

JUNE 2005

SECTION A

1. The action of hot concentrated hydrochloric acid on manganese (IV) oxide to produce chlorine is represented by the following redox equation:



(a) What do you understand by oxidation?

(i) In terms of oxygen .....

(ii) In terms of hydrogen.....

(iii) In terms of electrons .....(3marks)

(b) In the equation above, identify the reactant that undergoes oxidation ..... (1 mark)

(c) (i) Describe a simple method of collecting the gas sample in the laboratory?

(ii) What simple test could be carried out to confirm that it is chlorine?(2marks)

(d) What would you observe if you bubbled the chlorine through a small quantity of a colourless solution of:

(i) Potassium bromide.....

(ii) Sodium chloride.. ..... (2 marks)

(e) Give the product of the reaction between iron and

(i)  $\text{HCl}_{(aq)}$  .....

(ii)  $\text{Cl}_{2(g)}$ ..... 2 marks

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2. Calcium carbonate exhibits polymorphism.

(a) What is polymorphism ?,. (1 mark)

(a) Name any THREE polymorphic forms of calcium carbonate..... (3 marks)

(b) What is the difference between polymorphism and allotropy? (1 marks)

(c) When calcium carbonate is strongly heated, it decomposes to produce lime (quick lime) which is usually spread on farms or gardens to condition them.

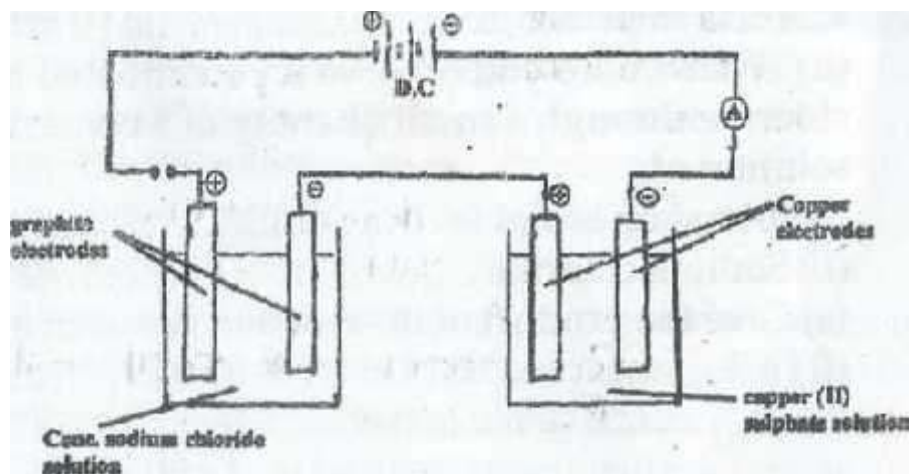
(i) Write down the chemical formula of lime.. ..

Would lime be applied to a soil of pH5 or to one pH 10? Give a reason for your answer.. (5 marks)

(d) A little water added to lime forms another substance called slaked lime. Write the chemical formula of slaked lime (1 mark)

(e) Give ONE large scale use of calcium carbonate (1 marks)

3. The following set up shows the simultaneous electrolysis of a concentrated solution of sodium chloride and an aqueous solution of copper (II) sulphate in 2 different containers.



(a) What would you observe during this electrolysis at the cathode (negative electrode) of each cell.

(i) NaCl Cell: ....

(ii) CuSO<sub>4</sub> cell ... (2 marks)

(b) Show by means of an equation, the reaction occurring at the anode (positive electrode) of

(i) NaCl Cell: .....

(ii) CuSO<sub>4</sub> cell: .... (2 marks)

(c) After passing a steady current of 0.8A of electricity through the two cells for 1 hour 30 minutes the experiment was stopped.

(i) Calculate the quantity of electricity in Coulombs used.....

(ii) Calculate the volume of the gaseous product at the anode of the NaCl cell .....

(iii) How many moles of gaseous molecules does this NaCl anode product represent? ..... (6 marks)

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4. The organic Compound, A, with formula,  $\text{CH}_3\text{CH}=\text{CHCH}_3$ , is very useful in many ways.

