Name _____ Index No. _____

Candidate's Signature _____

Date _____

233/1
CHEMISTRY
PAPER 1
THEORY
JULY / AUGUST 2010
2 HOURS

FORM IV MID YEAR CONTINUOUS ASSESSMENT TEST
Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 1
2 HOURS

INSTRUCTIONS TO CANDIDATES

(a) Write your name and index number in the spaces provided.
(b) Answer ALL the questions in the spaces provided.
(c) Mathematical tables and electronic calculators may be used.
(d) All working MUST be clearly shown where necessary.

FOR EXAMINER'S USE ONLY

QUESTIONS	MAXIMUM SCORE	CANDIDATES SCORE
1 – 29	80	

This paper consists of 12 printed pages

Turn Over

1. Using dots (.) and crosses (x), show bonding in:

(a) The compound formed when nitrogen reacts with fluorine
(Atomic numbers F = 9, N = 7) (2 marks)

(b) Sodium oxide. (Atomic numbers Na = 11, O = 8) (1 mark)

2. The set up below was set by a form two students to investigate the effects of electric current on molten copper (II) chloride. Study it and answer the questions that follow.

Bulb Gap Boiling tube Copper (II) chloride

(a) On the diagram label the anode and the cathode. (1 mark)

(b) What precaution was necessary during the experiment ? Explain. (2 marks)

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3. When aluminium oxide was electrolysed, 1800g of aluminium metal were obtained.
(a) Write an equation for the formation of aluminium metal. (1 mark)

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(b) Calculate the quantity of electricity in faradays used (Al = 27). (2 marks)

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4. $60cm^3$ of oxygen gas diffused through a porous partition in 50 seconds. How long would it take for $60cm^3$ of sulphur (IV) oxide gas to diffuse through the same partition under the same conditions?
(S = 32.0, O = 16.0) (3 marks)

5. (a) Complete the nuclear equation below. (1 mark)

$$^{37}_{18}A + \text{----------} \longrightarrow {}^{37}_{17}B$$

(b) State one use of radioisotopes in agriculture. (1 mark)

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(c) What danger is associated with exposure of human beings to radioisotopes. (1 mark)

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6. In an experiment to study the properties of concentrated sulphuric acid a mixture of the acid and wood charcoal was heated in a boiling tube.

(a) Write the equation of the reaction that took place in the boiling tube. (1 mark)

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(b) Using oxidation numbers, show that reduction and oxidation reaction took place in the boiling tube. (2 marks)

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7. A teacher wanted to prepare dry hydrogen gas using magnesium ribbon. He used sandpaper to clean the magnesium ribbon and set up the apparatus as shown below.

(a) Why was it necessary to clean the magnesium ribbon. (1 mark)

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(b) What was the purpose of heating the wet sand. (1 mark)

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(c) Write the equation for the reaction . (1 mark)

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8. Study the experimental set-up below and answer the questions that follow.

State the observations made after heating in

(i) Test-tube A. (1 mark)

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_____

_____

(ii) Test-tube B. (1 mark)

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9. Show the products formed when the following salts are heated by writing a balanced chemical equation.

(i) $KNO_{3(s)}$ $\xrightarrow{\text{Heat}}$? _____

(ii) $(NH_4)_2\ CO_{3(s)}$ $\xrightarrow{\text{Heat}}$? _____

(iii) $ZnSO_{4(s)}$ $\xrightarrow{\text{Heat}}$? _____

(3 marks)

10. Explain why when one is stung by a bee application of a little solution of sodium hydrogen carbonate helps to relieve the pain. (3 marks)

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11. The following table gives the melting point of oxides of the third period elements. Study it and answer the questions that follow.

Formula of oxides	Na_2O	MgO	Al_2O_3	S_iO_2	P_4O_{10}	SO_2
Melting point (^0O)	1190	3080	3050	1730	560	-73

(a) Explain the large difference in the melting points of MgO and P_4O_{10}. (1 mark)

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(b) Write the equation for the reaction between Al_2O_3 with;

(i) Alkali (1 mark)

_____

_____

_____

(ii) Acid (1 mark)

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12. A hydrocarbon slowly decolourlises bromine in presence of sunlight but does not decolourise acidified potassium permanganate.

