

Name Index No.

School Candidates signature

233/2

Date

CHEMISTRY

Paper 2

(Theory)

July 2018

Time : 2 Hours

FORM 4 END OF TERM 2 EXAM

CHEMISTRY

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INSTRUCTIONS TO CANDIDATES

- Write your name and index number in the spaces provided.
- Sign and write the date of examination in the spaces provided.
- Answer **all** questions in the spaces provided in the question paper.
- Mathematical tables and silent calculators may be used.
- All working must be clearly shown where necessary.
- Candidates should check the question paper to ascertain that all pages are printed.
- Use English when answering the questions.

For Examiner's Use Only

Question	Maximum Score	Candidate's score
1	12	
2	13	
3	12	
4	11	
5	10	
6	12	
7	10	
Total	80	

1. a) The table below shows the ions of elements W, X, Y, Z and their electron arrangement. The letters do not represent the actual symbols of the element.

Ion	Electron configuration
W^-	2.8.8
X^{2+}	2.8.8
Y^{3+}	2.8
Z^{2-}	2.8

- i) Which two elements belong to the same period? Give a reason. (2 marks)

.....

- ii) In which group of the periodic table does Y belong? (1 mark)

.....

- iii) Write the formula of the compound formed between W and X. (1 mark)

.....

- iv) What type of bond is formed between W and X. Explain. (2 marks)

.....

- b) i) What is a coordinate bond? (1 mark)

.....

- ii) Draw a dot (•) and cross (x) diagram showing bonding in the hydroxonium ion H_3O^+ (2 marks)
 (H = 1, O = 8)

.....

- c) Aluminium chloride and sodium chloride are both chlorides of period 3 elements. Use this information to explain the following observations.

- i) A solution of $AlCl_3$ in water turns blue litmus paper red while that of sodium chloride does not. (1½ marks)

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ii) The melting point of sodium chloride 801°C is higher than that of AlCl₃ (180°C) (1½ marks)

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2. a) What is meant by molar heat of neutralisation ? (1 mark)

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.....

b) State Hess law. (1 mark)

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.....

c) Given the following molar heat of combustion of graphite, hydrogen and anthracene (C₁₄H₁₀) as

$$\Delta H_c^{\ominus}(\text{graphite}) = -394 \text{KJmol}^{-1}$$

$$\Delta H_c^{\ominus}(\text{H}_2\text{g}) = -286 \text{KJmol}^{-1}$$

$$\Delta H_c^{\ominus}(\text{C}_{14}\text{H}_{10}) = -7114 \text{KJmol}^{-1}$$

i) Write the equation for the formation of anthracene. (1 mark)

.....
.....

ii) Draw an energy cycle diagram that links heat of formation of anthracene with heat of combustion of hydrogen, graphite and anthracene. (2 marks)

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Hence calculate the standard heat of formation of anthracene. (2 marks)

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d) i) When excess iron fillings were added to 25.0cm³ of 0.4M copper (II) sulphate solution, temperature rose by 15.0°C. Other than rise in temperature state and explain any other observation made. (2 marks)

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ii) Determine the molar heat change. (3 marks)

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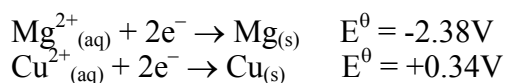
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iii) Draw an energy level diagram to represent the above reaction. (1 mark)



3. Given the following



a) Identify the reducing agent. (1 mark)

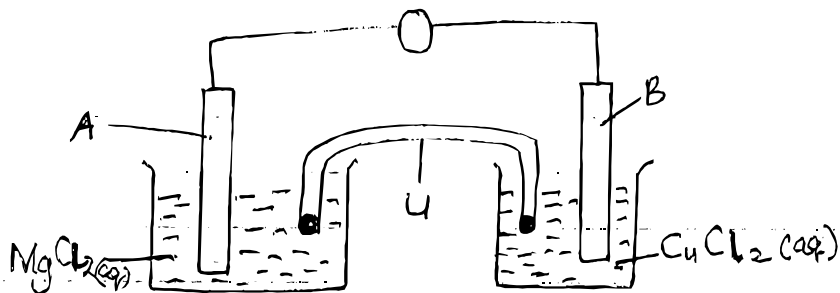
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b) Write the ionic equation for the reaction that takes place when magnesium ribbon is dipped in a solution of copper (II) ions. (1 mark)

.....

.....

e) The diagram below shows an electrochemical cells. Study it and answer the questions that follows.



i) Identify the metal that makes electrodes A and B (1 mark)

A

B

ii) Show on the diagram using an arrow, the direction of flow of electron. (1 mark)

d) Starting with solid copper (II) sulphate, describe how solid copper (II) hydroxide can be obtained. (2 marks)

.....

e) Explain why lead nitrate solution cannot be used to fill the part labelled U. (1 mark)

.....

f) In another experiment copper was purified using electrolysis.

i) Draw a diagram to show how the process would be carried out. (2 marks)

.....

ii) A current of 3A was passed through a solution of copper (II) ions for 3 hours 30min. Determine the mass of copper deposit (Cu= 63.5, Faraday = 96500C) (3 marks)

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4. a) Give the names of the following compounds.

