NA

JURONGVILLE SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2022
Secondary 4 Normal (Academic)

STUDENT NAME			
CLASS		INDEX NUMBER	

SCIENCE 5105/02

Paper 2 Physics

19 AUGUST 2022

Papers 1 and 2: 1 hour 15 minutes

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

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

Answer **all** the questions in Section A and any **two** questions in Section B.
Enter the question number of the Section B question you have answered on the dotted lines in the grid below.
In calculations, you should show all steps in your working, giving your answer at each stage.
You are advised to spend no more 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.

Take acceleration due to gravity on Earth, g, to be 10 m / s^2 unless stated otherwise.

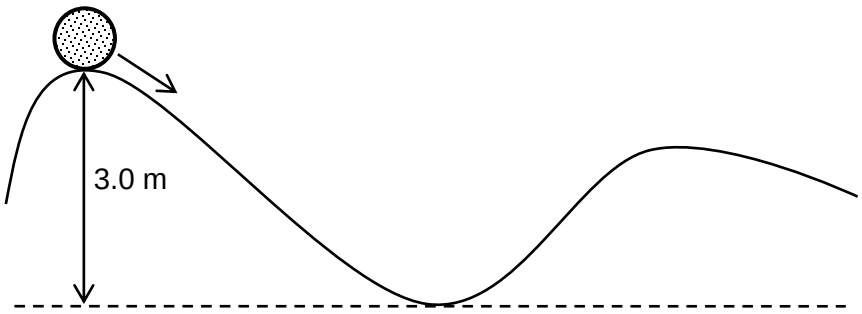
For Examiner's Use	
Section A	**/ 14**
Section B	
.....	**/ 8**
.....	**/ 8**
Total	**/ 30**

Setter: Raymond Tan

Section A

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

1 The diagram shows a ball being released from rest. The ball has a mass of 800 g.



(a) Mark on the slope with a cross and label A where the ball has the greatest kinetic energy. [1]

(b) Calculate the greatest kinetic energy of the ball.

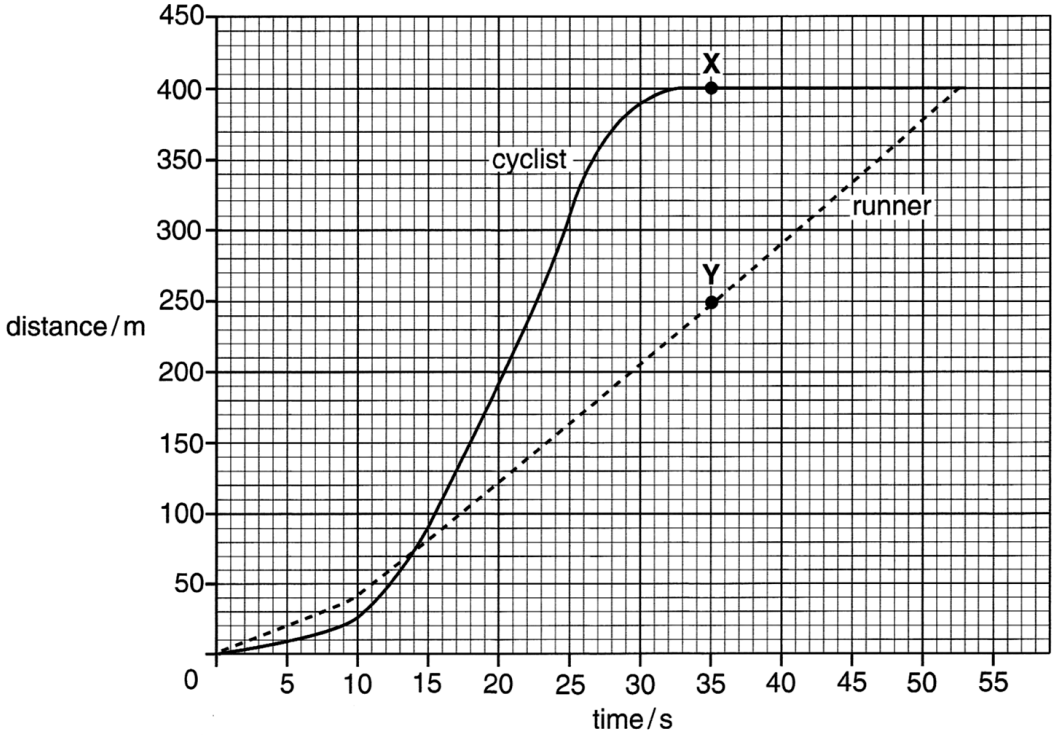
Use g = 10 N/kg in your calculations.

greatest kinetic energy = …….. J [2]

[Total: 3]

2 A cyclist and a runner had a race around a running track in a park.

The graph shows the distance travelled by the cyclist and the runner over time during the race.



