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for o better future	
CANDIDATE	

BEDOK VIEW SECONDARY SCHOOL **PRELIMINARY EXAMINATION 2022**

NAME

REGISTER NUMBER

SCIENCE (PHYSICS) **Secondary 4 Normal Academic**

Paper 2 Theory

CLASS

5105/02 28 July 2022 Paper 1 and 2: 1 hour 15 minutes

Additional Materials: -

READ THESE INSTRUCTIONS FIRST

Write your 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 a soft pencil for any diagrams, graphs or rough working. Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

Answer all questions in the spaces provided.

Section B

Answer any **two** questions. Write your answers in the spaces provided.

Candidates are reminded that **all** quantitative answers should include appropriate units.

The use of an approved scientific calculator is expected, where appropriate.

Candidates are advised to show all their working in a clear and orderly manner, as more marks are awarded for sound use of concepts than for correct answers.

At the end of the examination, fasten all your work securely together.

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

Setter(s): Abdul Malek Osman

Parent's / Guardian's Signature:

This document consists of **11** printed pages.

Do not turn over the page until you are told to do so.

For Examiner's use				
Paper 1	/ 20			
Section A				
1	/ 2			
2	/ 7			
3	/ 5			
Section B				
4	/ 8			
5	/ 8			
6	/ 8			
Total	/ 50			
% / Grade	/			

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Section A

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



Fig. 2.1

A 100 g load is attached to the metre rule such that the centre of the load is a distance *d* away from the pivot. The rule is displaced a small distance to one side then allowed to swing and the time *t* taken for 10 complete swings is recorded.

For examiner's use

[3]

The results for the experiment are recorded in Table 2.1.

<i>d</i> / cm	70.0	75.0	80.0	85.0	90.0	
t/s	16.80	17.10	17.60	17.90	18.40	
T/s		1.71		1.79	1.84	

_			-	
Та	b	e	2.	1

(2)	Calculate the period T for $d = 70.0$ cm and $d = 80.0$ cm in Table 2.1	[1]
(a)	Calculate the period 7 for $d = 70.0$ cm and $d = 80.0$ cm in Table 2.1.	[1]

(b) On the graph below, plot the graph of T/s against d/cm and draw the best-fit line.



For (c) From your graph, determine the distance d when the period T is 1.75 s. Give examiner's your answer to one decimal place. use *d* = cm [1] In a second experiment, the scientist uses the same metre rule but replaces (d) the load with a lighter load of 50 g. State and explain the effect on the period of the swinging rule with a lighter load. [2] [Total: 7] 3 Fig. 3.1 shows a pin and Fig. 3.2 shows a person pushing the pin into a wall with a force of 60 N. top surface 60 N of the pin point Fig. 3.1 Fig.3.2 The area of the top surface of the pin is 1.5 cm². Calculate the pressure (a) exerted on the top surface of the pin. pressure = N/cm² [2] The area of the top surface of the pin is 500 times larger than the area of (b) the point. Calculate the value of the pressure exerted by the point on the wall. pressure = N/cm² [1]

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(c)	Describe the effect on the force applied to top surface of the pin when the pin is used on a soft wall. Explain why.	For examiner's use
	[2] [Total: 5]	



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



(d) Calculate the acceleration of the car between points D and E.

For examiner's use

acceleration = m/s^2 [1]

(e) The Electronic Road Pricing (ERP) system is the primary method of regulating traffic in Singapore. ERP gantries erected at key positions charge motorists for utilising certain roads at times when these roads are more prone to congestion.

The ERP system leverages on technology to allow for a more effective and flexible method of congestion charging. An automated collection of a congestion fee from any vehicle passing under a ERP gantry during its operating hours was implemented. The gantry points use the ERP units that are placed at the windscreen of vehicles to charge vehicle on their toll.

Fig. 4.2 shows an ERP unit that is commonly seen at the windscreen of the vehicle.



Fig. 4.2

The gantry points send an electromagnetic signal that activates the tag on the ERP unit and reflects the wave back to the gantry points with its tag identification.

(i) State the type of electromagnetic wave that is used in the ERP system.

.....[1]

(ii) The electromagnetic wave in the ERP system has a frequency of 900 MHz. The speed of the electromagnetic wave in air is 3×10^8 m/s.

Calculate the wavelength of this electromagnetic wave.



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For (b) The cooling curve of a substance with a boiling point of 220 °C is shown in examiner's Fig. 5.2. use temperature / °C А 220 В С 80 D time / min Fig. 5.2 (i) State the state(s) of the substance in regions labelled B and D in Fig. 5.2. B = D = [1] (ii) Explain why there is no temperature change observed in regions A and C. [2] [Total: 8]

6 A student makes a circuit to switch on a lamp from two different switches X and Y. Fig. 6.1 shows the circuit.

For examiner's use



(ii) The student connects another similar lamp in parallel with the first lamp, as shown in Fig. 6.2.

For examiner's use



Fig. 6.2

State the potential difference and current passing through each lamp when the circuit is closed.

	End of Paper	
	cost = \$ [Tota	[2] : 8]
(d)	Calculate the cost of using the lamps for 15 full days (1 day = 24 hours) if the electrical energy costs 22 cents per kWh.	
		[1]
(c)	State an advantage of connecting lamps in parallel.	
	current =A	[2]
	potential difference =V	