UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

7292104438

PHYSICS **0625/32**

Paper 3 Extended **October/November 2010**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

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 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.

Answer **all** questions.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1 kg to be 10 N (i.e. acceleration of free fall = 10 m/s^2).

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.

This document consists of **17** printed pages and **3** blank pages.

DC (NF/SW) 24992/4

UNIVERSITY of CAMBRIDGE International Examinations

1 A hillside is covered with snow. A skier is travelling down the hill.

Fig. 1.1

The table below gives the values of the acceleration of the skier at various heights above the bottom of the hill.

height / m	350	250	150	50
acceleration / m/s^2	7.4	3.6	1.2	0

(a) On Fig. 1.2, plot the values given in the table, using dots in circles.

Draw the best curve for these points. [2]

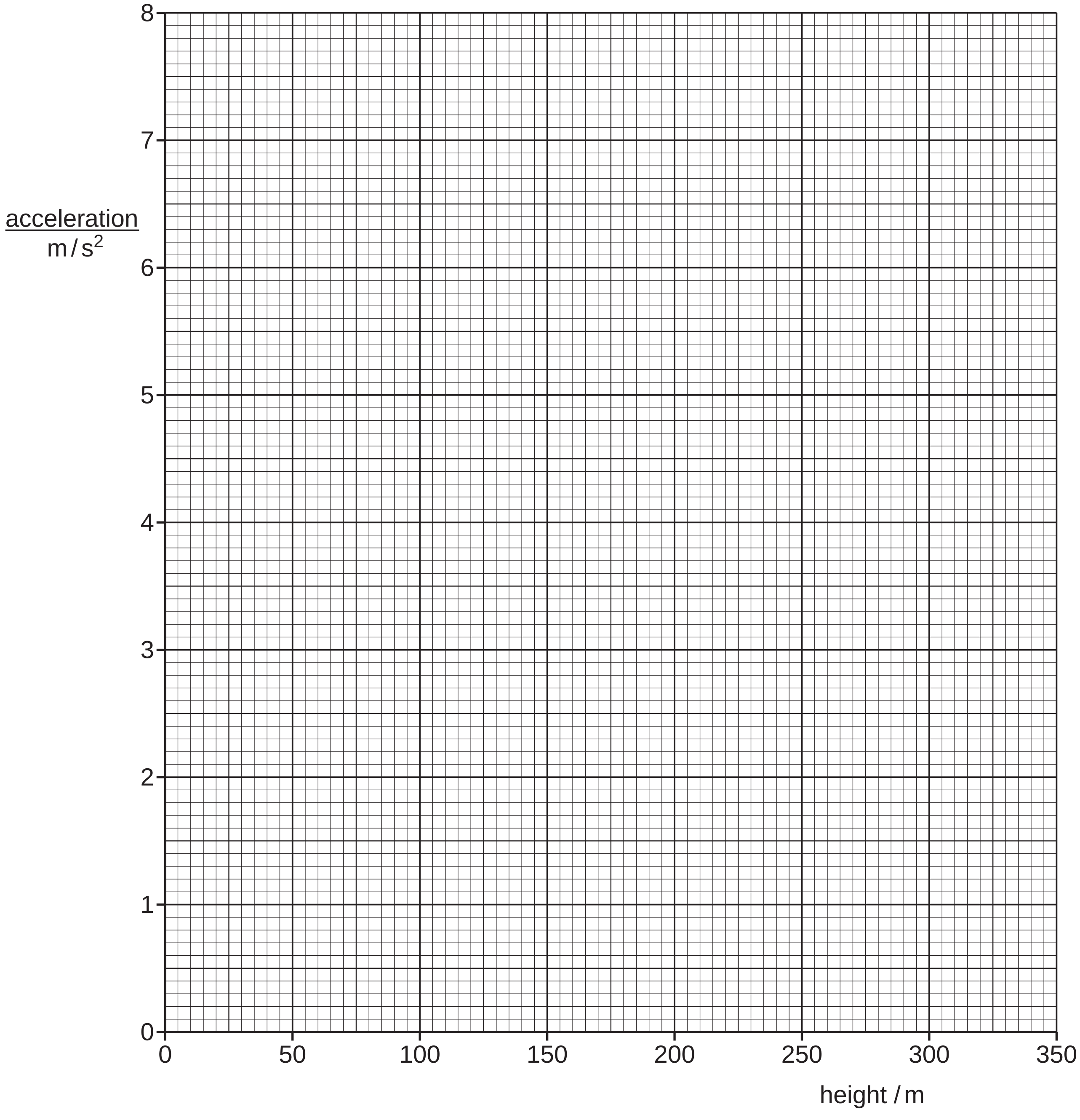

Fig. 1.2

(b) Describe what is happening, during the descent, to

(i) the acceleration of the skier,

....

....

.... [1]

(ii) the speed of the skier.

....

....

.... [1]

(c) The acceleration becomes zero before the skier reaches the bottom of the hill.

Use ideas about forces to suggest why this happens.

....

.... [1]

(d) Below a height of 50 m, further measurements show that the acceleration of the skier has a negative value.

