Name: ……..…

Class: ……

Index Number	

Anglo-Chinese School
(Barker Road)

PRELIMINARY EXAMINATION 2021

SECONDARY FOUR NORMAL ACADEMIC

SCIENCE (PHYSICS) 5105 / 02

PAPER 1 AND PAPER 2: 1 HOUR 15 MINUTES

INSTRUCTIONS TO CANDIDATES:

Write your Name, Class and Exam Index Number at the top of this page.

INFORMATION FOR CANDIDATES:

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.

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

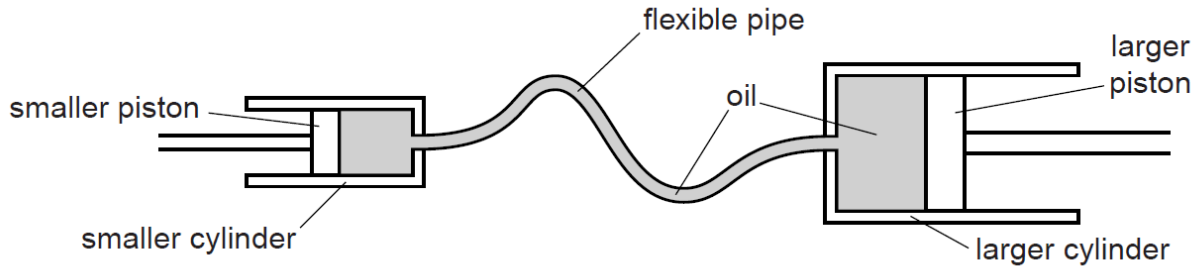
		For Examiner's Use
Paper 1		**/ 20**
Paper 2	**Section A**	**/ 14**
	Section B	**/ 16**
Total		**/ 50**

*This question paper consists of **11** printed pages.*

SECTION A (14 marks)

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

1 A hydraulic system consists of two cylinders and a flexible pipe that joins them. Two pistons keep the oil in the cylinders. The arrangement is shown in figure below.



The cross-sectional area of the larger cylinder is twice the cross-sectional area of the smaller cylinder.

A force is applied on the smaller piston and the is pressure transmitted through the oil to the larger piston. The pressure at the larger piston is equal to the pressure at the smaller piston.

(a) State and explain whether the force at the larger piston is greater than the force at the smaller piston.

……

……

……

…… [2]

(b) Describe what happens to the molecules of oil when the temperature increases.

……

…… [1]

2 Two identical rooms are installed with two different air conditioners A and B respecitvely. Each air conditioner is switched to cool the room.

The table shows the initial temperature of the room before the air conditoner is switched on and the final temperature of the room if the air conditioner is switched on.

day	initial temperature of room / °C (before air conditioner is switched on)	final temperature of room / °C (air conditioner A switched on)	final temperature of room / °C (air conditioner B switched on)
Monday	33	21	22
Tuesday	35	25	23
Wednesday	31	23	20
Thursday	32	23	25
Friday	34	20	24
Saturday	36	25	24
Sunday	30	22	20

(a) The electrical energy required to cool a room by 2°C is 10 MJ.

Calculate the electrical energy used on Wednesday for air conditioner A.

