



EXAMINATIONS COUNCIL OF ESWATINI
Eswatini General Certificate of Secondary Education

CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
NUMBER

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PHYSICAL SCIENCE

6888/03

Paper 3 Practical Test

October/November 2021

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces provided.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs, tables or rough working.

Do **not** use staples, paper clips, highlighters, glue or correction fluid.

Do **not** write on the barcode.

Answer **all** questions.

You may use an electronic calculator.

You may lose marks if you do not show your working or if you do not use appropriate units.

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.

Chemistry practical notes for this paper are printed on page 8.

For Examiner's Use	
1	
2	
Total	

This document consists of **8** printed pages and **4** blank pages.

1 You are provided with two substances **A** and **B**.

You will determine their relative acidity or alkalinity.

A is aloe juice and **B** is copper(II) carbonate.

You are also provided with test-tubes labelled **A** and **B**.

(a) (i) Pour about 6 cm³ of substance **A** into the test-tube labelled **A**.

Add about 6 cm³ of distilled water into test-tube **B**.

Add a quarter of spatula of substance **B** into test-tube **B** and stir.

Add a few drops of Universal Indicator solution into each of the test-tubes.

Record the colour of the Universal Indicator in each substance in Table 1.1. [2]

Table 1.1

substance	colour of Universal Indicator	pH value	conclusion
A			
B			

(ii) Determine the pH value of each substance in (a)(i) using the pH chart.

Record the pH value in Table 1.1. [2]

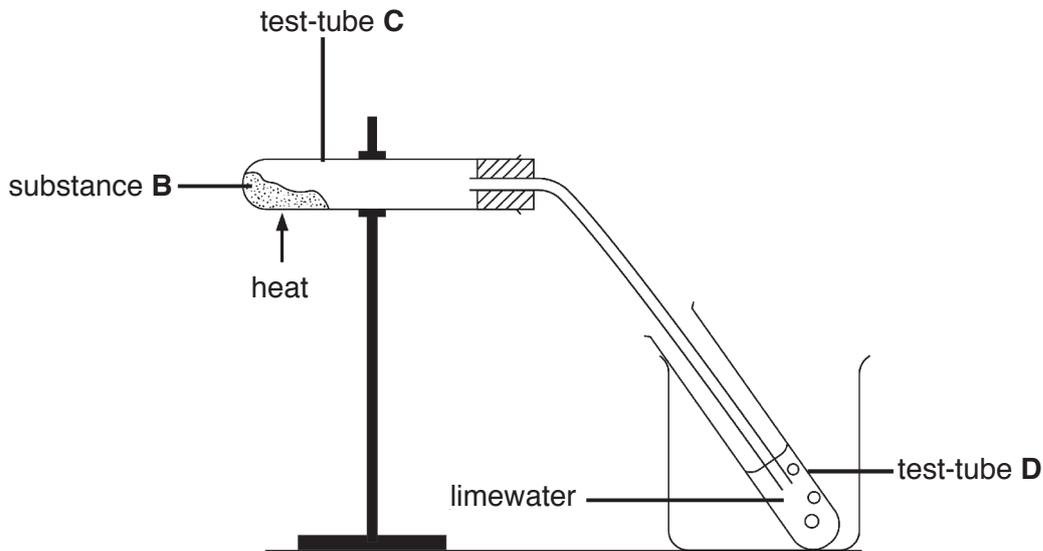
(iii) Record your conclusion for each of the substances in Table 1.1. [2]

(iv) Describe how you determine the pH value of the solutions when using the Universal Indicator.

..... [1]

- (b) You are provided with the apparatus that you should use to heat substance **B** as shown in Fig. 1.1.

Complete the set-up by inserting test-tube **D** as shown in Fig. 1.1.



Heat test-tube **C** with a strong Bunsen burner flame for about three minutes.

Observe what happens to the limewater.

- (i) Explain why the gas produced is carbon dioxide.

..... [1]

- (ii) Name the type of reaction that has taken place in test-tube **C**.

..... [1]

- (iii) Explain, using observations made when carrying out the experiment in (b), why a chemical change has occurred.

.....

.....

..... [2]

- (c) You are provided with two samples of carbon dioxide gas, one sample in a plastic bottle and another in a test-tube.

Keep the bottle closed and test-tube in an upright position at all times.

- (i) Determine the smell of carbon dioxide gas in the test-tube.

..... [1]

- (ii) Describe the correct method of determining the smell of a gas.

..... [1]

- (iii) Explain why the carbon dioxide will escape slowly when the test-tube is in an upright position.

..... [1]

- (iv) Measure about 100cm³ of distilled water in a measuring cylinder.

Open the plastic bottle.

Quickly add the 100cm³ of distilled water and then **quickly** close the bottle tightly.

Shake the bottle for about a minute.

State and explain your observation.

observation [1]

explanation

..... [2]

- (d) Describe an experiment that can be used to test for the presence of iron(III) ions in substance **A**.

.....

 [3]

- 2 You are going to investigate the effect of height in driving a steel nail into a bar of soap by dropping a 1 kg mass.

Fig. 2.1 shows the set-up you will use.

