FORM FOUR CLUSTER KCSE MODEL14

CHEMISTRY PAPER 1 QUESTIONS

1. Element Y has two isotopes, Y and $^{7}_{3}Y$ and $^{6}_{3}Y$.

   i) Determine the number of neutrons in $^{7}_{3}Y$ (1mk)

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   ii) If the relative atomic mass of Y is 6.94, determine the percentage abundance of each isotope.
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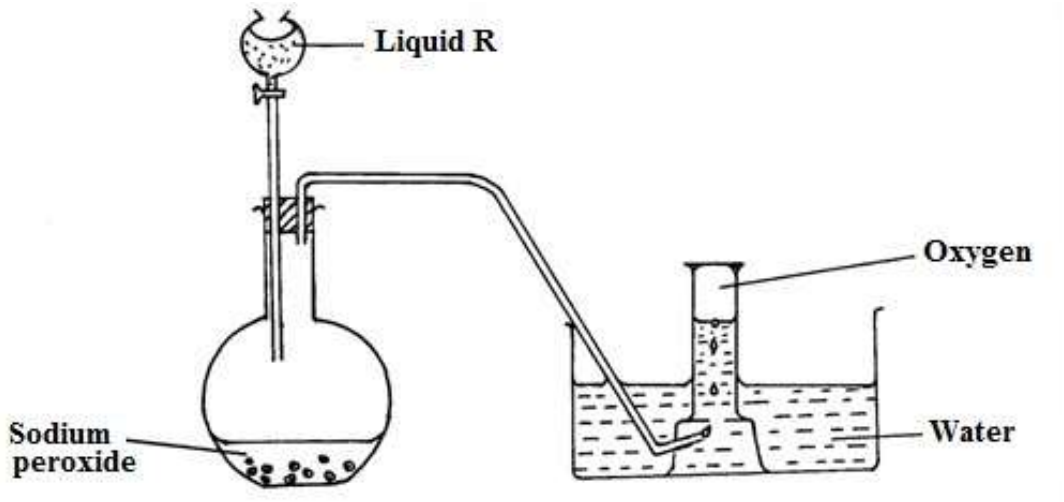
2. The diagram below represents a set up that can be used to prepare oxygen gas.



   a) Name liquid R

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   b) Write an equation for the reaction that takes place in the flat bottomed flask.
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   c) What property of oxygen that makes it possible to be collected as indicated in the set up above.
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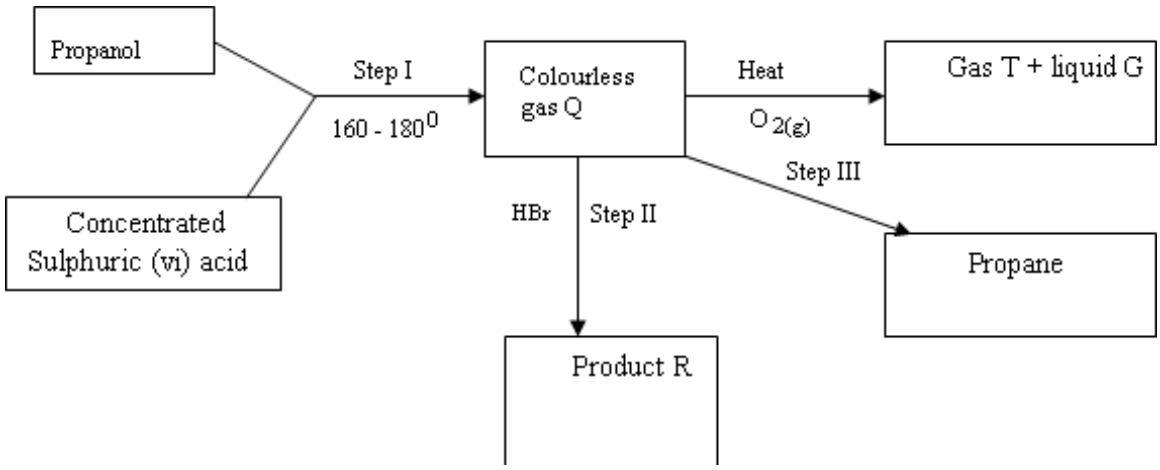
3. When 10g of a mixture of potassium chloride and sodium sulphate is dissolved in water and excess barium chloride solution added, 6.9g of barium sulphate is precipitated. Calculate the composition of the mixture. (Ba= 137; Na = 23.0; S= 32; O=16; K=39; Cl=35.5)

4. Study the reaction scheme below and answer the questions that follow:



i) Name the type of reaction taking place in step I

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ii) State the industrial importance of the reaction taking place in step III.

