

FORM FOUR CLUSTER KCSE MODEL2

CHEMISTRY PAPER 2 QUESTIONS

1. Study the following table of elements and answer the questions that follow. The letters are not the actual symbols of the elements.

${}_{12}^{24}A$	${}_{13}^{27}B$	${}_{16}^{32}T$	${}_{17}^{36}E$
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a) State the following:

- i. Atomic number of element A. (½ mark)

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- ii. Atomic number of element B. (½ mark)

.....

- iii. Number of neutrons in element T. (½ mark)

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- iv. Electronic configuration of element E. (½ mark)

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- b) To which period of the periodic table do the elements belong? Explain. (2 marks)

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.....
.....

c) What's the nature of the oxide formed by

- i. Element A (½ mark)

.....

- ii. Element T (½ mark)

.....

d) The diagram below is a grid of the periodic table with some elements represented by the letters A to K. Use it to answer the questions that follow.

A			D	E	F	
B				J	G	
C				K	H	

- i. Write the formulae of the oxides of (2 marks)

A.....

E.....

ii. Write down the electronic configuration of the ions of (2 marks)

J

B

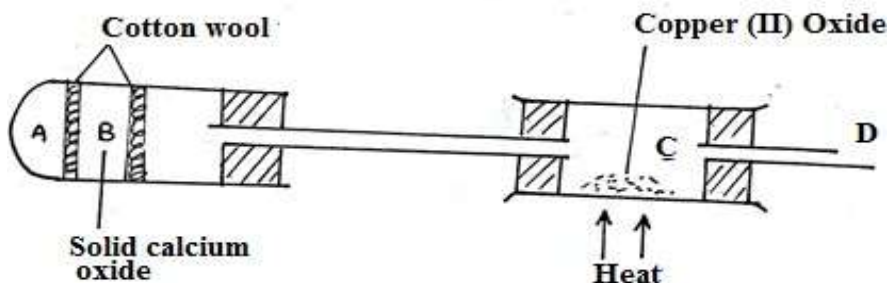
iii. What type of structure is exhibited by element J? (1 mark)

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iv. Explain the trend in the values of the first ionization energies of elements A, B and C. (2 marks)

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2. a) Study the diagram below and answer the questions below.



Ammonia is produced by heating a mixture of A in a test tube. The ammonia gas is then passed over heated copper (II) oxide in the combustion tube.

i. What mixture can be placed at A? (1 mark)

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ii. What can be observed at C? (1 mark)

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.....

iii. Write an equation of the reaction that takes place in the combustion tube.(1 mark)

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iv. State any two uses of ammonia gas. (2 marks)

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b) The following information was obtained from an investigation involving potassium sulphate solution at 50°C.

Mass of evaporating dish =42.5 g

Mass of dish + saturated solution =130.0g

Mass of dish +dry potassium sulphate =90.7 g

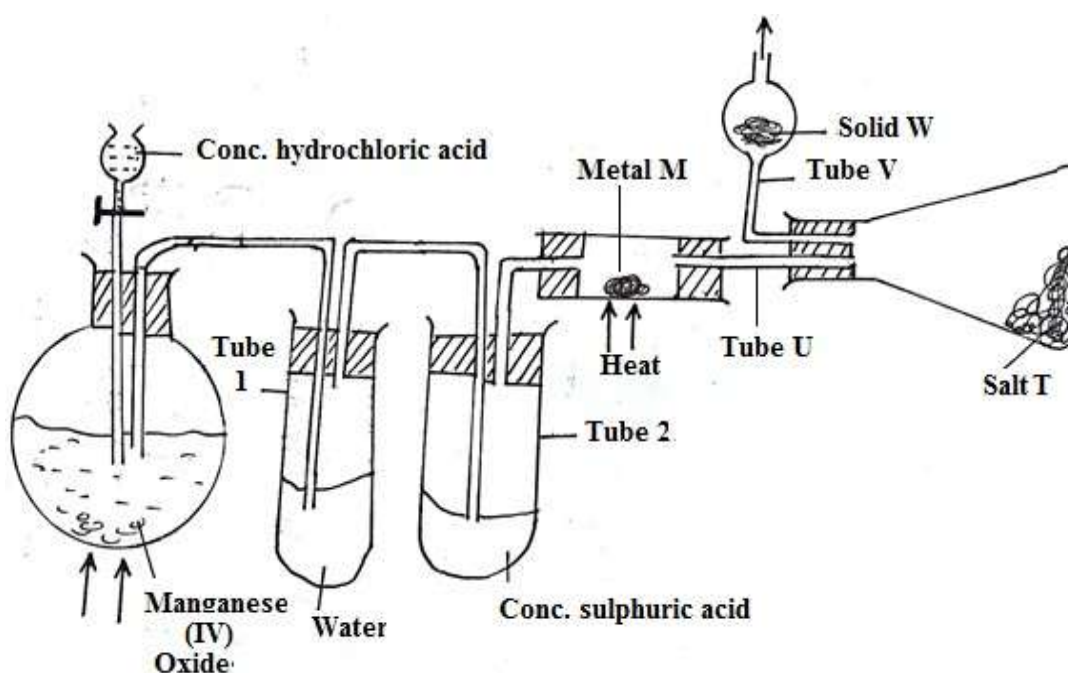
Determine the:

