Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2015

Centre Number

Candidate Number

Chemistry

Assessment Unit AS 3
assessing
Module 3: Practical Examination

Practical Booklet A

AC133

[AC133]
FRIDAY 8 MAY, MORNING

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Answer **both** questions.
Write your answers in the spaces provided.

INFORMATION FOR CANDIDATES

The total mark for this paper is 24.
Question 1 is a practical exercise worth 8 marks.
Question 2 is a practical exercise worth 16 marks.
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.
You may not have access to notes, textbooks and other material to assist you.

Question Number	Marks	
	Examiner Mark	Remark
1		
2		
Total Marks		

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

Examiner Mark	Remark

1 Titration

You are required to titrate sodium hydroxide solution of unknown concentration against standard sulfuric acid solution.

You are provided with:

0.1 mol dm^{-3} sulfuric acid solution

sodium hydroxide solution of unknown concentration

phenolphthalein indicator

- Rinse out a burette with the 0.1 mol dm^{-3} sulfuric acid solution.
- Fill the burette with the 0.1 mol dm^{-3} sulfuric acid solution.
- Rinse out a pipette with the sodium hydroxide solution.
- Using the pipette and a pipette filler, place 25.0 cm^3 of the sodium hydroxide solution in the conical flask.
- Add 3 drops of phenolphthalein to the conical flask, and titrate with the 0.1 mol dm^{-3} sulfuric acid solution until the end point is reached.

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

[8]

2 Observation

Examiner Mark	Remark

You are provided with three unknown substances, solution **A**, solid **B** and liquid **C**. Carry out the tests described below and record your observations.

(a) Tests on solution **A**

	Test	Observations
1	Transfer 1 cm^3 of the solution **A** into each of three separate test tubes. **(a)** Add 5 drops of sodium hydroxide solution to the first test tube.	[2]
	(b) Add 5 cm^3 of sodium hydroxide solution to this test tube.	[1]
2	Add 5 drops of barium chloride solution to the second test tube.	[2]
3	Add 5 drops of silver nitrate solution to the third test tube.	[1]

(b) Tests on solid **B**

	Test	Observations
1	Describe the appearance of **B**.	[1]
2	**(a)** Add half a spatula measure of **B** to a test tube one quarter filled with dilute ethanoic acid.	[2]
	(b) Use limewater to test any gas that is produced.	[1]
3	Add a spatula measure of **B** to a dry boiling tube and heat.	[1]
4	Dip a clean nichrome wire loop into concentrated hydrochloric acid, touch sample **B** with the wire, then hold it in a blue Bunsen flame.	[1]

Examiner Mark	Remark

(c) Tests on liquid **C**

N.B. Water bath filled using hot water from a kettle.

	Test	Observations
1	To 1 cm^3 of **C** in a test tube add 1 cm^3 of water.	[1]
2	Place 10 drops of **C** on a watch glass on a heatproof mat. Ignite it using a burning splint.	[1]
3	Add 10 drops of **C** to 2 cm^3 of acidified potassium dichromate solution in a test tube. Warm the mixture gently in a water bath.	[2]

THIS IS THE END OF THE QUESTION PAPER

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Module 3: Practical Examination
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APPARATUS AND MATERIALS LIST

Advice for centres

- All chemicals used should be at least laboratory reagent specification and labelled with appropriate safety symbols, e.g. irritant.

- For centres running multiple sessions – candidates for the later session should be supplied with clean, dry glassware. If it is not feasible then glassware from the first session should be thoroughly washed, rinsed with deionised water and allowed to drain.

- **Ensure all chemicals are in date otherwise expected observations may not be seen.**

Each candidate must be supplied with safety goggles or glasses.

Question No. 1

Each candidate must be supplied with:

- one 50 cm^3 burette of at least class B quality;
- a funnel for filling the burette;
- a retort stand and clamp;
- one beaker for waste solution;
- one 25 cm^3 pipette of at least class B quality;
- a safety pipette filler;
- three conical flasks of 250 cm^3 capacity;
- a white tile or white paper;
- a wash bottle containing deionised water;
- phenolphthalein indicator with dropper;
- 150 cm^3 of 0.1 mol dm^{-3} sulfuric acid labelled **sulfuric acid 0.1 mol dm^{-3}**;
- 150 cm^3 of 0.1 mol dm^{-3} sodium hydroxide solution labelled **sodium hydroxide** and **irritant**.

