UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

PHYSICS **0625/22**

Paper 2 Core **October/November 2011**

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 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.

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 **16** printed pages.

1 **(a)** An empty glass beaker has a mass of 210 g.

When 200 cm^3 of olive oil is poured into the beaker, the total mass is 394 g.

Calculate the density of the olive oil.

density = ... [4]

(b) When the beaker and olive oil are heated, the olive oil expands.

What happens to the density of the olive oil?

..... [1]

[Total: 5]

2 **(a)** Describe what is meant by an *echo*.

.....

.....

..... [2]

(b) Fig. 2.1 shows the mouth of a river, viewed from above. A and B are on opposite banks, and are 800 m apart.

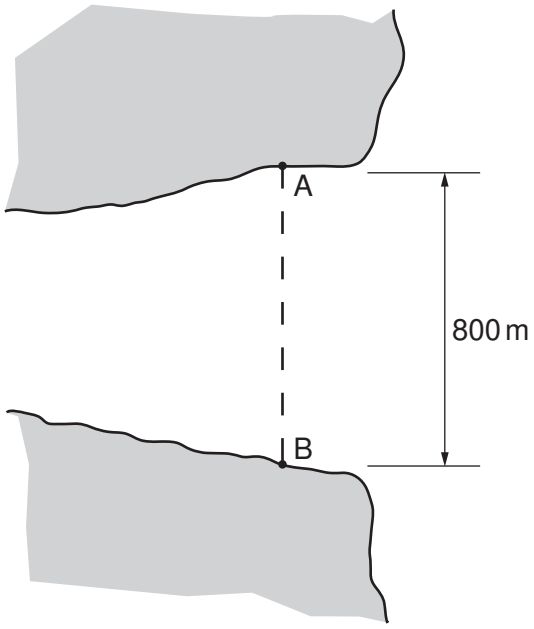

Fig. 2.1

Echo depth measurements use the time taken for sound to go from the surface to the river bed and back again.

Such measurements give the following values for the depth of the water at different distances from A, along the line AB.

distance from A / m	0	100	200	300	400	500	600	700	800
depth of water / m	0	1.8	5.1	12.9	18.9	22.2	16.5	6.3	0

(i) The speed of sound in water is 1500 m / s.

Calculate how long a sound wave takes to travel from the surface to the bottom of the river at a point 300 m from A.

time = ... s [3]

(ii) A ship has 3 m of itself below the surface of the water.

From the figures in the table, estimate how close to A it can sail without hitting the bottom of the river.

distance from A = ... m [1]

[Total: 6]

3 **(a)** State what is meant by the *moment* of a force.

.....

..... [1]

(b) A warehouse worker is about to close a large door, as shown in Fig. 3.1.

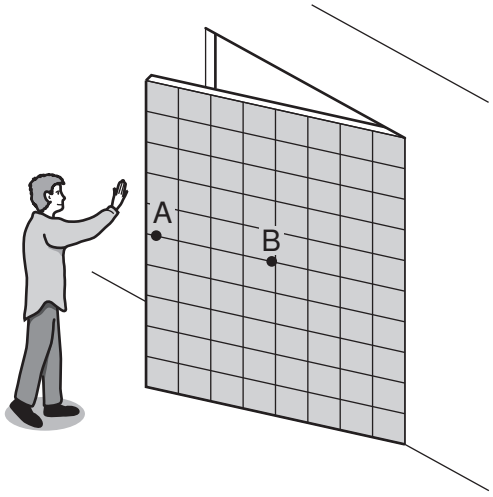

Fig. 3.1

(i) State, with a reason, which of the two positions, A or B, will enable him to close the door with least force.

.....

.....

..... [1]

(ii) On another occasion, with the door in the position shown in Fig. 3.1, two workers each push on the door with the same force at the same time. One worker pushes at A, from the side seen in Fig. 3.1. The other worker pushes at B, from the other side of the door.

