EXAMINATIONS COUNCIL OF ESWATINI
Eswatini General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

PHYSICAL SCIENCE **6888/04**

Paper 4 (Alternative to Practical) **October/November 2022**

1 hour

Candidates answer on the Question Paper.

No additional materials are required.

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 a 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 the appropriate units.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
Total	

This document consists of **9** printed pages and **3** blank pages.

1 **(a)** A student investigates some of the properties of liquids **A, B** and **C**.

He places a spatula-full of anhydrous cobalt(II) chloride powder in each of three petri dishes.

(i) State the colour of the anhydrous cobalt(II) chloride powder.

..... [1]

He uses a dropper to add two or three drops of each of the liquids **A, B** and **C** onto the anhydrous cobalt(II) chloride powder.

The cobalt(II) chloride turns pink in all the three petri-dishes.

(ii) State your conclusion about the presence or absence of water in each of the three liquids **A, B** and **C**.

A .....

B .....

C ..... [1]

(b) Describe an experiment that he may carry out to test if liquid **A** is a pure substance.

.....

.....

.....

..... [3]

(c) A student carries out three experiments on liquids **A, B** and **C** to investigate their properties.

In Experiment 1, he adds washing powder.
In Experiment 2, he boils the liquid before adding washing powder.
In Experiment 3, he adds sodium carbonate (washing soda) before adding washing powder.
In each experiment he sets up test-tubes as shown in Fig. 1.1.

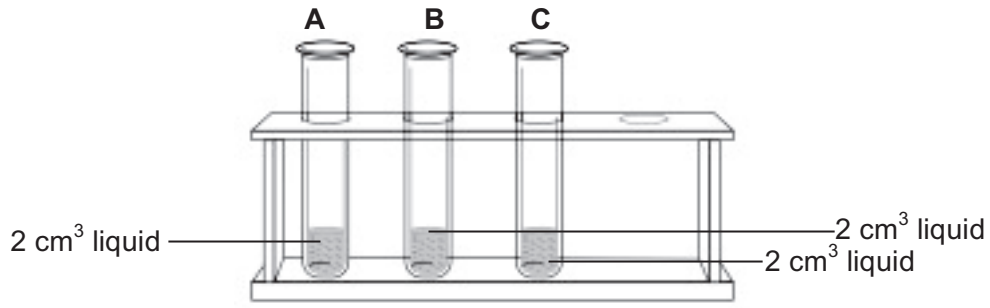

Fig. 1.1

Experiment 1

The student adds a spatula full of washing powder to each test-tube.
He stirs the contents of each test-tube using a clean stirring rod for each test-tube.

Experiment 2

The student sets up test-tubes as shown in Fig. 1.1.
He boils the liquid in each test-tube for two minutes and then cools each test-tube for one minute in an ice bath.
He then adds a spatula full of washing powder to each test-tube.
He stirs the contents of each test-tube using a clean stirring rod for each test-tube.

Experiment 3

The student sets up test-tubes as shown in Fig. 1.1.
To each test-tube, he then adds a spatula-full of washing soda, sodium carbonate.
He stirs the mixture for approximately one minute.
He then adds washing powder to each test-tube and stirs.

Table 1.1 shows his results from Experiments 1, 2 and 3.

Table 1.1

liquid	**Observations**		
	Experiment 1	Experiment 2	Experiment 3
A	lather forms readily	**(d)(i)**	lather forms readily
B	lather forms after sometime	lather forms readily	**(e)(i)**
C	scum forms	scum forms	lather forms readily

(i) State the test the student is carrying out in Experiment 1.

..... [1]

(ii) Suggest a reason for using different stirring rods in the three test-tubes in Experiment 1.

.....

..... [1]

(iii) The volume of the liquids is the same in all the test-tubes.

Suggest another variable that must be kept constant as this reaction proceeds.

..... [1]

(d) (i) Complete the box labelled **(d)(i)** in Table 1.1. [1]

(ii) Explain the change in lather formation observed in test-tube **B** in Experiment 2.

.....

.....

..... [2]

(iii) State another observation that he will make when heating test-tube **B**.

.....

..... [1]

(e) (i) Complete the box labelled **(e)(i)** in Table 1.1. [1]

(ii) State the procedure responsible for the observation in test-tube **C** in Experiment 3.

..... [1]

(iii) Suggest the name of the anion that causes the observations in liquid **B** in Experiment 3.

..... [1]

(iv) Suggest the name of the cation that causes the changes that are observed in liquid **C** in Experiment 3.

