

Paya Lebar Methodist Girls' School (Secondary) Preliminary Examination 2022 Secondary 4 Normal Academic

5105/02

3 August 2022

1 hour 15 minutes

CANDIDATE NAME		
CLASS	•	

SCIENCE (Physics)

Paper 2 Physics

(Taken together with Paper 1)

Candidates answer on the Question Paper.

No additional materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on the front cover. Write in dark blue or black pen. You may use a soft pencil for any diagrams, graphs or rough working. Do not use staples, paper clips, glue or correction fluid. The use of an approved scientific calculator is expected, where appropriate.

Section A (14 marks)

Answer **all** questions. Write your answers in the spaces provided on the question paper.

Section B (16 marks)

Answer any **two** questions.

Write your answers in the spaces provided on the question paper.

Enter the question number in Section B that you have answered on the lines in the grid below.

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

For Examiner's Use Only		
Paper Number	Marks	
Paper 1	/ 20	
Paper 2 Section A	/ 14	
Paper 2 Section B	/ 16	
Q		
Q		
Total	/ 50	

This document consists of <u>11</u> printed pages (including this cover page).

SECTION A (14 marks)

Answer **all** questions in this section.

1. The following graph shows the motion of two cyclists.

(a) State which cyclist, A or B, slows down faster.

.....

(b) Calculate the acceleration of cyclist B.

acceleration = m/s² [2]

[1]

2. Three blocks, A, B and C are placed on three inclined planes as shown.



(b) State which block(s), A, B or C will not topple. Explain your answer.

......[2]

.....

3. A battery is connected to two <u>identical</u> light bulbs, **P** and **Q** and a resistor **R** as shown in the diagram below.



(a) Define e.m.f.

(a)

 	[1]

(b) The current in light bulb **P** is 0.15 A. Calculate the current in resistor **R**.

Current in resistor **R** = A [2]

[Turn Over

4. The diagram shows a boy and a man standing on skateboards at the top of a track. The total weight of the boy and his skateboard is 500 N. The total weight of the man and his skateboard is 800 N.



(a) Calculate the work done by the **boy** in carrying his skateboard from the bottom to the top of the stairs.

Work Done = J [2]

(b) Assuming there is no energy loss due to friction, calculate the speed of the man at C. Take g = 10 N/kg.

Speed = m/s [2]

(c) Suggest what should the boy do to reach E.

......[1]

END OF SECTION A

SECTION B (16 marks)

Answer any two questions from this section in the spaces provided

- 5. Sound travels in the form of longitudinal waves.
 - (a) Define *longitudinal waves*.

.....[1]

(b) In an experiment, a vibrating tuning fork is placed in front of a microphone. The microphone is connected to a piece of apparatus that shows waveforms.

The output trace, A, from the microphone is shown on the screen of the apparatus as seen below.



The controls of the apparatus are **not** altered throughout the experiment.

(i) The same tuning fork is made to produce a softer sound. Sketch on the diagram below the output trace, B, seen on the screen for the softer sound.



trace B

[1]

A different tuning fork is placed in front of the microphone. It is made to produce the same volume of sound as that originally produced by the first tuning fork.

The output trace, C, is seen on the screen as shown below.



(ii) Explain the difference between trace A and trace C.



(c) The loudness of sound is measured in decibels (dB).

> A loudspeaker produces a loud sound. A sound meter is used to measure the loudness of the sound as it is moved away from the loudspeaker.

The results obtained are shown in the table below.

Distance/ m	1.0	2.0	4.0	6.0	8.0	12.0
Loudness/ dB	100	90	80	74	70	68

Plot a graph of loudness against distance, marking each point with a (i) cross, (x). [1] [1]





(iii) A man stands 3.0 m from the loudspeaker.

Use your graph to find how loud the sound is at this distance.

Loudness of sound = dB [1]

(iv) The table shows the maximum length of time that is safe for a person to experience a continuous sound.

Continuous sound/ dB	Maximum length of time
79	32 hours
82	16 hours
85	8 hours
88	4 hours
91	2 hours
94	1 hour
97	30 minutes

Estimate the length of time for which it is safe for the man to stand 3.0 m away from the loudspeaker whilst it is making the sound.

(v) Suggest **one** way in which the man could safely extend this time.

.....[1]

6. A student carries out an experiment to study the relationship between potential difference (p.d.) across a resistor, R, and the current flowing through it.

The student uses the circuit shown below.



- - (ii) State the purpose of the component labelled **X**.

The student adjusts component **X** until the voltmeter reads 0.20 V. He then records the current reading.

By adjusting component **X** four more times, the student obtains the results shown below.

p.d. reading/ V	Current reading/ A
0.20	0.10
0.40	0.20
0.60	0.30
0.80	0.40
1.00	0.50

(b) Use one row of data from the table above to calculate the resistance of resistor R.

Resistance = $\dots \Omega$ [1]

(c) (i) State the upper limit of the voltmeter reading.

Upper Limit =V	[1]
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(ii) Suggest why this voltmeter reading has an upper limit.

......[1]

The student now replaces the voltmeter to measure the potential difference across component \mathbf{X} as shown below.

Once again, he adjusted component **X** to obtain several new readings.



(d) Complete the table below to show the new voltmeter and ammeter readings.

p.d. reading/ V	Current reading/ A
1.80	0.10
1.40	
	0.50

[2]

(e) Household circuits contain earth, live and neutral wires.

State which wire must fuses be connected to.

......[1]

7. The diagram shows a drone hovering in the air at a constant height.



- (a) Draw and label **two** arrows to show the main forces acting on the drone when it is hovering. [1]
- (b) State what can be concluded about the magnitude of each of these forces when the drone is hovering.



The drone obtains energy from a battery.

(c) Complete the sequence of useful energy conversions as the drone **rises** into the air at constant speed.



The graph shows the velocity-time graph of the drone as it moves vertically upwards from the ground before hovering at that fixed position.

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Using data from the graph,

(d) (i) calculate the maximum kinetic energy of the drone,

Kinetic Energy = J [2]

(ii) determine the height at which the drone starts to hover.

height = m [2]

END OF PAPER