

Centre Number	Candidate Number	Name
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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**SCIENCE** **5124/02, 5125/02**

Paper 2 Physics October/November 2004

**1 hour 15 minutes**

Additional Materials: Answer paper

**READ THESE INSTRUCTIONS FIRST**

Write your name, Centre number and Candidate number on all the work you hand in.  
Write in dark blue or black pen.  
You may use a soft pencil for any diagrams, graphs, tables or rough working.  
Do not use staples, paper clips, highlighters, glue or correction fluid.

**Section A**  
Answer **all** questions.  
Write your answers in the spaces provided on the Question Paper.

**Section B**  
Answer any **two** questions.  
Write your answers on the lined paper provided and, if necessary, continue on separate answer paper.

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.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

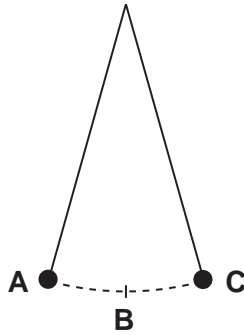
For Examiner's Use	
Section A	
Section B	
<b>TOTAL</b>	

**Section A**

Answer **all** the questions.

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

- 1 A simple pendulum swings between **A** and **C** as shown in Fig. 1.1.



**Fig. 1.1**

A student starts a stopwatch as the pendulum bob, moving from **A** to **C**, passes **B**. He stops the watch when the bob, moving from **C** to **A**, next passes **B**. The reading on the stopwatch is 1.0 seconds.

- (a) What is the period of this pendulum?

[1]

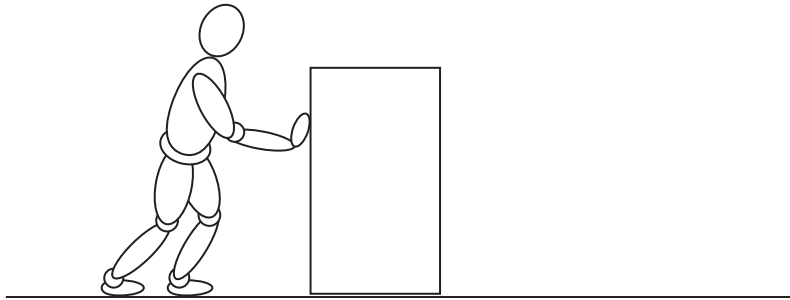
- (b) Explain how the student could obtain a more accurate measurement of the period of the pendulum, without using any extra equipment.

.....

.....

.....[2]

- 2 Fig. 2.1 shows a man pushing a box of mass 20 kg across a horizontal floor at a constant speed of 0.2 m/s. The box slides without tipping. He pushes the box by applying a constant horizontal force of 80 N.



**Fig. 2.1**

- (a) (i) State the size of the frictional force acting on the box, and explain how you obtain your answer.

.....  
 .....  
 ..... [2]

- (ii) What is the direction of the frictional force?

..... [1]

- (b) The man does work in moving the box. State and explain what happens to the energy used by the man.

.....  
 .....  
 ..... [2]

- 3 Fig. 3.1 shows a uniform metre rule of weight  $W$  hanging from a string at  $P$ . When  $P$  is at the 20 cm mark, the rule is balanced by a weight of 3.6 N hanging at the 10 cm mark.

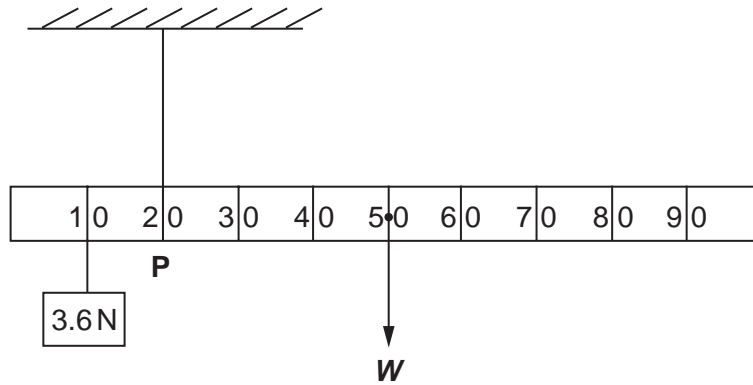


Fig. 3.1

- (a) Calculate the moment of the 3.6 N weight about  $P$ .

[1]

- (b) Use the principle of moments to calculate the weight,  $W$ , of the rule.

[2]

- 4 (a) Calculate the kinetic energy of a car of mass 1400 kg that is moving at 20 m/s along a straight horizontal road.

[2]

- (b) The car is stopped by a constant braking force in a distance of 50 m.  
By considering the work done in stopping the car, calculate the size of this braking force.

[3]

- 5 A metal can has polished surfaces. A similar can has its surfaces painted black. Fig. 5.1 shows how the temperature of each can varies over a short period of time after they are moved into strong sunlight.

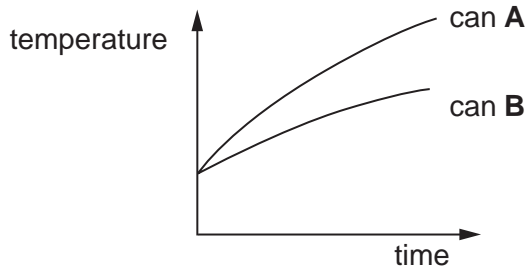


Fig. 5.1

- (a) State the name of the process that transfers energy to the cans.

..... [1]

- (b) Which can, **A** or **B**, is the one painted black? Give a reason for your answer.

.....  
 .....  
 ..... [2]

- 6 (a) (i) Explain, by reference to ripples on water, the meaning of the term *transverse wave*.

