



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2011

Centre Number

71

Candidate Number

Chemistry

Assessment Unit AS 3

assessing

Module 3: Practical Examination 1

[AC131]

TUESDAY 10 MAY



TIME

2 hours 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Answer **all five** questions.

Write your answers in the spaces provided.

INFORMATION FOR CANDIDATES

The total mark for this paper is 90.

Section A

Question 1 is a practical exercise worth 25 marks.

Question 2 is a practical exercise worth 29 marks.

Section B

Question 3 is a planning exercise worth 20 marks.

Questions 4 and 5 are written questions worth a total of 16 marks, testing aspects of experimental chemistry.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

A Periodic Table of Elements (including some data) is provided.

Question Number	Marks	
	Teacher Mark	Examiner Check
1		
2		
3		
4		
5		

Total Marks		
--------------------	--	--

Section A

1 Titration exercise

Sulfuric acid is used in car batteries.

You are required to carry out a titration and use the results to calculate the concentration of the acid obtained from a car battery.

You are provided with:

Sodium hydroxide solution of concentration 0.10 mol dm^{-3}

A solution containing 0.80 cm^3 of car battery acid diluted to 250 cm^3 with distilled water

Phenolphthalein indicator

- (a) Describe how you would ensure that your titration is both accurate and reliable.

[4]

Teacher Mark	Examiner Check	Remark

(b) Carry out the titration by:

- rinsing out a burette with the 0.10 mol dm^{-3} sodium hydroxide solution
- filling the burette with the 0.10 mol dm^{-3} sodium hydroxide solution
- transferring 25.0 cm^3 of the diluted car battery acid to the conical flask
- adding 2–3 drops of phenolphthalein indicator to the solution in the conical flask and titrating until the end point is reached.

Present your results in a suitable table and calculate the average titre.

Teacher Mark	Examiner Check	Remark

[12]

(c) State the colour change at the end point of your titration.

_____ to _____ [1]

(d) Write the equation for the reaction of sulfuric acid with sodium hydroxide.

_____ [2]

BLANK PAGE
(Questions continue overleaf)

2 Observation/deduction

Safety glasses must be worn at all times and care should be taken during this practical examination.

- (a) You are provided with a mixture of two salts, labelled X, which have a common cation. Carry out the following experiments on the mixture. Record your observations and deductions in the spaces below and identify the two salts.

Teacher Mark	Examiner Check	Remark

Experiment	Observations	Deductions
1 Describe X.	[1]	[1]
2 (a) Fill a test tube one quarter full of water and record the temperature. (b) Add three spatula measures of X to the test tube, stir and record the temperature. (c) Record the temperature change. Keep the contents of this test tube for experiments 3 and 4.	[1]	[1]
3 (a) Add 1–2 cm ³ of the solution formed in experiment 2 above to another test tube. (b) Acidify with 1 cm ³ of dilute nitric acid and then add 1 cm ³ of silver nitrate solution. (c) Add 5 cm ³ of dilute ammonia solution to the test tube.	[3]	[3]
4 (a) Add 1–2 cm ³ of the solution formed in experiment 2 above to another test tube. (b) Acidify with 3 drops of dilute nitric acid and then add 3 drops of barium chloride solution.	[1]	[1]
5 Add a spatula measure of X to a test tube one third full of dilute sodium hydroxide solution and warm gently, testing any gas evolved with moist Universal Indicator paper.	[2]	[3]

Name the **two** salts present in X:

_____ [2]

Teacher Mark	Examiner Check	Remark

- (b) You are provided with an aqueous solution of an organic liquid labelled Y. Carry out the following experiments on the solution. Record your observations and deductions in the spaces below.

Experiment	Observations	Deductions
1 Describe the smell of solution Y.		
	[1]	[1]
2 Using a glass rod place a drop of Y onto Universal Indicator paper.		
	[1]	[1]
3 Add a spatula measure of anhydrous sodium carbonate to a test tube one quarter full of solution Y and identify the gas evolved using a suitable reagent.		
	[2]	[2]
4 Add 1 cm ³ of Y to a test tube and then add a 2 cm length of magnesium ribbon.		
	[2]	[1]

Based on the above tests, suggest a functional group which is present in Y.

_____ [1]

Y contains only one functional group and two carbon atoms. Write an equation for the reaction occurring in experiment 4 above.