(a) State the distance travelled by the cyclist at the end of point **X.**

distance = …….. m [1]

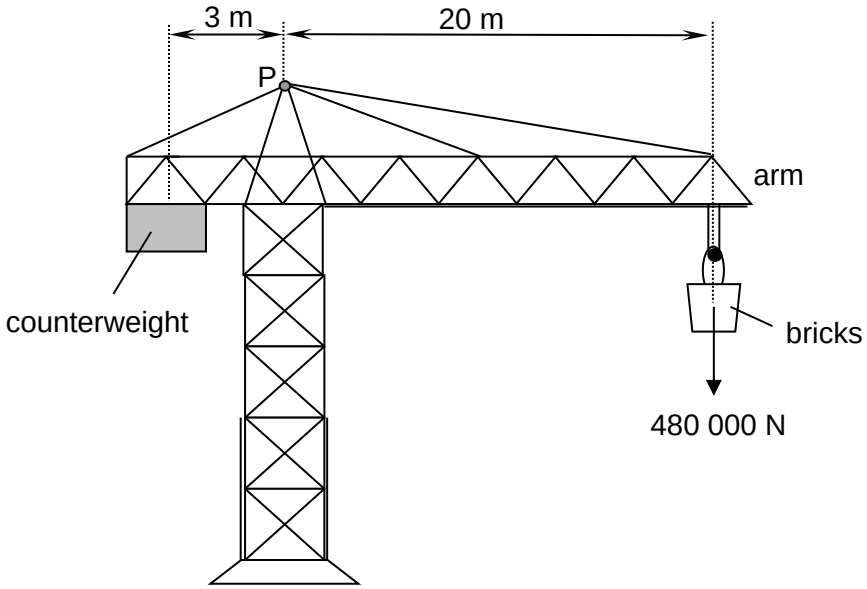
(b) Calculate the average speed of the runner from the start to the end of point **Y.**

average speed = …….. m / s [2]

[Total: 3]

[Turn over

3 The diagram shows a crane lifting some bricks during the construction of a building. The weight of the bricks and the counterweight produce moments on the arm of the crane about the point P. The weight of the bricks is 480 000 N. The crane is balanced about the point P.



(a) Calculate the clockwise moment about P.

clockwise moment about P = …….. Nm [1]

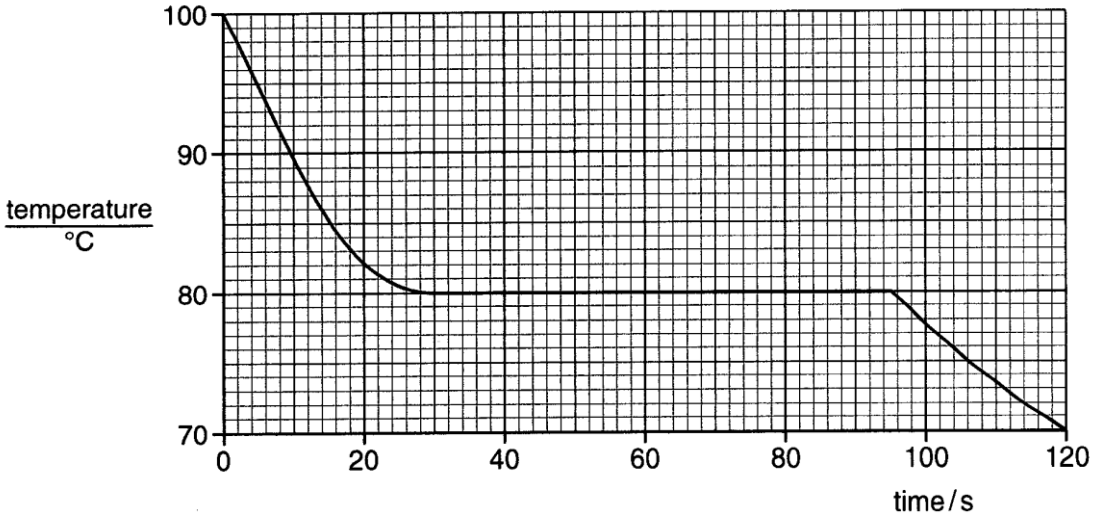
(b) Calculate the weight of the counterweight.