.....  
 .....  
 ..... [2]

- (ii) State what is being transferred by the transverse waves on the water surface.

..... [1]

- (b) An object that is dipping into a lake vibrates 120 times in 1.0 minute, producing ripples of wavelength 25 cm. Calculate the speed of these ripples.

[3]

- 7 A ray of blue light is incident on the edge **AB** of a glass block **ABCD**, as shown in Fig. 7.1.

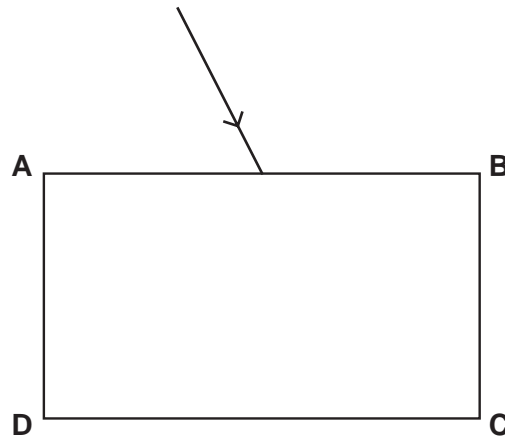


Fig. 7.1

- (a) On Fig. 7.1, sketch the path of the ray of light in the block and also after it emerges from edge **CD**. Mark on your diagram the angle of incidence  $i$  and the angle of refraction  $r$  at the edge **AB**. [3]

- (b) For one particular ray of blue light, the angle of incidence is  $45^\circ$  and the angle of refraction is  $28^\circ$ . Calculate the refractive index of the glass for blue light.

[2]

- 8 Two identical resistors, each of resistance  $6.0\ \Omega$ , are to be connected between the terminals of a 2 V cell.

- (a) (i) Complete Fig. 8.1 to show the resistors connected **in series** between **X** and **Y**.

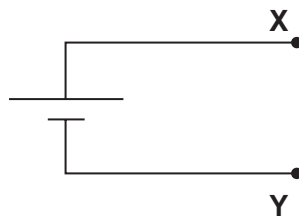


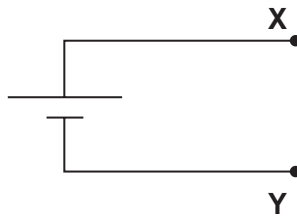
Fig. 8.1

[1]

- (ii) Calculate the total resistance of this circuit.

[1]

(b) (i) Complete Fig. 8.2 to show the resistors connected **in parallel** between X and Y.



[1]

**Fig. 8.2**

(ii) Calculate the total resistance of this circuit.

[1]

(iii) Calculate the current in each resistor.

[2]

9 Some electrical appliances have a metal case that has an earth wire connected to it.

(a) Why is it called an *earth wire*?

.....  
 .....[1]

(b) A fuse is connected in the live wire of the circuit that includes the appliance.

(i) How would you choose the rating of the fuse to be used in the circuit?

.....  
 .....[2]

(ii) Explain why the fuse is connected in the live wire.

.....  
 .....  
 .....[2]

- 10 The radioactive decay of a certain nucleus of bismuth (Bi) to a nucleus of lead (Pb) is known to proceed in **two** steps, as indicated in Fig. 10.1.



**Fig. 10.1**

In the complete process an alpha-particle and a beta-particle are emitted.

- (a) State the proton (atomic) number and the nucleon (mass) number of the intermediate nucleus if the alpha-particle is emitted before the beta-particle.

proton number .....

nucleon number ..... [2]

- (b) State the proton number and the nucleon number of the intermediate nucleus if the beta-particle is emitted before the alpha-particle.

proton number .....

nucleon number ..... [2]



## Section B

Answer any **two** questions.

Write your answers on the lined paper provided and, if necessary, continue on separate answer paper.

- 11 (a) Describe an experiment to measure room temperature with an initially unmarked mercury-in-glass thermometer. [7]
- (b) Give a brief description of a thermocouple thermometer. Why is such a thermometer often used to measure rapidly changing temperatures? [3]
- 12 (a) Describe an experiment to measure the speed of sound in air. Make clear what measurements you would take, and how you would use the measurements to calculate the result. [7]
- (b) State an approximate value for the highest frequency that can be heard by a human being. When a note of this frequency is heard under water, its wavelength is longer than when in the air. Explain this fact. [3]
- 13 (a) You are provided with a coil of wire, a magnet and any other equipment you may require. Describe an experiment to demonstrate
- (i) the production of an induced e.m.f. in the coil,
- (ii) **one** factor affecting the magnitude of this induced e.m.f. [5]
- (b) Two metal rods, **A** and **B**, of the same size are placed inside a solenoid, as shown in Fig. 13.1. The solenoid is connected to a battery through a switch **S**.

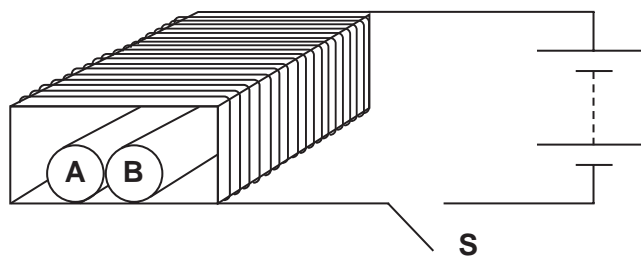


Fig. 13.1

One rod is made of iron, the other of steel.

Explain the following observations that are made with this equipment.

- (i) After **S** is closed, the metal rods roll away from each other.
- (ii) After some time **S** is then opened. The rods roll towards each other.

[5]

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