_____ [2]

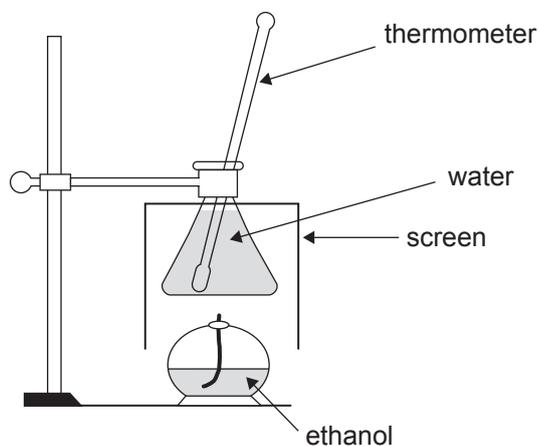
max [29]

Teacher Mark	Examiner Check	Remark

Section B

3 Planning

- (a) The enthalpy of combustion of ethanol can be found using a calorimeter. The apparatus used is shown below.



- (i) Explain the purpose of the screen.

_____ [1]

- (ii) State which **three** masses should be recorded at the start and end of the experiment.

 _____ [3]

- (iii) The specific heat capacity of water at 20°C is $4.18 \text{ J g}^{-1} \text{ } ^\circ\text{C}^{-1}$. Explain what this means.

 _____ [2]

Teacher Mark	Examiner Check	Remark

(b) In an experiment 0.35 g of ethanol was burned raising the temperature of 300 g of water by 5.5 °C.

(i) Calculate the molar enthalpy of combustion of ethanol.

_____ [3]

(ii) The value quoted for this combustion in tables of thermodynamic data is $-1367 \text{ kJ mol}^{-1}$. State **two** reasons why the value determined in the above experiment is different to the tabulated value.

_____ [2]

(c) The enthalpy of combustion for ethanol may also be calculated using Hess's Law and average bond enthalpy values.

(i) Write the equation for the complete combustion of ethanol.

_____ [2]

(ii) Given the data below, calculate the standard enthalpy of combustion for ethanol.

Bond	Bond Enthalpy/ kJ mol^{-1}
C – C	346
C – H	413
C – O	360
C = O	740
O – H	463
O = O	497

_____ [3]

Teacher Mark	Examiner Check	Remark

- (iii) The tabulated values for the enthalpies of combustion for ethanol and propan-1-ol are -1367 and $-2021 \text{ kJ mol}^{-1}$ respectively. Use these values to estimate the enthalpy of combustion for pentan-1-ol.

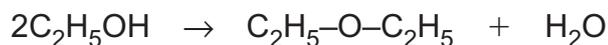
_____ [2]

- (iv) All alcohols burn in a plentiful supply of oxygen to produce carbon dioxide and water. Name **two** other chemicals which are produced in the incomplete combustion of an alcohol.

_____ [2]

Teacher Mark	Examiner Check	Remark

- 4 Diethyl ether, $C_2H_5-O-C_2H_5$, is a highly flammable, colourless liquid with a boiling point of $35^\circ C$. It can be prepared by the slow addition of ethanol to concentrated sulfuric acid followed by heating in a distillation apparatus to $155^\circ C$. The crude distillate is cooled in an ice bath as it is collected.



- (a) Suggest the role of the concentrated sulfuric acid in this preparation.

_____ [1]

- (b) (i) Suggest why the diethyl ether collected must be cooled in an ice bath.

_____ [2]

- (ii) Suggest an organic impurity which would be present in the crude distillate.

_____ [1]

- (c) The crude distillate is purified by shaking with a 10% sodium carbonate solution in a separating funnel. Once separated the organic layer is further treated with anhydrous magnesium sulfate.

- (i) State the purpose of adding sodium carbonate solution to the crude distillate.

_____ [1]

- (ii) Explain why diethyl ether does not mix with water.

_____ [1]

- (iii) State the purpose of the anhydrous magnesium sulfate.

_____ [1]

- (iv) How would the magnesium sulfate be removed from the organic layer?

_____ [1]

Teacher Mark	Examiner Check	Remark

- (v) The diethyl ether is finally purified by distillation. Explain why distillation achieves a satisfactory separation.

_____ [1]

- 5 (a) Explain, with expected observations, how you would use aqueous sodium hydroxide to distinguish between aqueous solutions of aluminium nitrate and magnesium nitrate.

_____ [3]

- (b) State **two** tests, including expected observations, which would confirm that an unknown solution contains dissolved iron(III) and sodium ions **without** the use of either aqueous ammonia or sodium hydroxide.

iron(III) ion test _____

_____ [2]

sodium ion test _____

_____ [2]

Teacher Mark	Examiner Check	Remark

THIS IS THE END OF THE QUESTION PAPER

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA
will be happy to rectify any omissions of acknowledgement in future if notified.