

NAME.....ADM. NO.....

SCHOOL.....CLASS.....

233/1

CHEMISTRY

PAPER 1

THEORY

JAN/FEB. 2013

2HRS

BUNYORE-MARANDA JOINT EXAMINATIONS

KENYA CERTIFICATE OF SECONDARY EDUCATION

CHEMISTRY

PAPER 1

THEORY

2 HOURS

INSTRUCTIONS TO CANDIDATES

- (a) Write your name and index in the spaces provided above
- (b) Answer all the questions in the spaces provided in the question paper.
- (c) Mathematical tables and silent electronic calculators may be used.
- (d) All workings MUST be shown clearly where necessary.

For official use only

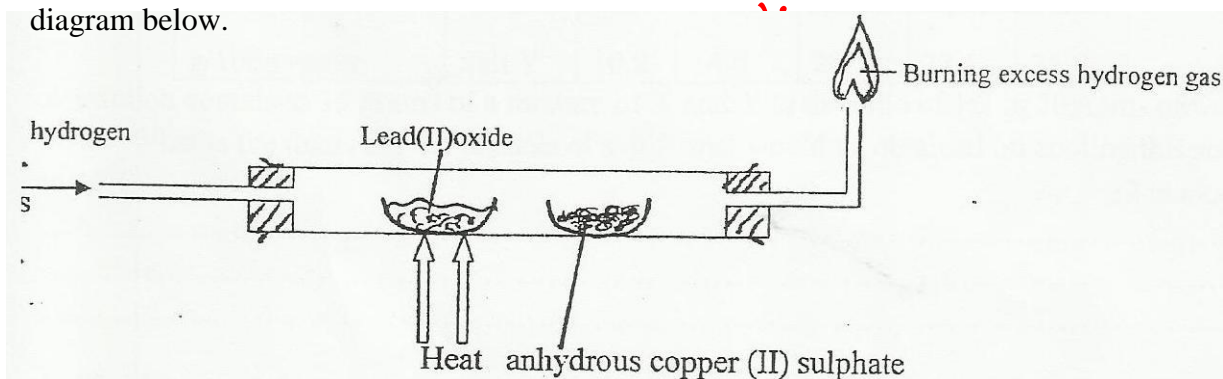
Questions	Maximum score	Candidate's score
1/27	80	

1. (a) Some sodium chloride was found to be contaminated with Copper (ii) oxide. Describe how a sample of sodium chloride can be separated from the mixture. (3mks)

.....

2. A hydrocarbon contains 80% carbon by mass. Given that 1dm^3 of the compound at STP has a mass of 1.35g, determine the molecular formula of the compound. (Molar volume of a gas at $= 22.4\text{dm}^3$, C= 12, H=1) (4mks)

3. In an experiment, dry hydrogen gas was passed over heated lead (ii) oxide as shown in the diagram below.



- i. State what is observed on the anhydrous copper (ii) sulphate (1mk)
-
-
- ii. Write a balanced equation for the reaction between lead (ii) oxide and hydrogen. (1mk)
-
-
- iii. After the reaction is over, dry hydrogen gas is continuously passed through the combustion tube until it cools down. Explain. (1mk)
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4. (a) Define the term solubility. (1mk)

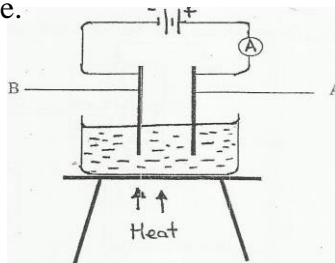
- (b) The table below shows the solubility of two salts X and Y at different temperatures.

Temperature $^{\circ}\text{C}$		10	20	30	40	50
Solubility in	Salt X	4.6	7.0	9.8	13.0	16.9
g/100g water	Salt Y	10.2	14.6	20.1	27.4	35.9

A solution contained 15 grams of a mixture of X and Y in the ratio of 1:2 in 50 grams of water at 50⁰ C. What is the total mass of crystals of salt X that would be contained on cooling this solution to 10⁰C? (2mks)

.....

