NAME ..... ADM NUMBER .....

SIGNATURE .....

DATE .....

233/1
CHEMISTRY
PAPER 1 (THEORY)
OCTOBER 2016
TIME: 2 HRS

KANDARA SUB-COUNTY SECONDARY SCHOOLS FORM 3 2016 JOINT EXAMINATION

Kenya Certificate of Secondary Education (KCSE)

CHEMISTRY

Paper 1 (Theory)
October 2016
Time: 2 hours

INSTRUCTIONS TO CANDIDATES

a) Write your name and adm number and class in the spaces provided above.

b) Answer **all** questions in the spaces provided below each question.

c) **All** working must be clearly shown where necessary.

d) Electronic and silent non-programmable calculators may be used.

FOR EXAMINERS USE ONLY

Question	Maximum Score	Candidates Score
1-28	80	

1. Phosphorous element smoulders in air to form two oxides.
a) Name the two oxides. (2 marks)

i) .....

ii) .....

b) State the nature of the solution when the above mentioned oxides are dissolved in water. (1 mark)

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2. The pressure of oxygen gas in $2dm^3$ cylinder at -183°C was 1×10^7 Pascals. Calculate;
a) volume of the gas at 25°C and 1×10^5 Pascals. (2 marks)

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b) Mass of oxygen gas (molar gas volume at RTP is $24dm^3$, O = 16) (2 marks)

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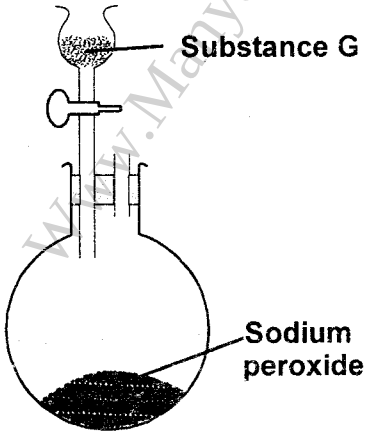
3. The apparatus shown below was set up to prepare and collect oxygen gas.



a) Name substance G ..... (1 mark)

b) Complete the set up to show how dry sample of oxygen gas is collected. (1½ marks)

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4. Element K has an atomic number of 7 while element M has an atomic number of 1.
a) Write down the electron arrangement of an ion of K. (1 mark)

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b) Draw dot (•) and cross (x) diagram to show the bonding between K and M. (2 marks)

5. A mixture contains aluminium chloride, copper (II) oxide and potassium chloride. Describe how each of the substances can be obtained from the mixture. (3 marks)

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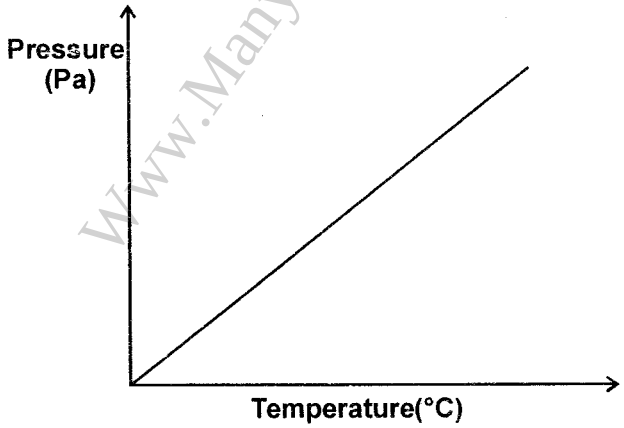
6. The graph below shows the relationship between pressure and temperature of a gas in a fixed volume container.



a) State the relationship between pressure and temperature that can be deduced from the graph. (1 mark)

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b) Using kinetic theory, explain the relationship. (2 marks)

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7. Calcium oxide can be used to dry ammonia gas.
a) Explain why calcium oxide is not used to dry hydrogen chloride gas. (2 marks)

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b) Name one drying agent for hydrogen chloride gas. (1 mark)

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8. The table gives the atomic numbers of elements A, B, C and D. The letters do not represent the actual symbols of the elements.

Element	A	B	C	D
Atomic number	9	10	11	12

a) Which one of the elements is least reactive? Explain. (1 mark)

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b) i) What two elements would react most vigorously with each other? (1 mark)

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ii) Write a chemical equation for the reaction which takes place in b(i) above. (1 mark)

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9. Compound X consists of 37.5% Carbon, 12.5% hydrogen and the rest oxygen.
a) Work out the empirical formula of the compound. (C = 12, H = 1, O= 16) (1½ marks)

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b) If the relative molecular mass of the compound is 32, work out its molecular formula. (1½ marks)

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10. In an experiment, sulphur (IV) oxide gas was bubbled into water followed by chlorine gas. The resulting colourless solution gave a white precipitate when mixed with barium chloride solution. Explain these observations. (3 marks)

