NA

GAN ENG SENG SCHOOL
Preliminary Examination 2022

CANDIDATE NAME			
CLASS		**INDEX NUMBER**	

SCIENCE (PHYSICS) 5105/02
Paper 2

19 Aug 2022
Papers 1 & 2: 1 hour 15 minutes

Sec 4 Normal (Academic)

Candidates answer on the Question Paper.

Calculators are allowed in the examination

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid/tape.

Answer **all** questions in Section A and any **two** questions in Section B.
Enter the numbers of the Section B questions you have answered on the dotted lines in the grid below.
In calculations, you should show all the steps in your working, giving your answer at each stage.
You are advised to spend no longer than 30 minutes on Paper 1.
You may proceed to answer Paper 2 as soon as you have completed Paper 1.

At the end of the examination, hand in your answers to Paper 1 and Paper 2 separately.
The number of marks is given in brackets [ ] at the end of each question or part question.

	For Examiner's Use
Section A	
Section B	
……..	
……..	
Total	**30**

Section A

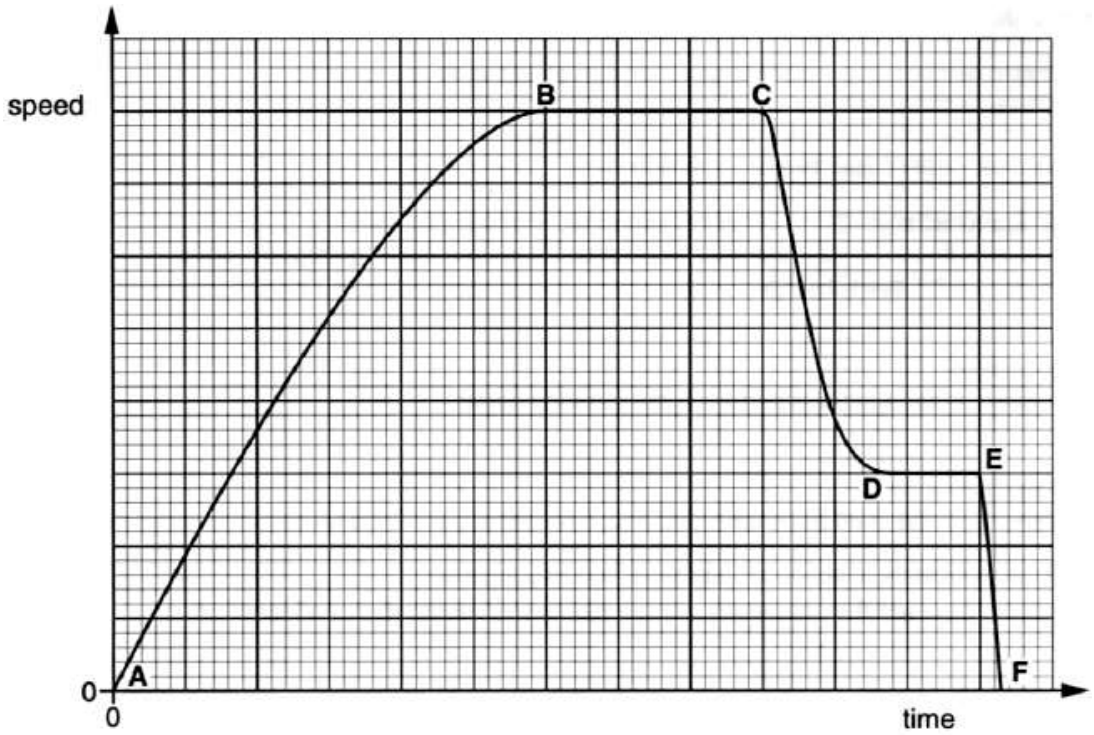
Answer **all** the questions in the spaces provided.

1 In 2014, Third Warrant Officer Shirley Ng, the first female Red Lion parachutist, jumped at the National Day Parade.

(a) Name **two** forces acting on her that oppose each other as she falls.

…… [1]

(b) As she falls, her speed changes with time as shown.



(i) Suggest why the acceleration decreases between **A** and **B**.

