Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

S24-3410U30-1A

MONDAY, 8 JANUARY – FRIDAY, 9 FEBRUARY 2024

CHEMISTRY – Unit 3 (3410U30)

PRACTICAL ASSESSMENT

INVESTIGATING THE EFFECT OF CONCENTRATION ON THE REACTION BETWEEN AN ACID AND AN ALKALI

SECTION A

1 hour

3410U301A
01

For Examiner's use only		
	Maximum Mark	**Mark Awarded**
Section A	**6**	

ADDITIONAL MATERIALS

A calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The total number of marks available for this section of the task is 6.

The number of marks is given in brackets at the end of each question or part-question.

This task is in 2 sections, **A** and **B**. You will complete Section **A** in one lesson and Section **B** in the next science lesson.

Introduction

Your task is to investigate the effect of concentration of an alkali in a reaction with an acid.

Apparatus Required

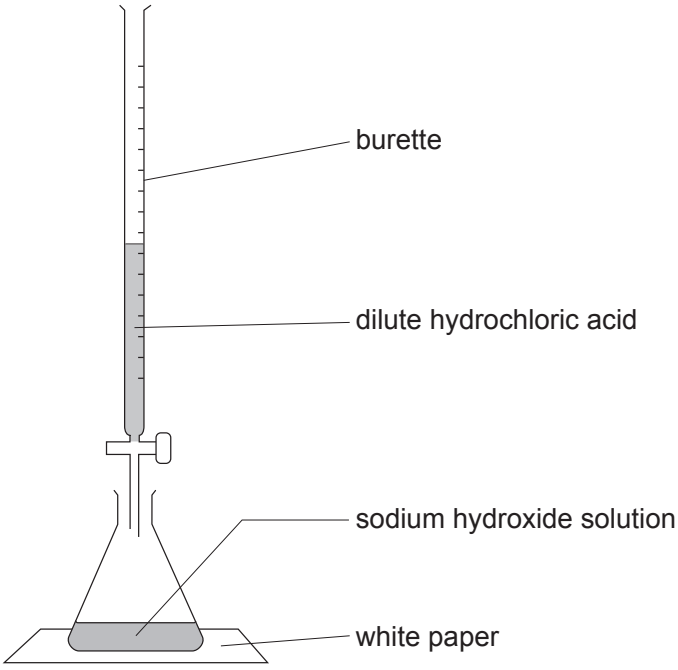
The following apparatus is required for each group: (each group should consist of no more than three candidates).

eye protection
1 × 50 cm^3 burette
1 × 25 cm^3 measuring cylinder
1 × conical flask
1 × filter funnel
1 × white paper (or white tile)
1 × clamp and stand (or burette stand)
1 × 100 cm^3 beaker (for waste)
250 cm^3 of dilute hydrochloric acid
30 cm^3 of 0.04, 0.06, 0.08 and 0.10 mol/dm^3 sodium hydroxide solution
phenolphthalein indicator

Access to:
waste bowl

CLEAPSS student safety sheet: 31 – Sodium hydroxide. This is provided on page **6** of this examination paper.

Diagram



Read the method and answer questions 1.(a) and 1.(b) before carrying out the experiment and recording your results.

Method

1. Wear eye protection.

2. Use the filter funnel to fill the burette with the dilute hydrochloric acid. Run a little acid into the waste beaker to fill the part of the burette that is below the tap. Remove the funnel. Record the starting volume of acid in the burette.

3. Measure 25 cm^3 of 0.10 mol / dm^3 sodium hydroxide solution using the measuring cylinder. Pour into the conical flask.

4. Add three drops of indicator to the flask.

5. Add the acid a little at a time, swirling the flask after each acid addition. Keep adding acid until the indicator changes colour. Record the final volume of acid in the burette.

6. Calculate the volume of acid added by taking the starting volume away from the final volume.

7. Pour the solution into the waste bowl and rinse the flask with water.

8. Repeat steps 2–7 with 0.08, 0.06 and 0.04 mol / dm^3 sodium hydroxide solution.

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SECTION A

Answer **all** questions.