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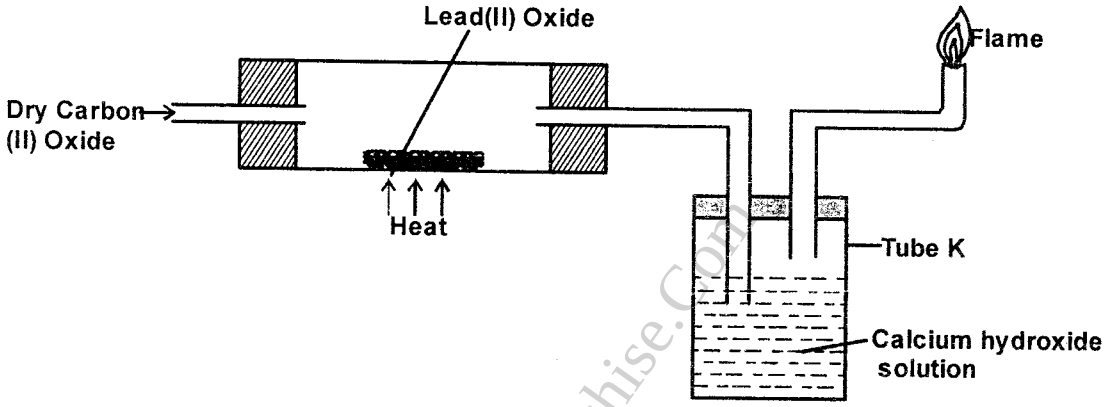
11. The apparatus shown below was used to investigate the effect of carbon (II) oxide on lead (II) oxide.



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

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b) Write equations for the reactions that took place in the tube K after a while. (2 marks)

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c) Why is it necessary to burn the gas coming out of tube K. (1 mark)

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12. Hydrogen sulphide gas was bubbled into an aqueous solution of iron (III) chloride. State two observations that were made. (2 marks)

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13. When hydrogen gas was passed over heated lead (II) oxide in a combustion tube and the gaseous products cooled, a colourless liquid was obtained.

i) Which chemical test would you use to confirm the colourless liquid above? (1 mark)

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ii) What observation was made in the combustion tube? (1 mark)

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iii) Write an equation for the reaction between hydrogen and lead (II) oxide. (1 mark)

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14. a) What are isotopes? (1 mark)

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b) The R.A.M of element P is 63.5. It has two isotopes of masses 63 and 65 respectively. Determine the percentage abundance of each isotope. (2 marks)

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15. The table below shows the formula of elements P, Q, R and S (not actual symbols) and their chlorides.

Element	P	Q	R	S
Formula of chloride	PCl	QCl_2	RCl_3	SCl_5

a) State the group to which each of the elements belong. (2 marks)

P..... Q.....

R ..... S.....

b) Write down the formula of the oxide of element R. (1 mark)

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16. State the property of argon that makes it suitable for filling filament lamps. (1 mark)

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17. $25cm^3$ of a solution of sodium hydroxide containing 2g of the alkali in $200cm^3$ of the solution required $28cm^3$ of nitric (V) acid for complete neutralisation. Calculate;

a) the concentration of the alkali solution in moles per litre. *(Na = 23, O = 16, H = 1)* (2 marks)

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b) the concentration of the acid in moles per litre. (1 mark)

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18. Paper chromatography is a method of separating colours or dyes. What two properties should the components of the mixture have that would make the separation possible. (2 marks)

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19. a) Define allotropes. (1 mark)

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b) i) State the name of the allotrope of carbon that conducts electricity. (1 mark)

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ii) Use structure and bonding to explain your answer in b(i) above. (1 mark)

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20. A sample of unknown compound Y is shown by analysis to contain sulphur and oxygen. The gas requires 28.3 seconds to diffuse through an aperture into a vacuum. An identical number of oxygen molecules pass through the same aperture in 20 seconds. Determine the molecular mass of Y (O = 16, S = 32). (3 marks)

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21. Solutions can be classified as acids, bases or neutral. The table below shows solutions and their pH values

Solution	pH value
K	1.5
L	7.0
M	14.0

a) Select any pair that would react to form a solution of pH 7. (1 mark)

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b) Identify two solutions that would react with aluminium hydroxide explain. (2 marks)

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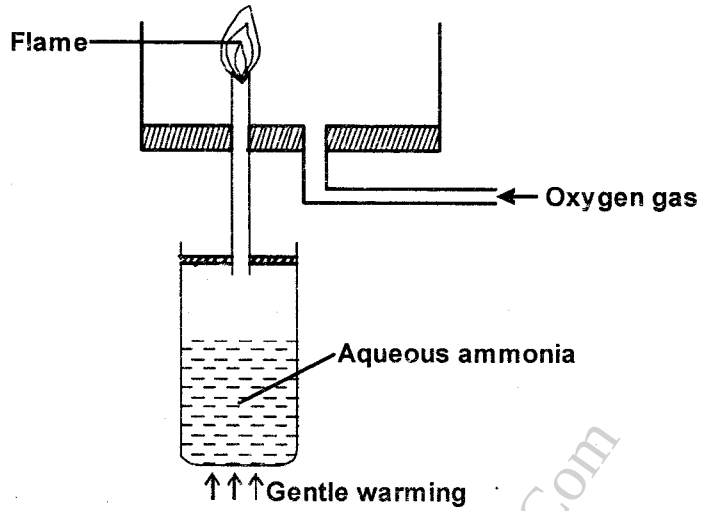
22. Study the set up below and answer the questions that follow.