Which way does the door move, if at all? Tick one box.

the door closes	☐
the door opens	☐
the door remains as it is	☐

[1]

[Total: 3]

4 **(a)** State what is meant by the term *melting point*.

.....

..... [2]

(b) Some ice has all reached its melting point, and it begins to melt. What happens to the temperature of the ice as it melts?

..... [1]

(c) A certain substance has a melting point of –10 °C (minus 10 °C). A small amount of this substance is cooled from 50 °C to –18 °C in a very cold freezer unit.

On Fig. 4.1, sketch a possible graph that shows how the temperature of the substance varies with time during the cooling process.

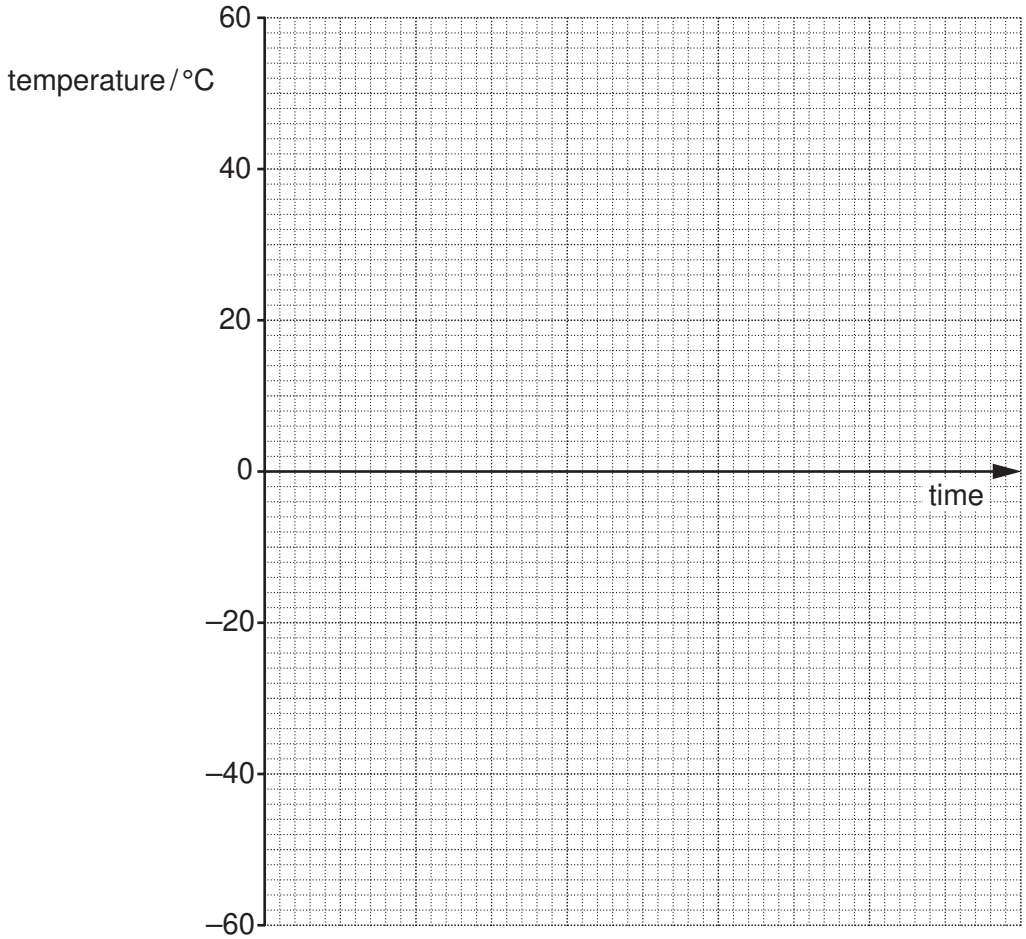

Fig. 4.1 [4]

[Total: 7]