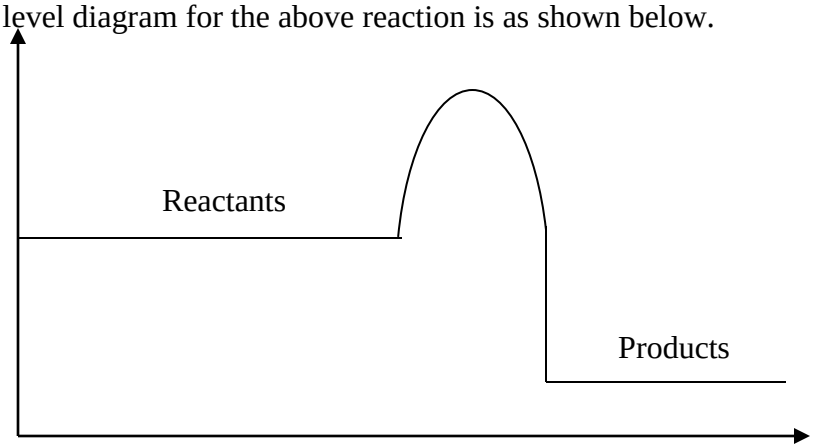
Name and draw the structural formula of the fourth member of the series to which the hydrocarbon belongs. (2 marks)

13. One method of removing water hardness is to add sodium carbonate. Write an ionic equation of the reaction involved. (1 mark)

14. Ammonia can be converted to nitrogen (I) oxide as shown in the equation below.

$$4NH_{3(g)} + 5O_{2(g)} \rightleftharpoons 4NO_{(g)} + 6H_2O_{(l)}$$

The energy level diagram for the above reaction is as shown below.



(a) Explain how an increase in temperature would affect the yield of nitrogen (I) oxide. (2 marks)

(b) On the diagram sketch the energy level diagram that would be obtained if the reaction is carried out in presence of a catalyst. (1 mark)

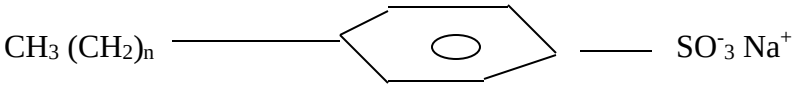
15. The following is a list of bond energies.

Bond	Energy kJ
C – C	348
C =	612
Cl ─ Cl	242
C ─ Cl	338

Calculate the enthalpy change for the following reaction. (3 marks)

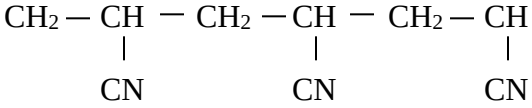
$CH_2 = CH_2 + Cl_2 \longrightarrow CH_2 - CH_2$ (Cl, Cl)

16. A compound whose structure is shown below is found in a detergent.



With reference to the structure explain how the detergent removes grease during washing. (3 marks)

17. A polymer has the following structure



A sample of this polymer is found to have a molecular mass of 5194. Determine the number of monomers on the polymer.

(H = 1.0, C = 12.0, N = 14.0) (2 marks)

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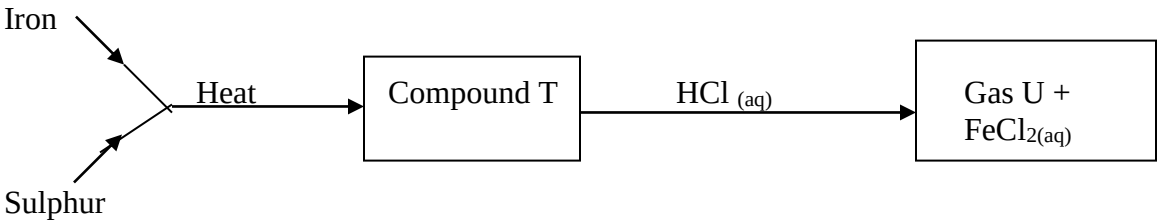
18. Study the flow chart below and answer the questions that follow.



(a) Name : (i) Compound T _____ (½ mark)

(ii) Gas U _____ (½ mark)

(b) Give a chemical test that you could use to identify gas U. (1 mark)

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19. Zinc metal and hydrochloric acid react according to the following equation.

$Zn_{(s)} + 2HCl_{(aq)} \longrightarrow ZnCl_{2(aq)} + H_{2(g)}$

1.96g of zinc were reacted with $100cm^3$ of 0.2M hydrochloric acid

(a) Determine the reagent that was in excess (2 marks)

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(b) Calculate the total volume of hydrogen gas that was liberated at S.T.P. (Zn = 65.4 molar gas volume = 22.4l at s.t.p) (1 mark)

20. An element Y has the electronic configuration 2.8.5

(a) Identify its period _____ (½ mark)

(b) Write a formula of the most stable anion formed when U ionizes. (1 mark)

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(c) Explain the differences between the atomic radius of element Y and its ionic radius. (1 ½ marks)

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21. Study the information in the table and answer the questions that follow.