5. The diagram below represents a set up of apparatus used to investigate the effect of electronic current on lead (ii) oxide.



(i) Identify the products of electrolysis at,

- (a) Electrode A..... ½ mk
 (b) Electrode B..... ½ mk

(ii) Describe what is observed at the electrode A during electrolysis. (1mk)

.....

(iii) State any application of electrolysis (1mk)

.....

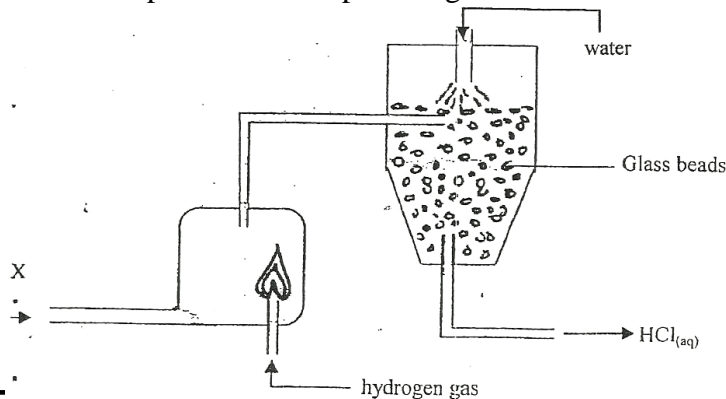
6. Aluminium chloride molecule has the following structure:



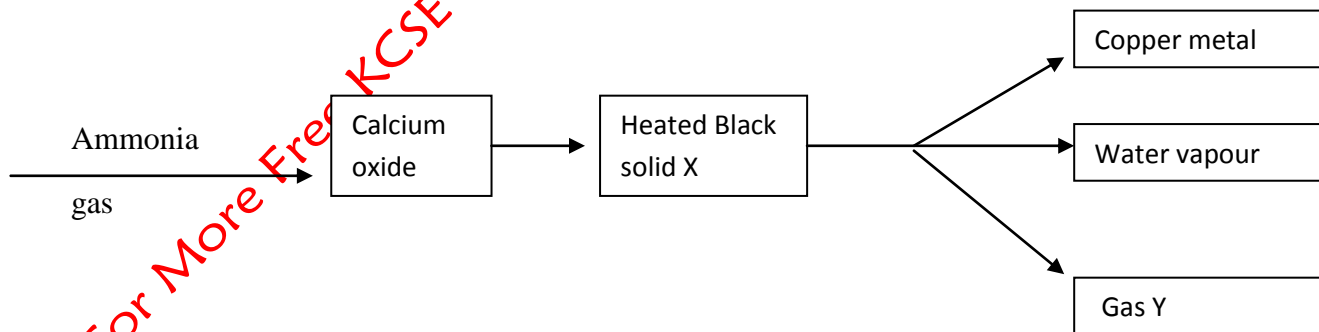
Label on the structure:

- i. Covalent bond (1mk)
 ii. Co-ordinate (dative) bond; (1mk)

7. The diagram below represents a set up for large scale manufacture of hydrochloric



- a. Name substance X (1mk)
.....
- b. What is the role of glass beads? (1mk)
.....
- c. Give two uses of hydrochloride acid. (1mk)
.....
.....
8. Sulphur (IV) oxide is a toxic gas that is normally prepared in a fume chamber.
- a. Name two reagents that can be used to prepare sulphur (IV) oxide in the laboratory. (1mk)
.....
.....
- b. Write equation for the reaction between sulphur (IV) oxide and hydrogen sulphide gas (1mk)
.....
- c. Other than production of sulphuric (IV) acid, state one commercial use of sulphuric. (1mk)
.....
9. (a) What is meant by the terms?
- i. Atom; (1mk)
.....
.....
- ii. Isotopes? (1mk)
.....
.....
- (b) The formula for a sulphate of titanium is $Ti_2(SO_4)_3$. What is the formula of its chloride?
.....
10. Study the flow chart below and answer the questions that follow.