5 The circuit in Fig. 5.1 is connected, and the ammeter reading is noted as the water is heated.

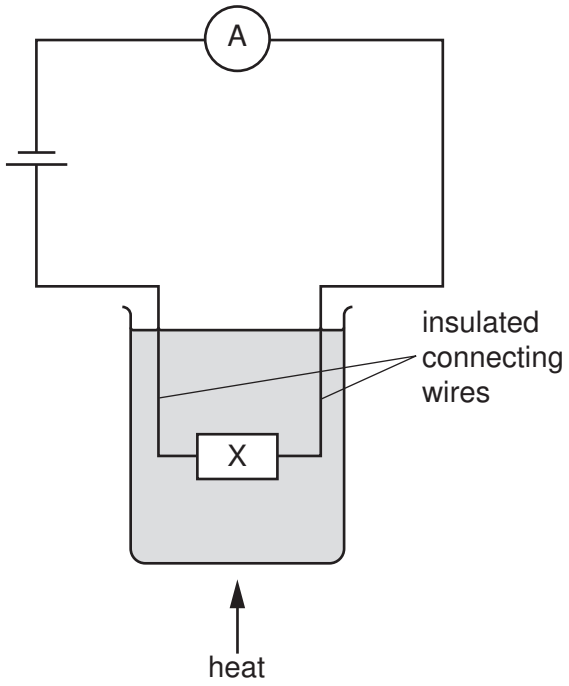

Fig. 5.1

It is found that the ammeter reading increases as the temperature rises.

(a) (i) State what happens to the resistance of component X as the temperature rises.

..... [1]

(ii) Suggest what component X might be.

..... [1]

(b) This circuit is to be used as a thermometer.

(i) What must be done to calibrate it

1. at 0°C,

.....

.....

..... [2]

2. at 100 °C?

.....

.....

..... [3]

(ii) The resistance of X does not vary linearly with temperature between 0 °C and 100 °C.

How will this affect the use of this circuit as a thermometer?

.....

.....

..... [2]

[Total: 9]

6 **(a)** In a laboratory optics experiment, a student stands a cylindrical converging lens on a large piece of paper and shines two parallel rays of light into it. This is shown in Fig. 6.1.

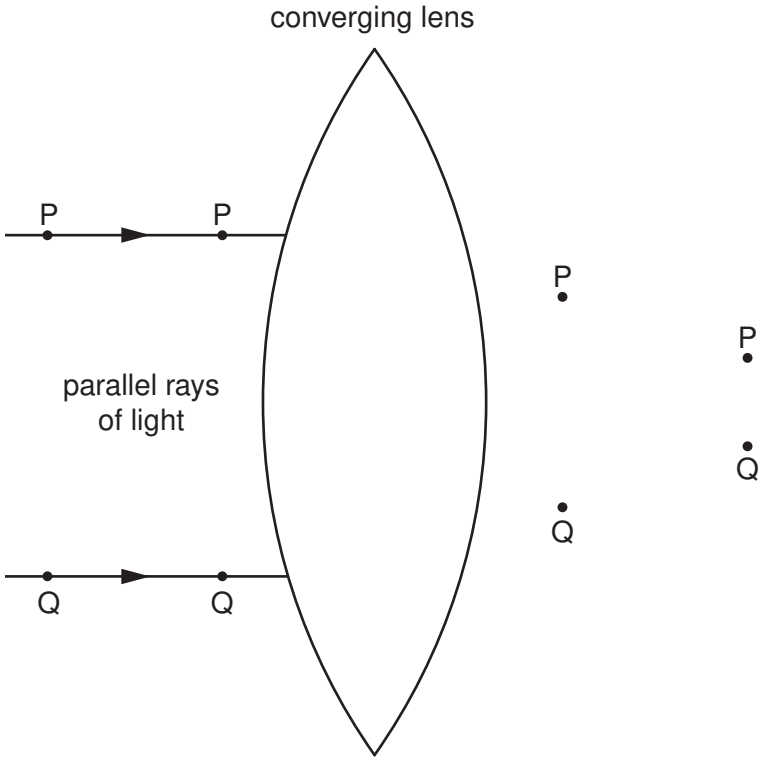

Fig. 6.1

The student traces one of the rays using four pins, labelled P in Fig. 6.1. He traces the other ray using four more pins, labelled Q.

