Centre Number	Candidate Number	Candidate Name

NAMIBIA SENIOR SECONDARY CERTIFICATE

PHYSICS ORDINARY LEVEL

6118/3

PAPER 3

1 hour 15 minutes

Marks 40

2022

Additional Materials: Non-programmable calculator
Ruler

INSTRUCTIONS AND INFORMATION TO CANDIDATES

- Candidates answer on the Question Paper in the spaces provided.
- Write your Centre Number, Candidate Number and Name in the spaces at the top of this page.
- Write in dark blue or black pen.
- You may use a soft pencil for any diagrams, graphs or rough working.
- Do not use correction fluid.
- Do not write in the margin *For Examiner's Use*.

- Answer **all** questions.

- The number of marks is given in brackets [ ] at the end of each question or part question.
- You may use a non-programmable calculator.

- Take the weight of 1 kg to be 10 N (i.e. acceleration of free fall g = 10 m/s^2).

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1	
2	
3	
4	
Total	

Marker	
Checker	

This document consists of **12** printed pages.

Republic of Namibia

MINISTRY OF EDUCATION, ARTS AND CULTURE

For Examiner's Use

1 A student investigates the depth of a hole made when a steel ball bearing is dropped into sand.

Fig. 1.1 shows the apparatus for the experiment.

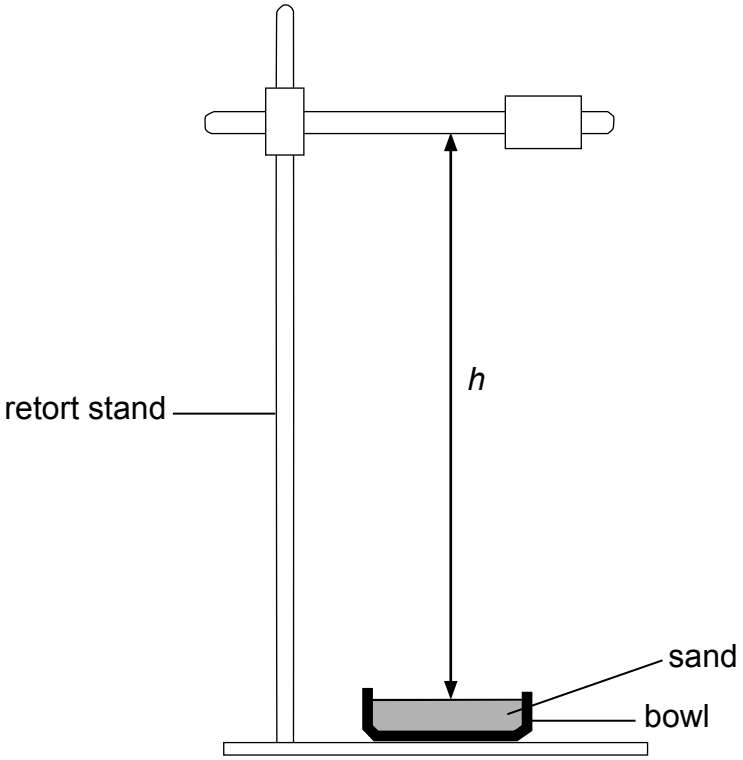

Fig. 1.1

(a) The student drops ball bearings of different diameters.

Each ball bearing is dropped from the same height.

(i) Measure the length *h* on Fig. 1.1.

h = ...cm [1]

(ii) Fig. 1.1 is drawn to $\frac{1}{10^{th}}$ full size.

Calulate the actual height *H*.

H = ...cm [1]

(iii) Explain why the student drops the ball bearings from the same height.

.....

..... [1]

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(b) The student measures the diameter of one of the ball bearings.

(i) Fig. 1.2 shows the apparatus that the student uses to measure the diameter of the ball bearing.

