

CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD	SUBJECT CODE NUMBER 715	PAPER NUMBER 2
General Certificate of Education Examination	SUBJECT TITLE AND SYLLABUS CHEMISTRY	
ADVANCED LEVEL	DATE JUNE 2006	
FOR EXAMINER'S USE ONLY Name of Examiner: Signature of Examiner: Date:	FOR OFFICE USE ONLY	FOR EXAMINER'S USE ONLY

Two hours

Open wide the flap attached to this booklet and enter the information required in the boxes of the flap.

Answer ALL SEVEN questions using the spaces provided. The mark allocation is indicated for each question.

Blank spaces in this question booklet may be used for rough work.

In calculations, you are advised to show all the steps in your working, giving your answer at each stage.

All necessary working must be shown. No marks will be awarded for answers without brief statements showing how the answers have been obtained.

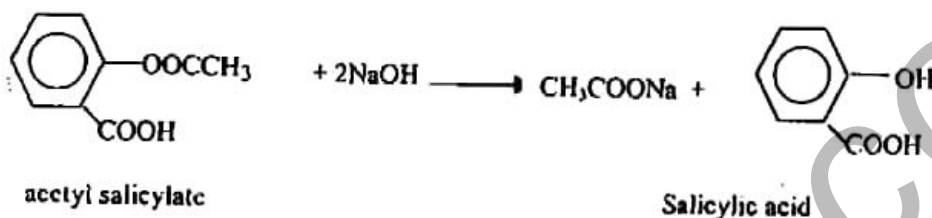
Noiseless, non-programmable calculators may be used.

- I. (a) Define the terms
(i) Relative molecular mass

(ii) Mole

- (b) Acetyl salicylate, $C_9H_8O_4$, reacts with sodium hydroxide as shown in the equation.

(2 marks)



1.50 g of acetyl salicylate were hydrolysed with 50 cm³ of 0.5 M sodium hydroxide and the mixture were made up to 250 cm³ with distilled water in a volumetric flask.
Calculate:

- (i) The number of moles of acetyl salicylate in 1.50 g
- (ii) The number of moles of sodium hydroxide in 50 cm³ of 0.5 M solution
- (iii) The concentration (mol dm⁻³) of excess sodium hydroxide in the 250 cm³ solution.

(4 marks)

- (c) If 1.25 g of salicylic acid, $C_7H_6O_3$, were obtained. Find the percentage yield in the reaction

(2 marks)

- (d) A radioactive substance R, producing alpha, beta and gamma particles has a half-life of 15 days
(i) Draw a well-labelled diagram to show the paths of the three particles passing through an electric field.

(ii) What is meant by half-life of 15 days?

(iii) Calculate the mass of R that remains when 1.60 g sample is allowed to decay for 120 days

(7 marks)
(Total = 15 marks)

2 (a) In the table below give the formulae of the chlorides of the elements in Period 3

Na	Mg	Al	Si	P	S	Cl	Ar

(b) What type of bonding exists in these chlorides?

(4 marks)

(c) Write equations for the reactions of the following with water; predict the pH of the resulting solution. (2 marks)

(i) Magnesium chloride

(ii) Silicon tetrachloride

(d) What is

(4 marks)

(i) a basic oxide

(ii) an amphoteric oxide

(iii) Choose an amphoteric oxide of an element in Period 3 and give two different reactions to show its amphoteric nature

(5 marks)
(Total = 15 marks)

Covalent bonds, ionic bonds and intermolecular forces are binding forces in substances.

(a) Define:

(i) covalent bond

(ii) ionic bond

(b) Identify the bond types and shapes of the following species (2 marks)

Species	Bond type(s)	Shape
NH_4^+		
PCl_5		
AlCl_3		

(c) (i) AlCl_3 readily dimerizes in the gas phase. Sketch the structure of the dimer. (3 marks)

(ii) The bond in anhydrous AlCl_3 is ionic with a strong covalent character. Explain this observation

(d) The hydrides of N, O and F all have hydrogen bonds (4 marks)

(i) What are the conditions necessary for the formation of the hydrogen bond?

(ii) Give two physical properties of the hydrides that result from the presence of hydrogen bonds in the molecules

(4 mark

(Total = 13 mark

- 4 Analysis of a certain liquid A reveals that it contains 92.3% carbon and 7.7% hydrogen. Vaporization of 0.20 g of the liquid at 99 °C and 740 mmHg pressure gives 80.5 cm³ of vapour.

(a) Calculate

(i) the empirical formula of A

.....

(ii) the molecular mass of A

.....

(iii) the molecular formula of A

.....

(6 marks)

(b) Benzene and cyclohexene are hydrocarbons with the same number of carbon atoms.

(i) How would each burn?

A: Benzene

.....

B: Cyclohexene

.....

(ii) Give the products, if any of the reaction of aqueous bromine with

A: Benzene

.....

B: Cyclohexene

.....

Explain any difference observed

.....

.....

.....

(6 marks)

(c) Outline the mechanism of the reaction between benzene and monochloromethane, CH₃Cl in the presence of aluminium trichloride

.....

.....

.....

.....

(2 marks)

(Total = 14 marks)

3. This question concerns the elements of fluorine, chlorine, bromine and iodine of the Periodic Table
- (a) (i) How does the electronegativity of the elements change down this group?

(ii) How do their physical states change down the group

Give reasons for the change in physical state.

