Name _____ Register Number: _ Class: _____

南僑中学

NAN CHIAU HIGH SCHOOL

PRELIMINARY EXAMINATION 2024
SECONDARY FOUR EXPRESS

CHEMISTRY **6092/03**

Paper 3 Practical **2 August 2024, Friday**

1 hour 50 minutes

Candidates answer on the Question Paper.
Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class on all the work you hand in.
Give details of the practical shift and laboratory where appropriate, in the boxes provided.
Write in dark blue or black pen.
Do not use staples, paper clips, glue or correction fluid.

Answer all questions in the spaces provided on the Question Paper.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.
Qualitative Analysis Notes are printed on page **9**.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

Shift
Laboratory

FOR EXAMINER'S USE	
1	/ 13
2	/ 15
3	/ 12
Total	

Parent's Signature:

_____

This document consists of **9** printed pages including the cover page.

1 You are provided with one sample of salt solution **S**.

Solution **S** contains **one** cation and **two** anions from those listed in the Qualitative Analysis notes.

You will carry out tests on solution **S** and identify the three ions present.

Read all the instructions below carefully before starting the experiments in Question 1.

Instructions

(a) Carry out the following tests on solution **S**. You should test and identify any gas evolved. Record all your observations in the table.

The volumes given below are approximate and should be estimated rather than measured unless stated otherwise.

test	observations
Test 1 Put 1 cm depth of solution **S** in a clean test-tube. Add 2 cm depth of potassium iodide solution and shake the mixture well. Filter the mixture and collect the filtrate in a clean test-tube. Rinse the residue with a little deionised water. Then, add a few drops of starch solution to the filtrate slowly with shaking until no further change is seen.	
Test 2 Put 2 cm depth of solution **S** in a clean test-tube. Add an equal depth of aqueous barium nitrate with shaking, then	
add dilute nitric acid slowly until no further change is seen.	
Test 3 Put 2 cm depth of solution **S** in a clean test-tube. Add an equal depth of aqueous silver nitrate with shaking, then	
add dilute nitric acid slowly until no further change is seen.	

Test 4 Put 1 cm depth of solution **S** in a clean boiling tube. Add 3 cm depth of aqueous sodium hydroxide slowly with shaking. **Gently** heat the contents of the boiling tube until no further change. **Keep the final solution for use in Test 5.**	
Test 5 To the cooled mixture from **Test 4**, add 1 piece of aluminium foil and **gently** warm the mixture.	

[9]

(b) Deduce the formulae of **one** cation and **two** anions present in solution **S**.

cation .....

anions ..... and ..... [2]

(c) Suggest the role of solution **S** in **test 1**.

Use your observations to explain how you have reached this conclusion.

..... [2]

[Total: 13 marks]

2 Some cleaning products contain a solution of sodium hydroxide.

You are going to determine the concentration of sodium hydroxide in three different samples of cleaning products labelled Q_1, Q_2 and Q_3 by titration with an acid **P**.

Read all the instructions carefully before starting the experiment in Question 2.

Instructions

You are provided with the following solutions.

P is a strong monobasic acid.

Q_1, Q_2 and Q_3 contains aqueous sodium hydroxide of three different concentrations.

(a) You are going to carry out three experiments. **Do NOT repeat titration for experiments 1, 2 and 3 and you will only perform the titration once for each experiment.**

Experiment 1

Fill up the burette with **P**.

Pipette 25.0 cm^3 of Q_1 into a conical flask.

Add a few drops of methyl orange indicator, to the solution in the conical flask.

Add **P** from the burette, swirling the flask constantly.

Continue adding **P** slowly from the burette until one drop of **P** produces an orange colour.

Record your titration result in an appropriate format in the space provided below.

Experiment 2 to 3

Repeat Experiment 1 using solution Q_2 and Q_3 respectively.

Results

[5]

(b) Suggest why Universal Indicator is **not** a suitable indicator to use in these three experiments.

.....

(c) Use your titration results to explain and deduce the order of concentration of sodium hydroxide in Q_1, Q_2 and Q_3.

.....

.....

most concentrated .....

.....

least concentrated ..... [2]

(d) **P** has a concentration of 0.02 mol/dm^3.

Using your titration results, calculate the concentration, in mol/dm^3, of sodium hydroxide in Q_1.

concentration of the sodium hydroxide in Q_1 ..... mol/dm^3 [2]

(e) **P** has a concentration of 1.26 g/dm^3. By showing relevant calculations, deduce the identity of acid **P**.

[A_r: H, 1; O, 16; N, 14; Cl, 35.5]

acid **P** is ..... [2]

(f) A student repeats the experiment but uses a cleaning product that contains aqueous ammonia of the same concentration instead of aqueous sodium hydroxide.

Describe and explain the effect this has on the titration results.

..... [2]

(g) Experiment 1 is repeated using H_2SO_4 as **P** instead of a strong monobasic acid, without changing the concentration.

State the effect this has on the titration results in experiment 1.