……

……

……

…… [2]

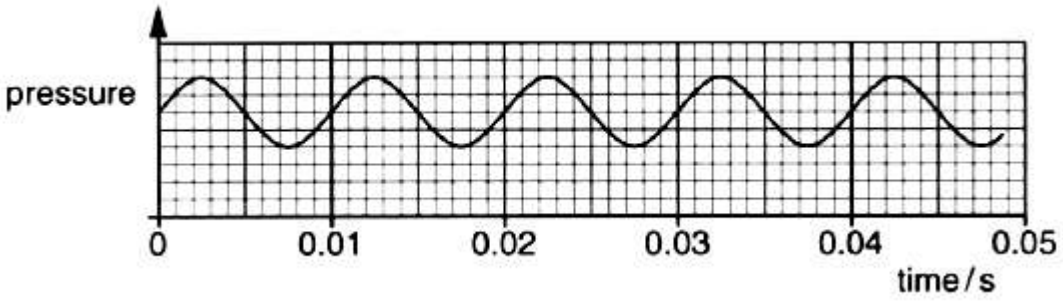
(ii) At which point on the graph when the parachute was opened?

…… [1]

(iii) State the section on the graph when she experienced constant deceleration.

…… [1]

2 The graph of pressure against time for a sound wave produced by a musical instrument is as shown.



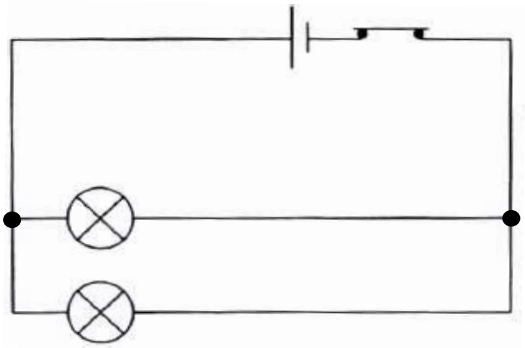
(a) Determine the frequency of this sound wave.

frequency = ... Hz [2]

(b) Given that the speed of sound in the air is 340 m/s, calculate the wavelength of this sound wave.

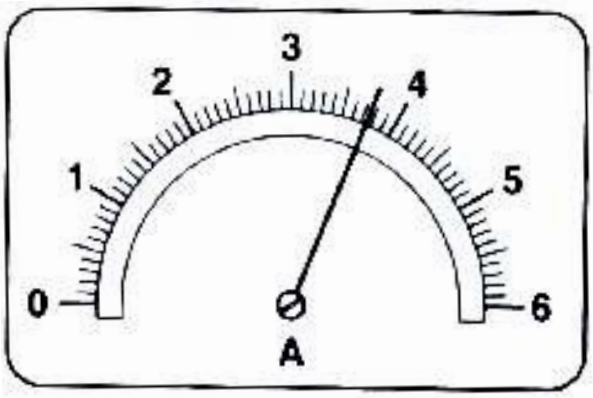
wavelength = ... m [1]

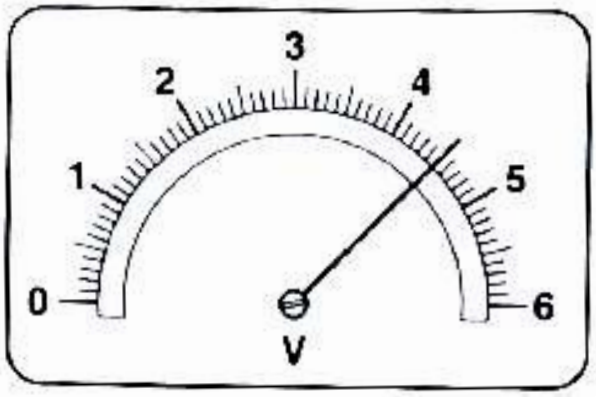
3 A circuit diagram is shown.



(a) Draw, on the circuit diagram above, where you would position an ammeter and a voltmeter so that the values for the total current through the two identical lamps and the potential difference across the lamps can be measured. [2]

(b) When connected correctly, the ammeter and the voltmeter appear as shown.





Use these readings to calculate the

(i) resistance of each lamp,

resistance = ... Ω [2]

(ii) power of the lamps.

power = ... W [2]

Section B

Answer any **two** questions from this section in the spaces provided.

