Centre Number

71

Candidate Number

Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2011

Chemistry

Assessment Unit AS 3
assessing
Module 3: Practical Examination 2

[AC132]

WEDNESDAY 11 MAY

AC132

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.

6960

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

Section A

Teacher Mark	Examiner Check	Remark

1   Titration exercise

Vinegar is a 4–5% aqueous solution of ethanoic acid.

You are required to carry out a titration and use the results to calculate the concentration of ethanoic acid in a sample of vinegar.

You are provided with:

Sodium hydroxide solution of concentration $0.05\,mol\,dm^{-3}$
A sample of vinegar of unknown concentration
Phenolphthalein indicator

(a) Carry out the titration by:

- rinsing out a burette with the $0.05\,mol\,dm^{-3}$ sodium hydroxide solution
- filling the burette with the $0.05\,mol\,dm^{-3}$ sodium hydroxide solution
- transferring $25.0\,cm^3$ of the vinegar 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.

[12]

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

_____ to _____ [1]

(c) Write the equation for the reaction of ethanoic acid with sodium hydroxide.

_____ [2]

(d) (i) Calculate the number of moles of sodium hydroxide used in the titration.

_____

_____ [1]

(ii) Calculate the number of moles of ethanoic acid in $25.0\,cm^3$ of vinegar.

_____ [1]

(iii) Calculate the concentration of ethanoic acid in the vinegar in $mol\,dm^{-3}$.

_____ [2]

(iv) Calculate the concentration of ethanoic acid in the vinegar in $g\,dm^{-3}$.

_____ [1]

(v) Calculate the percentage of ethanoic acid in vinegar assuming the density of vinegar to be $1\,g\,cm^{-3}$.

_____ [1]

Teacher Mark	Examiner Check	Remark

6960   **3**   **[Turn over**

(e) Anhydrous (concentrated) ethanoic acid is called glacial ethanoic acid as it freezes to form ice-like crystals. Describe how you would prepare a diluted solution of glacial ethanoic acid from $1\,cm^3$ of the concentrated acid to make $250\,cm^3$ of diluted solution and safely transfer $25.0\,cm^3$ of the diluted solution to a conical flask ready for titration.

_____

_____

_____

_____

_____

_____ [4]

Teacher Mark	Examiner Check	Remark

6960

4

BLANK PAGE

(Questions continue overleaf)

2 Observation/deduction

	Teacher Mark	Examiner Check	Remark

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 Describe A.	[1]	[1]
2 **(a)** Make a solution of A by dissolving a spatula measure of A in a test tube half full of water. **(b)** Acidify $2\,cm^3$ of this solution 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]
3 **(a)** Add $1\,cm^3$ of the solution formed in part 2(a) 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]
4 **(a)** Make a solution of A by dissolving half a spatula measure of A in a test tube one third full of water. **(b)** Add 3 drops of dilute ammonia solution to the test tube. **(c)** Add excess dilute ammonia solution to the same test tube.	[3]	[2]
5 **(a)** Place a spatula measure of A on a watch glass and add a few drops of **concentrated** hydrochloric acid. **(b)** Use a clean loop of nichrome wire to place a small amount of this acidified sample of A in a blue Bunsen flame.	[2]	[2]
6 Place a spatula measure of A in a dry test tube and heat gently.	[1]	[1]

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

_____

_____ [2]

(b) You are supplied with three **primary** halobutanes labelled X, Y and Z. Carry out the experiment and complete the table below. Identify X, Y and Z.

Experiment	Observations	Deductions
	X	**X**
	[1]	[1]
Place 1 cm^3 of X, Y and Z separately into three test tubes. Label the test tubes with their contents. Add 1 cm^3 of ethanol and 1 cm^3 of silver nitrate solution to each test tube. Place the three test tubes in a beaker of water heated to 50–60 °C. Leave for 5 minutes noting the relative rate of reaction.	**Y**	**Y**
	[1]	[1]
	Z	**Z**
	[1]	[1]

Name the unknown samples.