1. (a) State a hypothesis for this experiment. [1]

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(b) Complete the risk assessment below for this experiment. [1]

You may use the student safety sheet on page **6** of this examination paper.

HAZARD	RISK	CONTROL MEASURE
Dilute sodium hydroxide solution is an irritant.		

You may record raw results in the space below.

Examiner only

(c) Present your results in a table. Include all of your results. [4]

END OF PAPER

Student safety sheets 31

Sodium hydroxide

also applies to **Soda lime** and **Potassium hydroxide**

Substance	Hazard	Comment
Sodium or **potassium hydroxide** solid Also known as **caustic soda** and **caustic potash**. **Soda lime** contains about 5 % sodium hydroxide, 1 % potassium hydroxide, 0.2 % silicon dioxide, 14 – 19 % water and the remainder calcium hydroxide (it is used to absorb carbon dioxide). **Carbosorb** in addition contains an indicator.	 **CORROSIVE**  **HARMFUL**	DANGER: causes severe skin burns and eye damage. Potassium hydroxide is also harmful if swallowed. It gives out heat when added to water which can cause boiling or create a choking mist. It is used in the home for clearing drains.
Sodium or **potassium hydroxide solution** (if 0.5 mol / dm^3 or more Sodium hydroxide; 0.4 mol / dm^3 or more potassium hydroxide)	 **CORROSIVE**  **HARMFUL**	DANGER: causes severe skin burns and eye damage. Potassium hydroxide is also harmful if swallowed if 3 mol / dm^3 or more. Fehling's solution contains sodium hydroxide of this concentration. It is used in the home as an oven cleaner.
Dilute sodium or **potassium hydroxide solution** (if less than 0.5 mol / dm^3 but 0.1 mol / dm^3 or more sodium hydroxide; if less than 0.4 mol / dm^3 but 0.1 mol / dm^3 or more potassium hydroxide)	 **IRRITANT**	WARNING: irritating to the eyes and skin.
Very dilute sodium or **potassium hydroxide solution** (if less than 0.125 mol / dm^3 sodium hydroxide; if less than 0.1 mol / dm^3 potassium hydroxide).	**Currently not classified as hazardous**	It may still cause harm in the eyes or in a cut.

Typical control measures to reduce risk

- Use the lowest concentration possible; avoid using the solid if possible.
- Use the smallest amount possible.
- **Wear eye protection**, including when making or disposing of solutions. Protect the face when transferring/dispensing large quantities of corrosive substance.
- If possible, use a safer alternative, e.g. sodium carbonate when making salts or Benedict's solution rather than Fehling's solution for food tests.

Assessing the risks

- What are the details of the activity to be undertaken? What are the hazards?
- What is the chance of something going wrong?
  e.g. Solution spurting out of test tubes when being heated.
- How serious would it be if something did go wrong?
  Note – alkali in the eye causes more damage than acid of equivalent concentration.
- How can the risk(s) be controlled for this activity?
  e.g. Can it be done safely? Does the procedure need to be altered? Should goggles or safety spectacles be worn?

Emergency action

In all emergency situations, alert the responsible adult immediately. Be aware that actions may include the following:

- In the eye — Irrigate the eye with gently-running tap water for at least 20 minutes. Call 999/111. If it is necessary to go to hospital, continue washing the eye during the journey in an ambulance.
- In the mouth/ swallowed — Do no more than rinse and spit with drinking water. Do **not** induce vomiting. Call 999/111.
- Spilt on the skin or clothing — Remove contaminated clothing. Quickly use a dry cloth or paper towel to wipe as much liquid off the skin as possible. Irrigate the affected area with gently-running tap water for at least 20 minutes. If a large area is affected or symptoms occur, call 999/111. Rinse clothing.
- 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.

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

Examiner only

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