What does this mean is happening to the speed of the skier in the last 50 m?

....

.... [1]

(e) The skier has a mass of 60 kg.

Calculate the resultant force on the skier at a height of 250 m.

resultant force = ... [3]

[Total: 9]

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2 A bob of mass of 0.15 kg is tied at the end of a cord to form a simple pendulum 0.70 m long.

The upper end of the cord is fixed to a support and the pendulum hangs vertically. A peg is fixed 0.50 m vertically below the support, as shown in Fig. 2.1.

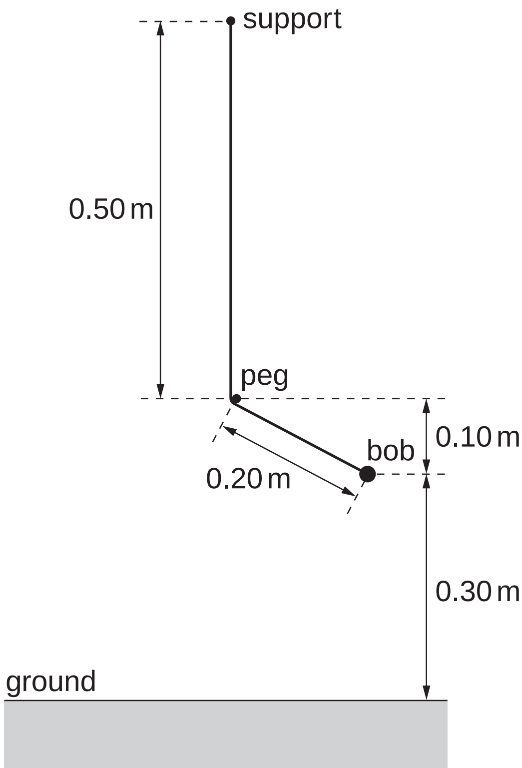

Fig. 2.1

The mass is pulled to the right, until it is in the position shown in Fig. 2.1.

Ignore air resistance throughout this question.

(a) Calculate the gravitational potential energy of the bob, relative to the ground, when the bob is in the position shown in Fig. 2.1.

gravitational potential energy = ... [2]

(b) The bob is released and swings to the left.

(i) Calculate the maximum kinetic energy of the bob.

kinetic energy = ... [4]

(ii) Calculate the maximum velocity of the bob.

velocity = ... [2]

(iii) As the pendulum swings to the left of vertical, state the maximum height above the ground that is reached by the bob.

.... [1]

(iv) On Fig. 2.1, use your ruler to draw carefully the pendulum when the bob is at its maximum height on the left. [3]

[Total: 12]

[Turn over

3 **(a)** A uniform metre rule is pivoted at its centre, which is also the position of its centre of mass.