a) Why is aqueous ammonia warmed gently? (1 mark)

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b) What is the colour of the flame? (1 mark)

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c) Write the chemical equation for the reaction that takes place. (1 mark)

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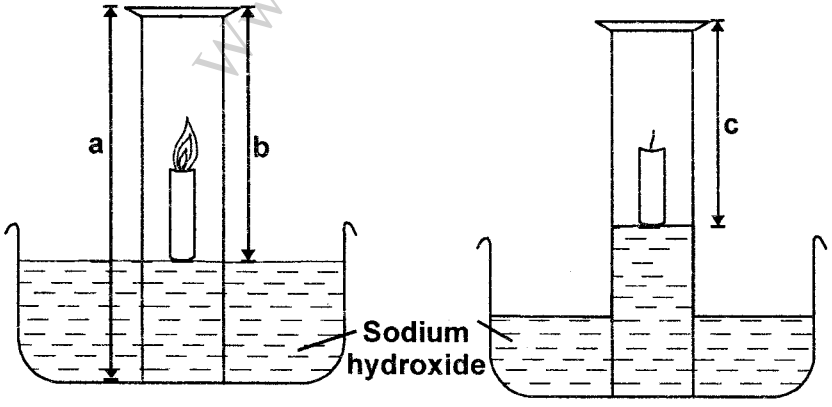
23. A form one student set-up the following apparatus to investigate the percentage of oxygen in air.



i) Why is sodium hydroxide preferred to water in the above experiment? (1 mark)

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ii) Write an equation to show how the percentage of oxygen can be calculated. (1 mark)

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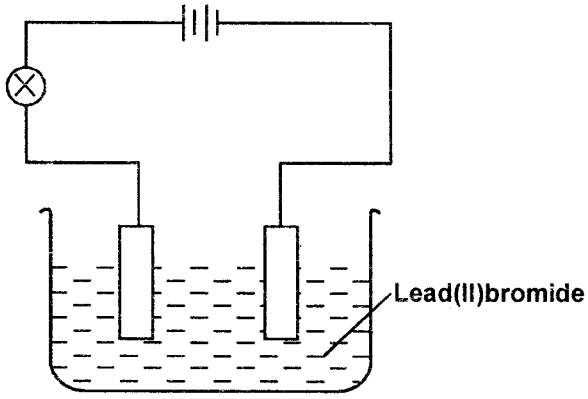
24. Study the set-up below for the electrolysis of molten lead (II) bromide.



a) What is omitted in the set-up? (1 mark)

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b) Write ionic equations for the reaction that took place at the electrodes when the omission is corrected.

i) Anode .....(½ mark)

ii) Cathode .....(½ mark)

c) State the observation made at each electrode.

i) Anode (½ mark)

.....

ii) Cathode (½ mark)

.....

25. A student burnt Magnesium ribbon in a gas jar full of sulphur (IV) oxide gas.

a) State two observation made in the gas jar. (2 marks)

i) .....

ii) .....

b) Write an equation for the reaction that took place. (1 mark)

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26. Study the table below and answer the questions that follow.

Element	Atomic radii (nm)	Ionic radii (nm)
Fluorine	0.071	0.136
Chlorine	0.099	0.181
Bromine	0.114	0.195

Explain why

i) Atomic radii increases from fluorine to bromine. (1 mark)

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ii) The ionic radius of a halogen in larger than its atomic radius. (2 marks)

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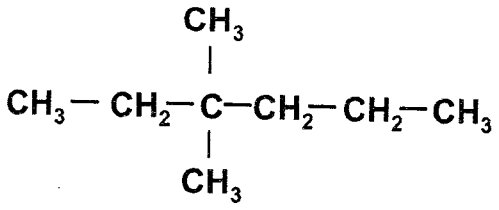
27. a) Name the following organic compound.



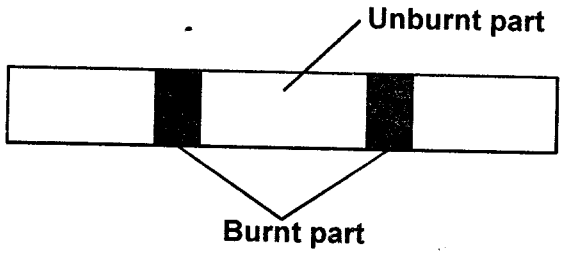
..... (1 mark)

b) Draw the structures of the following;

i) 2 - Bromo-4-chloro-3, 3 - dimethylhex-1-ene (1 mark)

ii) 2 - Bromo - 1 - chloro - 4 - methylpentane (1 mark)

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



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

b) Explain why the splint was burnt as shown in the diagram. (2 marks)

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