UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

SCIENCE **5125/02**

Paper 2 Physics **October/November 2011**

Candidates answer on the Question Paper **1 hour 15 minutes**

Additional Materials: Answer Booklet/Paper

READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
Write your Centre number, candidate number and name on all the work you hand in.
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, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

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.

For Examiner's Use	
Section A	
Section B	
Total	

This document consists of **12** printed pages and **4** lined pages.

Section A

For Examiner's Use

Answer **all** the questions.

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

1 A student carries out an experiment to investigate how the length of a spring varies when different weights are attached to it, as shown in Fig. 1.1.

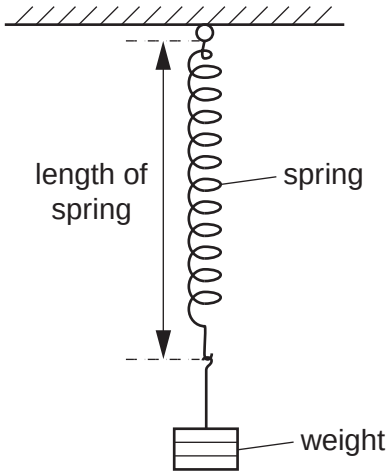

Fig. 1.1

Fig. 1.2 shows the graph he obtained from his results.

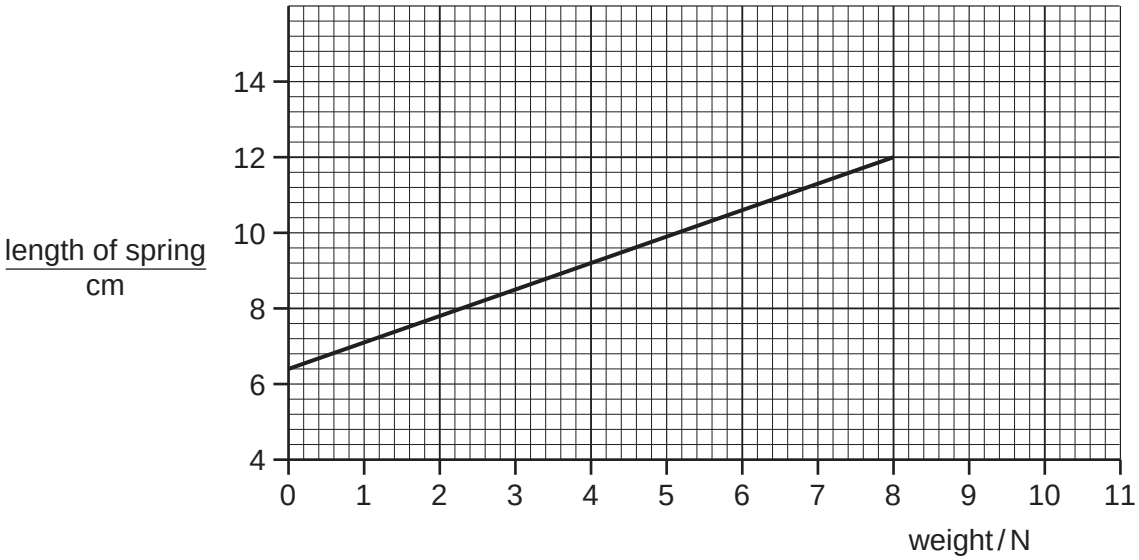

Fig. 1.2

(a) **(i)** State the length of the spring when no weight is attached to it.

length = ... cm [1]

(ii) A weight of 4.6 N is attached to the spring. Determine its **extension**.

extension = ... cm [1]

(b) During the experiment, the student stops adding weights to the spring because he knows that more weight would stretch the spring beyond its limit of proportionality.

On Fig. 1.2, sketch the graph that he could have drawn if he had continued to add weights.

[1]

2 Some scientists investigate rocks that were brought back to Earth from the Moon.

The density of one type of rock is found to be 5.5 g / cm^3. The volume of the rock is 20 cm^3. The gravitational field strength on the Moon is 1.6 N / kg.