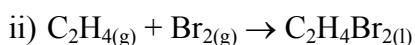
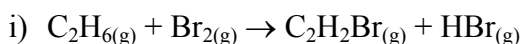
i) $\text{CH}_3\text{CH} = \text{CHCH}_2\text{CH}_3$ (1 mark)

.....

ii) $\text{CH}_3\text{CH}_2\text{CH}_2$ (1 mark)

.....

b) Ethane and ethene reacts with bromine according to the equation given below.

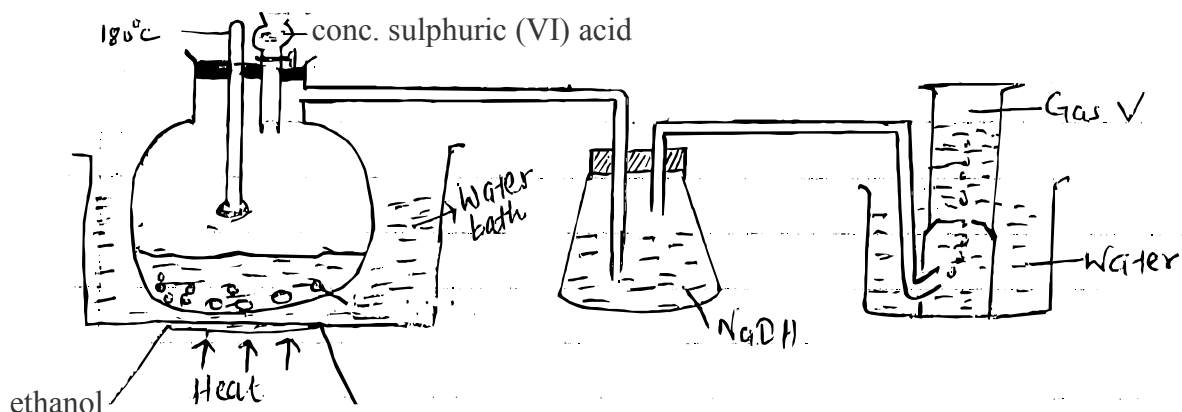


Name the type of bromination reaction that takes place in : (2 marks)

i)

ii)

c) The set up below was used to prepare gas V.



i) Name gas V (1 mark)

.....

ii) What is the role of :

a) Broken porcelain (1 mark)

.....

b) Sodium hydroxide (1 mark)

.....

iii) Explain why water bath is used instead of direct heating is the above set up. (1 mark)

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.....

.....

c) Draw the structural formula of a portion of the polymer which contains three repeating units of the monomer.

C_2F_4 (1 mark)

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.....

.....

e) State any two advantages that synthetic polymers have over natural polymers. (2 marks)

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5. a) A student was supplied with a colourless liquid suspected to be water.

i) Describe one chemical test that could have been used to show that the liquid was water. (2 marks)

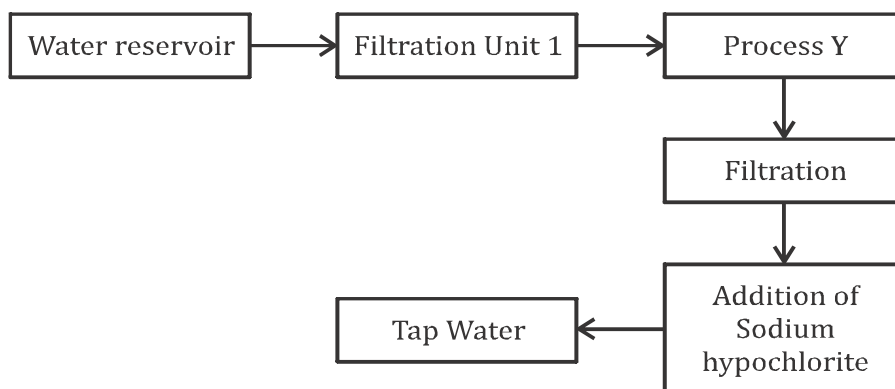
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ii) How could it have been shown that the liquid was pure water? (1 mark)

.....

.....

b) The flow chart below shows the various stages of water treatment. Study it and answer the questions that follow.



i) Which substances are likely to be removed in filtration unit 1? (1 mark)

.....

ii) What is the name of the process Y ? (1 mark)

.....

iii) What is the purpose :

I. Process Y (1 mark)

.....