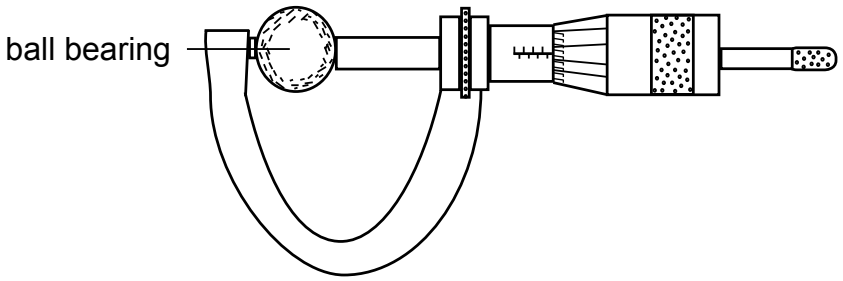

Fig. 1.2

State the name of the apparatus shown in Fig. 1.2.

..... [1]

(ii) Fig. 1.3 shows the reading from Fig.1.2.

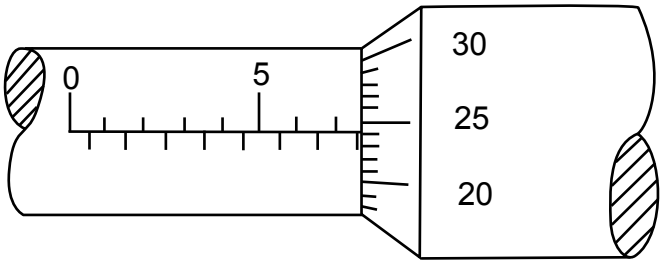

Fig. 1.3

Record the diameter *d* of the ball bearing.

d = ... mm [1]

(c) The student:

- measures the diameter *d* of five different ball bearings
- drops each ball bearing into the bowl of sand
- measures the depth *D* of the hole each ball bearing makes.

Table 1.1 shows the results.

Table 1.1

d / mm	*D* / mm
4.83	33
4.47	30
4.12	27
3.75	24
3.39	20

(i) Name an apparatus that can be used to measure the depths *D*.

..... [1]

(ii) Describe **one** difficulty in doing this experiment.

.....

..... [1]

(iii) The learner suggests that the diameter *d* of the ball bearing is directly proportional to the depth *D* of the hole it makes when dropped in the sand.

State whether you agree with this suggestion. Justify your answer by reference to the results.

statement .....

.....

justification .....

..... [2]

[9]

2 A student investigates the oscillation of a metre rule.

She assembles the apparatus as shown in Fig. 2.1. The distance *L* is 20 cm.

The rule is balanced on the beaker.

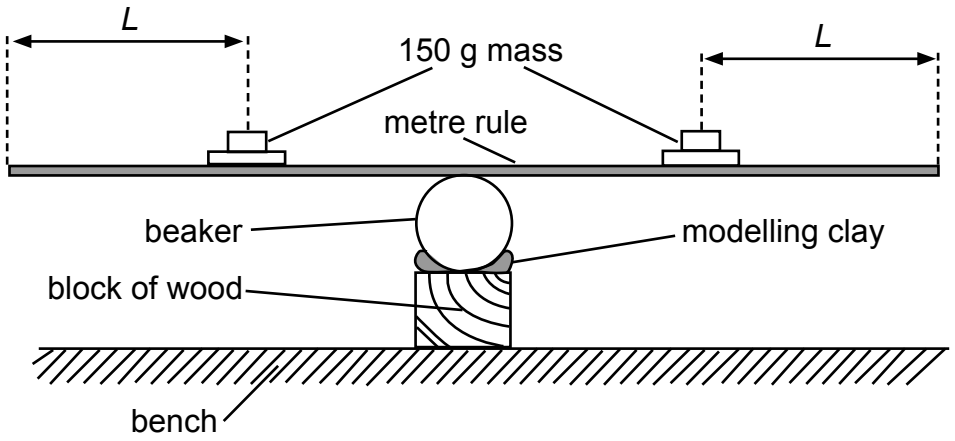

Fig. 2.1

The student:

- pulls one end of the rule down through a short distance
- releases the end of the rule so that it oscillates
- uses a stopwatch and times 10 oscillations
- repeats the timing three times

(a) The time *t* is shown on the stopwatches in Fig. 2.2.

Fig. 2.2

(i) Record the times *t* 1, *t* 2 and *t* 3 shown in Fig. 2.2.

t 1 .....s

t 2 .....s

t 3 .....s [1]

(ii) Determine the period T of the oscillations.

T .....s [2]

(b) The learner reduces the length L shown in Fig. 2.1 and repeats points **(a)(i)** and **(a)(ii)** until she has eight sets of data.