(a) Calculate the mass of the rock.

mass = ... [2]

(b) Calculate the weight of the rock when it was on the Moon.

weight = ... N [2]

(c) Suggest why the weight of the rock on Earth is greater than what it was on the Moon.

.....

..... [1]

3 A motorcycle and rider have a combined mass of 500 kg. During a trial run on a racetrack, the motorcycle accelerates from rest at a constant rate of 5.0 m/s^2 until the speed is 40 m/s. The motorcycle then travels at constant speed until it has gone a further 440 m. It then comes to rest with constant deceleration in a further 6.0 s.

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(a) On the grid of Fig. 3.1, plot a speed-time graph to show the motion of the motorcycle. [3]

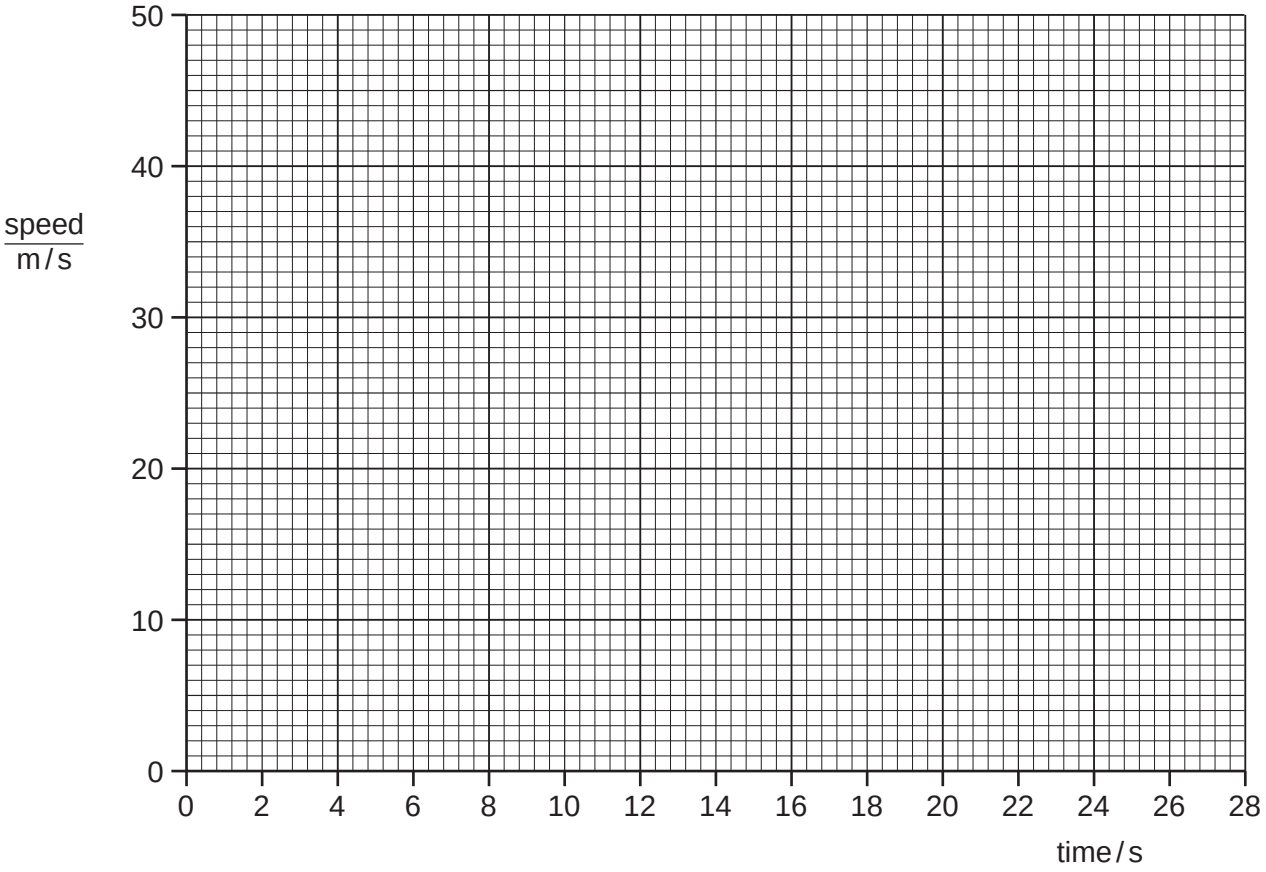

Fig. 3.1

(b) Calculate the kinetic energy of the motorcycle and rider when they are travelling at constant speed.