Three loads, 2.0 N, *F* and 3.0 N are positioned on the rule at the 20 cm, 30 cm and 90 cm marks respectively, as shown in Fig. 3.1.

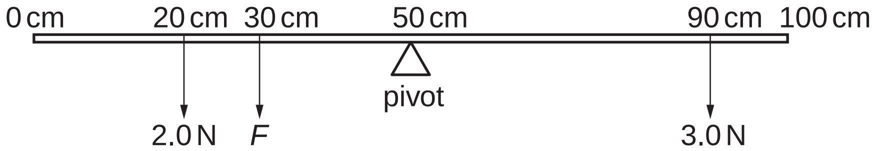

Fig. 3.1

(i) Calculate the moment of the 3.0 N load about the pivot.

moment = ... [1]

(ii) Calculate the moment of the 2.0 N load about the pivot.

moment = ... [1]

(iii) The force *F* maintains the metre rule in equilibrium on the pivot.

Calculate the value of *F*.

F = ... [3]

(b) The weight of the metre rule is 1.2 N and can be considered to act at the 50 cm mark.

All the weights in **(a)** are removed. The pivot is positioned under the 30 cm mark and the 2.0 N load is placed on the rule as shown in Fig. 3.2.

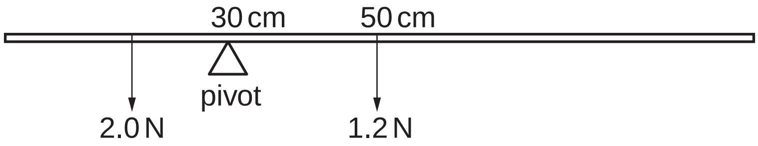

Fig. 3.2

The position of the 2.0 N load is adjusted until the metre rule is again in equilibrium.

Determine the position of the 2.0 N load.

2.0 N load is at the .... cm mark [3]

[Total: 8]

4 A solar panel is mounted on the roof of a house. Fig. 4.1 shows a section through part of the solar panel.

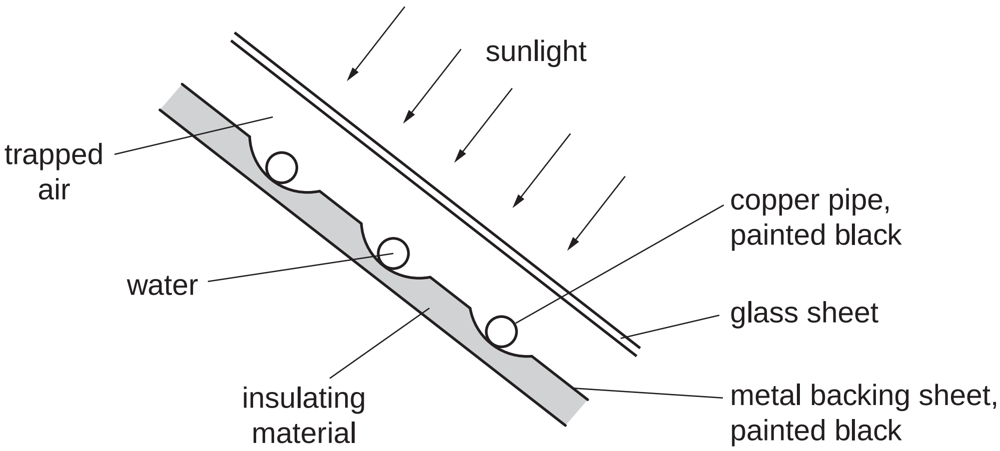

Fig. 4.1

A pump makes water circulate through the copper pipes. The water is heated by passing through the solar panel.

(a) Suggest why

(i) the pipes are made of copper,

....

.... [1]

(ii) the pipes and the metal backing sheet are painted black,

....

.... [1]

(iii) an insulating material is attached to the metal backing sheet,

....