X _____

Y _____

Z _____ [3]

Order of reactivity for X, Y and Z (most reactive first) _____ [1]

max [29]

Section B

3 **Planning**

The value of x in the formula $Ni(NO_3)_2.xH_2O$ (hydrated nickel(II) nitrate) may be determined by gently heating a known mass of the solid to drive off all the water of crystallisation and reweighing.

(a) **(i)** What is meant by the term **water of crystallisation**?

_____

_____ [1]

(ii) Hydrated nickel(II) nitrate is a green crystalline solid. State **one** observation which may be made during the dehydration of the hydrated nickel(II) nitrate.

_____ [1]

(iii) State how you could ensure, using weighings, that all of the water was removed.

_____

_____ [2]

(b) In an experiment 3.22 g of hydrated nickel(II) nitrate, $Ni(NO_3)_2.xH_2O$, produced 2.02 g of the anhydrous salt.

(i) Write the equation for the dehydration.

_____ [1]

(ii) Using the above data calculate the mass of water given off.

_____ [1]

(iii) Calculate the number of moles of water given off.

_____ [1]

Teacher Mark	Examiner Check	Remark

(iv) Calculate the number of moles of anhydrous nickel(II) nitrate formed.

_____ [1]

(v) Determine the value of x in $Ni(NO_3)_2.xH_2O$.

_____

_____ [1]

(vi) Suggest **one** reason why the value of x determined by this experiment may be less than the actual value.

_____

_____ [1]

(vii) Prolonged strong heating will result in a higher value of x being determined. Suggest what effect strong heating may have on the salt.

_____ [1]

(c) Hydrated magnesium sulfate, $MgSO_4.7H_2O$, may be prepared by reacting magnesium metal with excess dilute sulfuric acid.

$Mg(s) + H_2SO_4(aq) \rightarrow MgSO_4(aq) + H_2(g)$
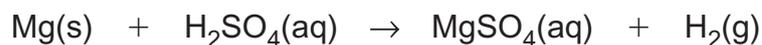
(i) State **two** observations during the reaction.

_____

_____ [2]

6960

9

[Turn over

Teacher Mark	Examiner Check	Remark

(ii) Crystals of the hydrated salt are obtained from the resulting solution. Describe how pure, dry crystals of the hydrated salt may be obtained from the solution.

_____

_____

_____

_____

_____ [4]

(iii) In an experiment a student reacted 2.34 g of magnesium ribbon with excess dilute sulfuric acid. A total of 16.35 g of the hydrated salt were obtained. Calculate the percentage yield of the hydrated salt.

_____

_____

_____

_____ [3]

6960

10

4 Ethanal is a colourless, volatile liquid with a boiling point of 21 °C. It can be prepared by heating together a mixture of sulfuric acid, sodium dichromate and ethanol at 50 °C in a distillation apparatus.

Teacher Mark	Examiner Check	Remark

(a) Explain what is meant by the term **volatile**.

_____ [1]

(b) (i) State the function of the acidified sodium dichromate.

_____ [1]

(ii) State the expected colour change in the reaction vessel.

_____ [2]

(c) (i) Explain why the ethanal must be distilled off as quickly as it is formed.

_____ [1]

(ii) Name **two** organic impurities which may be present in the sample of ethanal collected.

_____ [2]

(iii) State **two** reasons why the yield obtained would be less than 100%.

_____

_____

_____ [2]

Teacher Mark	Examiner Check	Remark

5 (a) Explain, with expected observations, how you would use aqueous ammonia to distinguish between aqueous solutions containing dissolved aluminium ions and zinc ions.

_____

_____

_____

_____ [3]

(b) State **two** tests, including expected observations, which would confirm that a solution contains both potassium ions and thiocyanate ions (SCN^-).

potassium ion test _____

_____

_____ [2]

thiocyanate ion test _____

_____

_____ [2]

THIS IS THE END OF THE QUESTION PAPER

111315