weight of counterweight = …….. N [2]

[Total: 3]

4 A liquid sample placed in a test-tube has a temperature of 100 ˚C. The sample is allowed to cool for 120 s in a laboratory of temperature 20 ˚C.

The graph shows the cooling curve obtained.



(a) State the time when the sample becomes completely solid.

time = …….. s [1]

(b) Explain why the temperature of the sample is constant from 30 s to 95 s, even though thermal energy is lost during this time.

……

……

……

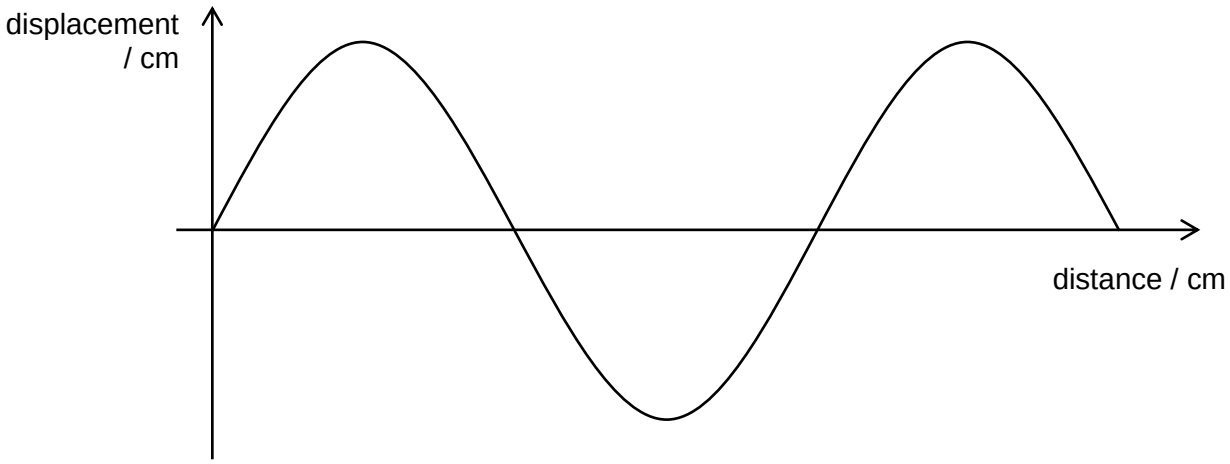
……

……

…… [2]

[Total: 3]

5 The graph represents a transverse wave and is drawn to scale.



(a) Use a ruler to measure the amplitude of the wave.

amplitude = …….. cm [1]

(b) Use a ruler to measure the wavelength of the wave.

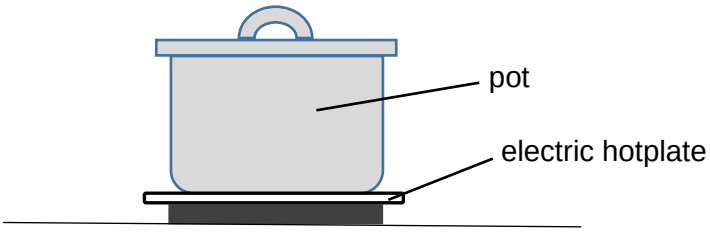
wavelength = …….. cm [1]

[Total: 2]