- a. State the role of calcium oxide in this process. (1mk)
.....
- b. Identify;
- i. Black solid X; (1mk)
.....
- ii. Gas Y; (1mk)
.....

11. The structure below represents a sweet smelling compound

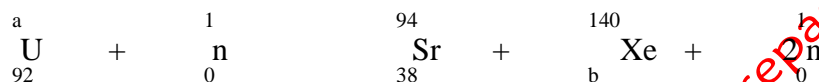


a. Suggest the name of the above compound. (1mk)

b. Give the names of the two organic compounds that can be used to prepare this compound in the laboratory. (2mks)

12. (a) A radioactive substance emits three different particles. Give the symbol of the particle with the lowest mass. (2 mks)

(b) i. Find the values of a and b in the nuclear equation below.



a=..... (1/2mk)

b=..... (1/2mk)

(ii) What type of nuclear reaction is represented in b (i) above? (1/2mk)

13. The table below shows some tests which were carried out on a green solid P and the observations that were made.

Test	Observation
(i) P was heated until there was no further change	-A colorless liquid condensed on the cooler part of the test tube. -A colourless gas which turned aqueous potassium dichromate (VI) to green was given out and a red brown residue R was left.
(ii) Chlorine was bubbled through an aqueous solution of P	Solution turned yellow from green.

a. Identify substances P and R (2mks)

b. Write an equation for the reaction that occurred in test (i) (1mk)

14. The table below shows the PH values of solutions A, B, C and D

Solution	A	B	C	D
PH	2	7	12	14

(a) Which solution is likely to be that of magnesium hydroxide? (1mk)

(b) Select the solution that reacts with calcium carbonate powder. Give a reason for your

Answer.

Solution..... (1mk)

Reason. (1mk)

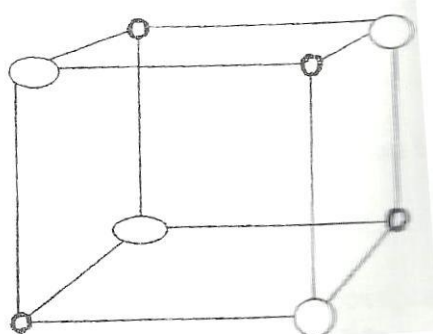
15. Element K (not actual symbol of element) has isotopes with relative abundances as shown below.

Isotope	Abundance (%)
$^{10}_5\text{K}$	18.69
$^{11}_5\text{K}$	81.31

Calculate the relative atomic mass of element K

(2mks)

16. The figure below shows part of the sodium chloride crystal lattice



a. Which ions are represented by the

i. Larger circles

(1/2mk)

ii. Smaller circles

(1/2mks)

b. Sodium Chloride has a higher melting point than hydrogen Chloride. Explain. (2mks)

c. Solid sodium chloride does not conduct electricity while its aqueous solution does.

Explain

(1mk)

17. Draw the structures and give the names of three alkenes having molecular formula C_5H_{10} .

(3mks)

18. Aluminium oxide reacts with both acids and bases.
- Name the class of oxide to which aluminium oxide belong. (1mk)
.....
 - Write an equation for the reaction between aluminium oxide and hydrochloric acid.(1mk)
.....
 - Using the equation in(ii) above calculate the number of moles of hydrochloric acid that would react completely with 153.0g of Al_2O_3 (Al=27, O=16.0) (2mks)

19. (a) Using electrons in the outermost energy level, draw the dot (.) and cross (x) diagrams for the molecules H_3O^+ and NaF. (H=1, Na=11, F=9, O=8)

i. Hydroxonium ion, H_3O^+

ii. Sodium fluoride, NaF

- (b) The formula of a complex ion is $\{\text{Zn}(\text{NH}_3)_4\}^{2+}$. Name the type of bond that is likely to exist between zinc and ammonia in the complex ion. (1mk)
.....