Substance	Solubility g/100g water
A	1.26×10^2
B	1.09×10^2

Describe how a solid sample of substance A could be obtained from a solid mixture of A and B. (3 marks)

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23. Use the information below to answer the questions that follow.

$A^{2+}_{(aq)} + 2e \rightleftharpoons A_{(g)}$ $E^{\Theta} = -0.76$

$B^{3+}_{(aq)} + 3e \rightleftharpoons B_{(s)}$ $E^{\Theta} = -1.66$

$C^{2+}_{(aq)} + 2e \rightleftharpoons C_{(s)}$ $E^{\Theta} = -0.44$

(a) Calculate the E^{Θ} value for the electrochemical cell represented below

$B_{(s)}$ / $B^{3+}_{(aq)}$ // $C^{2+}_{(aq)}$ / $C_{(s)}$

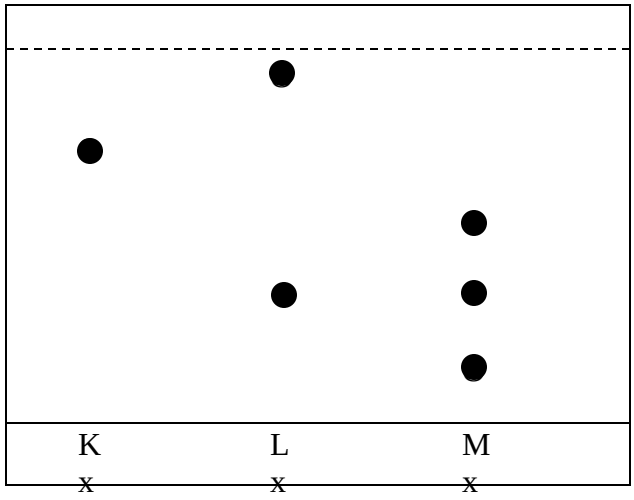
(2 marks)

(b) Identify

(i) Strongest reducing agent. (½ mark)

(ii) Strongest oxidizing agent. (½ mark)

(11) The diagram below represents a paper chromatogram for three brands of juices suspected to contain banned food colourings.



Brand of juice

(a) Circle the spots which show the banned food colourings. (1 mark)

(b) Show the solvent front. (1 mark)

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24. Starting with copper metal describe how a solid sample of copper (II) carbonate can be prepared. (3 marks)

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25. Study the information in the table below and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	Electrical conductivity	Ductility	Action of water
A	Good	Good	No reaction
B	Good	Poor	No reaction
C	Good	Good	Reacts

Select the element which is

(a) Likely to be in group II of the periodic table. (1 mark)

_____

(b) Could be used to make electric cables. (1 mark)

_____

(c) Likely to be graphite. (1 mark)

_____

26. When a solid sample of sulphur is heated in a test tube it changes into liquid which flows easily. On further heating, the liquid darkens and does not flow easily. Explain these observations. (3 marks)

27. 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 tube. Explain why the flower was bleached. (1 ½ marks)

(b) The second test-tube was corked and exposed to sunlight. After a few days it was found to contain a gas that rekindled a glowing splint. Write an equation for the reaction which produced the gas. (1 ½ marks)

28. (a) Define pollution. (1 mark)

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(b) Mention two pollutants that are

(i) Particles (1 mark)

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(ii) Gaseous (1 mark)

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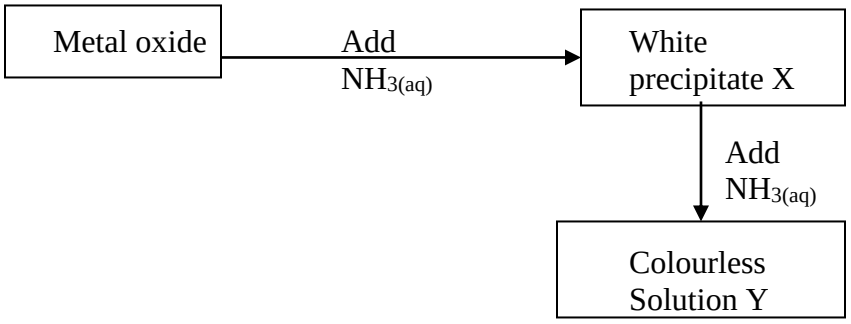
29. Study the flow chart below and answer the questions that follow.



(a) Identify the metal oxide. (1 mark)

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(b) Write an ionic equation leading to the formation of the white precipitate X. (1 mark)

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(c) Give the formula of the ions responsible for the colourless solution Y. (1 mark)

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