Question No. 2

Each candidate must be supplied with:

- seven test tubes;
- a dry boiling tube;
- a test tube holder;
- a test tube rack;
- a spatula of similar size to the Nuffield spatulas supplied by Scientific & Chemical Supplies Ltd (SPA 050 010);
- a heatproof mat;
- a Bunsen burner;
- a splint;
- a watch glass;
- a beaker for water bath;
- a nichrome wire loop;
- a delivery tube for limewater test (optional)
- several plastic droppers;
- access to a kettle;
- about 10 cm^3 of a 0.1 mol dm^{-3} solution of zinc sulfate in a stoppered reagent bottle labelled **A** [28.7 g dm^{-3} $ZnSO_4.7H_2O$];
- about 1 g of hydrated sodium carbonate ($Na_2CO_3.10H_2O$) in a small stoppered reagent bottle labelled **B**;
- about 10 cm^3 of ethanol in a stoppered sample bottle labelled **C** and **flammable**;
- about 10 cm^3 of sodium hydroxide solution in a reagent bottle labelled **sodium hydroxide** and **corrosive**. This solution should be approximately 1 mol dm^{-3};
- about 10 cm^3 of barium chloride solution in a reagent bottle labelled **barium chloride**. This solution should be approximately 0.1 mol dm^{-3} (20.8 g dm^{-3} for $BaCl_2$ or 24.4 g dm^{-3} for $BaCl_2.2H_2O$);
- about 5 cm^3 of concentrated hydrochloric acid in a stoppered reagent bottle labelled **concentrated hydrochloric acid** and **corrosive**;
- about 5 cm^3 of dilute ethanoic acid in a reagent bottle/beaker labelled **ethanoic acid**. This solution should be approximately 1 mol dm^{-3}.

- about 10 cm^3 of calcium hydroxide solution in a stoppered reagent bottle labelled **limewater**. This solution should be saturated.

- about 5 cm^3 of acidified potassium dichromate(VI) solution in a stoppered reagent bottle labelled **acidified potassium dichromate solution** and **irritant**. This solution should be about 0.1 mol dm^{-3}, made by dissolving 30 g of potassium dichromate(VI) in 100 cm^3 of 1 mol dm^{-3} sulfuric acid and made up to 1 dm^3 with deionised water.

- about 5 cm^3 of silver nitrate solution in a reagent bottle/beaker labelled **silver nitrate**. This solution should be approximately 0.1 mol dm^{-3} (17.0 g dm^{-3}).

AS3 Chemistry Practical Risk Assessment – Summer 2015

Chemical	Notes	Emergency action
Sulfuric acid ($0.1\ mol\ dm^{-3}$)	Low hazard Even at this low concentration it may still cause harm in the eyes or in a cut.	In the eye – flood the eye with gently-running tap water for 10 minutes. See a doctor. Swallowed – do no more than wash out the mouth with water. Do not induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. Spilt on the skin or clothing – remove contaminated clothing. Especially with concentrated acid, quickly use a dry cloth or paper towel to wipe as much liquid as possible off the skin. Then drench the skin with plenty of water. If a large area is affected or blistering occurs, see a doctor. Spilt on the floor, bench, etc. – wipe up small amounts with a damp cloth and rinse it well. For larger amounts, and especially for (moderately) concentrated acid, cover with mineral absorbent (eg, cat litter) and scoop into a bucket. Neutralise with sodium carbonate. Rinse with plenty of water.
Sodium hydroxide ($0.1\ mol\ dm^{-3}$)	IRRITANT Irritating to the eyes and skin.	In the eye – flood the eye with gently-running tap water for at least 20 minutes. See a doctor. If a visit to hospital is necessary, continue washing the eye during the journey in an ambulance. Swallowed – do no more than wash out the mouth with water. Do not induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. Spilt on the skin or clothing – remove contaminated clothing. Drench the skin with plenty of water. If a large area is affected or blistering occurs, see a doctor. Spilt on the floor, bench, etc. – wipe up small amounts with a damp cloth and rinse it well. For larger amounts, and especially for (moderately) concentrated solutions, cover with mineral absorbent (eg, cat litter) and scoop into a bucket. Neutralise with citric acid. Rinse with plenty of water.
Phenolphthalein	Not classified as hazardous but should be used with caution. Skin contamination should be avoided.	In the eye – flood the eye with gently-running tap water for at least 10 minutes. See a doctor. Swallowed – do no more than wash out the mouth with water. Do not induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. Spilt on the skin or clothing – remove contaminated clothing. Wash off the skin with soap and plenty of water. Rinse contaminated clothing. Spilt on the floor, bench, etc. – wipe up with a damp cloth and rinse it well.
Zinc sulfate ($0.1\ mol\ dm^{-3}$)	Low hazard	In the eye – flood the eye with gently-running tap water for at least 10 minutes. See a doctor. Swallowed – do no more than wash out the mouth with water. Do not induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. Dust breathed in – remove the casualty to fresh air. See a doctor if breathing is difficult. Spilt on the skin or clothing – remove contaminated clothing and rinse it. Wash off the skin with plenty of water. Spilt on the floor, bench, etc. – scoop up solid (take care not to raise dust). Wipe up small solution spills or any traces of solid with cloth; for larger spills use mineral absorbent (e.g. cat litter).