- i. Mass of saturated solution. (1 mark)
- ii. Maximum mass of potassium sulphate that was dissolved in the saturated solution. (1 mark)
- iii. Mass of water present in the saturated solution. (1 mark)
- iv. Solubility of potassium sulphate at 50°C. (2 marks)

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3. a) A student set-up an apparatus as shown in the diagram below to prepare an anhydrous salt of metal M.

Study the diagram and answer the questions that follow.



i. Identify the mistake in the set up. (1

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ii. Potassium manganate (VII) can be used instead of manganese (IV) oxide. In this case heating is not required.

Explain. (1 mark)

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iii. Write the equation for the reaction between concentrated hydrochloric acid and manganese (IV) oxide. (1 mark)

b) What is the function of i. Water in tube I? (1 mark)

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ii. Concentrated sulphuric acid in tube 2? (1 mark)

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iii. Tube V? (1 mark)

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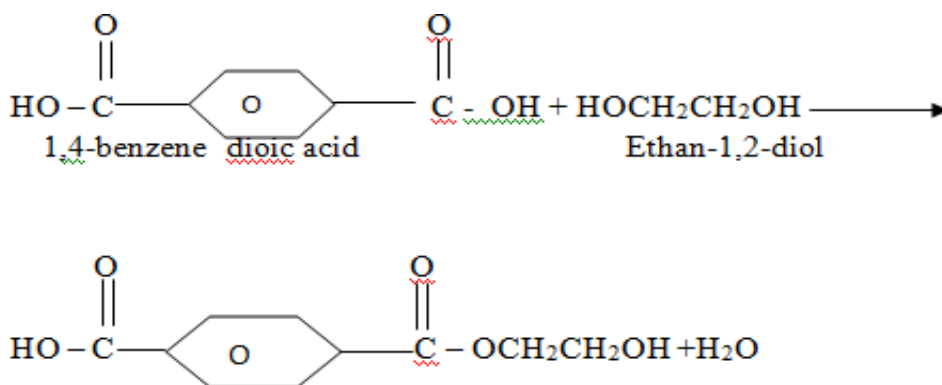
c (i) Suggest a suitable reagent that can be used as solid W. (1 mark)

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(ii) What is the function of solid W? (1 mark)

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.....

d) In the reaction above, 0.675g of metal M reacted completely with 1800cm³ of chloride gas at room temperature. Determine the molecular formula of the chloride formed, given that its relative molecular mass is 267. (M=27.0, Cl=35.5, Molar gas volume at room temperature. =24l) (3 marks)

4. a) The reaction below is used during the formation of a certain class of synthetic polymers. Study it and answer the questions that follow.



i. Name the class of the polymers that are made using this reaction. (1 mark)

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ii. The polymer formed is an example of condensation polymer. Explain why this is so? (1 mark)

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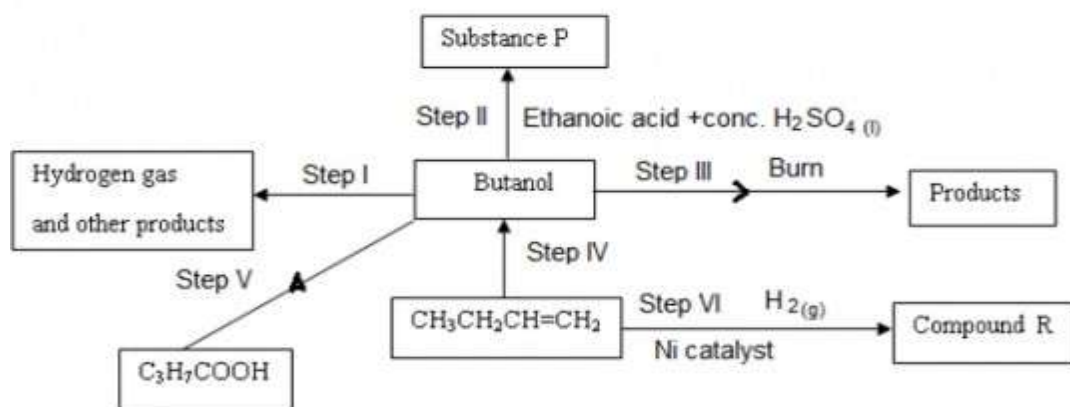
iii. Give the structural formula of a molecule of the polymer. (1 mark)

