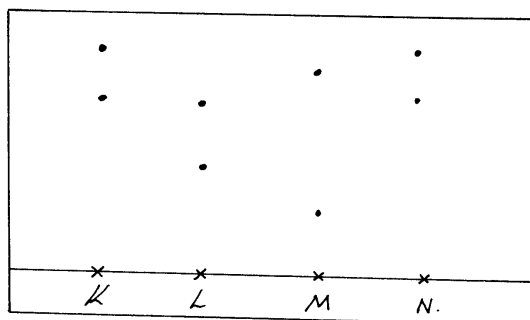**SAMPLE PAPER 3**
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Paper 1

1.   Kibet, Lagat and Maiyo are international athletes. Paper chromatology was used to test for the presence of illegal drugs in their blood. The diagram below shows the chromatogram with the illegal drug labeled N.


   (a) Who among them tested positive for the illegal drug? Explain.   2mks

   (b) Explain what is meant by 'solvent front'   1mk

2.   Potassium hydroxide of mass Yg was dissolved in distilled water to make $200cm^3$ of solution. $100cm^3$ of the solution required $100cm^3$ of 2M nitric acid for complete neutralization. Calculate the value of Y (K=39, O=16, H=1)
                       3mks

3.   In the equilibrium given below, identify the 'acid' in the forward reaction. Explain your answer.   2mks

$$NH_{3(g)} + H_2O_{(l)} \rightleftharpoons NH_4^+{}_{(aq)} + OH^-{}_{(aq)}$$
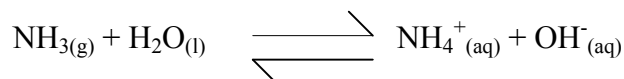
4.   Omolo a student in Soy secondary set up an apparatus as shown for the preparation of dry chlorine gas.
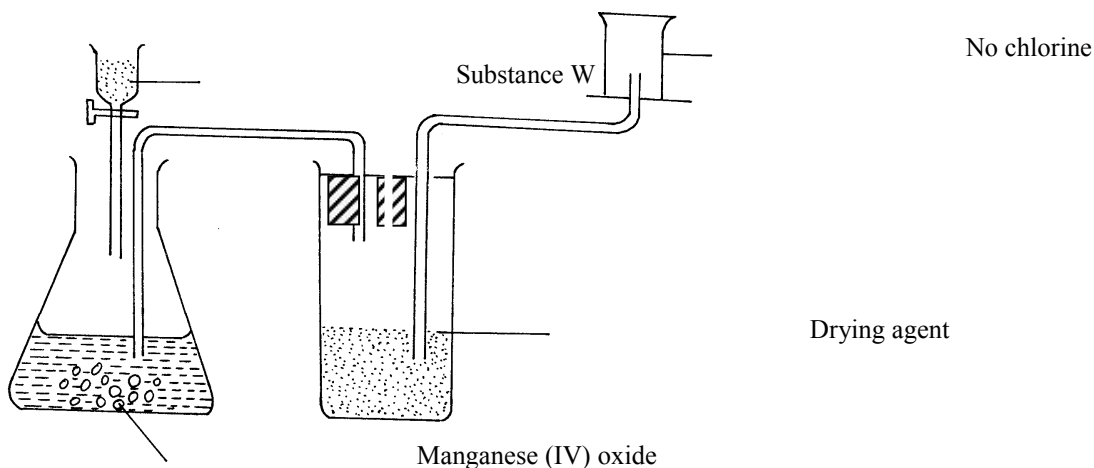
   a) (i) Name substance W.   ½ mk

       (ii) State a suitable drying agent.   ½ mk

b) Identify three mistakes in the set-up. 2mks

5. A solution of hydrogen chloride in methylbenzene does not react with carbonates. However on adding water and then shaking the resulting mixture, there is vigorous effervescence. Explain the above observation.

     3mks

6. Form two students of Ainabkoi Sec. School reacted three elements as shown in the table below.

Element	Reaction with oxygen	Reaction with water
X	Formed acidic oxide	No reaction
Y	Formed basic oxide	Formed soluble hydroxide and gave off hydrogen
Z	Formed acidic oxide	Dissolved to form acidic solution

Which element(s) is / are likely to be

(i) metal (s) ? 1mk

(ii) Non-metal(s)? 1mk

(iii) Insoluble in water? 1mk

7. The diagram below shows how two gases P and Q were collected.

(i)   Q.→   (ii)
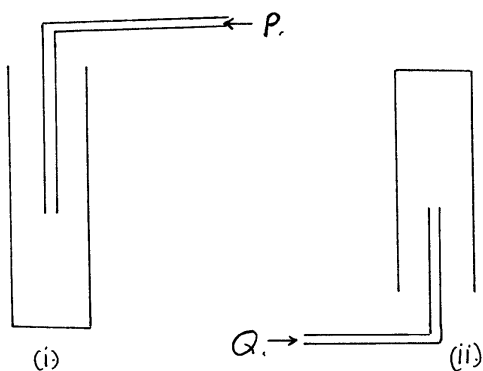
a) Name the two methods used