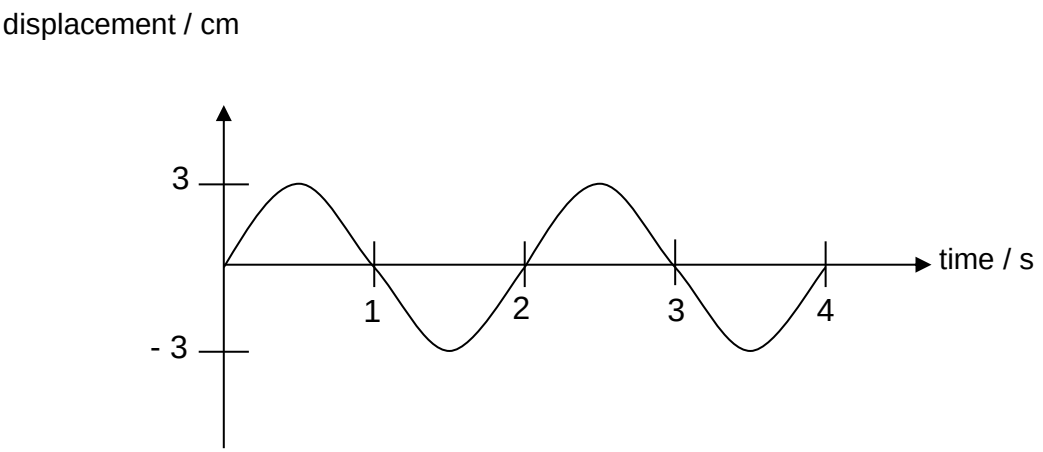
energy used =……MJ [2]

(b) Determine by calculations, whether it will be better to use air conditioner A or B to have a cooler room for the week.

……

…… [1]

3 The diagram shows a displacement-time graph of a sound wave.



(a) Determine the period of the wave.

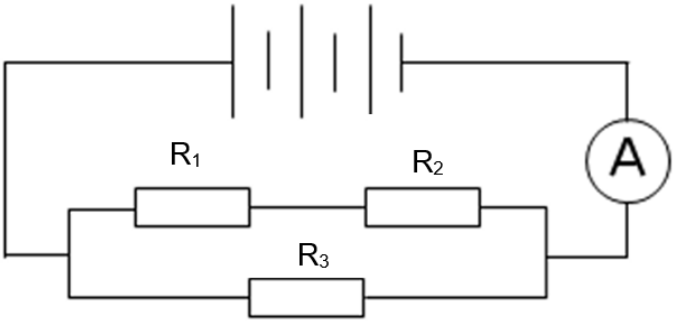
period = …….s [1]

(b) Calculate the frequency of the wave.

frequency = ……..Hz [1]

(c) On the diagram, draw a new sound wave that is softer and has a higher pitch. [2]

4 A student sets up a circuit as shown in the diagram.



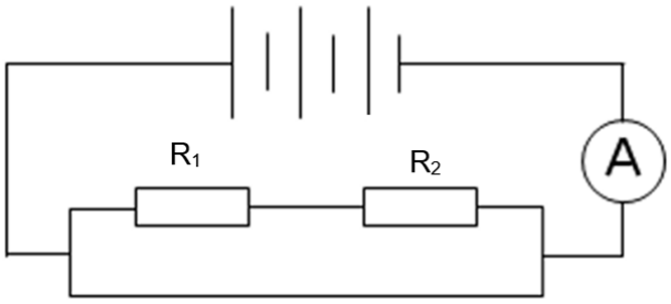
Each resistor has a resistance of 3 Ω.

(a) On the diagram, draw the direction of electron flow. [1]

(b) Calculate the effective resistance of the circuit.

effective resistance = …… Ω [2]

(c) Resistor R_3 is removed and replaced with a conductor wire as shown in the diagram.



The ammeter reading increases to its maximum value and the circuit heats up rapidly.

Explain why this happens.

…….....

……..... [1]

SECTION B [16 marks]