4 Clairessa checks the purity of a small, uniform bar of gold on the ground by measuring its density. She measures the dimensions of the bar as shown.

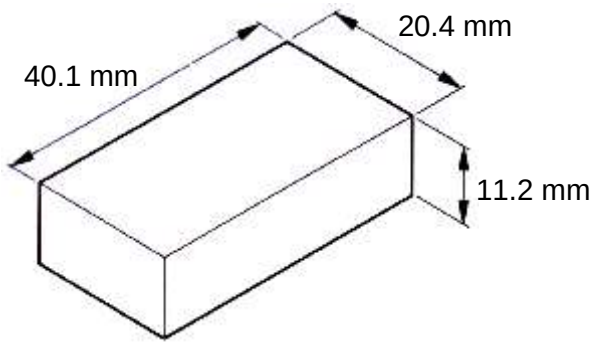


Fig. 4

(a) She has written down every digit of the readings from the measuring instrument that she used. Suggest the name of the instrument used.

..... [1]

(b) Draw, on the bar above, to show its centre of gravity. Label this point as **C**. [1]

(c) She measures the mass of the bar as 176.8 g and the weight of the bar as 1.80 N.

(i) Calculate the gravitational field strength at the location where the measurements were made.

gravitational field strength = ... N/kg [1]

(ii) Calculate the density of the bar.

density = ... g/cm^3 [2]

(iii) The density of pure gold is 19.281 g/cm^3. State and explain whether the bar is made of pure gold.

……

……

……

…… [1]

(iv) Determine the pressure exerted by the bar on the ground when placed as shown in Fig. 4.

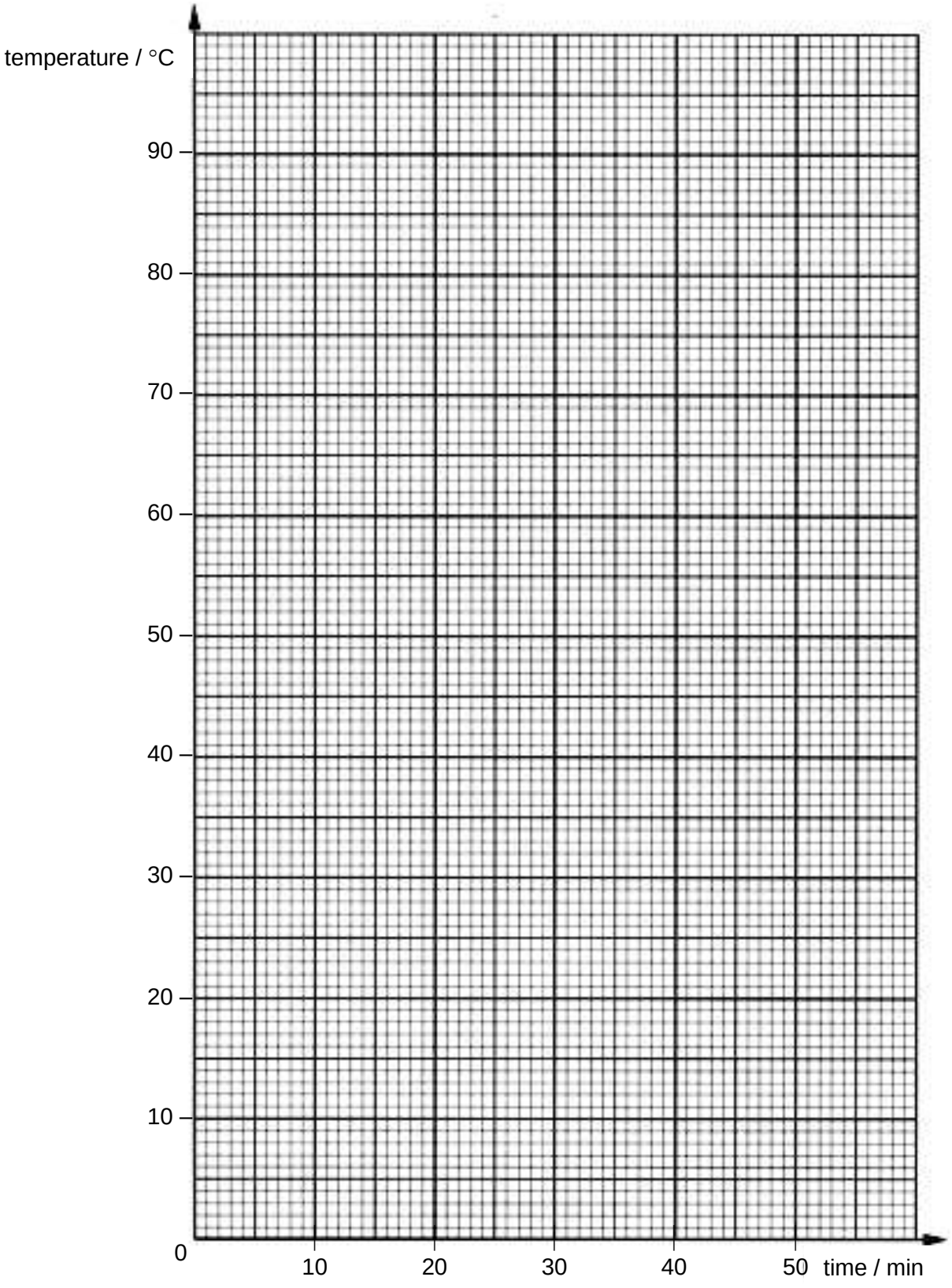
pressure = …… N/cm^2 [2]