(i) …………………………………………………………………………… ½ mk

(ii) ………………………………………………………………………….. ½ mk

b) How do the densities of P and Q compare? 2mks

8. The stages shown in the following flow diagram can be used to extract zinc from its oxide.

$C_{(s)} + O_{2(g)}$ → $ZnO_{(s)} + CO_{(g)}$ → $Zn_{(g)}$

$CO_{2(g)} + C_{(s)}$

Stage 1   Stage 2   Stage 3
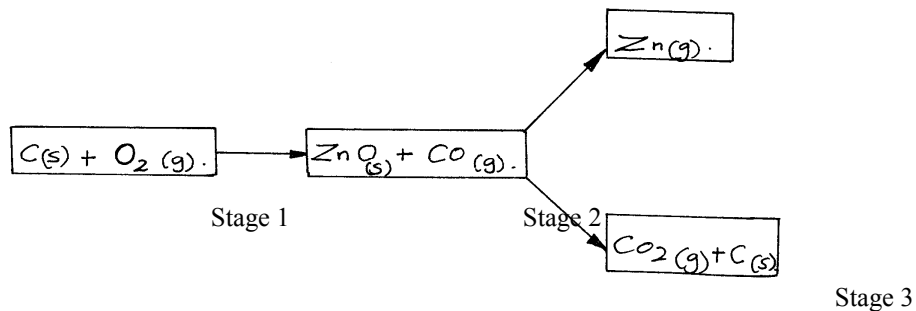
In each stage name the process taking place in it

Stage 1 ……………………………………………………..

Process ………………………………………………………………..

Stage 2 ……………………………………………………..

Process ………………………………………………………………..

Stage 3 ……………………………………………………..

Process   …………………………………………………………………..

         3mks*Kyo*

9.   (i) Copper and graphite conducts electricity. Explain this phenomenon using their structure and bonding.   2mks

(ii)   Diamond is an allotrope of carbon and is the hardest known substance. Explain.

1mk

10.   A student   was provided with the following organic samples CH_3CH_2OH and CH_3CH_2COOH. Explain how the student would distinguish then using a chemical method.
              2mks

11. $10cm^3$ of gaseous hydrocarbon was mixed with $90cm^3$ of oxygen and sparked. The resulting volume at r.t.p was $70cm^3$ which was reduced to $30cm^3$ on shaking with sodium hydroxide. Find the empirical formula of the hydrocarbon.   3mks

12.   a) Write an ionic equation for the reaction between zinc (II) ions in solution and excess ammonia solution.   1mk

b) Name the complex ion formed in the reaction (a) above   1mk

13.   A fixed mass of gas occupies $105cm^3$ at -14^0C and 650mm pressure. At what temperature will it have a volume of $15cm^3$ if the pressure is adjusted to 690 mm pressure?
   3mks

14.   Study the information below and answer the questions that follow. A mixture contains the three gases; Ethene, Hydrogen and Ammonia.

	Water	Concentrated	Concentrated sodium

		sulphuric acid	hydroxide
Ammonia	Very soluble	Very soluble	Very soluble
Hydrogen	Slightly soluble	Insoluble	Insoluble
Ethene	Slightly soluble	Soluble	insoluble

(i) Explain how you would obtain a sample of hydrogen gas from a mixture of the three gases.   2mks

(ii) Write an equation for the reaction between ethene and concentrated sulphuric acid.

1mk

15.   (i) When burning magnesium was lowered in a gas jar full of carbon dioxide, It continued to burn but when burning zinc was lowered into a gas jar full of carbon dioxide, It was put off. Explain the above observations.   2mks

16.   Both ions Y^{2-} and Z^{2+} have an electron configuration 2:8:8

(i) Write the electron arrangement for

Y ……………………………………………………………………………..   ½ mk

Z ……………………………………………………………………………..   ½ mk

(ii) Draw the structure of atom Z given that it has 20 neutrons.   1mk

17.   State and explain the observation you would make when aqeous sulphuric acid is added to anhydrous copper II sulphate.   2mks

18.   Jepkemoi performed an experiment to determine the solubility of potassium chlorate in water at 30^0c. She obtained the following results.

Mass of dish ⟶ 15.86g

Mass of dish + saturated solution at 30^0c ⟶ 26.86g

Mass of dish + solid potassium chlorate after evaporation to dryness ⟶ 16.86g

Calculate the mass of the saturated solution containing 60g of water at 30^0c.   3mks

19.