(i) Using a ruler, draw

1. the paths of the two rays in the air to the right of the lens,

2. the paths of the two rays as they pass through the lens.

(ii) On Fig. 6.1, use the letter F to label the principal focus of the lens.

[3]

(b) Fig. 6.2 shows part of the path of a ray of light through a glass block.

The critical angle for the glass/air boundary is 42°.

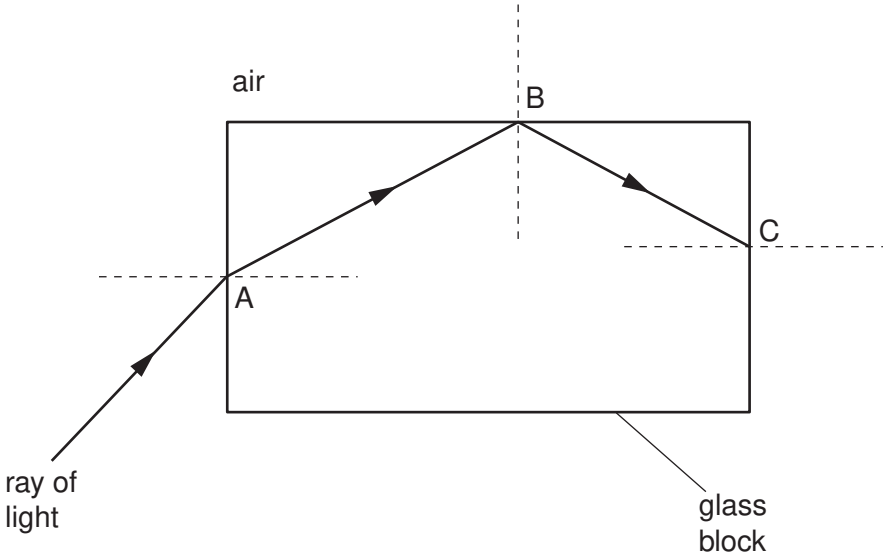

Fig. 6.2

(i) State the name that describes what is happening to the ray

1. at A, ...

2. at B. ..... [3]

(ii) On Fig. 6.2, draw the path of the ray after it has reached C. [2]

[Total: 8]

7 Plane waves travel on the surface of some water in a tank. Fig. 7.1 shows the appearance, from above, of the waves before and after the boundary between two different depths of water in the tank.

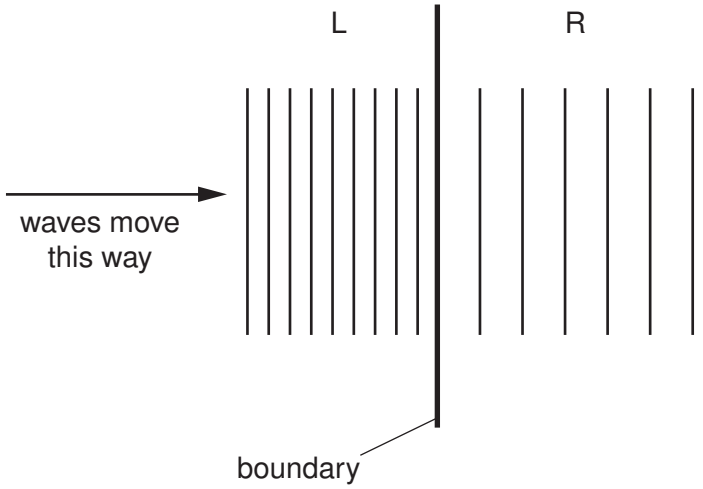

Fig. 7.1

(a) State what happens to the wavelength as the waves cross the boundary.