Chemical	Notes	Emergency action
Hydrated sodium carbonate	IRRITANT Irritating to the eyes but the anhydrous solid presents a bigger risk because it is finely powdered, whereas the hydrate is crystalline.	In the eye – flood the eye with gently-running tap water for 10 minutes. See a doctor if pain persists. Swallowed – do no more than wash out the mouth with water. Do not induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. Spilt on the skin or clothing – brush solid off contaminated clothing. Rinse clothing or the skin as necessary. Spilt on the floor, bench, etc. – brush up solid spills, trying to avoid raising dust, then wipe with a damp cloth. Wipe up solution spills with a cloth and rinse it well.
Ethanol	There is a serious risk of liquid catching fire; its vapour may catch fire above 13 °C. Breathing vapour may result in sleepiness:	In the eye – flood the eye with gently-running tap water for 10 minutes. See a doctor. Swallowed – do no more than wash out the mouth with water. Do not induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. NB: The casualty may show signs of drunkenness. Spilt on the skin or clothing – remove contaminated clothing and rinse it. Wash the affected area and clothing with plenty of water. Clothing catches fire – smother flames on clothing or the skin with a fire blanket or other material. Cool any burnt skin with gently-running tap water for 10 minutes. Other ethanol fires – allow fires in sinks, etc. to burn out. Fires at the top of test tubes, beakers, etc. should be smothered with a damp cloth or heat-proof mat. Spilt on the floor, bench, etc. – extinguish all Bunsen-burner flames. Wipe up small amounts with a cloth and rinse it well. For larger amounts, open all windows, cover with mineral absorbent (e.g. cat litter), scoop into a bucket and add water. **NB. Ethanol should not be heated with a Bunsen burner. If heating is required, place the test tube of ethanol in a beaker of boiling water from a kettle (the beaker should be on a heatproof mat).**
Sodium hydroxide (1 mol dm^{-3})	CORROSIVE Causes severe burns; it is particularly dangerous to the eyes	In the eye – flood the eye with gently-running tap water for at least 20 minutes. See a doctor. If a visit to hospital is necessary, continue washing the eye during the journey in an ambulance. Swallowed – do no more than wash out the mouth with water. Do not induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. Spilt on the skin or clothing – remove contaminated clothing. Drench the skin with plenty of water. If a large area is affected or blistering occurs, see a doctor. Spilt on the floor, bench, etc. – wipe up small amounts with a damp cloth and rinse it well. For larger amounts, and especially for (moderately) concentrated solutions, cover with mineral absorbent (e.g. cat litter) and scoop into a bucket. Neutralise with citric acid. Rinse with plenty of water.

Chemical	Notes	Emergency action
Barium chloride ($0.1\ mol\ dm^{-3}$) Barium chloride (solid)	HARMFUL It is harmful if swallowed and irritating to the eyes, skin, lungs, etc. TOXIC Until recently, it was classed as HARMFUL if swallowed or if dust is breathed in. It is irritating to the eyes, skin, lungs etc	In the eye – flood the eye with gently-running tap water for at least 10 minutes. See a doctor. Swallowed – do no more than wash out the mouth with water. Do not induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. Spilt on the skin or clothing – brush off any solid. Remove contaminated clothing. Drench the skin with plenty of water. If a large area is affected or blistering occurs, see a doctor. Rinse contaminated clothing with water. Spilt on the floor, bench, etc. – scoop up any solid. Rinse the area with water, diluting greatly. Solutions should be treated with mineral absorbent (e.g. cat litter).
Concentrated hydrochloric acid	CORROSIVE It causes burns. The vapour irritates the lungs.	In the eye – flood the eye with gently-running tap water for 10 minutes. See a doctor. Vapour breathed in – remove to fresh air. Call a doctor if breathing is difficult. Swallowed – do no more than wash out the mouth with water. Do not induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. Spilt on the skin or clothing – remove contaminated clothing. Then drench the skin with plenty of water. If a large area is affected or blistering occurs, see a doctor. Spilt on the floor, bench, etc. – for release of gas, consider the need to evacuate the laboratory and open all windows. For large spills, and especially for (moderately) concentrated acid, cover with mineral absorbent (e.g. cat litter) and scoop into a bucket. Neutralise with sodium carbonate. Rinse with plenty of water. Wipe up small amounts with a damp cloth and rinse it well.
Ethanoic acid ($1\ mol\ dm^{-3}$)	Low hazard It may still cause harm in the eyes or in a cut.	In the eye – flood the eye with gently running tap water for 10 minutes. See a doctor. Vapour breathed in – remove to fresh air. Call a doctor if breathing is difficult. Swallowed – do no more than wash out the mouth with water. Do not induce vomiting. Sips of water may help cool the throat and help keep the airway open. See doctor. Spilt on the skin or clothing – remove contaminated clothing. Then drench the skin with plenty of water. If a large area is affected or blistering occurs, see a doctor. Spilt on the floor, bench, etc. – wipe up small amounts with a damp cloth and rinse it well. For large spills, and especially for (moderately) concentrated acid, cover with mineral absorbent (e.g. cat litter) and scoop into bucket. Neutralise with sodium carbonate. Rinse with plenty of water.

