UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

SCIENCE **5124/02**
5125/02

Paper 2 Physics **October/November 2007**

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 **10** printed pages and **2** lined pages.

Section A

Answer **all** the questions.

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

1 A student measured the extension of a spring when different weights were hung from it. Fig. 1.1 shows his results.

weight / N	extension / cm
0	0
2.0	1.0
4.0	2.0
6.0	3.0
8.0	6.0

Fig. 1.1

(a) On the grid of Fig. 1.2, plot a graph of the results and draw the best line.

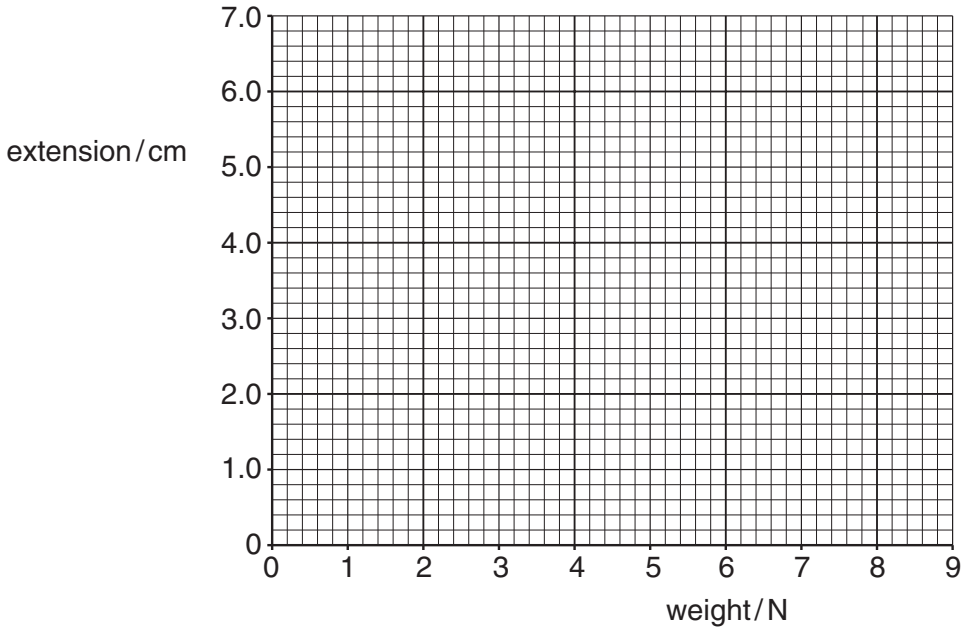


Fig. 1.2

[2]

(b) Use your graph in Fig. 1.2 to determine the limit of proportionality of the spring.

.....[1]

(c) An unknown weight is hung from an identical spring that has not been stretched beyond its limit of proportionality. The extension is 2.7 cm. Determine the weight of the object.

weight = ... N [1]