.... [1]

(iv) the presence of the glass sheet increases the energy collected by the water.

....

.... [1]

(b) During one day, 250 kg of water is pumped through the solar panel. The temperature of this water rises from 16 °C to 38 °C.

The water absorbs 25% of the energy falling on the solar panel, and the specific heat capacity of water is 4200 J / (kg °C).

Calculate the energy falling on the solar panel during that day.

energy = ... [4]

[Total: 8]

5 The front views of two cars are shown in Fig. 5.1, to the same scale.

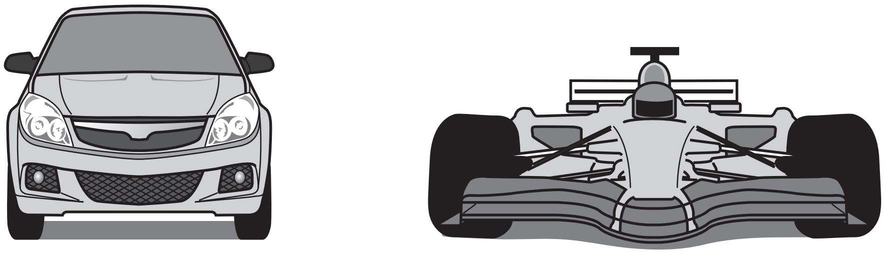

Fig. 5.1

(a) Suggest which car has the greater stability, and give two reasons.

car ....

reason 1 ....

....

reason 2 ....

.... [2]

(b) The cars have the same weight.

Study Fig. 5.1 and suggest why the stationary racing car exerts less pressure on the ground.

....

.... [1]

(c) The family car's tyres each have an area of $0.012\,m^2$ in contact with the ground.

The weight of the car and its contents is 9600 N.

Calculate the pressure exerted by the car on the ground.

pressure = ... [2]

[Total: 5]

6 **(a)** Explain what is meant by the terms *analogue* and *digital*, as applied to electronic circuits.

analogue ....

....

digital ....

.... [2]

(b) Describe, if necessary using a diagram, the function of an AND gate in digital electronics.

....

....

....

.... [2]

[Total: 4]

7 When he leaves work at 6.30 p.m. (18:30) one evening, a caretaker forgets to switch off the 100 W lamp in his office. He doesn't discover this until he returns at 7.30 a.m. (07:30) the next morning.

The mains electricity supply is 250 V.

(a) Calculate how much energy the caretaker has wasted.

energy wasted = ... [2]

(b) Calculate the charge that passed through the lamp during this time.

charge = ... [3]

(c) What happened to the energy wasted by the lamp?

....

.... [1]

[Total: 6]

8 Fig. 8.1 shows a simple transformer.

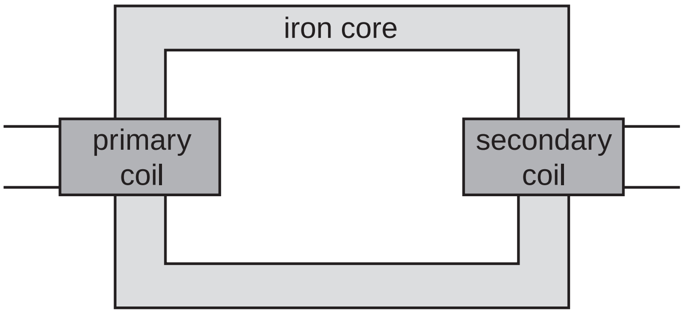

Fig. 8.1

(a) Describe how a voltage across the primary coil causes a voltage across the secondary coil.

....

....

....

....

....

.... [3]

(b) State what design feature would cause the voltage across the secondary coil to be larger than the voltage across the primary coil.

....

.... [1]

(c) The output of a power station is connected to a transformer, which you are to assume is 100% efficient.

The input to the primary coil is 24 000 V, 12 000 A.

