

Name ..... Index Number ...../.....

233/2  
**CHEMISTRY**  
**Paper 2**  
**(THEORY)**  
**Oct./Nov. 2014**  
 2 hours

Candidate's Signature.....

Date .....



**THE KENYA NATIONAL EXAMINATIONS COUNCIL**  
**Kenya Certificate of Secondary Education**  
**CHEMISTRY**  
**Paper 2**  
**(THEORY)**  
 2 hours

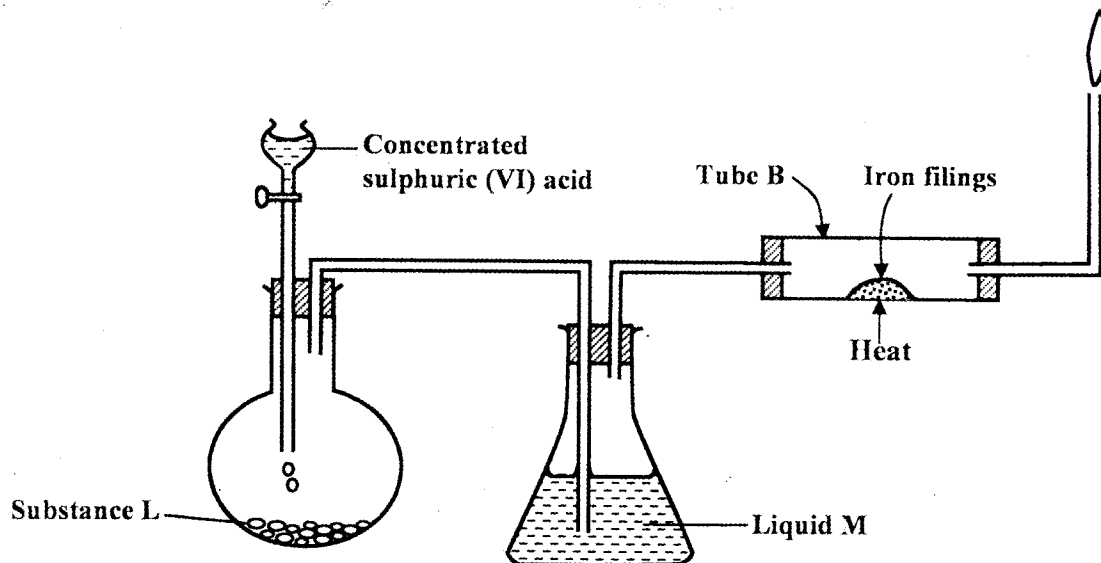
**Instructions to candidates**

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) Answer *all* the questions in the spaces provided.
- (d) KNEC Mathematical tables and silent electronic calculators may be used.
- (e) All working *must* be clearly shown where necessary.
- (f) This paper consists of 15 printed pages.
- (g) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
- (h) Candidates should answer the questions in English.

**For Examiner's Use Only**

Question	Maximum Score	Candidate's Score
1	10	
2	12	
3	13	
4	10	
5	12	
6	10	
7	13	
<b>Total</b>		

- 1 (a) The set-up below was used to prepare dry hydrogen chloride gas, and investigate its effect on heated iron filings.



- (i) Name substance L (1 mark)  
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- (ii) Name liquid M. (1 mark)  
 .....
- (iii) What will be observed in tube B? (1 mark)  
 .....
- (iv) Write an equation for the reaction that occurs in tube B. (1 mark)  
 .....  
 .....
- (v) Why is the gas from tube B burnt? (1 mark)  
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(b) (i) Explain the following observations:

(I) a white precipitate is formed when hydrogen chloride gas is passed through aqueous silver nitrate. (1 mark)

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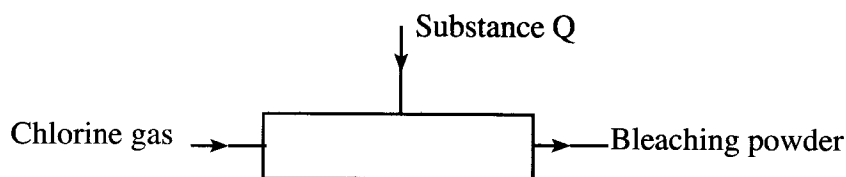
(II) hydrogen chloride gas fumes in ammonia gas. (1 mark)

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(ii) State **two** uses of hydrogen chloride gas. (1 mark)

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(c) The diagram below is a representation of an industrial process for the manufacture of a bleaching powder.