..... [1]

(f) The student uses Universal Indicator solution to test the pH of the washing powder.

(i) Describe how he tests the pH of the washing powder.

.....

.....

..... [2]

(ii) The indicator turns blue when added to the washing powder.
Suggest, from the results, the pH value and whether the solution is acidic, neutral or alkaline.

pH value .....

pH ..... [2]

2 A student determines the density of glass using glass block **Q**.

He sets up the experiment as shown in Fig. 2.1.

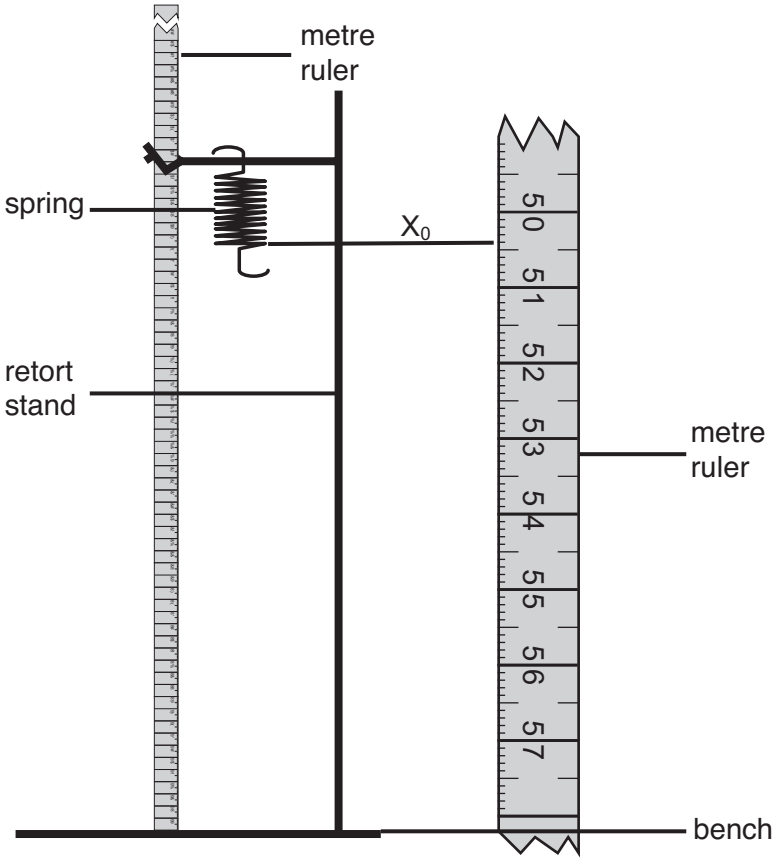

Fig. 2.1

(a) (i) He takes the reading of the position of the bottom of the spring, X_0.

Read and record the reading, X_0, on the ruler shown in Fig. 2.1.

X_0 ..... [2]

(ii) He then hangs the glass block on the spring as shown in Fig. 2.2.