The output from the secondary coil is 400 000 V. This is the voltage at which the electrical energy is transmitted through the transmission lines.

Calculate the current in the secondary coil.

current = ... [2]

(d) State two reasons why it is cheaper to transmit electrical energy at high voltage.

1. ....

....

2. ....

.... [2]

[Total: 8]

9 Fig. 9.1 shows three rays of light, parallel to the axis of a thin converging lens.

The rays strike the first surface of the lens. F_1 and F_2 are the two principal foci of the lens.

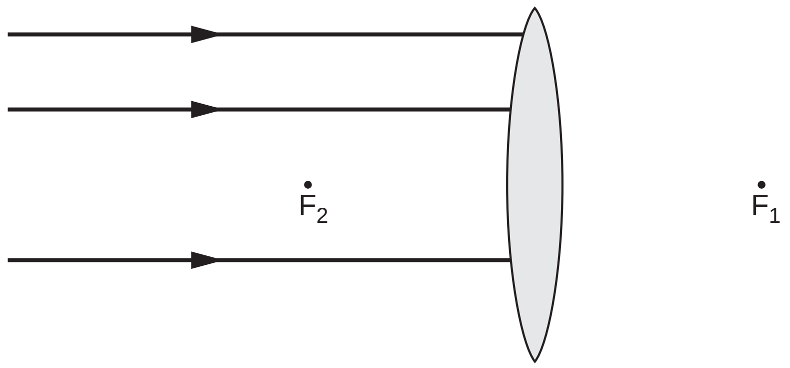

Fig. 9.1

(a) Describe and explain what happens to the top ray as it enters the lens.

....

....

....

....

....

.... [3]

(b) On Fig. 9.1, use a ruler to,

(i) complete the three rays through the lens, until they reach about 5 cm to the right of the lens, [2]

(ii) draw a fourth ray, parallel to the others on the left of the lens, which passes through F_2, until it reaches about 5 cm to the right of the lens. [1]

(c) A lens such as that shown in Fig. 9.1 can be used as a magnifying glass.

(i) On Fig. 9.1, show with an X where the object could be positioned for the lens to be used as a magnifying glass. [1]

(ii) State 3 characteristics of the image formed by a magnifying glass.

1. ....

2. ....

3. .... [2]

[Total: 9]

10 In Geiger and Marsden's α-particle scattering experiment, α-particles were directed at a very thin gold foil.

Fig. 10.1 shows five of the nuclei of the atoms in one layer in the gold foil. Also shown are the paths of three α-particles directed at the foil.

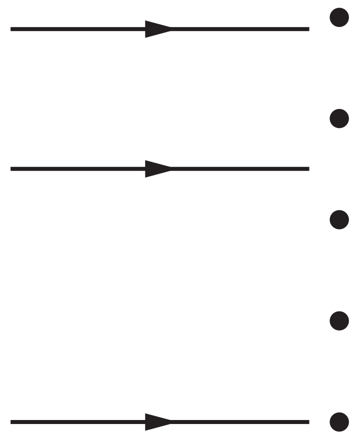

Fig. 10.1

(a) On Fig.10.1, complete the paths of the three α-particles. [3]

(b) (i) What result of the experiment confirmed that an atom consisted of a very tiny charged core, containing almost all the mass of the atom?

....

.... [1]

(ii) What is the sign of the charge on this core? .... [1]

(iii) What occupies the space between these charged cores?

.... [1]

[Total: 6]

11 An atom of one of the isotopes of sodium contains

11 protons, 11 electrons and 13 neutrons.

(a) Underline which of these three will be the same in neutral atoms of all isotopes of sodium. [2]

(b) State the nucleon number of this isotope. .... [1]

(c) What can you say about the chemical properties of the different isotopes of sodium?

.... [1]

(d) One isotope of sodium is ^{25}Na.

How many neutrons are there in one atom of this isotope? .... [1]

[Total: 5]

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