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.....

iv. Give one commercial use of the polymer. (1 mark)

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.....

b) The flow chart below shows a series of reactions in organic compounds. Use it to answer the questions that follow.



i. Give the structural formula and name of the compound labeled R. (1 mark)

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ii. Write an equation for the reaction in step III. (1 mark)

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iii. Name the reagents and conditions necessary for the reactions in step IV (1 mark)

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iv. Give the most suitable reagent for the reaction in step V. Give a reason. (1 mark)

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v. In an experiment, excess magnesium ribbon was placed in butanoic acid and the gas produced was measured at 5 seconds intervals.

a) Write an equation for the reaction. (1 mark)

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b) Using the information in v (a) above, sketch a curve of volume against time of the gas produced in the above reaction. (2 marks)

c) On the same grid, sketch the curve that would be obtained if hydrochloric acid of the same volume and concentration of butanoic acid was used. Label it T. (1 mark)

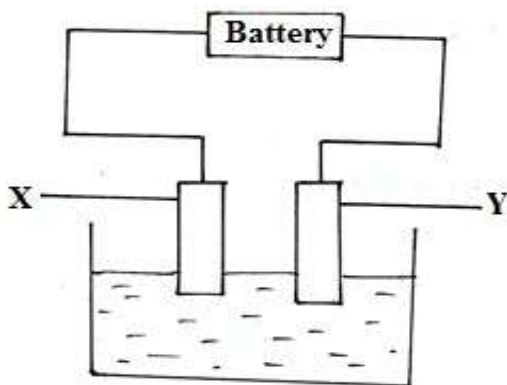
vi. Suggest a suitable reagent that can be used in step I. (1 mark)

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vii. What is the identity of substance P (1 mark)

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5. a) The set up below was used to investigate the products formed at the electrodes during electrolysis of a dilute solution of magnesium sulphate using inert electrodes.



i. Name two substances that can be used as X and Y (electrodes) (1 mark)

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ii. During electrolysis, hydrogen gas was formed at electrode Y. Identify the anode.

Give a reason for your answer. (2 marks)

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iii. Write the equation for the reaction that takes place at electrode X. (1 mark)

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iv. Why is the concentration of magnesium sulphate expected to increase during electrolysis? (2 marks)

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v. What will be observed if red and blue litmus papers were dipped into the solution after electrolysis. (2 marks)

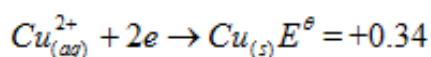
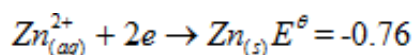
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vi. During electrolysis of magnesium sulphate, a current of 0.3A was passed for 30 minutes. Calculate the volume of gas produced at the anode. (3 marks) (Molar gas volume=24 litres) (IF =96500C)

vii. State two applications of electrolysis. (1 mark)

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b) Given the following reduction potentials:



Can a container made of zinc store a solution of copper (II) sulphate? Explain. (2 marks)

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6. A form four student from Lutacho high school burnt 0.4 g of ethanol () 52 OH HC and then used the heat produced to warm 200 g of water in a calorimeter. He then made the data below. Initial temperature of water =300C

Final temperature of water = 45°C Molar mass of ethanol = 46 g. Specific heat capacity of water = 4.2 J g⁻¹ K⁻¹

a) Write the equation of the reaction between ethanol and air. (1 mark)

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b) What is meant by molar enthalpy of combustion of substance? (1 mark)

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c) Calculate the molar enthalpy of combustion of ethanol (assume the heat absorbed by the calorimeter is negligible). (2 marks)

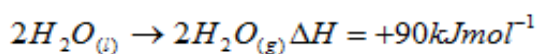
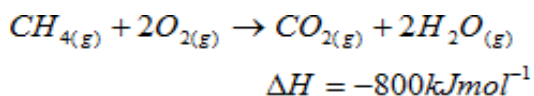
d) The experiment value obtained above was found to be lower than the actual value. Explain. (1 mark)

