

## PATHLIGHT SCHOOL END OF YEAR EXAMINATION SECONDARY 4 NORMAL (ACADEMIC)

CANDIDATE NAME					
CENTRE NUMBER	S		INDEX NUMBER		

# SCIENCE

5105/02

Paper 2 Physics

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 Centre number, 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, glue or correction fluid.

Answer **all** questions in Section A and any **two** questions in Section B. The use of an approved scientific calculator is expected, where appropriate. 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.

You may lose marks if you do not show your working or if you do not use appropriate units.

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.

This document consists of **11** printed pages and **1** blank page.

[Turn over

#### Section A

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

1 (a) Convert the following using a correct prefix symbol.

$$789.2 \times 10^{-8} = 7.892 \dots g$$
 [1]

7.892 x 10<sup>-6</sup> =

(b) Convert the following value to the required unit.

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0.06 km<sup>2</sup> = ..... m<sup>2</sup>
0.06 x 1 000 000 = 60 000 m<sup>2</sup>
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(c) A student wants to find the period of a pendulum made from a string of length 1 m and a steel ball.

He uses a digital stopwatch to measure the time taken for the pendulum to make 20 oscillations. The process is repeated five times and the results are as follows:

35.26 s 36.23 s 34.83 s 34.94 s 36.02 s

Calculate the period of the pendulum.

Total time = 177.28 T = 177 / (20\*5) = 1.77 s

period = .....s [2]

[1]

2 A student conducts an experiment to study the motion of a toy car. He attaches a ticker tape to the back of the toy car. When the tape is pulled along by the toy car, the ticker timer punches holes onto the tape.



The ticker timer punches 20 holes in one second.

The resulting tape after the toy car travels from X to Y is as shown.



(a) Determine the time taken for the toy car, as it travels from X to Y.
 1/20=0.05
 0.05 x 6 = 0.3 s

(b) Estimate the final velocity by considering the last 0.60 m of the tape shown.

Time = 0.1 s Velocity = 0.6 / 0.1 = 6 m/s

velocity = ..... m/s [1]

(c) Describe the motion of the of the car as it travels from X to Y.

**3** The diagram below shows a simple hydraulic brake system.



When a force F is applied on the braking pedal, the lever will apply 42 N onto piston A.

(a) Taking moments about the pivot, calculate the force F that is applied on the breaking pedal.

F = ..... N [1]

**(b)** The cross-sectional area of piston A is 100 cm<sup>2</sup>.

Calculate the pressure exerted by piston A.

pressure = ..... N/cm<sup>2</sup> [1]

(c) The pressure is transmitted fully through the hydraulic fluid.

Given that piston *B* has a cross-sectional area of 300  $\text{cm}^2$ , calculate the force exerted on the brake pad.

force = ..... N [1]

(d) Hydraulic fluids are incompressible fluids.

If the hydraulic fluid is replaced with air, a greater force *F* is required to perform the same brake.

Suggest a reason why.

......[1]

54 Complete the table to show the correct colour of the insulation for each wire.

wire	colour of insulation
earth	
live	
neutral	

### **Section B**

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

5 The figure below shows a beaker of water which is fitted with a cooling coil.



A cooling liquid is passed through the coil and the temperatures shown on thermometers A and B are recorded.

The graphs below illustrate the readings obtained.



- (a) State the method of heat transfer responsible for the difference in readings obtained by thermometers A and B.
- .....[1]
- (b) Describe how the method of heat transfer in (a) cools the water below the cooling coil.

(c) State and explain the change in internal energy of the water in the beaker.
[2]
(d) Another set up is identical except the coil is wrapped with a plastic material.
State and explain how the graph for thermometer A changes.

.....

[2]

6 (a) The figure below shows three waves A, B and C.

They travel 20 m in 4 s through the same medium.



#### Determine

(i) the wavelength of the wave A.

wavelength = ..... m [1]

(ii) the period of the wave A.

(iii) the speed of wave B.

speed = ..... m/s [1]

period = .....s [1]

(iv) the amplitude of wave C.

(b) The table below contains some statements about electromagnetic waves and sound waves. Some of these statements are true and some are false.

Complete the table by writing either true or false in each box.

statement	true / false
All electromagnetic waves have the same wavelength in air.	
All electromagnetic waves have vibrations that are parallel to the direction of travel of the energy of the wave.	
All electromagnetic waves obey the laws of reflection and refraction.	
Gamma rays have the highest frequency.	
Microwaves are used to transmit satellite television signals.	
Sound waves travel at a speed of 330 m/s in a vacuum.	
The average human ear can hear sounds of range 200 Hz to 20000 Hz.	
Ultraviolet rays have a higher frequency than x rays	

7 A circuit containing four resistors W, X, Y and Z and a battery of electromotive force 12 V is connected.



Resistors W and X each have a resistance of 6.0  $\Omega$ . Resistor Y has a resistance of 3.0  $\Omega$  and resistor Z has a resistance of 7.0  $\Omega$ .

(a) Calculate the total resistance of the circuit.

total resistance = .....  $\Omega$  [3]

(b) Calculate the current in resistor W.

current = ..... A [1]

(c) Calculate the potential difference across resistor Z.

potential difference = ..... V [1]

(d) Calculate the power dissipated in resistor X.

power = ..... W [2]

(e) Calculate the energy dissipated in resistor X in 1 minute.

energy = ..... J [1]