II. Addition of sodium hypochlorite (1 mark)

.....

c) It was confirmed that magnesium sulphate was present in the tap water.

i) What type of hardness was present in the water ? (1 mark)

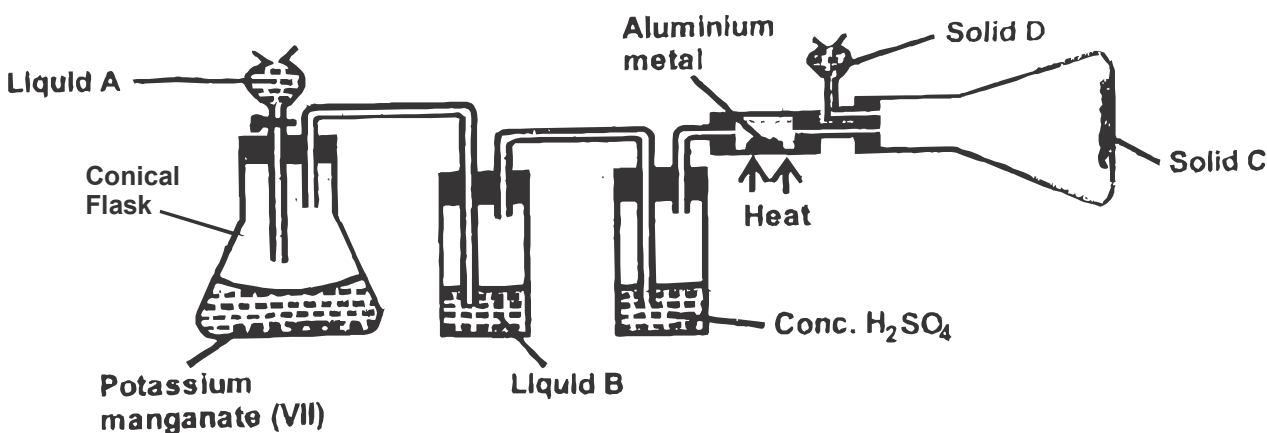
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ii) Explain how the hardness can be removed. (2 marks)

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.....

6. a) Study the diagram below and answer the questions that follow.



i) Name liquids A and B

A

B

ii) Suggest a suitable reagent that can be used as solid D (1 mark)

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iii) State the role of solid D (1 mark)

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iv) Write a balanced chemical equation for the reaction in the conical flask. (1 mark)

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v) Explain why solid C collects further away from the heated aluminium metals. (1 mark)

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vi) In the combustion tube above, xg of aluminium metal reacted completely with 1800cm³ of chlorine gas at room temperature. Calculate the value of x. (A= 27.0, Cl = 35.5, molar gas volume r.t.p = 24.0 litres) (2 marks)

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b) The reaction between hot concentrated sodium hydroxide and chlorine gas produces sodium chlorate (V) as one of the products.

i) Write the equation of the reaction. (1 mark)

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ii) Give one use of sodium chlorate (V) (1 mark)

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c) Explain the difference between bleaching by chlorine and bleaching by sulphur (VI) oxide. (2 marks)

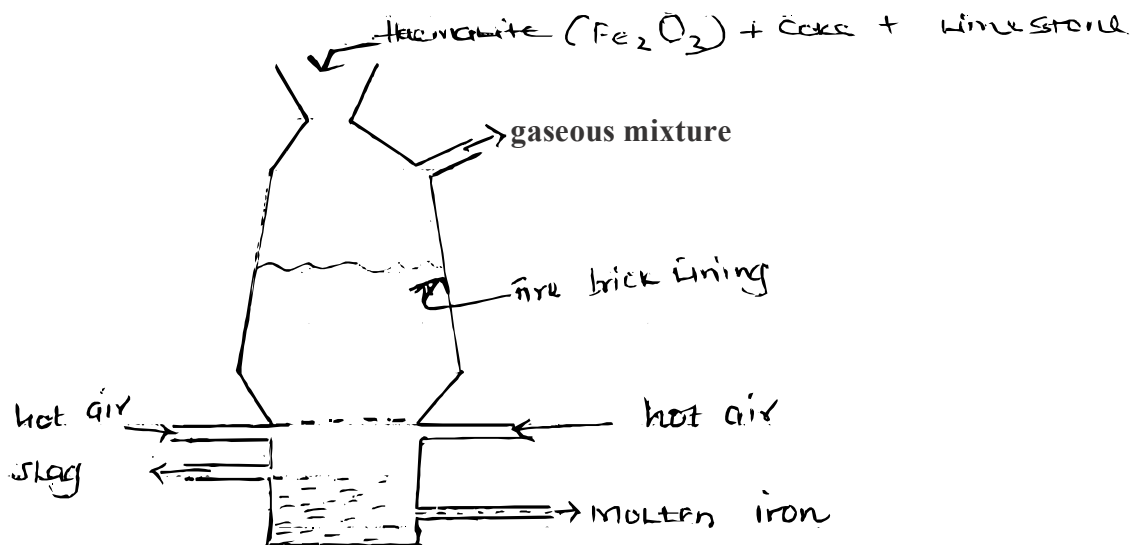
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7. I. The extraction of iron from its ores takes place in the blast furnace. Below is a simplified diagram of a blast furnace. Study it and answer the questions that follow.



a) Name :

i) One of the substance in the slag. (1 mark)

.....

ii) Another iron ore material used in the blast furnace. (1 mark)

.....

iii) One gas which is recycled. (1 mark)

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b) Describe the process which lead to the formation of iron in the blast furnace. (3 marks)

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c) State the purpose of limestone in the blast furnace. (1 mark)

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d) Give a reason why the melting point of the iron obtained from the blast furnace is 1200°C while that of pure iron is 1535°C . (1 mark)

.....
.....

e) State two uses of steel. (2 marks)

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