(i) Name substance Q. (1 mark)

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(ii) When the bleaching powder is added to water during washing, a lot of soap is used. Explain. (1 mark)

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- 2 (a) The grid below represents part of the periodic table. Study it and answer the questions that follow. The letters are not the actual symbols of the elements.

A				B		C	
	D			E		F	G
H							

- (i) Select the most reactive metal. Explain. (2 marks)

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- (ii) Select an element that can form an ion with a charge of  $3^-$ . (1 mark)

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- (iii) Select an alkaline earth metal. (1 mark)

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- (iv) Which group 1 element has the highest first ionization energy? Explain. (2 marks)

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- (v) Element A combines with chlorine to form a chloride of A. State the most likely pH value of a solution of a chloride of A. Explain. (2 marks)

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- (b) (i) Explain why molten calcium chloride and magnesium chloride conduct electricity while carbon tetrachloride and silicon tetrachloride do not. (2 marks)

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- (ii) Under the same conditions, gaseous neon was found to diffuse faster than gaseous fluorine. Explain this observation. (F = 19.0; Ne = 20.0) (2 marks)

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3 (a) Draw the structures of the following:

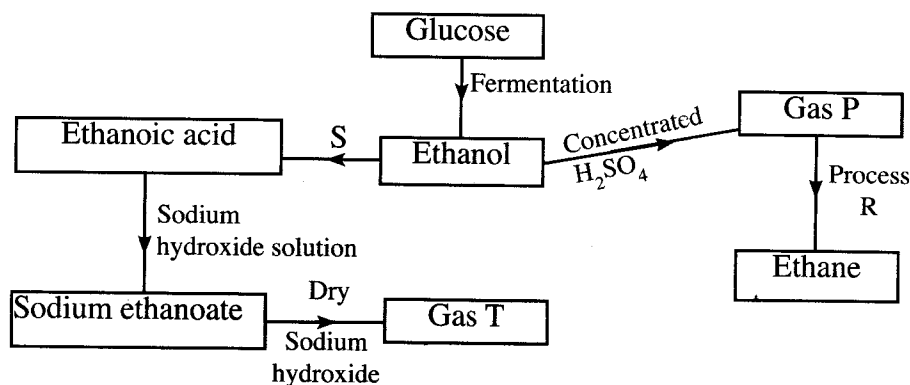
- (i) Butan-1-ol (1 mark)

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- (ii) Hexanoic acid. (1 mark)

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(b) Study the flow chart below and answer the questions that follow.



(i) State the conditions necessary for fermentation of glucose to take place. (1 mark)

(ii) State **one** reagent that can be used to carry out process S. (1 mark)

(iii) Identify gases: (2 marks)

P:.....

T:.....

(iv) How is sodium hydroxide kept dry during the reaction? (1 mark)

(v) Give **one** commercial use of process R. (1 mark)

(c) When one mole of ethanol is completely burnt in air, 1370kJ of heat energy is released. Given that 1 litre of ethanol is 780g, calculate the amount of heat energy released when 1 litre of ethanol is completely burnt. (3 marks)  
(C = 12.0; H= 1.0; O = 16.0)

- (d) State **two** uses of ethanol other than as an alcoholic drink. (2 marks)

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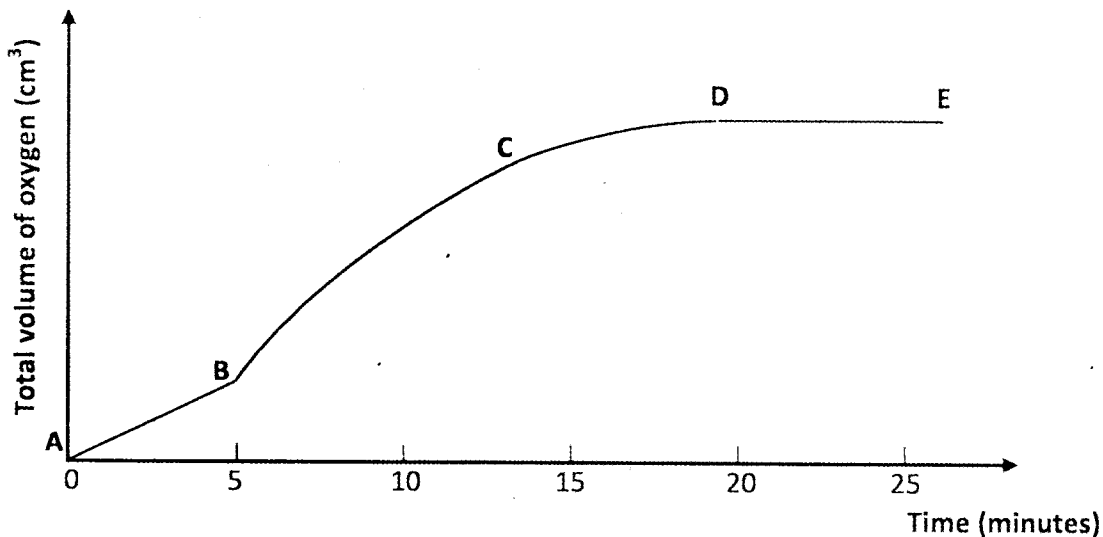
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- 4 (a) Other than temperature, state **two** factors that determine the rate of a chemical reaction. (1 mark)