Table 2.1 shows her results.

Table 2.1

L / cm	T / s
16.0	4.44
14.0	4.50
12.0	4.57
10.0	4.62
8.0	4.68
6.0	4.74
4.0	4.79
2.0	4.86

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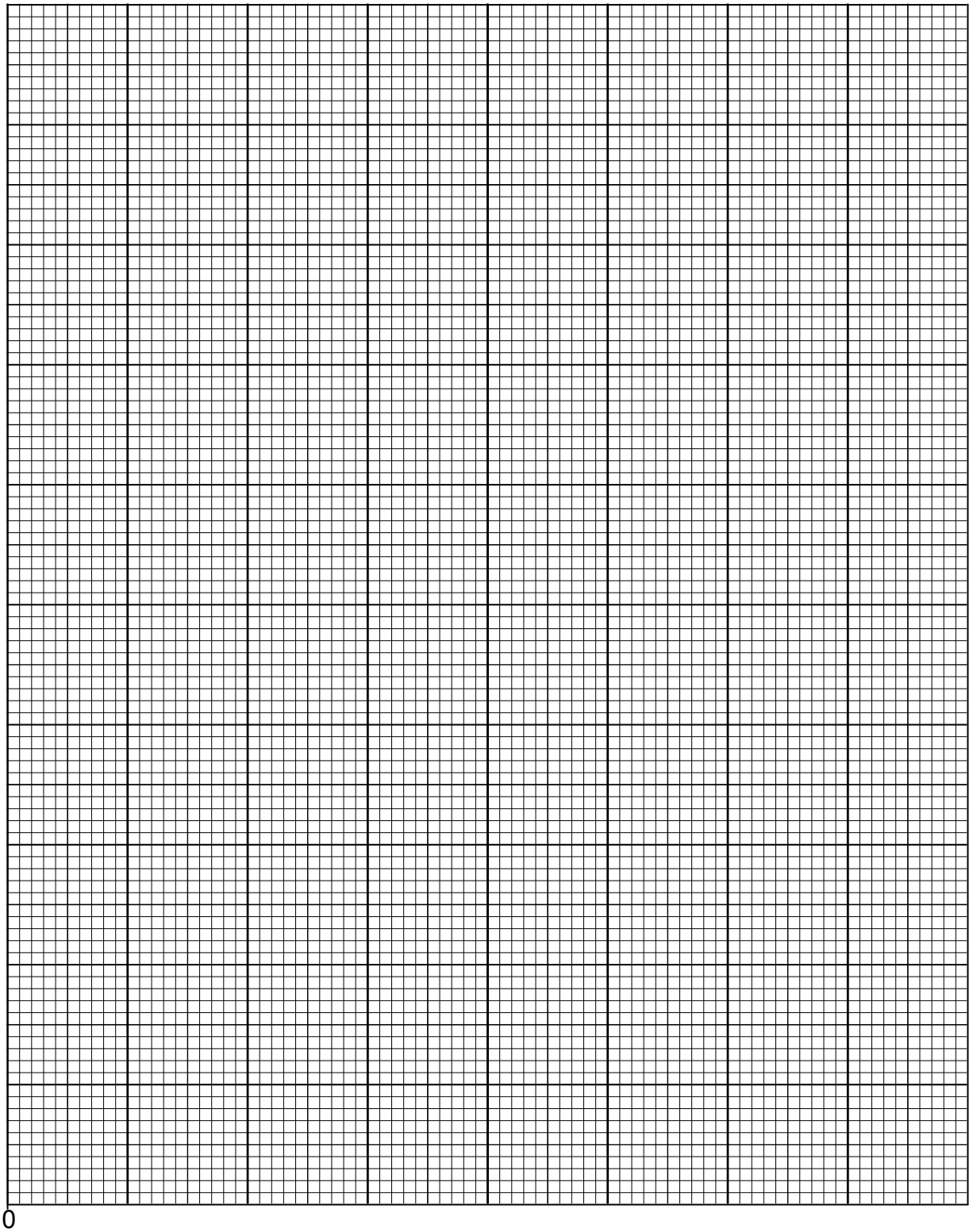
(i) Use the grid to draw the graph of L / cm (y-axis) against T / s (x-axis). Draw a line of best fit.