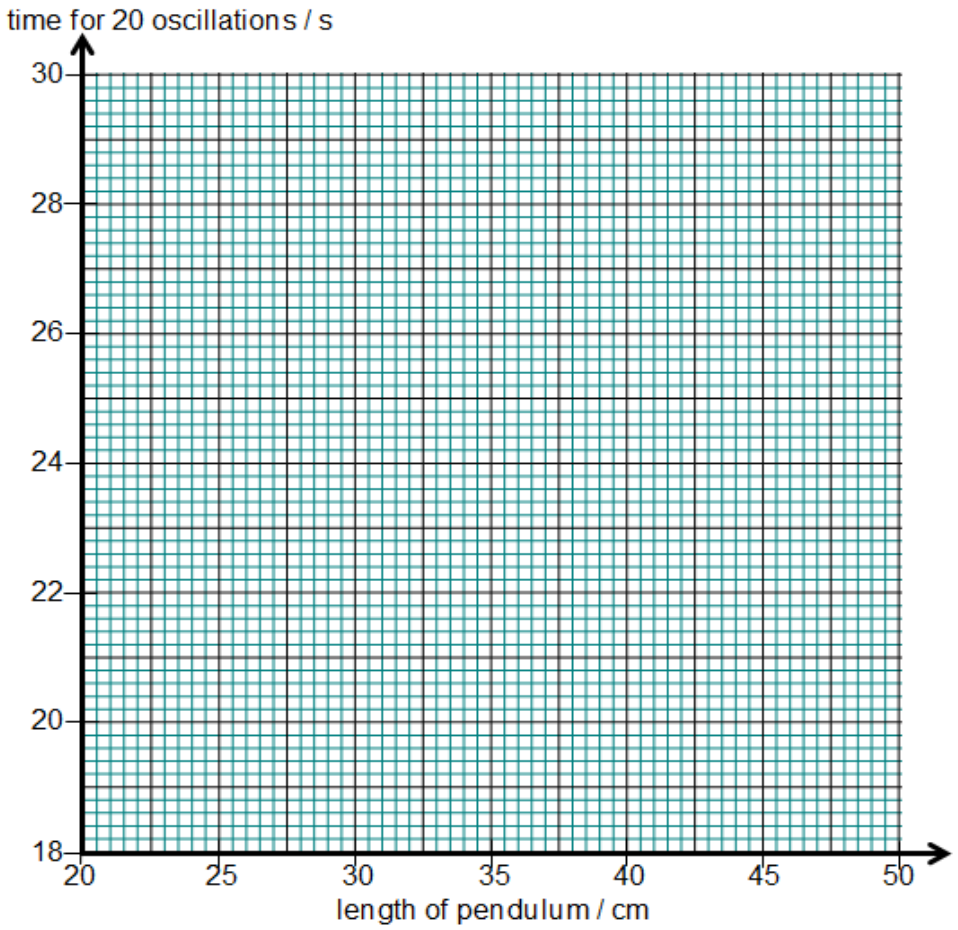
Answer any **two** out of the three questions from this section in the spaces provided.

5 A student sets up a simple pendulum and measures the time taken for 20 complete oscillations using different pendulum lengths.

The results are shown in the table below.

length of pendulum / cm	time for 20 oscillations / s
20.0	18.00
25.0	18.80
30.0	19.40
35.0	21.50
40.0	23.20
45.0	24.50
50.0	28.50

(a) (i) Plot a graph of these results marking each point with a cross (x).
Draw a best-fit line taking into account all the plotted points.

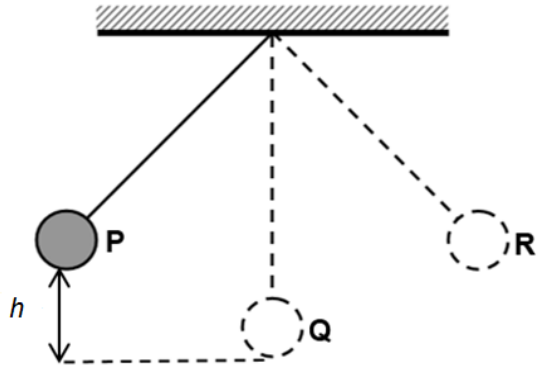


[2]

(ii) Use your graph to predict the time it takes for 20 oscillations for a 42.0 cm long pendulum.

time = ……..s [1]

(b) The diagram shows the pendulum oscillating from P to Q to R.



A 0.2 kg pendulum is raised from Q to P and released from rest at P.

(i) The pendulum gained 0.15 J of gravitational potential energy when it was raised from Q to P.

Calculate the height *h* which the pendulum was raised from Q to P.
Take *g* to be 10 N/kg.

h = ……m [2]

(ii) The speed of the pendulum at Q is 1.1 m/s.

Calculate the kinetic energy of the pendulum at Q.