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- (b) A solution of hydrogen peroxide was allowed to decompose and the oxygen gas given off collected. After 5 minutes, substance **G** was added to the solution of hydrogen peroxide. The total volume of oxygen evolved was plotted against time as shown in the graph below.



- (i) Describe the procedure of determining the rate of the reaction at minute 12. (3 marks)

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- (ii) How does the production of oxygen in region AB compare with that in region BC? Explain. (2 marks)

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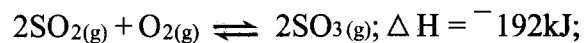
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- (iii) Write an equation to show the decomposition of hydrogen peroxide. (1 mark)

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- (c) Sulphur (IV) oxide reacts with oxygen to form Sulphur (VI) oxide as shown in the equation below:



- (i) Explain the effect on the yield of  $\text{SO}_3$  of lowering the temperature for this reaction. (2 marks)

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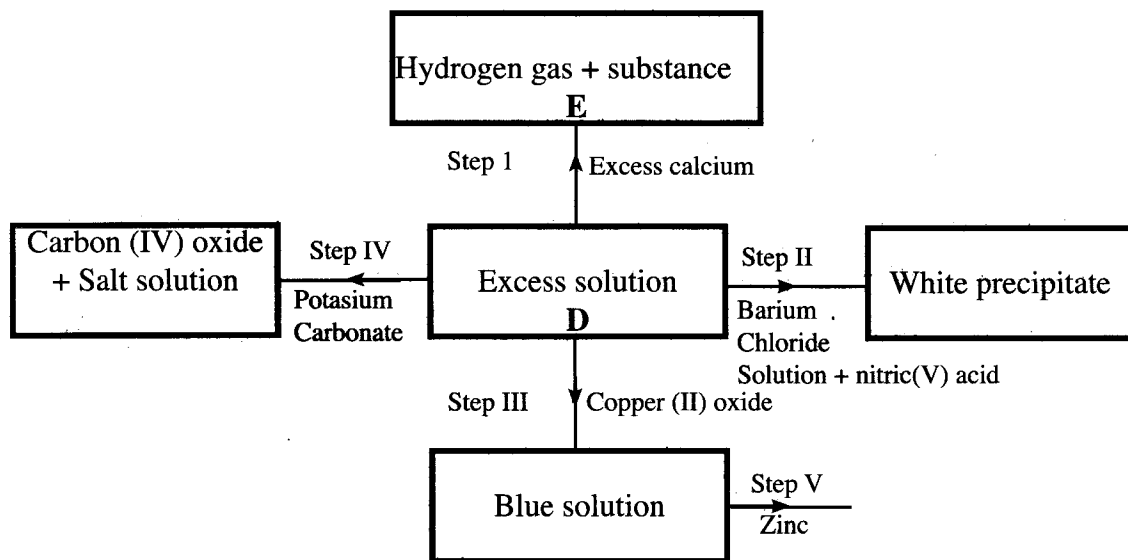
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- (ii) Name **one** catalyst used for the reaction. (1 mark)

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- 5 (a) The scheme below shows some of the reactions of solution **D**. Study it and answer the questions that follow.



