_2O_3$ the precipitate forms more quickly. Explain. (2 marks)

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21 (a) Iron metal is extracted from the ore haematite by reduction in the blast furnace. The resultant iron contains some impurities especially carbon. Explain how blowing hot air through the iron from the blast furnace increases its purity. (1mark)

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(b) (i) State the chemical formula of rust.

(1mark)

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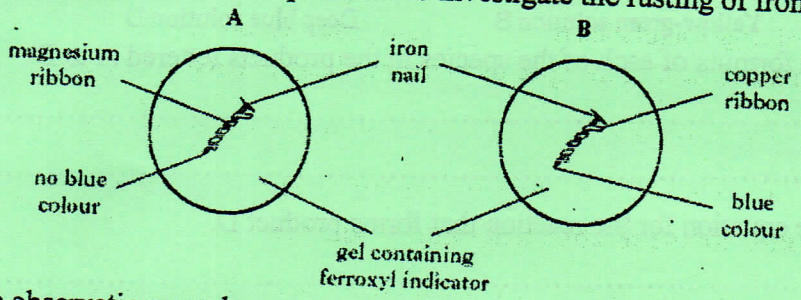
(ii) **Ferroxyl indicator** is a solution containing potassium ferricyanide and phenolphthalein. It turns blue in the presence of Fe^{2+} ions, pink in the presence of hydroxide ions, and can be used to detect metal oxidation. A student carried out an experiment to investigate the rusting of iron.



Account for the observations made.

(2 marks)

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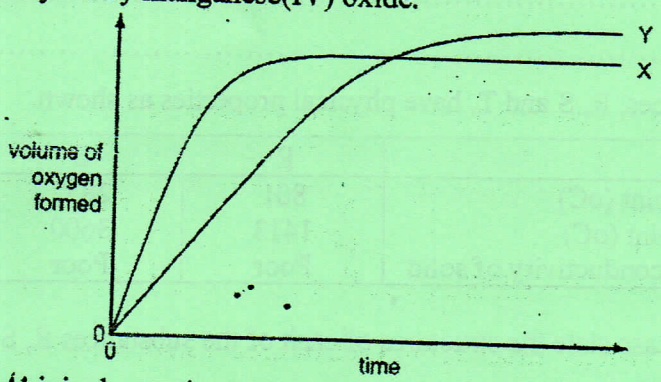
22. In the diagram, curve X was obtained by observing the decomposition of 100 cm^3 of 1.0 mol dm^{-3} hydrogen peroxide, catalysed by manganese(IV) oxide.



Which alteration to the original experimental conditions would produce curve Y? (1mark)

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23 (a) What is electron affinity?

(1mark)

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(b) Explain the trend in first ionization energies of alkali metals.

(2 marks)

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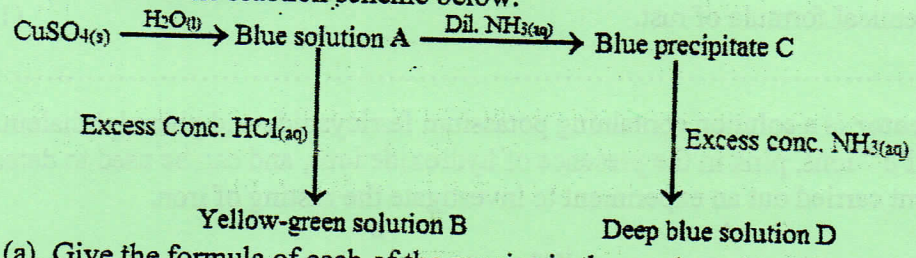
24. Examine the reaction scheme below.



(a). Give the formula of each of the species in the products lettered A to D. (2 marks)

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(b) Write the equation for the reaction that forms product D. (1mark)

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25. In an experiment 0.02 mol of aluminium is burned in oxygen and the product is reacted with 2.00 mol dm^{-3} hydrochloric acid.
What minimum volume of acid will be required for complete reaction? (3 marks)

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26. Three substances, R, S and T, have physical properties as shown.

Substance	R	S	Y
Melting point (oC)	801	2852	3550
Boiling point (oC)	1413	3600	4827
Electrical conductivity of solid	Poor	Poor	Good

With a reason in case state the structures of each of the substances R, S and T. (3 marks)

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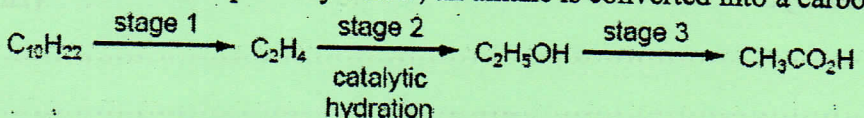
27. In the reaction pathway below, an alkane is converted into a carboxylic acid through several stages.



(a) Which processes occur at stage 1 and at stage 3? (1mark)

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(b) Write an equation for the reaction in stage 3. (1mark)

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28. A student observed the reactions when sodium chloride and sodium iodide were each reacted separately with concentrated sulphuric (VI) acid and with concentrated phosphoric (V) acid. The observations are recorded in the table.

	sodium chloride	sodium iodide
conc. H_2SO_4	colourless acidic gas formed	purple vapour formed
conc. H_3PO_4	colourless acidic gas formed	colourless acidic gas formed

(i) Write an equation for the formation of the purple vapor. (1mark)

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(ii) From the results, compare the oxidizing power of the two acids. Explain. (2 marks)

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29. Given the data: 3 g of zinc, 50 cm^3 of 2M copper (II) sulphate, SHC = 4.2J /kg/K, density = 1g/cm^3, ΔH = 14°C. Calculate the Molar enthalpy of displacement. (Zn = 65) (3 marks)

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30 (a) In an experiment, 2grams of zinc powder are separately placed in 5cm^3 of 2M hydrochloric acid and 5cm^3 of 2M ethanoic acid respectively. Compare the volume of hydrogen gas evolved. (2 marks)

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(b) 2.63g of a solution of sodium chloride at 20°C was reacted with excess silver nitrate. After filtration, washing and drying 2.36g of silver chloride was obtained. Determine the solubility of sodium chloride at 20°C. (Na = 23, Cl = 35.5, Ag = 108). (3 marks)

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31. Explain the bleaching action of chlorine. (3 marks)

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