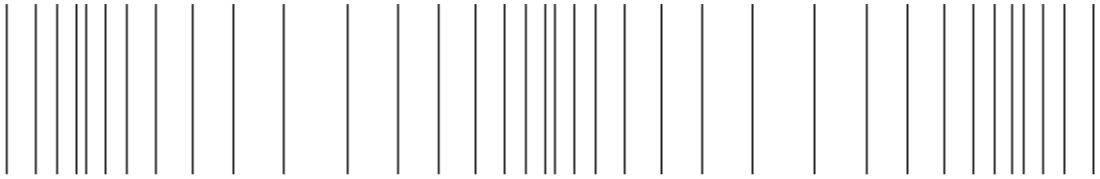
kinetic energy =……J [2]

(iii) Using your answer from (ii), explain if there is any energy converted to thermal and sound energy as the pendulum oscillates from P to Q.

……

…… [1]

6 A sound wave travelling in a rock is shown in the full-scale diagram.



(a) On the diagram, mark the position of one centre of compression with a cross (**x**) labelled with the letter **C** and the position of one centre of rarefaction with a cross (**x**) labelled with the letter **R**. [2]

(b) Determine the wavelength.

wavelength = ……cm [1]

(c) The frequency of the sound wave is 75 800 Hz.

Calculate the speed of the sound wave in the liquid.

speed =……..……..cm/s [2]

(d) State one difference between a sound wave and an electromagnetic wave.

……..

……..

…….. [1]

(e) In another experiment, two students work together to determine how fast sound travels in air.

student A with pistol

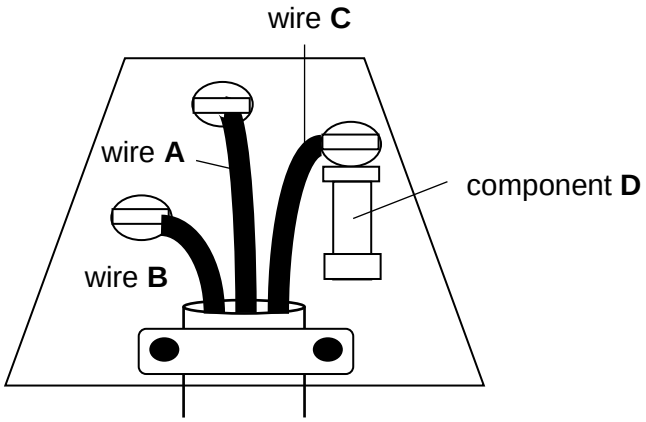
student B with stopwatch

Student A stands at a distance of 1500 m from student B and fires a pistol. Student B starts the stopwatch when he sees the smoke from the pistol and stops the stopwatch when he hears the sound.

Student A repeats the experiment standing 100 m further away each time until student A is 2000 m away from student B.

Construct a results table for the students to use. The table should contain all appropriate headings and units. [2]

7 The diagram shows a three pin plug of a kettle.



(a) Complete the table below to fill in the correct name of the wire and its corresponding colour of insulation.

	name of wire	colour of insulation
wire **A**	Earth wire	
wire **B**		blue
wire **C**		

[2]

(b) Identify component **D** and describe its function.

……...……...

……...……...

……...……... [2]

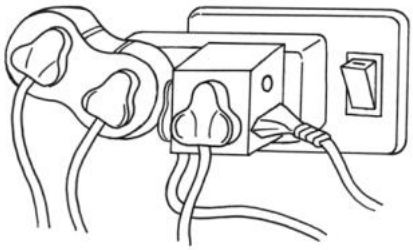
(c) State which wire should be connected to the metal casing of the kettle and explain why.

……

……..

…….. [1]

(d) The diagram shows the the kettle and other appliances plugged into a single wall socket.



State the danger that it poses.

……..…… [1]

(e) The potential difference across the kettle is 240 V.

810 C of charge flow through the the kettle in 3 min.

Calculate the power in the kettle.

power = ……..W [2]

End of paper