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iii) Write a balanced equation for the reaction forming gas T.

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5. When solid calcium carbonate was added to a solution of hydrogen chloride in methylbenzene, there was no apparent reaction. On addition of water to the resulting mixture, there was a vigorous effervescence. Explain these observations

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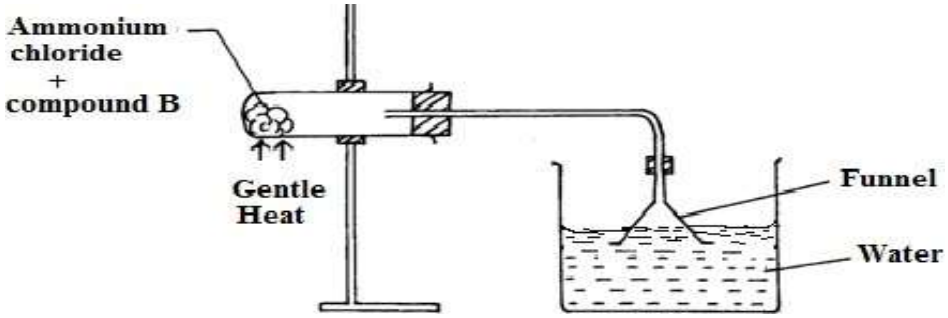
6. The set-up below was used to prepare aqueous solution of ammonia.



a) Name compound B

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b) Why was a funnel used when dissolving ammonia?

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c) Which ion is responsible for the alkaline nature of the ammonia solution?
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7. a) Given the following:-

	$E^{\theta}V$
$Pb^{2+}_{(aq)} + 2e^{-} \rightarrow Pb_{(s)}$	-0.13
$Ag^{+}_{(aq)} + e^{-} \rightarrow Ag_{(s)}$	$+0.80$

Calculate the e.m.f of the electrochemical cell:

$$Pb_{(s)} / Pb^{2+}_{(aq)} // Ag^{+}_{(aq)} / Ag_{(s)}$$

b) 0.726g of metal X were deposited when a current of 0.55Ampheres was passed through an electrolyte for 1 hour and twelve minutes. Determine the charge on the ion of metal X. (Relative atomic mass of X= 59; 1 Faraday =96500 coloumbs).
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8. Study the information in the table below and answer the questions that follows

Element	flourine	chlorine	Bromine
Boiling point (^{0}c)	-188	-35	59

Explain the trend in the boiling points.

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9. a) State Hess's Law (1mk)
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b) Calculate the heat of formation of butane from the following data:-

$C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$	$\Delta H = -393 kJmol^{-1}$
$H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(l)}$	$\Delta H = -286 kJmol^{-1}$
$C_4H_{10\ (g)} + 6\frac{1}{2}O_{2(g)} \rightarrow 4CO_{2(g)} + 5H_2O_{(l)}$	$\Delta H = -2877 kJmol^{-1}$

10. When white crystals of a sodium salt were heated with concentrated sulphuric (VI) acid, a gas G which turns moist blue litmus paper red was evolved. When Manganese (IV) oxide was added to the reaction and the mixture warmed, a gas B was given off.

i) Name gases G and B:- (2mks)

Gas G.....

Gas B.....

ii) What is the purpose of Manganese (IV) oxide in the experiment (1mk)

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11. The table below gives the solubility of potassium bromide and potassium sulphate at 0^0C and 40^0C.

Substance	solubility	(g/100g of water) at:
	0^0C	40^0C
Potassium bromide	55	75
Potassium Sulphate	10	12

When an aqueous mixture containing 60g of potassium bromide and 7g of potassium sulphate in 100g of water at 800c was cooled at 00c some crystals were formed. a) Identify the crystals formed

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b) Determine the mass of the crystals

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c) Name the method used to obtain the crystals

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12. 12. A gaseous compound containing carbon and nitrogen only was burnt completely in oxygen when 250cm3 of the compound was completely burnt, 500cm3 of carbon (IV) oxide and 250cm3 of nitrogen were formed. Determine the formula of the compound.
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13. Explain how you would obtain crystals of sodium carbonate from a mixture of sodium carbonate and calcium carbonate powders.
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14. Briefly explain how you can distinguish between SO_4^{2-} *and* SO_3^{2-} ions