Start of experiment

End of experiment
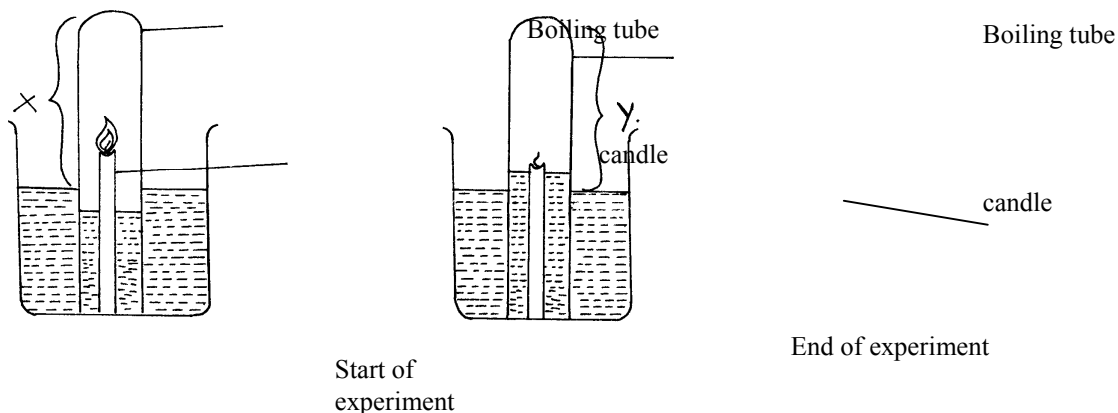
An experiment was set-up as shown above diagram. Study and answer the questions that follow.

a) Write an equation in terms of X and Y to show the percentage of gas used up in the experiment. 1mk

b) Explain what was observed if the red and blue litmus papers were dipped into the water in the test tube at the end of the experiment. 2mks

20. Consider the following data concerning the compounds $AlCl_3$ and $MgCl_2$

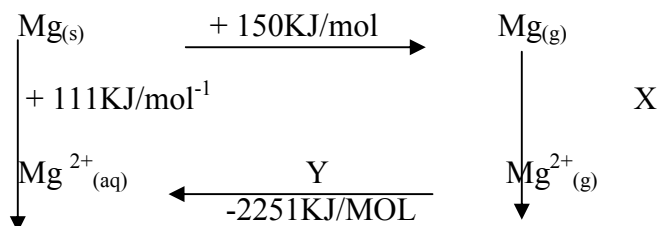|	$AlCl_2$	$MgCl_2$
Action of heat	Sublimes at 453K	Melts at 1690k
R.M.M (Vapour phase)	267	95
Action with water	Reacts (hydrolysed)	Dissolves

Using the data above:

a) Deduce the type of bonding in

(i) $AlCl_3$ 1mk

(ii) $MgCl_2$ 1mk

b) Give the formula of $AlCl_3$ in the vapour phase. 1mk

21. State a physical property used to ascertain the purity of a solid substance. 1mk

22. Use the energy cycle below to answer questions that follow.

$$Mg_{(s)} \xrightarrow{+150KJ/mol} Mg_{(g)}$$

+ 111KJ/mol⁻¹ → $Mg^{2+}_{(aq)}$ X

$Mg^{2+}_{(aq)} \xleftarrow[-2251KJ/MOL]{Y} Mg^{2+}_{(g)}$

(i) Name energy changes X and Y 2mks

(ii) Calculate the energy change X 1mk

23. The structure below represent a cleansing agent which is said to be both a blessing and a curse.

R. — benzene ring — S(=O)(=O) — O⁻Na⁺
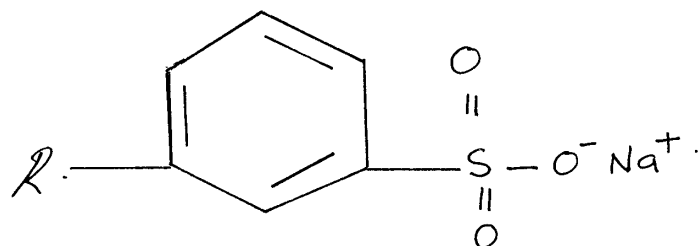
Sodium alkyl benzene sulphonate.

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(i) Which type of cleansing agent does the structure above represent. 1mk

(ii) How is it a blessing. ½ mk

(iii) How is it a curse. ½mk

24. Dinitrogen tetroxide exists in equilibrium with Nitrogen dioxide as shown by the equation below.

$$N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$$

Pale yellow   brown
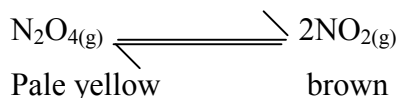
Given that the forward reaction absorbs heat what would be the observation made and the effect of the following on the equilibrium mixture?