Section B

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

6 Water in a pot is heated by an electric hotplate. The temperature of the water is measured and recorded every minute.

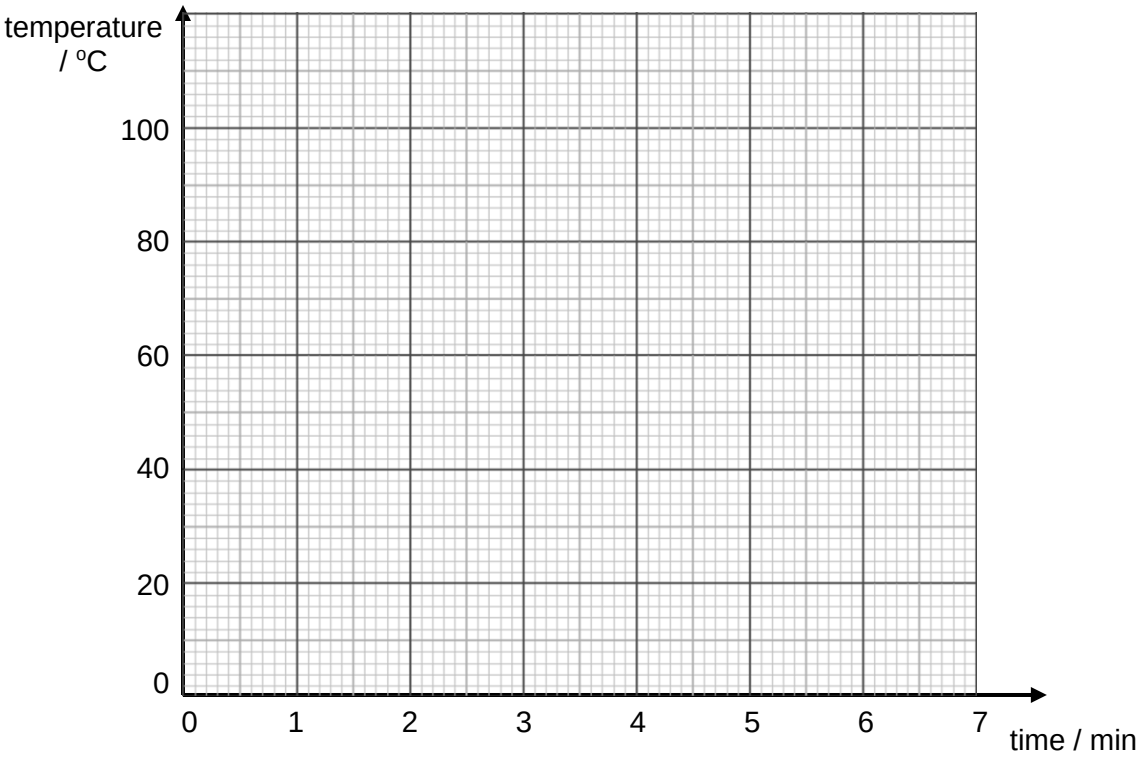


The results obtained are shown in the table.

time / min	0	1	2	3	4	5	6	7
temperature / °C	20	36	52	64	74	82	86	90

(a) **(i)** Plot the graph of temperature against time, marking each point with a cross, (x).

Draw a curved line of best fit, taking into account all the points. [2]

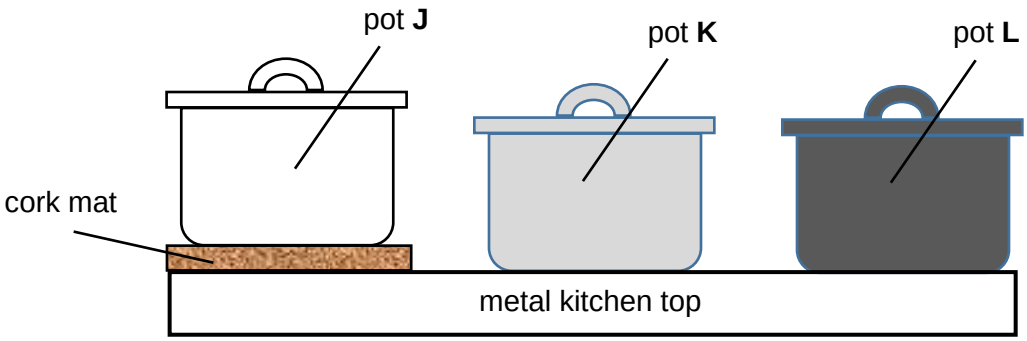


(ii) Use your graph to determine the time it takes for the water to reach 70°C.

time = …… min [1]

(b) The diagram shows three similar-sized copper pots (**J**, **K** and **L**) used for boiling water. When the water is boiling, the pots are removed from the electric heater and left to cool by placing them on a metal kitchen top.