15. a) State Graham's Law of diffusion

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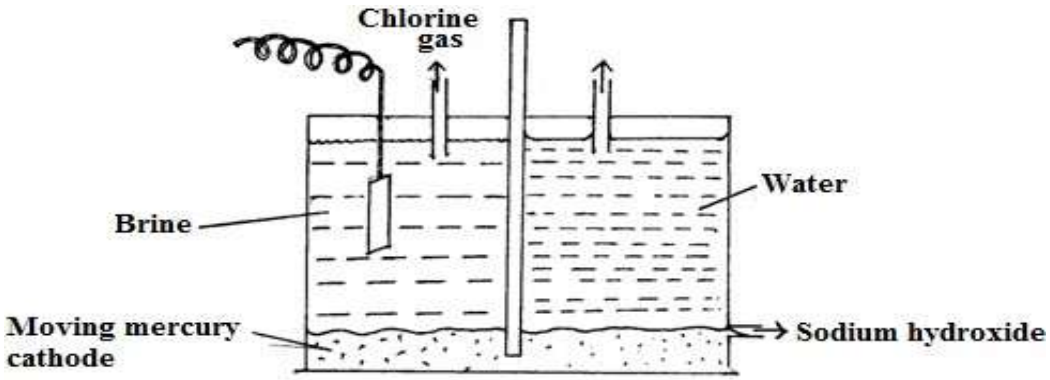
The molar masses of gas X and Y are 32.0 and 44.0 respectively. The rate of diffusion of X through a porous membrane is 12cm3/s.

Calculate the rate of diffusion of gas Y through the same membrane.

19. a) The figure below shows a mercury cell. Study it and answer the questions that follow:-



i) Which other gaseous product is formed?

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ii) State one industrial use of sodium hydroxide

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20. a) Sulphur (IV) oxide is oxidized according to the equation below

$$2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$$

i) Temperature increased to 500^0C.

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ii) Excess oxygen is added

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22. A sample of a gas occupied 45cm3 at 27^0C and 750mmHg pressure. Determine the volume at s.t.p. (2mks)

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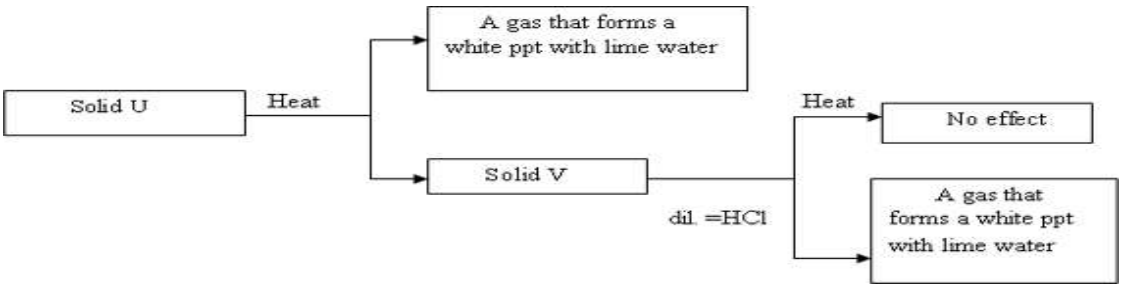
23. Study the flow chart and answer the questions that follows:



Identify solids U and V.

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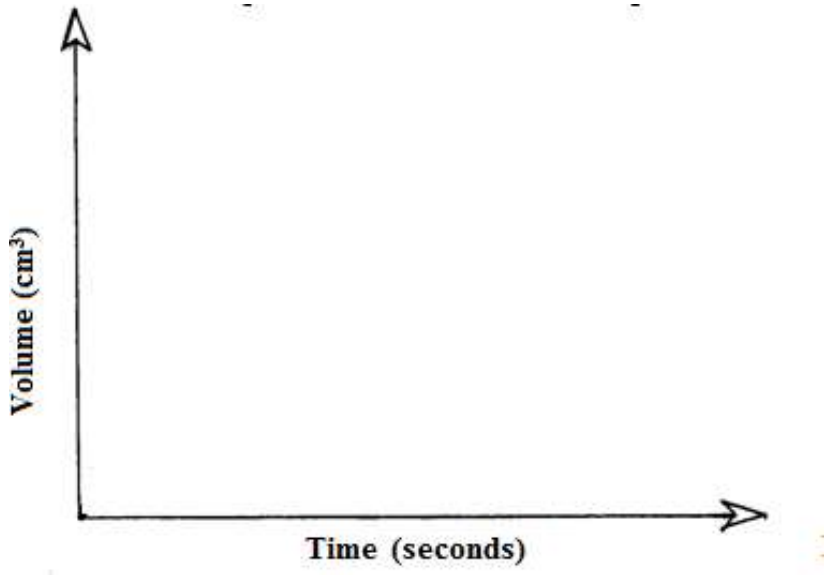
24. In an experiment involving the reaction between magnesium and 1M hydrochloric acid, the volume (cm3) of hydrogen gas produced after t seconds was measured. The experiment was repeated with the same amount of magnesium reacting with 2M hydrochloric acid. On the same axis, sketch the expected results for the two experiments.