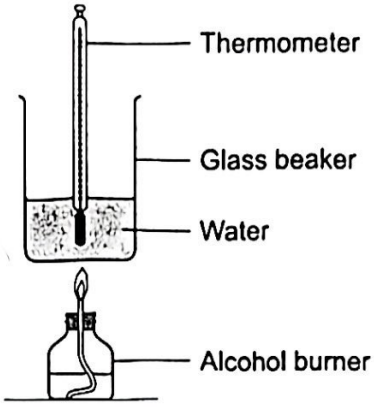
..... [1]

[Total: 15 marks]

3 All chemical reactions include energy changes. The amount of energy involved in a reaction can be determined by measuring temperature changes

(a) In an experiment, the combustion of five different types of alcohol was conducted.

The set-up below is used to determine the amount of heat produced when four different alcohols namely methanol, ethanol, propanol and pentanol were burnt.



Some methanol was placed in the alcohol burner. The initial temperature of the water was measured.

Then the burner was lit and allowed to burn for one minute. The flame was extinguished and the final temperature of the water was measured. The experiment was repeated with the remaining alcohols, ethanol, propanol and pentanol.

The results of the experiment are tabulated in the table below.

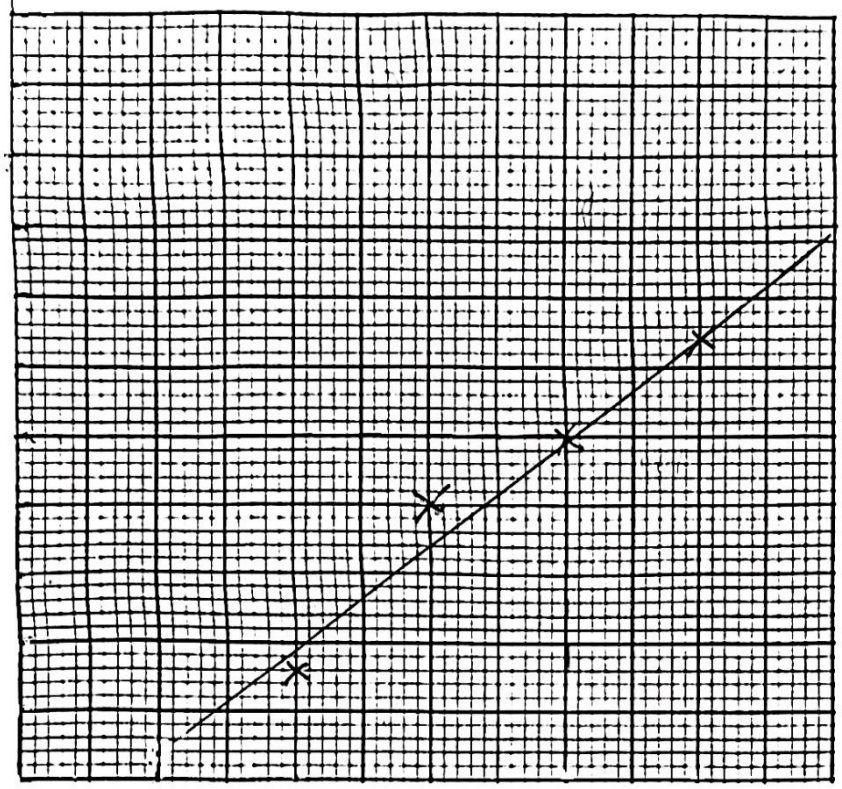
(i) Complete the table by filling in the temperature rise for each alcohol.

alcohol	chemical formula	number of carbon	initial temperature / °C	final temperature / °C	temperature rise / °C
methanol	CH_3OH	1	25.0	32.0	
ethanol	C_2H_5OH	2	26.0	39.0	
propanol	C_3H_7OH	3	23.0	48.0	
butanol	C_4H_9OH	4	-	-	
pentanol	$C_5H_{11}OH$	5	25.0	62.0	

[1]

(ii) Plot the results on the grid with **temperature rise** on the y-axis and **number of carbon atoms in alcohol formula** on the x-axis.

Draw a line of best fit.



[3]

(iii) Use your line from **(a)(ii)** to determine the temperature rise for butanol, C_4H_9OH.

Show clearly on the grid how you obtained your answer.

temperature rise ..... °C [1]

(iv) Suggest an experimental error in this experiment and explain how it would affect the results.

error

effect

..... [2]

(v) 'Each carbon atom provides a higher temperature rise in larger alcohol molecules as compared to smaller molecules.'

Based on your plotted graph in part **(a)(ii)**, do you agree with the statement above? Explain why.

..... [1]

(b) You are given four colourless solutions which could be one of the following:

an alcohol, an alkene, a carboxylic acid and water

Using simple chemical tests only, plan an investigation to identify the four solutions.

You are **not** allowed to use litmus papers or any indicators or taste test in this investigation.

In your investigation, you should include the:

- named chemicals / reagents used for the identification of each of the solution,
- expected observations that enables the identification of the solution. You do **not** need to explain the observations.

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.....

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.....

.....

..... [4]

[Total: 12 marks]