5 Estelle investigated the heat loss from two brass cans which had different surface coatings. The diagram shows the two cans at the start of the experiment when water from a boiling kettle is poured into both of them.

Her results are shown in the table.

time / min	temperature / °C	
	can **A**	can **B**
0	90	90
5	60	76
10	40	70
15	30	47
20	25	35
25	25	30
30	25	27
35	25	25
40	25	25
45	25	25
50	25	25

(a) Plot a graph of temperature against time, marking each point with a cross (×). Draw the **best-fit line** to connect the points for can **B**. [2]



(b) Use the information from the table and the graph to answer the following questions.

(i) State which reading for can **B** appears to be incorrect.

time = ... min [1]

(ii) State the room temperature at which Estelle did the experiment.

temperature = ... °C [1]

(iii) Cans **A** and **B** had either shiny / light or dull / black surfaces.

1 State the type of surface can **A** had.

..... [1]

2 Give **two** reasons for your choice of answer in part **1** above.

.....

.....

.....

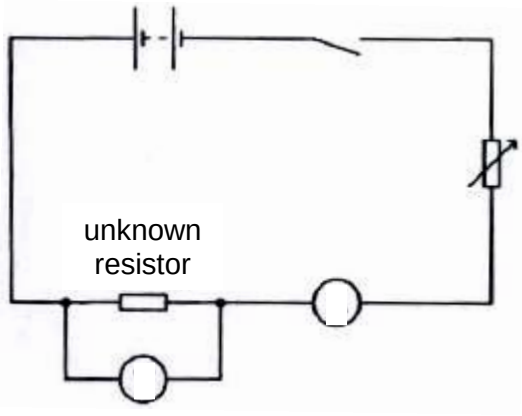
..... [2]

(c) Suggest how the heat loss from both cans could have been reduced.

.....

..... [1]

6 **(a)** Evy set up an experiment to find the resistance of an unknown resistor. The circuit used is as shown.