2 Fig. 2.1 shows how the speed of a bicycle varies with time.

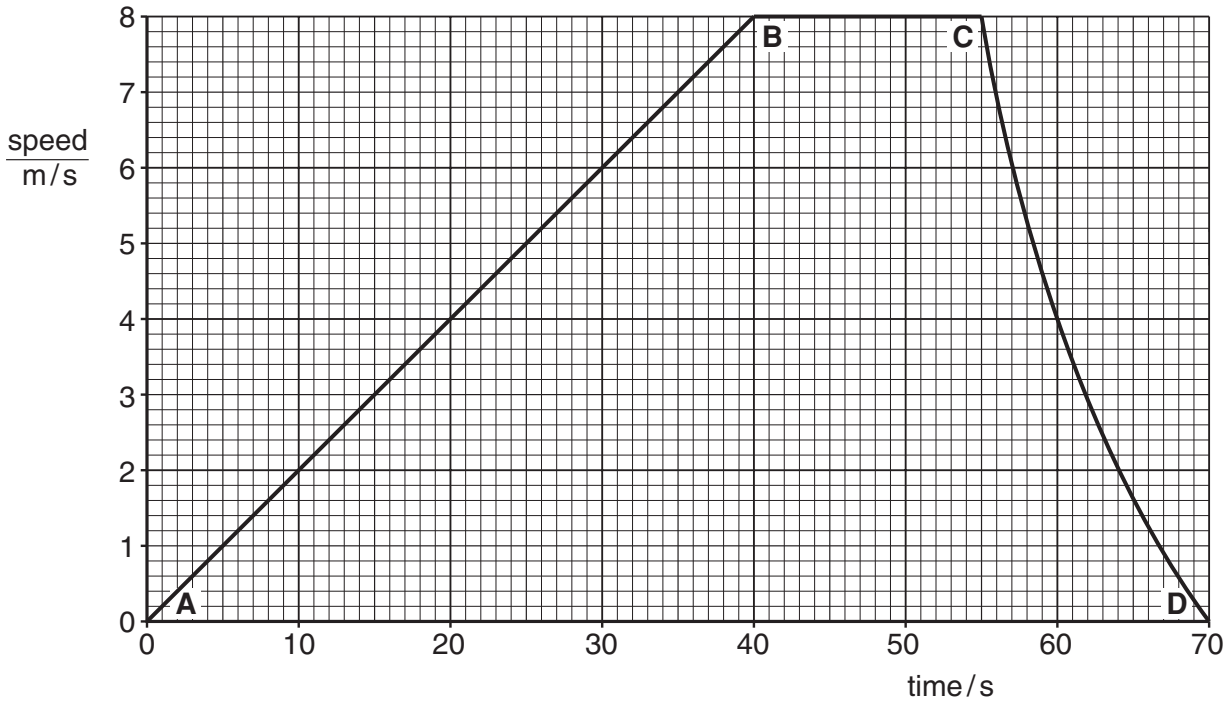


Fig. 2.1

(a) Calculate the acceleration of the bicycle between **A** and **B**.

acceleration = ... m/s^2 [2]

(b) State the part, or parts, of the journey where the forces on the bicycle are balanced. Explain your answer.

.....

.....

.....[2]

3 A cube has sides that are 3.0 cm long. The mass of the cube is 54 g.

(a) Explain what is meant by *mass*.

.....

.....[1]

(b) Calculate the density of the cube.

density = ... g / cm^3 [3]

(c) Calculate the weight of the cube. Give the unit. (g = 10 m / s^2)

weight = ... [2]

4 Fig. 4.1 is a diagram of a model of a hydroelectric power station. Water from the tap flows through a turbine. The turbine drives a generator.

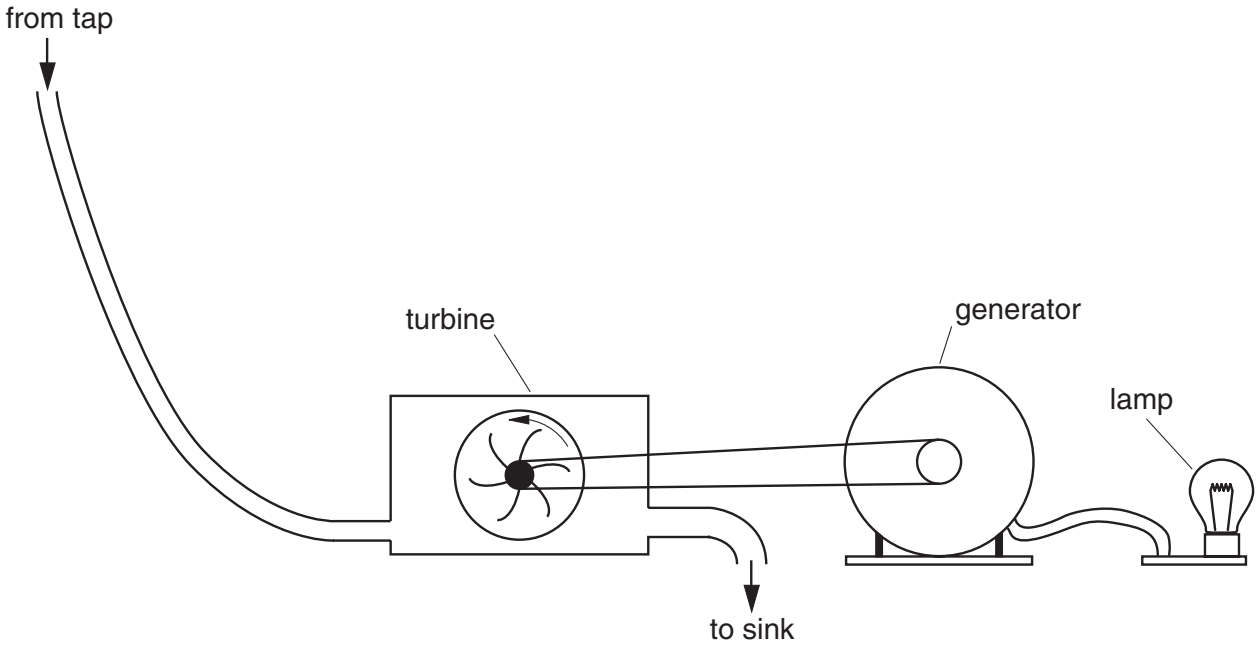


Fig. 4.1

(a) State an energy transfer that occurs in the generator.