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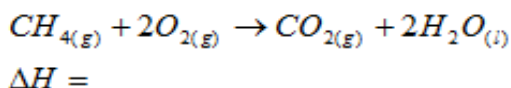
e) (i) State Hess's law of heat summation. (1 mark)

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(ii) Consider the equations below. (2 marks)

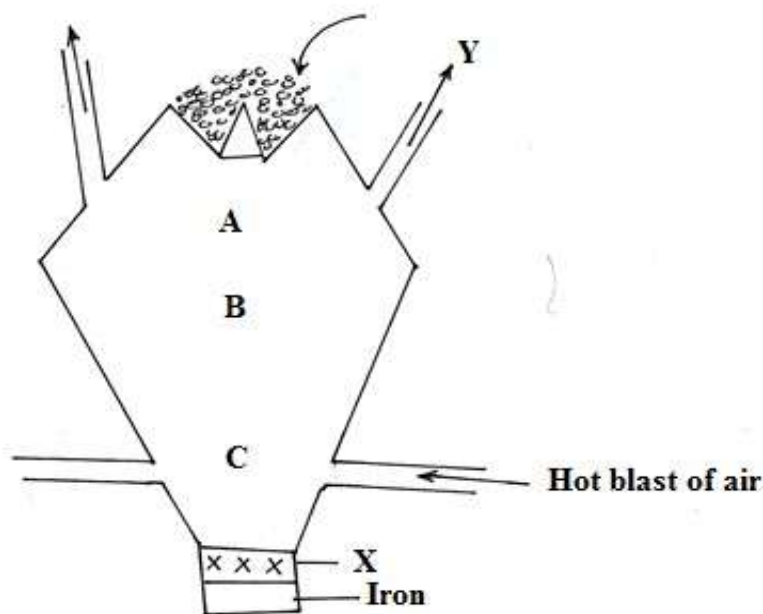


Work out the enthalpy change for the reaction.



7. The diagram below represents a blast furnace used in the extraction of iron from its ore.

Study it and answer the questions that follow.



a) Give the name of the main ore used to extract iron. (½ mark)

b) The ore is mixed with coke and limestone. State the role of each in the extraction of iron.

i) Coke.....(1mark)

ii) Limestone.....(1mark)

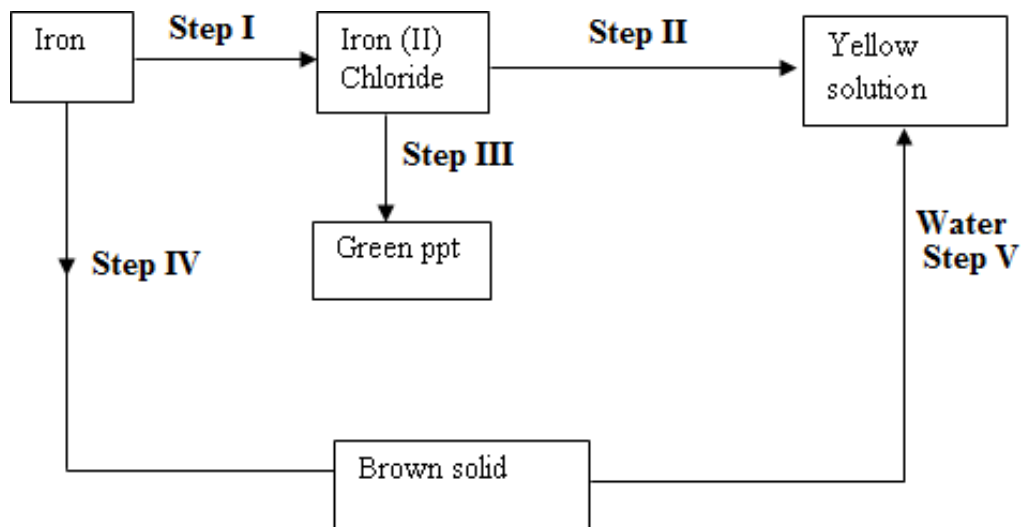
c) Write equations of the reactions that produce iron in the blast furnace. (2marks)

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d) Give the chemical name of X. (½ mark)

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II. Iron metal was subjected to a series of reactions as shown in the scheme below. Study it and use it to answer the questions that follow.



a) Identify the reagent that can be used in Step I (½ mark)

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Step II (½ mark)

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b) Describe fully how you would obtain crystals of iron (II) chloride. (2 marks)

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c) Write equations for the reactions that occur in: Step III (1 mark)

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Step I (1 mark)

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d) Name the process in step (IV) (1 mark)

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e) State one use of iron metal. (1 mark)

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