Chemical	Notes	Emergency action
Limewater		Even a saturated solution of calcium hydroxide is so dilute that it is not classed as irritant. However, sometimes the solution is made up from solid calcium hydroxide which is irritating to the eyes and skin.
Potassium dichromate	TOXIC OXIDISING Toxic by inhalation or if swallowed. They may cause sensitisation and/or ulcers in contact with the skin. They may cause cancer by inhalation but inhalation is not at all likely in most school uses.	In the eye – flood the eye with gently-running tap water for at least 10 minutes. See a doctor. Swallowed – do no more than wash out the mouth with water. Do not induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. Spilt on the skin or clothing – remove contaminated clothing and rinse it until no colour remains. Wash off the skin with plenty of water. If skin contamination is more than small, see a doctor. Spilt on the floor, bench, etc. – wear eye protection and gloves. Scoop up the solid. Rinse the area with water and wipe up, rinsing repeatedly until no colour remains. Rinse the mop or cloth thoroughly.
Silver nitrate (0.1 mol dm^{-3})	Low hazard Very dilute solutions are adequate for most school work when testing for halides in solution.	In the eye – flood the eye with gently-running tap water for at least 10 minutes. See a doctor. Swallowed – do no more than wash out the mouth with water. Do not induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. Spilt on the skin or clothing – remove contaminated clothing and rinse it. Wash off the skin with plenty of water. If the silver nitrate produces more than small burns, see a doctor. Spilt on the floor, bench, etc. – wear eye protection and gloves. Scoop up the solid. Rinse the area with water and wipe up, rinsing repeatedly. Rinse the mop or cloth thoroughly.

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FRIDAY 8 MAY, MORNING

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For use with the

Confidential Instructions to the Supervisor of the Practical Examination

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

Examiner Mark	Remark

1 Titration

You are required to
titrate sodium hydroxide solution of unknown concentration against standard sulfuric acid solution.

You are provided with:

0.1 mol dm^{-3}
sulfuric acid solution

sodium hydroxide solution of unknown concentration

phenolphthalein indicator

- Rinse out a burette with the 0.1 mol dm^{-3} sulfuric acid solution.
- Fill the burette with the 0.1 mol dm^{-3} sulfuric acid solution.
- Rinse out a pipette with the sodium hydroxide solution.
- Using the pipette and a pipette filler, place 25.0 cm^3 of the sodium hydroxide solution in the conical flask.
- Add 3 drops of phenolphthalein to the conical flask, and titrate with the 0.1 mol dm^{-3} sulfuric acid solution until the end point is reached.

Examiner Mark	Remark

2 Observation

You are provided with three unknown substances, solution **A**, solid **B** and liquid **C**. Carry out the tests described below and record your observations.

(a) Tests on solution **A**

Test	Observations
1 Transfer 1 cm^3 of the solution **A** into each of three separate test tubes. **(a)** Add 5 drops of sodium hydroxide solution to the first test tube. **(b)** Add 5 cm^3 of sodium hydroxide solution to this test tube.	
2 Add 5 drops of barium chloride solution to the second test tube.	
3 Add 5 drops of silver nitrate solution to the third test tube.	

(b) Tests on solid **B**

Test	Observations
1 Describe the appearance of **B**.	
2 **(a)** Add half a spatula measure of **B** to a test tube one quarter filled with dilute ethanoic acid. **(b)** Use limewater to test any gas that is produced.	
3 Add a spatula measure of **B** to a dry boiling tube and heat.	
4 Dip a clean nichrome wire loop into concentrated hydrochloric acid, touch sample **B** with the wire, then hold it in a blue Bunsen flame.	

(c) Tests on liquid **C**

N.B. Water bath filled using hot water from a kettle.

	Test	Observations
1	To 1 cm^3 of **C** in a test tube add 1 cm^3 of water.	
2	Place 10 drops of **C** on a watch glass on a heatproof mat. Ignite it using a burning splint.	
3	Add 10 drops of **C** to 2 cm^3 of acidified potassium dichromate solution in a test tube. Warm the mixture gently in a water bath.	

Examiner Mark	Remark

THIS IS THE END OF THE QUESTION PAPER

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