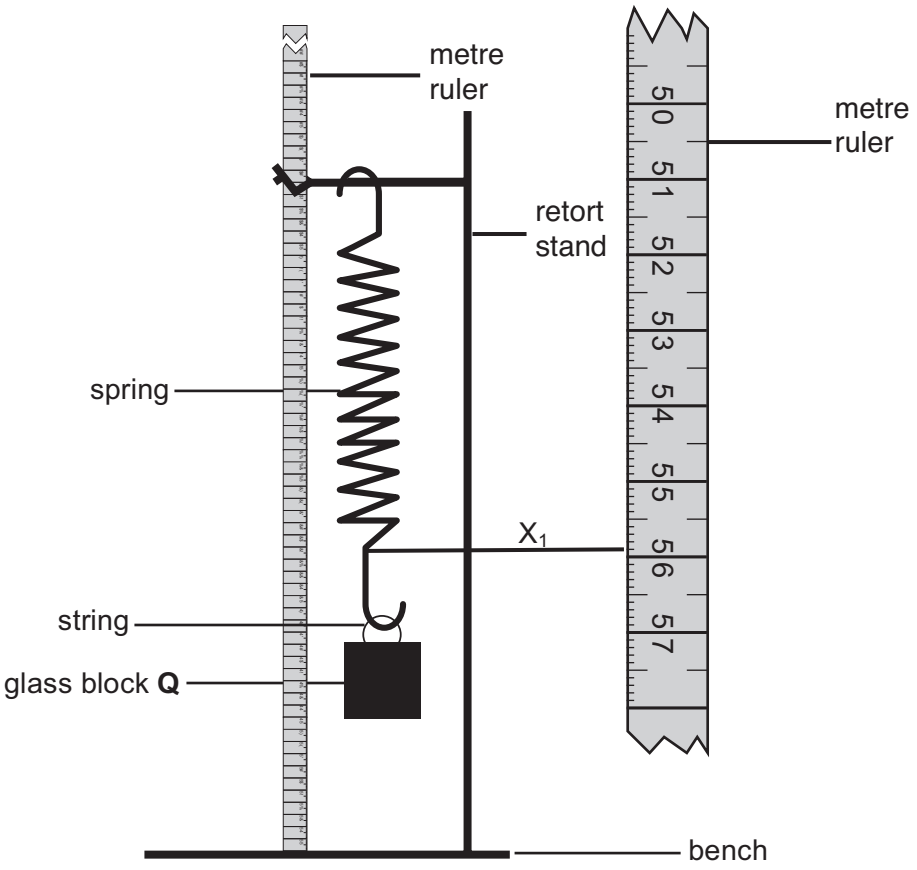

Fig. 2.2

Read and record the new position of the bottom of the spring, X_1, on Fig. 2.2.

X_1 ..... [1]

(iii) Calculate the extension, e_1, on the spring using the equation

$e_1 = X_1 - X_0$.

e_1 ..... [2]

(b) He gently raises beaker **A** with water under glass block **Q** until the block is totally submerged.

Fig. 2.3 shows the set-up.

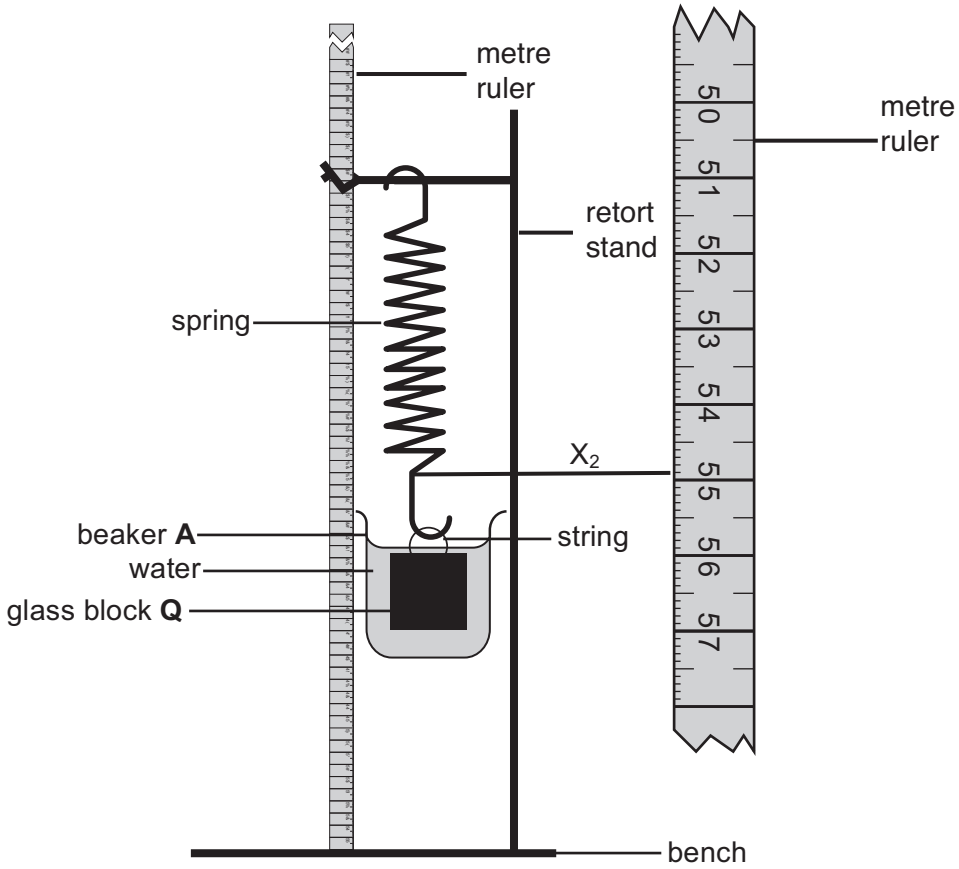

Fig 2.3

(i) Read and record the new position of the bottom of the spring, X_2, on the ruler.