.....[1]

(b) The mass of water passing through the turbine every second is 0.8 kg. The speed of the water at the turbine is 4 m / s.

(i) Calculate the kinetic energy of 0.8 kg of water at the turbine.

kinetic energy = ... J [2]

(ii) Suggest why not all of this kinetic energy is transferred to the turbine.

.....

.....[1]

5 **(a)** Fig. 5.1 shows two flasks at room temperature.

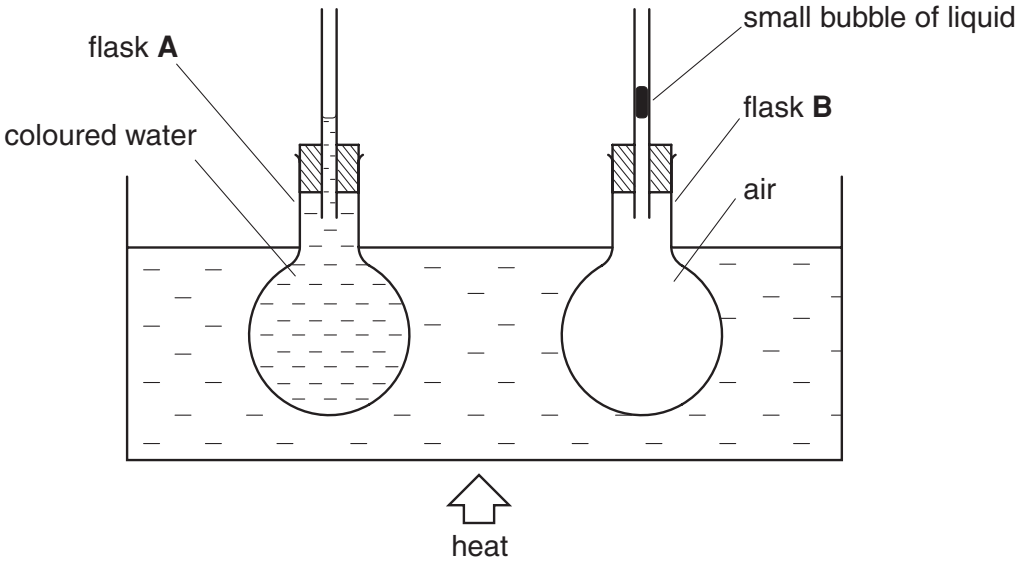


Fig. 5.1

The flasks are heated so that their temperatures are always the same as each other. Flask **A** contains coloured water. Flask **B** contains air. A small bubble of liquid traps the air in the flask.

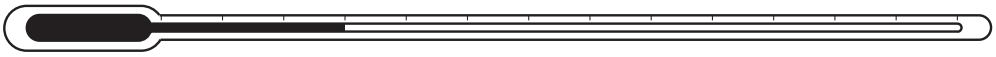
State how this apparatus shows that the air expands more than the water.

.....

.....[1]

(b) Fig. 5.2 shows two thermometers **A** and **B**.

thermometer **A**



thermometer **B**

Fig. 5.2

State which thermometer is the more sensitive. Explain your answer.

.....

.....[2]

6 Fig. 6.1 shows a magnet attached to a paper cone. The magnet is close to a coil of wire that is part of an electrical circuit. When the switch is closed, the coil is magnetised so that the left-hand end of the coil becomes a North pole.

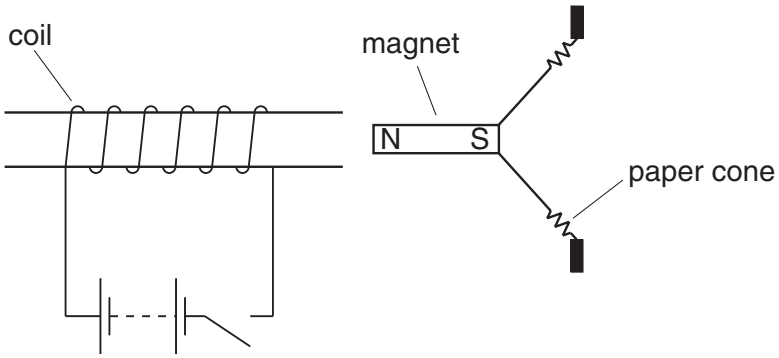


Fig. 6.1

(a) State what happens to the magnet when the switch is closed.
Explain your answer.

.....

.....[2]

(b) The connections to the battery are reversed.
State what now happens to the magnet when the switch is closed.

.....[1]

(c) The battery is now replaced by an a.c supply of frequency 250 Hz.
Explain why the paper cone now gives out a sound wave.

.....

.....[2]

(d) A sound wave has a frequency of 250 Hz .

