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233/1
CHEMISTRY
PAPER 1(THEORY)
JULY/AUGUST 2009
TIME:2 ½ HRS

NANDI EAST DISTRICT JOINT EVALUATION TEST 2009

Kenya Certificate of secondary Education
Chemistry
Paper 1
Time 2 hrs

1. A certain carbonate, $XC)_3$ reacts with dilute hydrochloric acid according to the equation given below

   $XCO_{3(s)} + 2HCI_{(aq)} \rightarrow XCI_{2(aq)} + CO_{2(g)} + H_2O_{(I)}$

   If 1g of carbonate reacts completely with $20cm^3$ of 1M hydrochloric, calculate the relative atomic mass of X.(C= 12.0,0=16.0 (3 marks)

2. Chlorine and iodine are elements in the same group in the periodic table. Chlorine gas $CI_{2(g)}$ is yellow while aqueous iodine, $I_{2aq)}$ is brown
   (a) What observation would be made if chlorine gas is bubbled though aqueous sodium iodide? (1 ½ marks)

   (b) Write the formula of the chloride of an element A, Whose atomic numbers is 5.(A is not the actual symbol of the element). (1 ½ marks)

3. Dilute nitric acid reacts with copper according to the ionic equation

$3Cu_{(S)} + 8H^{+}_{(aq)} + 2\,NO^{-}{}_{3(aq)} \rightarrow 3Cu^{2+}_{(aq)} + 2NO_{(g)} + H_2O_{(l)}$

(a) What is the oxidation number of nitrogen in
(i) $NO^{-}_{3:}$ (1 mark)
(ii) NO: (1 mark)

(b) With respect to nitrogen, explain whether the above reaction is an oxidation or reduction process

4. A compound $C_4\ H_{10}O$ is oxidized by excess acidified potassium magnate (VII) to form another compound $C_4H_8O_2$. The same compound $C_4\ H_{10}O$ reacts with sodium to produce hydrogen gas
(a) Draw the structural formula and name compound $C_4H_{10}O$ (2 marks)

(b) Write an equation for the reaction between sodfium and compound $C_4H_{10}O$

5. (a) 100g of radioactive $^{223}_{91}pa$ was reduced between to 12.5g after 81

days. Determine the half- life of Pa

(b) Complete the nuclear equation below: -

$$^{223}_{91}pa + ---- \longrightarrow {}^{233}_{90}pa$$

6. A given volume of oxygen gas diffused from a certain apparatus in 96seconds. Calculate the time taken by an equal volume of Sulphur (IV) oxide gas to diffuse under the same condition. (S = 32.0, 0 = 16,0) (3 marks)

7. At 25^0C, NO_2 and N_2O_4 gases exists in equilibrium as shown in the equation below:

$N_2O_{4(g)} \quad \Longleftrightarrow \quad 2NO_{2(g)}$; ΔH = +ve

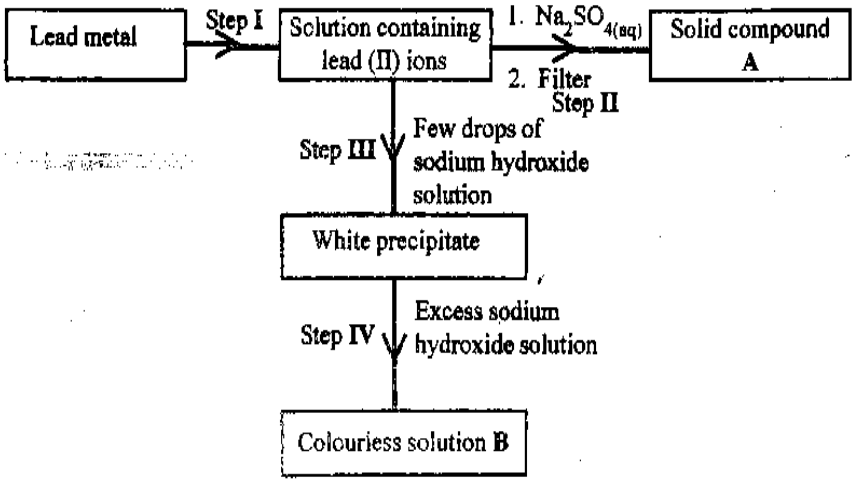
Pale- yellow Brown

State and explain the observation that would be made when:

(a) the temperature of the mixture at 25^0C is increased to 60^0C (1 ½ marks)

(b) The volume of the gaseous mixture is reduced (1 ½ marks)

8. Study the flow chart and answer the questions that follow



(a) Name

(i) The reagent used in step l (1 mark)

(ii) Compound A (1 mark)

(b) Write an ionic equation for the reaction in step IV

9. (a) A few drops of freshly prepared iron (ii) sulphate solution were added to potassium nitrate solution in a test tube. Concentrated Sulphuric (VI) acid was then carefully added to the mixture. State the observation that was made (1 mark)

(b) Write an equation for the reaction that occurs when solid potassium nitrate is strongly heated (1 mark)

10. Chlorine can be prepared by using the following three reagents: solid sodium chloride, concentrated sulphuric (VI) acid and potassium manganate (VII)

(a) What is the role of each of the following in the reaction?

