Rewarding Learning

Centre Number

71

Candidate Number

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2010

Chemistry

Assessment Unit AS 3

assessing

Module 3: Practical Examination 1

[AC131]

AC131

FRIDAY 14 MAY, MORNING

TIME

2 hour 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 Marks	Examiner Check
1		
2		
3		
4		
5		
Total Marks		

Section A

1 Titration Exercise

Some liquid oven cleaners contain sodium hydroxide.

You are required to carry out a titration and use the results to calculate the concentration of the sodium hydroxide in a liquid oven cleaner.

You are provided with:

Hydrochloric acid of concentration 0.10 mol dm^{-3}
A solution containing 25.0 cm^3 of oven cleaner diluted to 500 cm^3 with distilled water
Methyl orange indicator

(a) Give an account of how you would prepare the diluted solution of oven cleaner and then how you would safely transfer 25.0 cm^3 of the diluted solution to a conical flask.

_____

_____

_____

_____

_____

_____ [4]

(b) Carry out the titration by:

- rinsing out a burette with the 0.10 mol dm^{-3} hydrochloric acid
- filling the burette with the 0.10 mol dm^{-3} hydrochloric acid
- transferring 25.0 cm^3 of the diluted oven cleaner to the conical flask
- adding 2–3 drops of methyl orange 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.

[12]

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

_____ to _____ [1]

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

_____ [1]

(e) **(i)** Calculate the number of moles of hydrochloric acid used in the titration.

_____

_____ [1]

(ii) Calculate the number of moles of sodium hydroxide in 25.0 cm^3 of the diluted oven cleaner.

_____ [1]

(iii) Calculate the number of moles of sodium hydroxide in 500 cm^3 of diluted oven cleaner.

_____ [1]

(iv) Calculate the number of moles of sodium hydroxide in 25.0 cm^3 of the undiluted oven cleaner.

_____ [1]

(v) Calculate the concentration of sodium hydroxide in the undiluted oven cleaner in mol dm^{-3}.

_____ [1]

(vi) Calculate the concentration of sodium hydroxide in the undiluted oven cleaner in g dm^{-3}.

_____ [1]

(vii) Assuming the oven cleaner has a density of 1.0 g cm^{-3} calculate the percentage of sodium hydroxide by mass in the oven cleaner.

_____

_____ [1]

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(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 A, 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.

Experiment	Observations	Deductions
1 Make a solution of A by dissolving a spatula-measure of A in a test tube half-full of water. Warm gently. Transfer 1 cm^3 of this solution into each of two separate test tubes. **(a)** Add a few drops of sodium hydroxide solution to the first test tube. Then add a further 3 cm^3 of the sodium hydroxide solution to the test tube. **(b)** Add a few drops of dilute ammonia solution to the second test tube. Then add a further 3 cm^3 of the ammonia solution to the test tube.		
2 Make a solution of A by dissolving half a spatula-measure of A in a test tube half-full of nitric acid solution. Warm gently. Transfer 1 cm^3 of this solution into each of two separate test tubes. **(a) (i)** Add a few drops of silver nitrate solution to the first test tube. **(ii)** Then add about 2 cm^3 of dilute ammonia solution to the same test tube. **(b)** Add a few drops of barium chloride solution to the second test tube.		

Name the two salts present in A:

_____

_____

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

Experiment	Observations	Deductions
1 Place 10 drops of B in a test tube and add 1 cm^3 of water.		
2 Place 10 drops of B on a watch glass placed on a heat proof mat and ignite it using a splint.		
3 Add approximately 10 drops of B to a test tube one quarter full of bromine water and mix well.		
4 Add 10 drops of B to 2 cm^3 of acidified potassium dichromate solution in a test tube. Warm the mixture gently.		

Based on the above tests, suggest:

a functional group which may be present in B.

_____

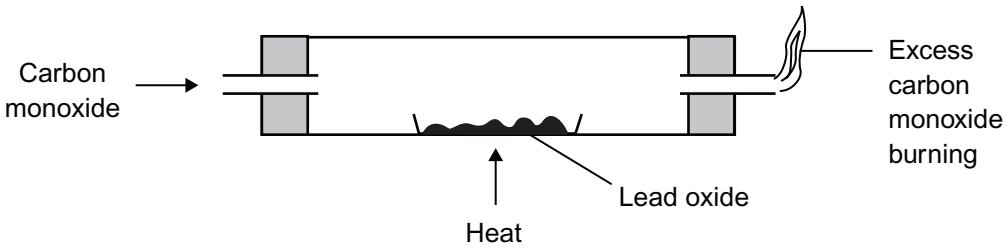
a functional group which is absent from B.

_____ [29]

Section B

3 Planning

(a) The empirical formula of an oxide of lead can be found by reducing the lead oxide using the apparatus below.



(i) What weighings should be taken before heating?

_____

_____ [2]

(ii) In addition to wearing safety glasses, suggest and explain **one** other safety precaution which should be taken.

_____

_____

_____ [2]

(iii) What steps would you take to ensure that all of the oxygen has been removed from the lead?

_____

_____ [2]

(iv) Explain why the carbon monoxide continues to be passed through the apparatus after all the lead oxide has been reduced.

_____

_____ [2]

(b) When 1.39 g of the lead oxide was reduced, 1.26 g of lead was formed.

(i) What mass of oxygen was present in the lead oxide?

_____ [1]

(ii) How many moles of oxygen were present in the lead oxide?

_____ [1]

(iii) How many moles of lead were formed?

_____ [1]

(iv) Calculate the empirical formula of the lead oxide.

_____

_____ [2]

(c) Lead can be extracted from the ore galena, which contains lead(II) sulphide (PbS).

The galena is first heated in air to form lead(II) oxide and sulphur dioxide. The lead(II) oxide is then heated with coke to form lead and carbon dioxide.

(i) Write the equation for the formation of the lead(II) oxide.

_____ [2]

(ii) Write the equation for the formation of the lead.

_____ [1]

(iii) A sample of galena weighing 20.32 g contains 8.5% by mass of lead(II) sulphide.

Calculate the percentage of lead in the sample of galena using the following headings.

Mass of lead(II) sulphide in the sample

_____

Percentage of lead in lead(II) sulphide

_____

Mass of lead in the sample

_____

Percentage of lead in the sample

_____ [4]

4 The liquid ester ethyl benzoate (boiling point 211 °C) can be prepared by refluxing a mixture of ethanol, benzoic acid and concentrated sulphuric acid.

(a) Explain what is meant by **refluxing**.

_____ [1]

(b) After refluxing, the mixture is distilled and an impure sample of the ester collected.

(i) Describe how acid impurities could be removed from the impure sample.

_____

_____ [2]

(ii) Describe how any trace of water could be removed from the impure sample.

_____

_____ [2]

(iii) Describe how a pure sample of the ester could be obtained from the remaining liquid.

_____

_____ [2]

5 A white solid is thought to be either sodium carbonate or sodium hydrogencarbonate.

(a) Describe how you would carry out a flame test to show the presence of sodium ions in the white solid. State the flame colour expected.

_____

_____

_____

_____ [3]

(b) Describe how you would confirm the presence of carbonate or hydrogencarbonate ions using dilute hydrochloric acid and confirm the identity of any gas given off. State any observations expected.

_____

_____

_____

_____ [3]

(c) Describe how you would distinguish between the presence of carbonate and hydrogencarbonate ions. State any observations expected.

_____

_____

_____

_____ [3]

THIS IS THE END OF THE QUESTION PAPER