(i) The speed of sound in air is 325 m / s.
Calculate the wavelength of the wave in air.

wavelength = ... m [2]

(ii) The sound wave passes from air into steel. State what happens to the speed and to the wavelength of the wave.

speed .....

wavelength .....[2]

7 Electrons carry a negative charge. Electrons can move easily through metals. Fig. 7.1 shows a metal rod with a strip of metal foil attached to it. The rod and strip have no charge.

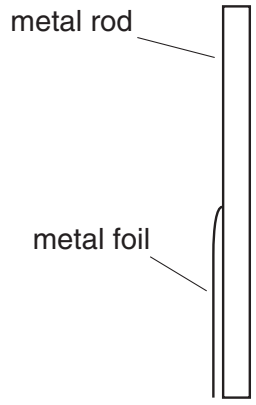


Fig. 7.1

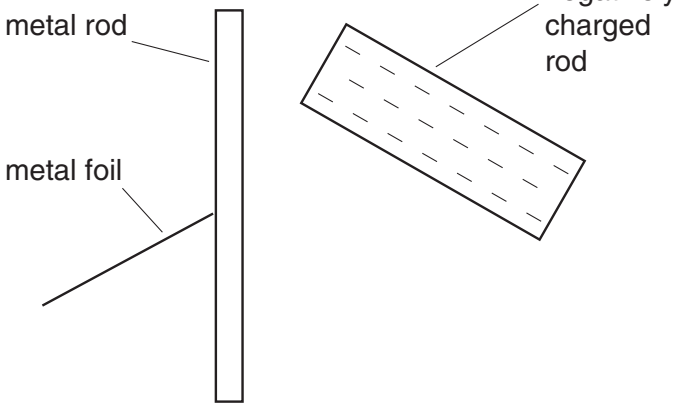


Fig. 7.2

A negatively charged rod is brought towards the top of the metal rod. The foil moves away from the metal rod as shown in Fig. 7.2. Explain why the foil moves.

.....

.....

.....[2]

8 Fig. 8.1 shows an electrical circuit.

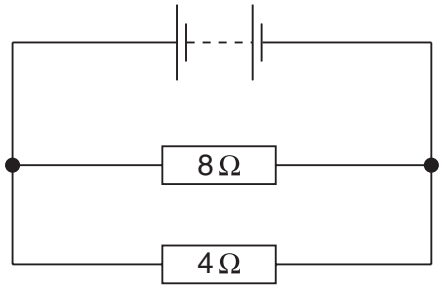


Fig. 8.1

(a) A charge of 90 C flows through the battery in 1 minute.
Calculate the current in the battery.

current = ... A [2]

(b) **(i)** Calculate the current in the 8 Ω resistor.

current = ... A [1]

(ii) Calculate the potential difference across the 8 Ω resistor.

p.d. = ... V [2]

(iii) Which of the two resistors transfers more energy per second?
Explain your answer.

.....

.....

.....[2]

(c) An electric iron should be earthed. Explain how earthing protects the user when a fault occurs.

.....

.....[2]

9 Bismuth–210 ($^{210}_{83}$Bi) decays to form a nucleus of polonium–210 ($^{210}_{84}$Po).

$$^{210}_{83}Bi \quad \text{changes to} \quad ^{210}_{84}Po$$

(a) How many protons are there in a nucleus of polonium–210?

number = ... [1]

(b) State what type of emission is given out by bismuth–210.
Explain your answer.

.....

.....[2]

(c) State which component of the electromagnetic spectrum is a type of emission from a radioactive source.

.....[1]

[Turn over

Section B

Answer any **two** questions.

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

10 **(a)** Describe an experiment to determine the refractive index of glass in the form of a rectangular block. [5]

(b) **(i)** Draw a ray diagram to show how a thin converging lens may be used as a magnifying glass.

(ii) State and explain whether the image produced in a magnifying glass is real or virtual. [5]

11 **(a)** Describe an experiment to compare the rates at which silver and dull black surfaces radiate heat. State the result you would expect. [5]

(b) When one end of a metal rod is heated, the other end becomes hot.
Explain, in terms of molecular motion, how heat energy is transferred along the rod. [3]

(c) Explain why the cooling coils in a refrigerator are at the top of the refrigerator rather than at the bottom. [2]

12 **(a)** **(i)** Describe an experiment to show that a changing magnetic field may be used to induce an e.m.f. in a circuit.

(ii) Describe how you would use your apparatus to demonstrate how different factors can change the magnitude of the induced e.m.f. [5]

(b) Draw a diagram of a simple transformer. Explain how an e.m.f. is induced in one coil of the transformer. [4]

(c) Sketch a graph to show how the output voltage changes with time for a simple a.c. generator. [1]