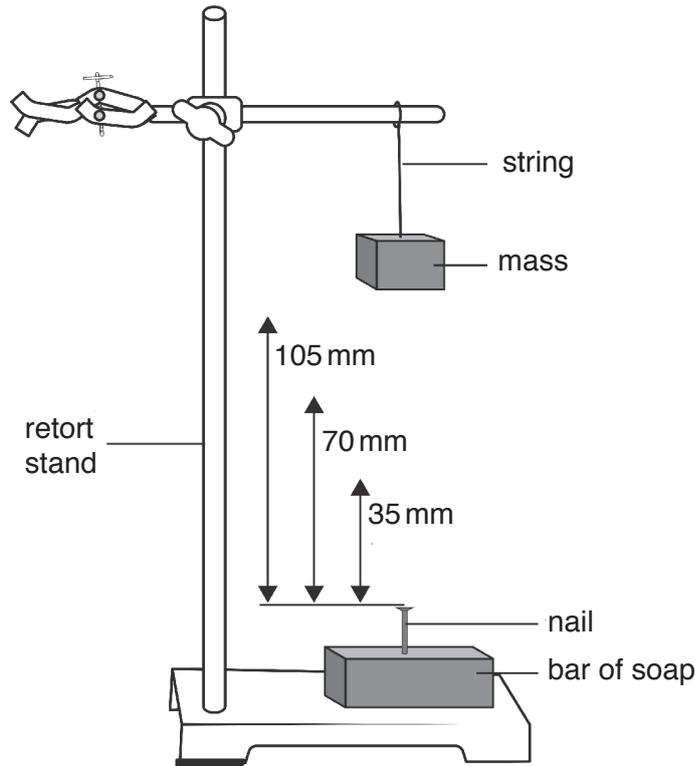


Fig. 2.1

- (1) Push the nail into the bar of soap up to a marked position, 1 cm from the tip of the nail.
- (2) Raise the mass such that its base is 35 mm from the top of the nail and keep it steady.
- (3) Place the bar of soap with the nail directly below the centre of the mass.
- (4) Release the mass such that it falls and hits the nail directly on the head.
- (5) Mark the nail, with a marker, at the position where it protrudes above the bar of soap as shown in Fig. 2.2. Take this as position X.

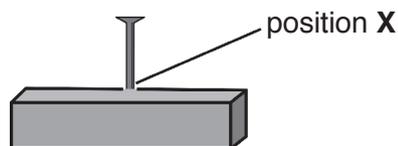


Fig. 2.2

- (6) Gently remove the nail from the bar of soap.

(a) Measure the length on the nail from the 1 cm mark to position **X**.
Record the length in Table 2.1. [1]

(b) Push a second nail into the bar of soap at a new position up to the 1 cm mark.
Raise the mass such that its base is at a 70mm height from the top of the nail.
Repeat steps 3 to 6(a) with the second nail. [1]

(c) Push a third nail into the bar of soap at a new position up to the 1 cm mark.
Raise the mass to the 105 mm mark.
Repeat steps 3 to 6(a) with the third nail. [1]

Table 2.1

position/mm	length/mm
35	
70	
105	

(d) State the kind of energy the **mass** has as it hits the nail.
..... [1]

(e) In step 4, when the mass hits the nail, it is forced into the bar of soap.
The energy of the mass is then transformed into other forms of energy.
State the forms of energy that you observe.
.....
..... [2]

(f) State and explain, using the results in Table 2.1, the height that causes the nail to be forced the greatest distance into the bar of soap.
height
explanation
..... [2]

(g) Write a conclusion on the relationship between the height from which the mass is released and the distance moved by the nail into the soap.
.....
..... [1]

(h) When the mass is released, it accelerates at 10 m/s^2 .

(i) Calculate, using the formula, $E_p = mgh$, the potential energy gained by the mass when it is raised to a height of 70mm.

..... J [2]

(ii) Calculate, using the formula, $v = \sqrt{2gh}$, the maximum speed at which the mass hits the nail when released from the 70mm height.

..... J [3]

(i) In raising the mass to 70mm, more energy is used than that calculated in (h)(i).

Explain why more energy is used.

.....
.....
..... [2]

(j) Suggest **two** changes in the design, without changing the height that could make the nail be driven further into the bar of soap.

1
.....
2
..... [2]

(k) In another experiment, the bar of soap is replaced with a wooden block.

Draw a diagram, based on the principle of moments, to show how you can easily pull out the nail from the wooden block.

[2]

CHEMISTRY PRACTICAL NOTES

Test for anions

Anion	Test	Test result
carbonate (CO ₃ ²⁻)	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl ⁻) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
Iodide(I ⁻) [in solution]	acidify with dilute nitric acid, and then add aqueous lead(II) nitrate/aqueous silver nitrate	yellow ppt.
nitrate (NO ₃ ⁻) [in solution]	add aqueous sodium hydroxide then aluminum foil; warm carefully	ammonia produced
sulfate (SO ₄ ²⁻) [in solution]	acidify with dilute nitric acid, then add aqueous barium nitrate	white ppt.

Test for aqueous cations

Cation	Effect of aqueous sodium hydroxide	Effect of aqueous ammonia
ammonium (NH ₄ ⁺)	ammonia produced on warming	–
calcium (Ca ²⁺)	white ppt, insoluble in excess	no ppt or very slightly white ppt.
copper(II) (Cu ²⁺)	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) (Fe ²⁺)	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe ³⁺)	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn ²⁺)	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess, giving a colourless solution

Test for gases

Gas	Test and test results
ammonia (NH ₃)	turns damp litmus paper blue
carbon dioxide (CO ₂)	turns limewater milky
chlorine (Cl ₂)	bleaches damp litmus paper
hydrogen (H ₂)	'pops' with a lighted splint
oxygen (O ₂)	relights a glowing splint