- Pot **J** is white and shiny.
- Pot **K** is dark blue and shiny.
- Pot **L** is black and dull.
- A cork mat was placed between the pot **J** and the kitchen top.



(i) State the pot that the water shall lose heat the fastest. Explain your answer.

pot ……

explanation ……

…….. [2]

(ii) State the pot that the water shall lose heat the slowest. Explain your answer.

pot ……

explanation ……

……..

…….. [3]

[Total: 8]

7 (a) The diagram shows the electromagnetic spectrum in order of increasing wavelength.

Each component in the electromagnetic spectrum travels at a speed of 3.0×10^8 m/s.

gamma rays	P	ultraviolet rays	Q	R	S	radio waves

(i) State the components of the electromagnetic spectrum at P, Q, R and S.

P …….....

Q …….....

R …….....

S ……..... [2]

(ii) Visible light has a range of wavelengths.

Calculate the frequency of the visible light that has a wavelength of 700×10^{-9} m. The speed of the visible light is 3.0×10^8 m / s.

frequency = ……..…….. Hz [2]

(b) A student found the following sentence in a science fiction story book.

"*David heard a deafening sound when the spaceship exploded in the vast emptiness of outer space.*"

State and explain what is wrong with the sentence.

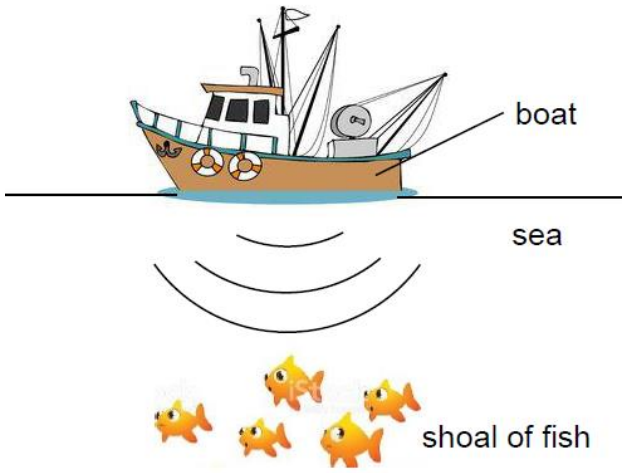
……..……..……..……..……..……

……..……..……..……..……..……

……..……..……..……..……..……

……..……..……..……..…… [2]

(c) The diagram shows a fishing boat uses sounding equipment to detect shoals of fish below the boat. Pulses of sound waves are sent out from the boat and the shoals of fish reflect the sound.



The receiver picks up a reflection of sound from a shoal of fish 0.80 seconds after it leaves the boat.

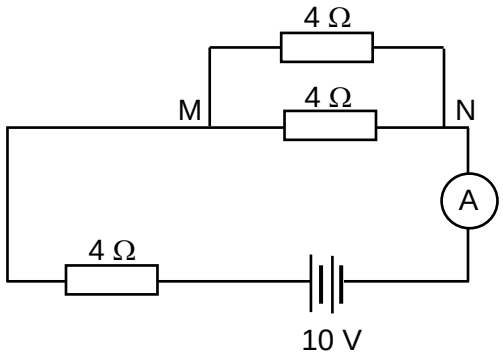
The speed of sound waves through water is 1500 m/s.

Calculate the distance of the shoal of fish below the boat.

distance = …….. m [2]

[Total: 8]

8 **(a)** The diagram shows a 10 V battery connected to three 4 Ω resistors.



(i) Calculate the effective resistance of the circuit.

effective resistance = …….. Ω [2]

(ii) Calculate the current flowing through the ammeter A.

current = …….. A [1]

(iii) Determine the potential difference across section MN.

potential difference = …….. V [2]

[Turn over

(b) An electric kettle, rated 1200 W 240 V, is used to boil water for 4 minutes per day.

(i) Calculate the energy consumption of the electric kettle in kWh per month.

energy consumption = …….. kWh [2]

(ii) 1 kWh of electrical energy costs $0.25.

Calculate the cost of using the kettle for one month.

cost = $ …….. [1]

[Total: 8]

End of paper

[Turn over