kinetic energy = ... J [2]

(c) Calculate the braking force on the motorcycle during the final 6.0 s of the journey.

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braking force = ... N [3]

4 One type of corkscrew is shown in Fig. 4.1.

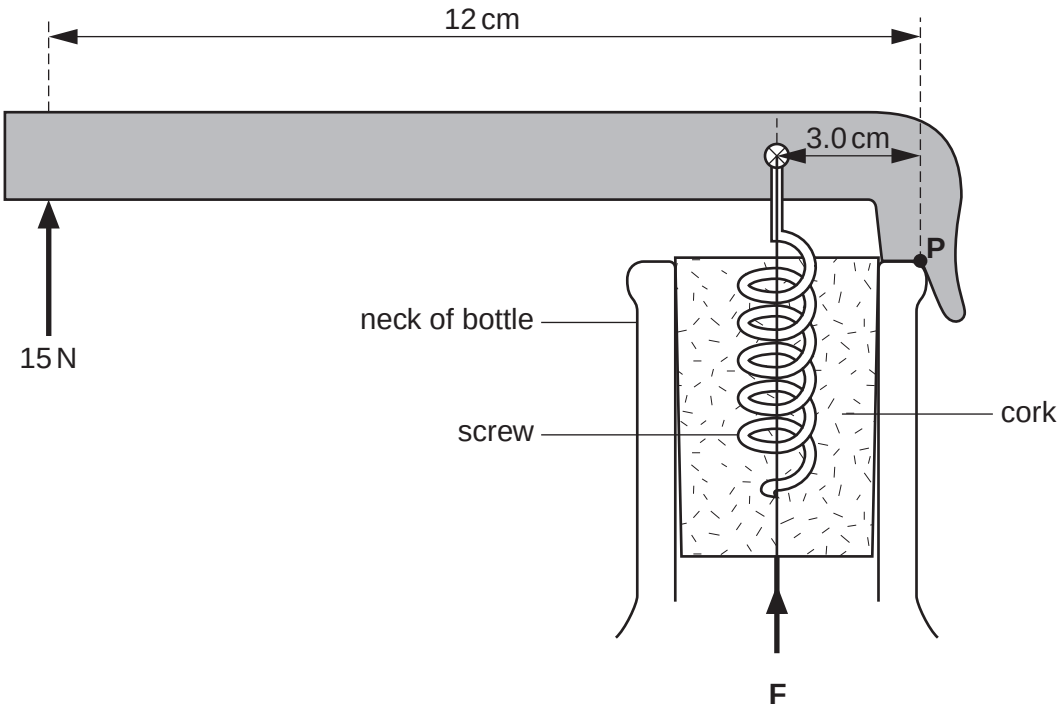

Fig. 4.1

A force of 15 N is applied to the end of the handle. The perpendicular distance of the line of action of this force to the pivot **P** is 12 cm. A force **F** is applied to the cork by means of the screw. The line of action of force **F** is a perpendicular distance of 3.0 cm from the pivot **P**.