(i) Increase in temperature

Observation ………………………………………………………………………………1mk

Effect …………………………………………………………………………… ………. 1mk

25. The diagram below shows the effect of heat on copper(II) nitrate.
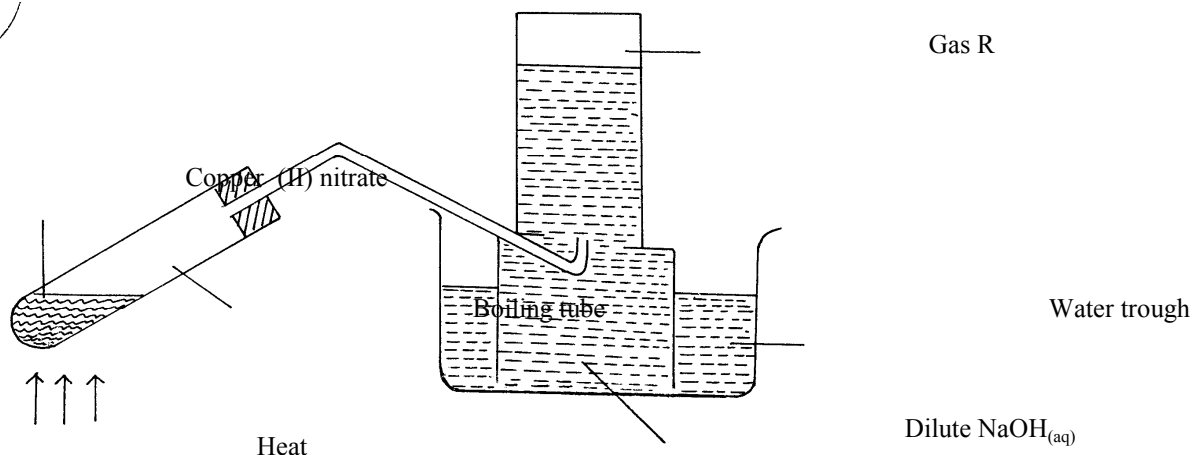
a) State two observations made in the boiling tube. 1mk

b) Write an equation for the reaction that takes place in the water trough. 1mk

c) How would you confirm the identity of gas R? 1mk

26. In the nuclear reaction below (a) identify the value of x and y.

$$^{235}_{92}U + ^{n}_{n}n \rightarrow ^{90}_{42}Sr + ^{X}_{Y}Xe + 3\,^{n}_{0}n + energy$$
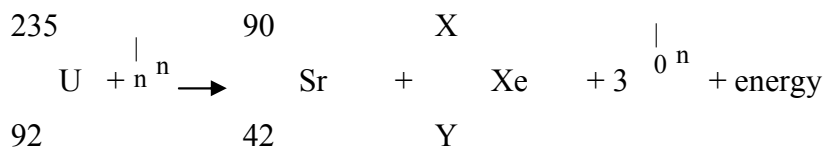
X …………………………………………………………………………… ½ mk

Y …………………………………………………………………………… ½ mk

b) State two applications for radioisotopes. 1mk

27.	Study the electrode potentials for the half-cells given below and answer the questions that follow. (The letters do not represent the actual symbols of the elements).

$N^+_{(aq)} + e^- \rightleftharpoons N_{(s)};$ 	- 2.92volts
$J^+_{(aq)} + e^- \rightleftharpoons J_{(s)};$ 	+ 0.52volts
$Q^+_{(aq)} + e^- \rightleftharpoons \frac{1}{2} Q_{2(g)};$ 	0.00volts
$\frac{1}{2} G_{2(g)} + e^- \rightleftharpoons G_{(aq)};$ 	+ 1.36volts
$M^{2+}_{(aq)} + 2e^- \rightleftharpoons M_{(s)}$ 	- 0.44volts

Explain whether a sulphate solution of J ($J_2SO_{4(aq)}$) can be kept in a container made of element M.

3mks

28.	Write an equation for the reaction between
(i) nitrogen dioxide and lime water. 	1mk
(ii) Concentrated nitric acid and copper metal. 	1mk
(iii) Concentrated nitric acid and sulphur. 	1mk

29.	Calculate the number of particles of chloride ions when the following substances are dissolved in water.
(i) 0.5 moles sodium chloride. 	1 ½ mks
(ii) 0.5 moles of Aluminium chloride. 	1 ½ mks

30.	Explain how electrical conductivity may be used to distinguish between magnesium oxide and silicon (IV) oxide.

	3mks