- (i) Give a possible cation present in solution **D**. (1 mark)

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- (ii) Write an ionic equation for the reaction in Step II. (1 mark)

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- (iii) What observations would be made in Step V? Give a reason. (2 marks)

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- (iv) Explain why the total volume of hydrogen gas produced in step 1 was found to be very low although calcium and solution **D** were in excess. (2 marks)

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- (v) State **one** use of substance **E**. (1 mark)

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- (b) Starting with solid sodium chloride, describe how a pure sample of lead (II) chloride can be prepared in the laboratory. (3 marks)

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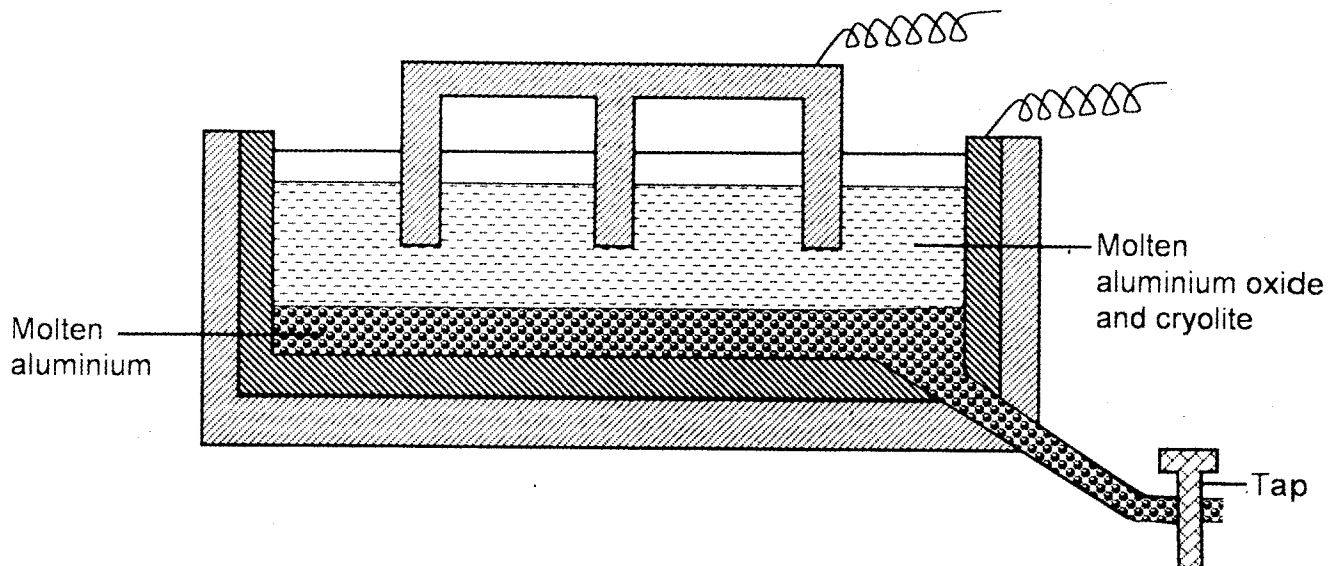
- (c) (i) State a property of anhydrous calcium chloride which makes it suitable for use as a drying agent for chlorine gas. (1 mark)

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- (ii) Name another substance that can be used to dry chlorine gas. (1 mark)

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6 The diagram below represents a set up of an electrolytic cell that can be used in the production of aluminium.



(a) On the diagram, label the anode. (1 mark)

(b) Write the equation for the reaction at the anode. (1 mark)

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(c) Give a reason why the electrolytic process is not carried out below 950°C. (1 mark)

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- (d) Give a reason why the production of aluminium is not carried out using reduction process. (1 mark)

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- (e) Give **two** reasons why only the aluminium ions are discharged. (2 marks)

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- (f) State **two** properties of duralumin that makes it suitable for use in aircraft industry. (2 marks)

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- (g) Name **two** environmental effects caused by extraction of aluminium. (2 marks)

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7. (a) Dissolving of potassium nitrate in water is an endothermic process. Explain the effect of increase in temperature on the solubility of potassium nitrate.

(2 marks)