(a) Write the systematic name of A (1 mark)

(b)(i) Give the name of the homologous series to which A belongs.....

(ii) What is a homologous series? .....(2marks)

(c) A reacts with hydrogen bromide.

(i) what name is given to this reaction type?

(ii) Write the structural formula of this product

(iii) Give the systematic name of the product

(iv) The product exhibits isomerism. What is isomerism?

(v) Give the structural formula of the compound. Which is isomeric to the product ..... 5marks

(d) State the reagents and conditions needed to convert compound A to  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$  2marks

5. Corrugated iron sheet on roof tops of houses rust faster in industrialized zones than in non-industrialized zone. (corrugated iron sheets are sheets coated with zinc).

(a) What conditions are needed for iron to rust? 2marks

(b) Explain why the iron sheets are coated with zinc (2marks)

(c) Identify any two substances present in the atmosphere of industrialized zones that cause the corrugated sheets to corrode faster -. (2marks)

(d) Give two other methods by which iron can be prevented from rusting (2marks)

What is

- (i) rust?.....
- (ii) the colour of rust?..... (2marks)

6. This question concerns an incomplete Periodic Table in which the letters shown are not the usual symbols for the elements.

I									
	II			III	iv	V	VI	VII	VIII
A	B					D	F	G	
						E			

Using the letters given for These elements, answer the questions that follow:

(a) Select from A to H, the element

- (i) Whose atom loses electrons most readily
- (ii) Whose atom accepts electrons most readily .....
- (iii) that is a gas with diatomic molecules at room temperature and pressure.....
- (iv) Whose atoms are most stable and unreactive (4marks)

(a) Write the molecular formula of the compound formed by two elements:-

- (i) A and G.....
- (ii) C and G.....
- (iii) B and G .....

## SECTION B

7. The following results were obtained when a piece of magnesium ribbon was added to excess dilute hydrochloric acid in a flask connected to a graduated receiver, while the temperature was kept constant.

Volume of gas evolved (cm)	0	40	70	94	112	128	146	154	158	160	160	160
Time(sec)	0	10	20	30	40	50	70	80	90	100	110	120

- (a) Write a balanced equation for the reaction taking place and name the gas evolved.
- (b) Plot a graph of volume of gas (on vertical or Y- axis) against time (on horizontal or X-axis).
- (c) From your graph determine:
- (i) the time it took to generate 100cm<sup>3</sup> of gas
  - (ii) the volume of gas produced after 66 seconds.
  - (iii) the time (in seconds) it took to use up all the magnesium ribbon added to the acid.
- (d) Calculate the mass of magnesium ribbon that liberated the volume of gas at the end of the experiment.
- (e) Give THREE factors that would affect the rate of this reaction briefly explaining how each factor will do so  
.....(25marks)

8. (a) Describe the extraction of sulphur by the Frasch Process
- (b) Describe how you would manufacture sulphuric acid from this sulphur by the Contact Process. State TWO large - scale uses of sulphuric acid.... (25marks)

9.

You are provided with anhydrous sodium carbonate, a 250cm<sup>3</sup> volumetric flask, a chemical balance, stirring rod and distilled water.

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- (a) Describe how you would use these to prepare a solution of 0.1 M  $\text{Na}_2\text{CO}_3$
- (b) Show how you would use this solution to determine the molarity of a solution of sulphuric acid. Your description should end at the point where you collect data.
- (c) If  $25\text{cm}^3$  of 0.1M  $\text{Na}_2\text{CO}_3$  neutralises  $20\text{cm}^3$  of a sample of dilute hydrochloric acid, calculate the concentration of acid in grams per  $\text{dm}^3$ .....

(25 marks)

10. Describe, giving reagents and reaction conditions, how ethanol can be converted into:-

- (a) sodium ethoxide
- (b) ethyl chloride
- (c) ethanoic acid
- (d) ethyl ethanoate

(25marks)

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