X_2 ..... [1]

(ii) Suggest an improvement in the experiment to increase the accuracy of the value of X_2.

.....

..... [1]

(iii) Calculate the extension, e_2, on the spring using the equation

$e_2 = X_2 - X_0$

e_2 ..... [2]

[Turn over

(c) Calculate the density of glass block **Q** using the equation given below.

[Density of water (ρ_w) = 1.0 g / cm^3]

$$\rho = \frac{e_1 p_w}{(e_1 - e_2)}$$

ρ = ... g / cm^3 [2]

(d) **(i)** Describe how error of parallax could be avoided when taking the reading in Fig. 2.3.

.....

..... [1]

(ii) State any other precaution the student took before taking the readings.

.....

..... [1]

(e) Glass block **Q** is replaced with a different glass block of the same material and mass, but it is thinner and longer.

This block is **not** completely submerged in the water.

State and explain whether,

(i) the value calculated for e_2 would be greater, smaller or equal to that obtained in **(b)(iii)**,

value of e_2 .....

explanation .....

..... [2]

(ii) the value calculated for density, ρ, would be greater, smaller or equal to that calculated in **(c)**.

value of density .....

explanation .....

..... [2]

(f) The student replaces beaker **A** with beaker **B** in Fig. 2.3.

Beaker **B** contains cooking oil.

He gently raises beaker **B** under glass block **Q** until the block is totally submerged.

Fig. 2.4 shows the set-up.

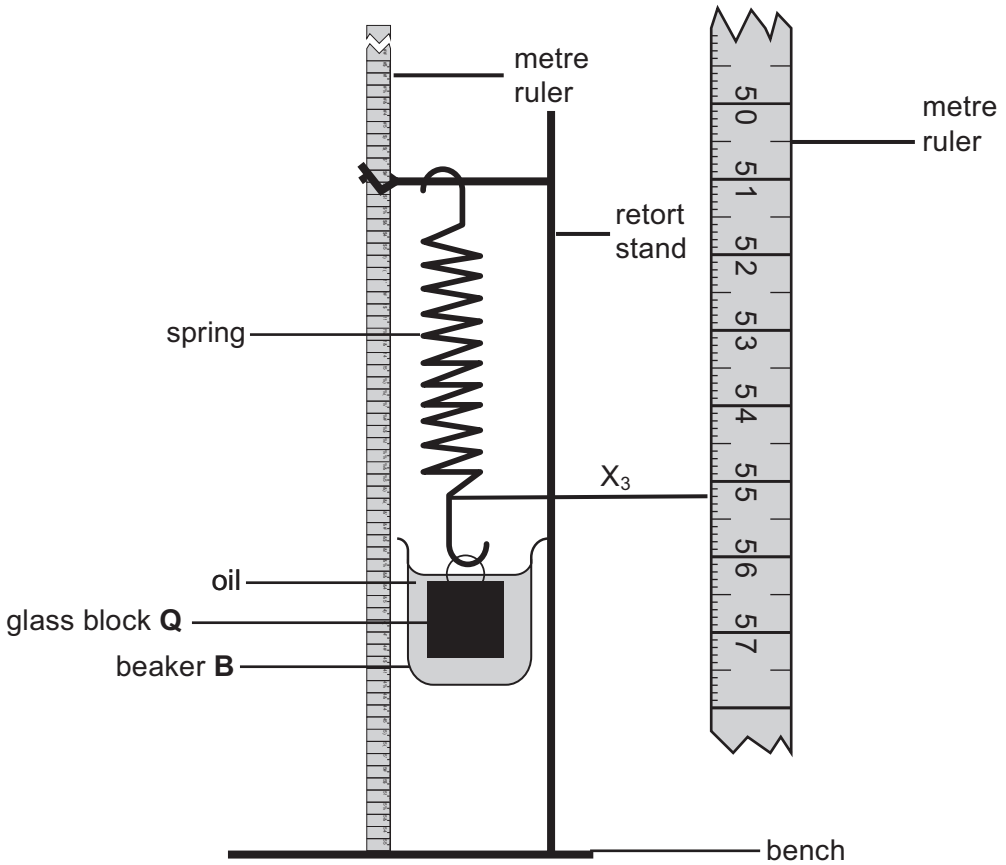

Fig. 2.4

(i) Read and record the position of the bottom of the spring, X_3, in Fig. 2.4.

X_3 ..... [1]

(ii) Explain why the reading in **(f)(i)** is different from the reading in **(b)(i)**.

.....

.....

..... [2]

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