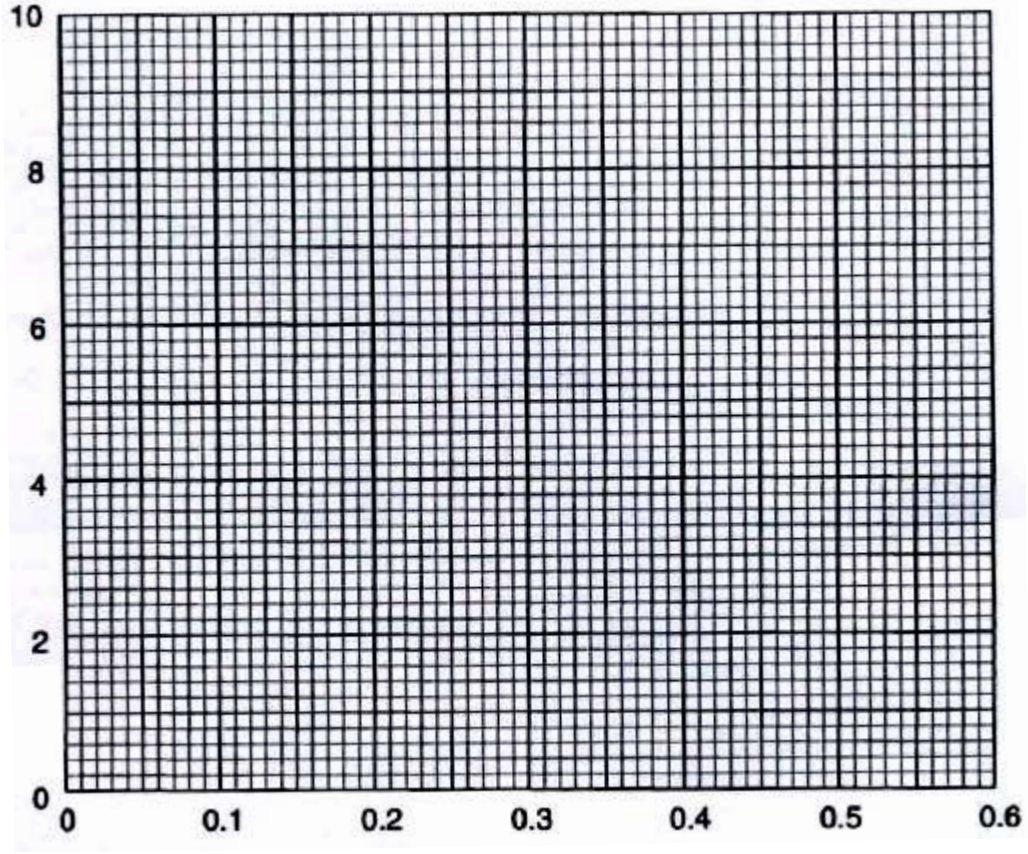


The rheostat was adjusted several times and current and potential difference readings were taken. The results obtained are shown in the table.

current / A	potential difference / V
0.1	1.6
0.2	3.2
0.3	4.8
0.4	6.4
0.5	8.0
0.6	9.6

(i) Plot a graph of potential difference against current, marking each point with a cross (×). Draw the **best-fit line** to connect the points. [2]

potential difference / V



current / A

(ii) Using your graph, calculate the resistance of the unknown resistor.

resistance = ... Ω [2]

(b) Evy used similar apparatus to carry out two further experiments. In the circuit, the unknown resistor was replaced by wires of the same material but of varying lengths and thicknesses.

The first experiment was to find a relationship between the length of a wire and its resistance.

The second experiment was to find a relationship between the thickness of a wire and its resistance.

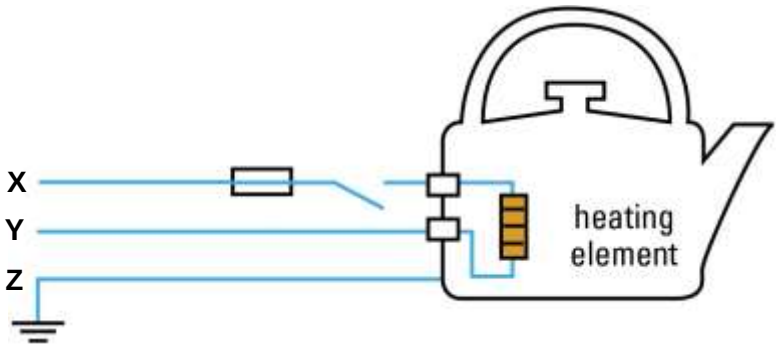
The following table was drawn.

Place a tick ✓ in the boxes to show which wire has a high resistance and which wire has a low resistance for each experiment.

	property of wire	high resistance	low resistance
first experiment	1 m long		
	2 cm long		
second experiment	2 mm thick		
	1 cm thick		

[2]

(c) The diagram shows an electric kettle.



State and explain which wire, **X**, **Y** or **Z**, is the live wire of the electric mains supply.

……

……

……

…… [2]

END OF PAPER