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[5]

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(ii) Determine the gradient of the graph. Show clearly on the graph how you obtained the necessary information.

Show your working.

State the unit of the gradient.

gradient .....

unit ..... [3]

[11]

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3 A student investigates the rate of cooling of water in different containers.

Fig. 3.1 shows three containers **X**, **Y** and **Z**. Each container is made of a different material.

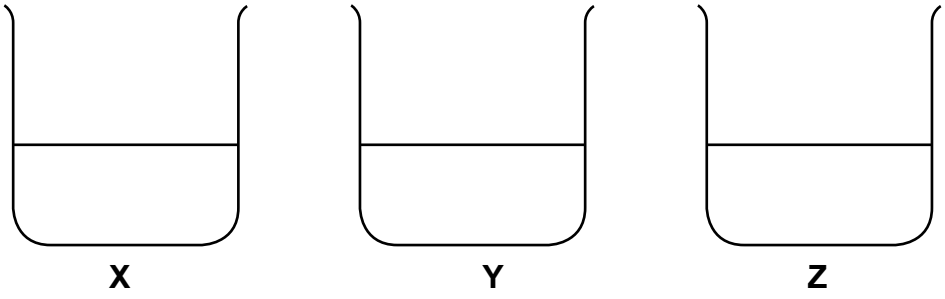

Fig. 3.1

(a) A student uses a measuring cylinder to measure 200 cm^3 of water to pour in each container **X**, **Y** and **Z**.

State **two** ways the student avoids a parallax error when measuring the volume of the hot water.

1 .....

.....

2 .....

..... [2]

(b) The student:

- takes a thermometer which is initially at room temperature θ_R.
- places the thermometer in container **X**.
- pours 200 cm^3 of water at a temperature of 90ºC into container **X**.
- starts a stopwatch and determines the time taken t for the water to cool to a final temperature θ_F.

Fig 3.2 shows the thermometer readings for θ_R and θ_F.

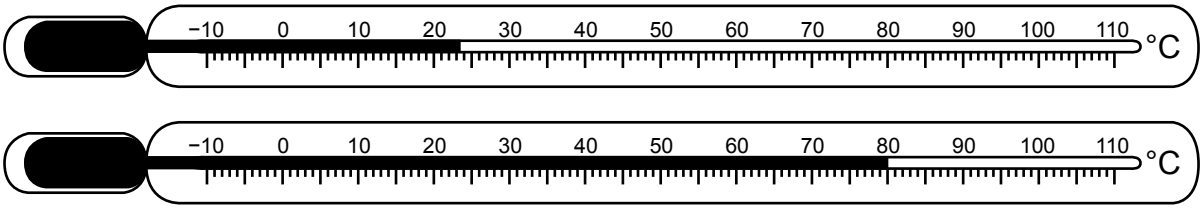

Fig. 3.2

Record θ_R and θ_F.

θ_R = ... °C

θ_F = ... °C [2]

(c) State **two** safety precautions the student takes when doing this experiment.

1 .....

.....

2 .....

..... [2]

(d) Table 3.1 shows the data obtained from the investigation.

Table 3.1

container	*t* /	*R* / .....
X	23.4	
Y	21.8	
Z	20.7	

(i) Calculate the rate of cooling *R* for containers **X**, **Y** and **Z**.

Use the equation $R = \frac{90 - \theta_F}{t}$.

Give your answers to **three** significant figures.

X .....

Y .....

Z ..... [2]

(ii) Complete the column headings in Table 3.1. [2]

(e) Students in another school carry out this experiment using identical equipment.

Suggest **two** differences in the conditions in various classrooms that might lead to differences in the time readings.

1 .....

.....

2 .....

..... [2]

[12]

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4 Plan an experiment to investigate the relationship between the extension of a spring and the mass hanged on the spring.

The following equipment is available:

- 1 × retort stand
- 1 × 50 g mass hanger
- 5 × 50 g masses
- 1 × metre ruler with millimetre scale.

In your plan, you should:

- explain briefly how the investigation would be carried out.
- state which measurements should be taken
- explain how the data will be presented
- explain how the data will be processed
- draw a labelled diagram of your apparatus
- explain how a conclusion will be reached.

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[8]