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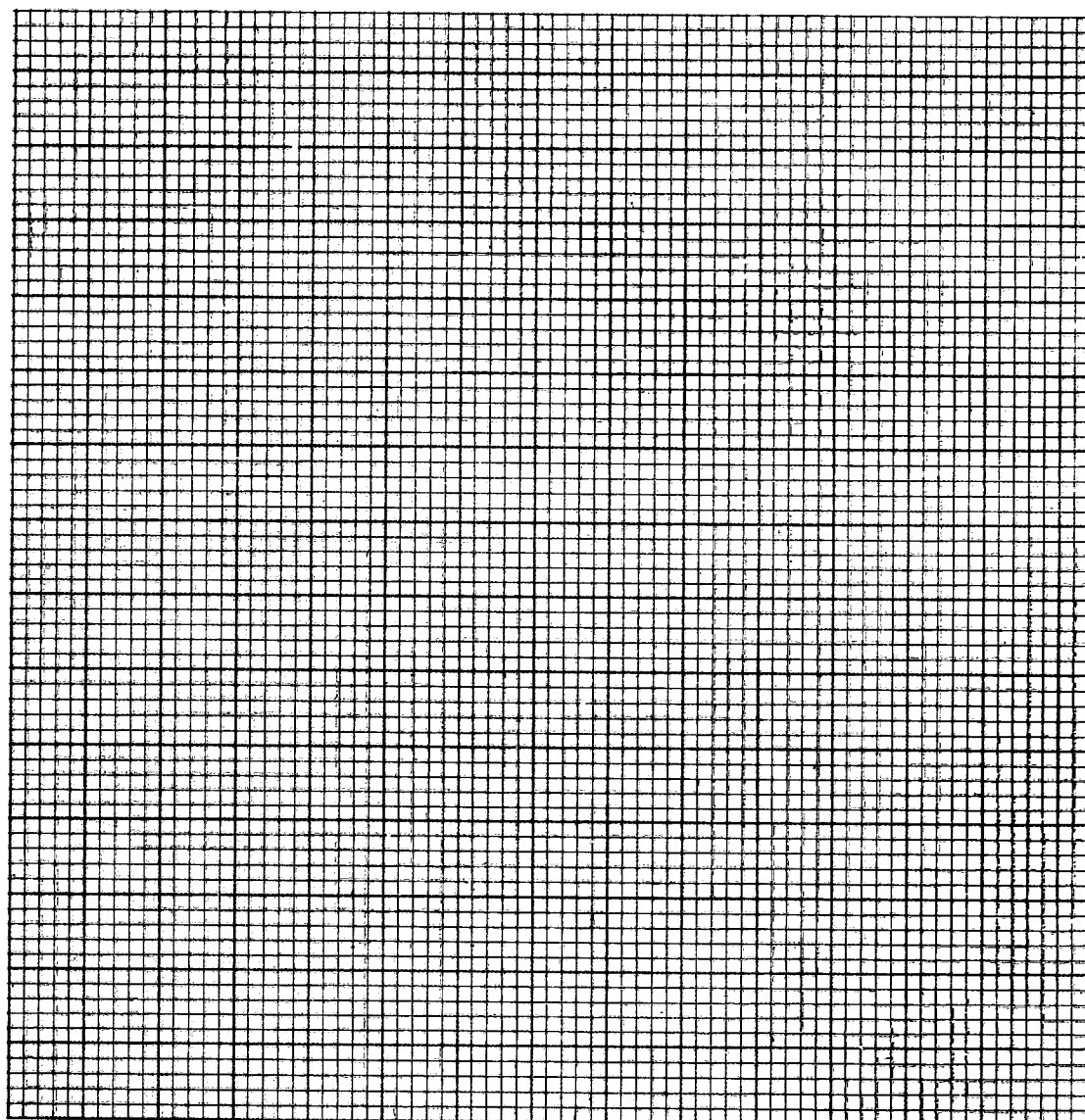
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- (b) The table below shows the solubilities of potassium sulphate and potassium chlorate (V) at different temperatures.

Temperature ( $^{\circ}\text{C}$ )	0	20	40	60	80	100
Solubility of $\text{K}_2\text{SO}_4$ g/100g water	8.0	10.0	14.0	17.5	20.0	22.0
Solubility of $\text{KClO}_3$ g/100g water	3.0	5.0	15.5	24.0	38.0	53.0

- (i) Draw the solubility curves for both salts on the same axis. (Temperature on the X-axis). (3 marks)



(ii) A solution of potassium sulphate contains 20g of the salt dissolved in 100g of water at 100°C. This solution is allowed to cool to 25°C.

I At what temperature will crystals first appear? (1 mark)

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II What mass of crystals will be present at 25°C? (1 mark)

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(iii) Which of the **two** salts is more soluble at 30°C? (1 mark)

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(iv) Determine the concentration of potassium sulphate in moles per litre when the solubility of the two salts are the same (K = 39.0, O = 16.0; S = 32.0). (3 marks)

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(v) 100g of water at 100°C contains 19g of potassium sulphate and 19g of potassium chlorate (V). Describe how a solid sample of potassium sulphate at 60°C can be obtained. (2 marks)

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