Calculate the magnitude of force **F**.

force = ... N [3]

5 Fig. 5.1 shows a girl doing 'step-ups' on to a box.

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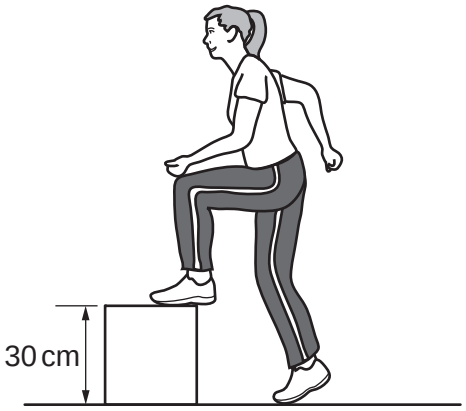

Fig. 5.1

The mass of the girl is 60 kg. The top of the box is 30 cm above the ground. The girl steps up on to the box 150 times in 5 minutes. The gravitational field strength is 10 N / kg.

(a) Calculate the gain in gravitational potential energy of the girl each time she steps up on to the box.

potential energy = ... J [2]

(b) Calculate the average power of the girl. (Ignore any work done when the girl steps down from the box.)

power = ... W [2]

6 **(a)** Describe how heat is transferred through solids.

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.....

.....

..... [2]

(b) Fig. 6.1 shows two copper cans of the same size and shape, **A** and **B**, containing water at different temperatures.

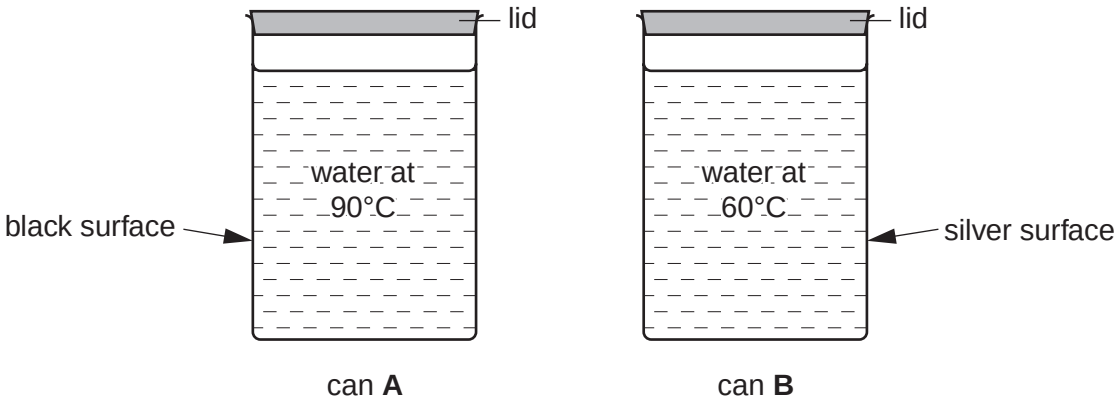

Fig. 6.1

Can **A** has a black surface and contains water at a temperature of 90 °C.

Can **B** has a silver surface and contains water at a temperature of 60 °C.

Explain why can **A** loses heat more quickly than can **B**.

.....

.....

..... [2]

7 Fig. 7.1 is a diagram of a type of thermometer.

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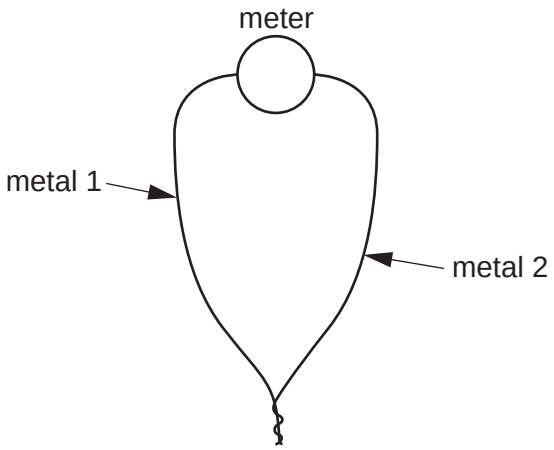

Fig 7.1

(a) State the type of thermometer shown in Fig. 7.1.

..... [1]

(b) Explain why this type of thermometer, rather than a liquid-in-glass thermometer, should be used to measure temperatures around 500 °C.

.....

..... [1]

8 Sound waves are **not** electromagnetic waves.

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(a) State **two** properties of sound waves that are different from the properties of electromagnetic waves.