20. The table below gives the first ionization energies of the alkali metals

Element	1 st ionization energy Kj mol^{-1}
A	494
B	418
C	519

- a. Define the term first ionization energy. (1mk)
.....
.....

- b. Which of the three metals is the least reactive? Give a reason. (2mks)
.....
.....

21. The atomic numbers of oxygen, fluorine and sodium are 8, 9 and 11 respectively. The formulae of their ions are O^{2-} , F^- and Na^+

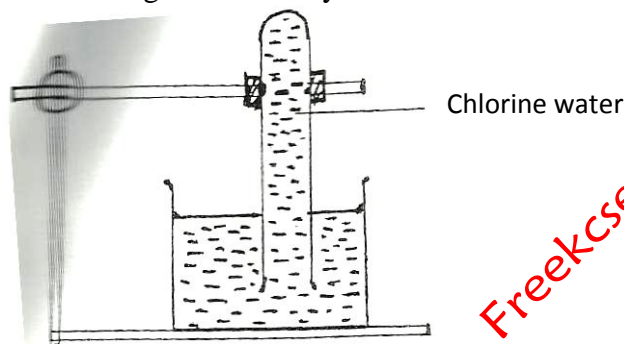
- a. Write the electron arrangement for the ions. (1mk)
.....

- b. Arrange the ions in the order of decreasing ionic radius starting with the largest, give a reason for the order. (2mks)
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.....
.....

22. Complete the following table by filling in the missing test and observations. (3mks)

NO	GAS	TEST	OBSERVATION
I	Chlorine	bubble the gas into a solution of potassium bromide.	
II		Put a filter paper dipped in a solution of potassium chromate (V)	PAPER TURNS GREEN
III	Butane		Red-brown colour of the liquid disappears (turn colourless)

23. In an experiment, a test-tube full of chlorine water was inverted in chlorine water as shown below and the set up left in sunlight for one day.



After one day, a gas was found to have collected in the test tube.

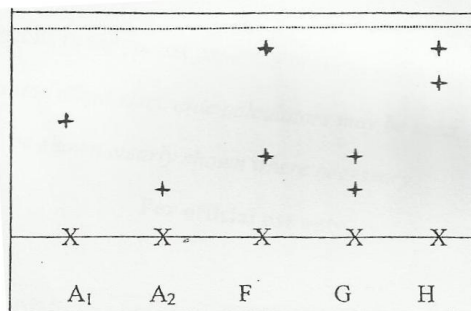
a. Identify the gas. (1mk)

.....

b. What will happen to the PH of the solution in the beaker after a day? Give an explanation. (2mks)

.....

24. Samples of urine from three participants F, G and H at an international sports meeting were spotted onto a chromatography paper alongside two from illegal drugs A1 and A2. A chromatogram was run using methanol. The figure below shows the chromatogram.



a. Identify the athlete who had used an illegal drug. (1mk)

.....

b. Which drug is more soluble in methanol? (1mk)

.....

25. (a) State the observation made at the end of the experiment when a mixture of iron powder and sulphur is heated in a test tube. (1mk)

.....

.....

(b) Write an equation for the reaction between the product in (a) above and dilute hydrochloric acid. (1mk)

(c) State how the gaseous product from the reaction in b above can be tested. (1mk)

26. In an experiment to determine the percentage of magnesium hydroxide in an anti-acid, a solution containing 0.50g of the anti-acid was neutralized by 23.0cm³ of 0.1M hydrochloric acid. (Relative formula mass of magnesium hydroxide=58)

a. Calculate the mass of magnesium hydroxide in the anti-acid. (2mks)

b. Determine the percentage of magnesium hydroxide in the acid. (1mk)

27. i. State Graham's law of diffusion. (1mk)

.....
.....
.....
.....

ii) A sample of unknown compound x is shown by analysis to contain sulphur and oxygen. The gas require 28.3 seconds to diffuse through a small aperture into vacuum. An identical number of oxygen molecules pass through the same aperture in 20 seconds. Determine the molecular mass of gas X. (O=16, S=32). (2mks)