(i) Concentrated sulphuric (VI) acid (1 mark)

(ii) Potassium manganate (VII) (1 mark)

(b) Give one industrial use of chlorine (1 mark)

11. The information in the table below relates to element in the same group of the periodic table. Study it and answer the questions that follow

Element	Atomic Size
A	0.18
B	0.23
C	0.15

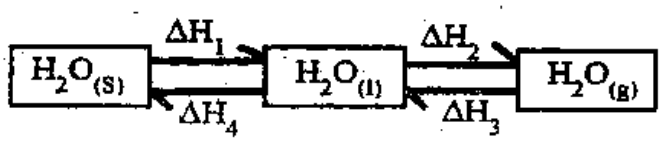
Which element has the highest ionization energy? Explain (2 marks)

12. (a) State one chemical compound responsible for temporary hardness in water

(1 mark)

(c) State and explain one disadvantage of using hard water in boilers (2 marks)

13. The scheme below shows the energy changes that are involved between ice, water and steam. Study it then answer the questions that follow



(a) What name is given to the process represented by energy change ΔH_4?
(1 mark)

(b) What is the sign of ΔH_3? Give a reason (2 marks)

14. When magnesium is burnt in air at high temperatures, magnesium nitride is formed as represented by the equation
$2Mg_{(s)} + N_{2(g)} \rightarrow Mg_3N_{2(S)}$

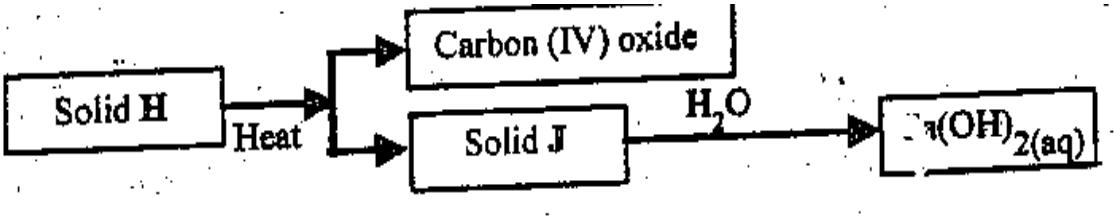
(a) Using dots (.) and crosses (x) draw the structure of magnesium nitride (Atomic numbers Mg = 12.0, N = 7.0) (2 marks)

(b) Write an equation for the reaction of magnesium nitride and water
(1 mark)

15. When a current of 1.5 amperes was passed through a cell containing M^{3+} ions on metal M for 15 minutes the mass of the cathode increased by 0.26g. (IF = 96500C).
(a) Calculate the quantity of electricity used (1 mark)

(b) Determine the relative atomic mass of metal M (1 mark)

16. Use the scheme below to answer the questions that follow



(a) Identify the solids (1 mark)

(b) State one commercial use of solid J (1 mark)

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

18. In an experiment, 1g of magnesium powder was reacted with excess dilute sulphuric (IV) acid at 25^0C. The time for the reaction to come to completion was recorded. The experiment was repeated at 40^0C. In which experiment was the time taken shorter? Explain your answer. (3 marks)

19. Excess hydrogen gas was passed over heated copper(II) oxide in a combustion tube

(a) State the observation made in the combustion tube at the end of the experiment (1 mark)

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

(c) Name one industrial use of hydrogen (1 mark)

20. The table below show the tests carried out on a sample of water and the results obtained

	Tests	**Observations**
I	Addition of sodium hydroxide solution drop wise until in excess	White precipitate which dissolves in excess.
II	Addition of excess aqueous ammonia	Colourless solution obtained
III	Addition of dilute hydrochloric acid followed barium chloride	White precipitate

(a) Identify the anion present in water (1 mark)

(b) Write the equation for the reaction in III (1 mark)

(c) Write the formula of the complex ion formed in II (1 mark)

21. (a) Name one Natural Fibre (1 mark)

(b) Give one advantage of synthetic fibres over natural fibres (1 mark)

22. Complete the table below (2 marks)

Species	Number of		
$^{4}_{2}He^{2+}$	Neutrons	Electrons	Protons

23. A compound whose structure is given below is found in a detergent

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

24. An element Y contains two isotopes $^{16}_{8}Y$ and $^{18}_{8}Y$ whose relative abundance is in the ratio 9: 1
Find the relative atomic mass of Y. (2 marks)

25. An aqueous sodium sulphate solution was electrolyzed using platinum electrodes in a cell

(a) Name the products formed at the
Anode (1 mark)
Cathode (1 mark)

(b) How does the concentration of the electrolyte change during the electrolysis? (1 mark)

26. In an experiment to determine the solubility of solid Y in water at 30^0Cthe following results were obtained.
    Mass of empty evaporating dish = 26.2g
    Mass of evaporating dish + saturated solution = 42,4g
    Mass of evaporating dish + dry solid = 30.4g
    Use the data to calculate the solubility Y at 30^0_C grams of Y per 100g water
    (3 marks)

27. The empirical formula of hydrocarbon is C_2 H_3. the hydrocarbon has a relative molecular mass of 54 (H = 1.0, C = 12.0)
    (a) Determine the molecular formula of hydrocarbon (1 ½ marks)

    (b) Draw the structural formula of the hydrocarbon (1 mark)

    (c) To which homologous series does the hydrocarbon drawn in (b) above belong (½ mark)

28. A candle burns with a more luminous flame whereas tin lamp filled with ethanol produces a less luminous flame. Explain.

29. The lattice of calcium chloride is + 2237 KJ/mol and hydration energies of calcium ions and chloride gas are -1562 KJ/mol and -384KJ/mol respectively. Draw an energy level diagram for dissolving calcium chloride. (3 marks)