1. .....

2. .....
[2]

(b) A radio wave has a wavelength of 1500 m.

(i) State the speed in a vacuum of the radio wave.

speed = ... m/s [1]

(ii) Calculate the frequency of the wave.

frequency = ... Hz [2]

9 A circuit contains two resistors $\mathbf{R_1}$ and $\mathbf{R_2}$ connected in parallel to a battery. Ammeters $\mathbf{A_1}$ and $\mathbf{A_2}$ and a voltmeter **V** are placed at different points in the circuit as shown in Fig. 9.1.

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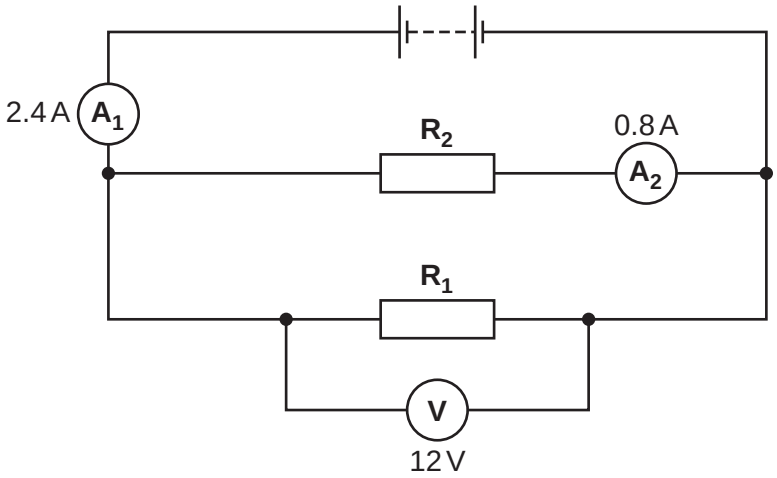

Fig. 9.1

The following readings are taken from the meters.

reading on the voltmeter **V** = 12 V
reading on ammeter $\mathbf{A_1}$ = 2.4 A
reading on ammeter $\mathbf{A_2}$ = 0.8 A

(a) Calculate the resistance of resistor $\mathbf{R_1}$.

resistance = ... Ω [3]

(b) Calculate the power dissipated in resistor $\mathbf{R_2}$.

power = ... W [2]

(c) Calculate the combined resistance of the two resistors $\mathbf{R_1}$ and $\mathbf{R_2}$ connected in parallel.

resistance = ... Ω [2]

10 Americium-241 ($^{241}_{95}$Am) is a radioactive isotope. A nucleus of americium-241 decays by emitting an alpha-particle to form a nucleus of neptunium (Np).

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(a) Calculate the number of neutrons in a nucleus of americium-241.

number of neutrons = ... [1]

(b) Give the nuclide notation of neptunium (Np) formed in the decay.

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

(c) Define the *half-life* of a radioactive isotope.

.....

.....

..... [1]

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 the refractive index of glass. [6]

(b) An object of length 2.0 cm is placed 5.0 cm away from a thin *converging* lens. The image formed by the lens is upright, virtual and of length 5.0 cm. By drawing a ray diagram, determine the focal length of the lens. [4]

12 **(a)** Describe how a steel rod can be permanently magnetised by using another permanent magnet. Identify the poles that are formed on the steel rod. [3]

(b) Describe how a coil of wire can be used to demagnetise a permanent magnet. [3]

(c) An electromagnet is used in a scrap-yard to separate iron and steel from other metals. Describe the structure of the electromagnet. Explain why magnetic materials such as iron and steel are attracted to a magnet. [4]

13 **(a)** A household mains plug is connected to three wires. State the name of each wire and the colours of the insulation around each of the wires. [3]

(b) When the plug is in normal use, there is no current in one of the wires. Name this wire and explain why the wire is needed. [3]

(c) Another plug contains a 5 A fuse. Show by calculation and explain why this plug would be unsuitable for use with a kettle rated '2 kW, 250 V'. [4]

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