- (b) Concentrated sulphuric acid reacts with sodium chloride and sodium iodide to give different products. (3 marks)

(i) Give the equation of the reaction of concentrated sulphuric acid with

(a) NaCl

(b) NaI

(ii) Explain the difference

(4 marks)

- (c) Complete the table below for the reactions of halides with various reagents

	(aq) AgNO_3 followed by conc. NH_3	Chlorine water followed by CCl_4
Sodium Chloride		
sodium bromide		
sodium iodide		

(5 marks)

- (d) "Eau de Javel" is an aqueous solution of chlorate(I) ions, ClO^- . It disproportionates on warming.

(i) What is a disproportionation reaction?

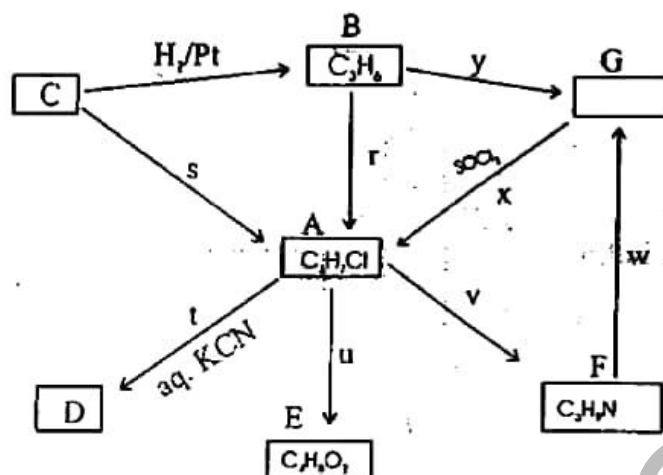
(ii) Write an equation for the disproportionation reaction.

(3 marks)

(Total = 15 marks)

127

6 The reaction scheme below is for the preparation and reactions of chloropropane.



(a) (i) Identify the compounds by filling the table below

Compound	Structure	Name
C		
D		
G		

(ii) To what class of compounds does compound E belong?

(4 marks)

(b) Give the reagents and reaction conditions for the stages labelled v, w, and y.

	Reagent(s)	Conditions
v		
w		
y		

(3 marks)

(c) What type of organic reaction occurs in the conversion of

(i) Compound A to F

(ii) Compound A to D

(2 marks)

(d) Outline the mechanism for the reaction associated with the processes r and t

(i) r

.....

.....

.....

(ii) t

.....

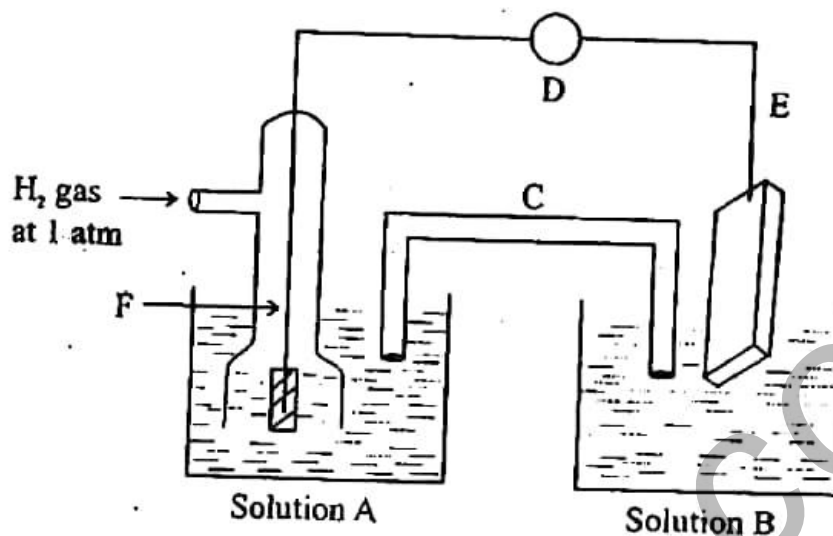
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(4 marks)

(Total = 13 marks)

This question is on equilibria. To determine the electrode potential of an electrode system it has to be coupled to a standard electrode.



Below are some values of standard electrode potentials:

- A: $\text{Cr}_2\text{O}_7^{2-}(\text{aq}) + 14\text{H}^+(\text{aq}) + 6\text{e}^- \leftrightarrow 2\text{Cr}^{3+}(\text{aq}) + 7\text{H}_2\text{O}(\text{l})$ $E^\circ = +1.33 \text{ V}$
 B: $2\text{H}_3\text{O}^+(\text{aq}) + 2\text{e}^- \leftrightarrow \text{H}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$ $E^\circ = 0.00 \text{ V}$
 C: $\text{Fe}^{2+}(\text{aq}) + 2\text{e}^- \leftrightarrow \text{Fe}(\text{s})$ $E^\circ = -0.44 \text{ V}$

(a) (i) Define "standard electrode potential"

(ii) What is a standard electrode?

(b) Give the names of the following parts labelled in the diagram:

(2 marks)

C:

D:

E:

F:

(4 marks)

(c) (i) What must be the concentrations of solution A and solution B when the apparatus is used to determine the standard electrode potential E° of any system?

	Concentration of A	Concentration of B
E°	1M	1M

(ii) Name the standard electrode used in the set up.

Standard Hydrogen Electrode

(3 marks)

(d) A cell is constructed by coupling the electrode systems A and C.

(i) Write the conventional cell diagram for the cell.

.....
.....

(ii) Calculate the standard cell emf and hence indicate the polarity of the right hand side electrode.

.....
.....

(iii) What is the effect on the cell e.m.f if the electrode system C is diluted. Explain.

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.....
.....

(e) (i) Define an acid buffer and give an example of it.

(4 marks)

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.....

(ii) Give one important use of buffers to the human being.

.....
.....

(2 marks)

(Total = 15 marks)

130