25. Using dots (•) and crosses (x) to represent electrons, show bonding in:-

a) The compound formed when silicon reacts with chlorine (Atomic numbers Si = 14, Cl =17)

b) Lithium oxide (Atomic numbers Li = 3; oxygen =8)

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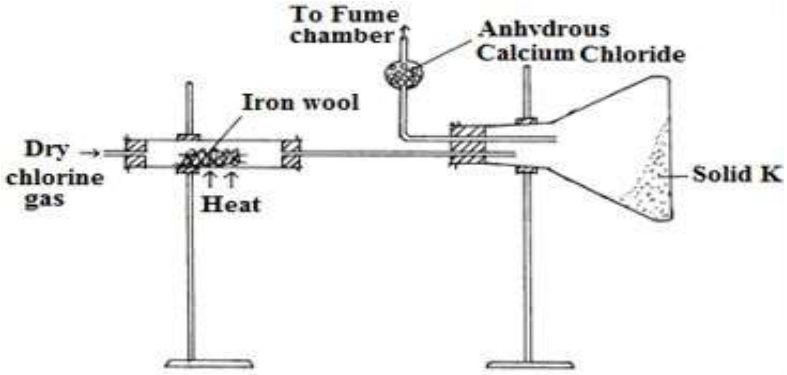
c) Ammonium ion $\left(NH_4^+\right)$ (N =7; H= 1)

26. Below is a set –up used in preparation of a particular salt. Study it and answer the questions that follow:-



i) Write the chemical equation that leads to the formation of solid K.
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ii) What property makes solid K to be collected in the flask as shown above?
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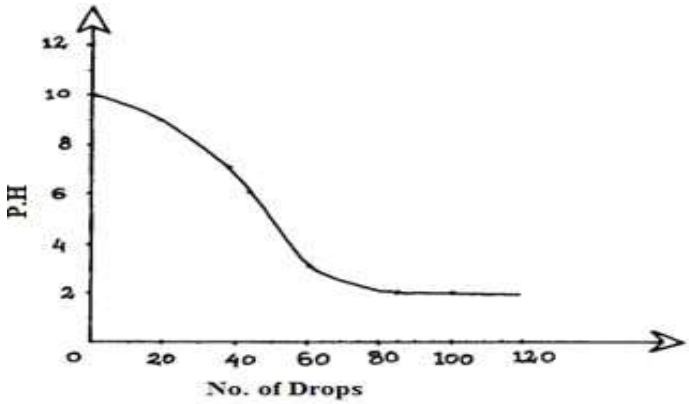
iii) State the purpose of anhydrous calcium chloride in the set- up above.

27. A form four student prepared sodium sulphate from sodium hydroxide and dilute sulphuric (VI) acid. He added 5cm3 of the acid to the alkali at intervals. To monitor the progress of the reaction, the student used the electrical conductivity of the mixture. He plotted the electrical conductivity against the volume of acid used and obtained the graph shown below.

28. Potassium hydroxide of mass Wg was dissolved in distilled water to make 300cm3 of solution. 50cm3 of this solution required 70cm3 of 0.9M sulphuric (VI) acid for complete neutralization. Calculate the value of W (K =39; O=16; H=1)

29. A liquid X is added dropwise to 20cm3 of urea fertilizer $(NH_2)_2CO$ solution.

The pH value of the solution is noted after the addition of every 10 drops. A graph of pH against drops was obtained as shown below.



a) From the evidence on the graph, state the nature of the liquid X. Explain your deduction.
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b) The table below shows solutions and their pH values.

Solution	pH values
P	2.0
Q	7.0
R	14.0

Select two solutions that would react with zinc hydroxide. Explain

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30. State one use of helium gas.