..... [1]

(b) Water waves travel more slowly when the water is shallower, but the frequency does not change.

(i) State, giving your reasons, which side of the boundary, L or R, has the deeper water.

.....

.....

.....

..... [3]

(ii) Some more water is poured into the tank, and waves of the same frequency as before are generated in the tank.

What difference, if any, will this make to the appearance of the waves

1. to the left of the boundary,

.....

2. to the right of the boundary?

..... [2]

[Total: 6]

8 **(a)** Two charged metal spheres are placed next to each other.

⊕ indicates that the sphere is positively charged.

⊖ indicates that the sphere is negatively charged.

In the box alongside each pair of spheres, write “attract” or “repel” or “no effect” to describe the effect the spheres have on each other.

(i) ⊕ ⊖ ____

(ii) ⊕ ⊕ ____

(iii) ⊖ ⊖ ____

[3]

(b) Water is flowing in a very narrow stream from a water tap (faucet). A negatively-charged plastic strip is held close to the stream of water, as shown in Fig. 8.1.

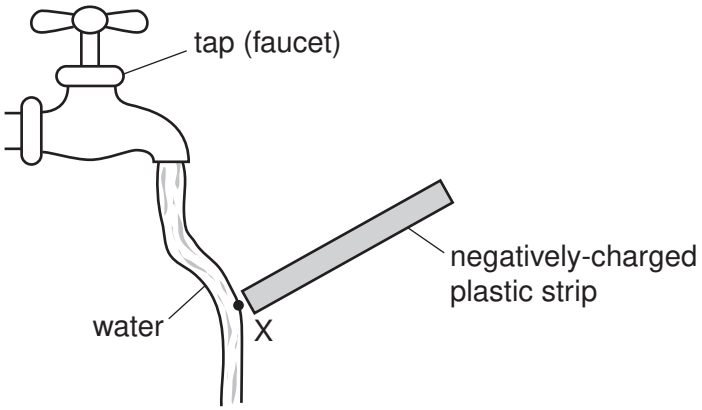

Fig. 8.1

The stream of water moves towards the plastic strip.

In terms of the water at the point labelled X, suggest why this happens.

.....

.....

.....

..... [3]

[Total: 6]

9 **(a)** Two coils are wound on an iron rod, as shown in Fig. 9.1. One coil is connected to a cell and a switch. The other is connected to a sensitive centre-zero millivoltmeter.

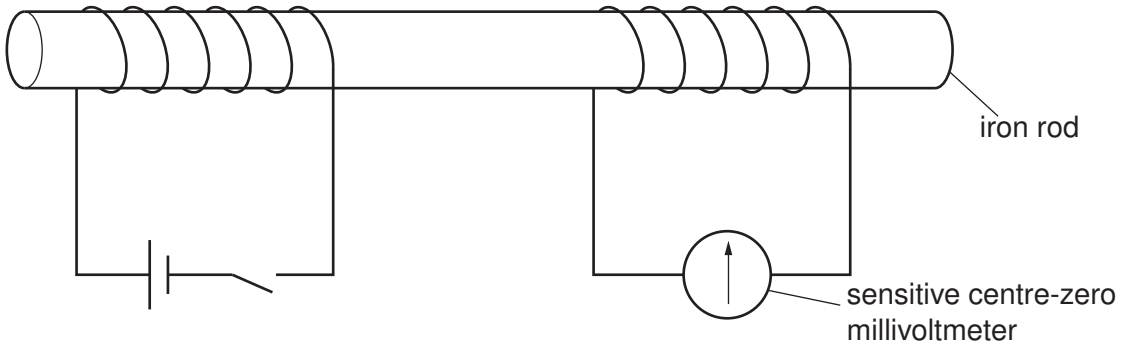

Fig. 9.1

(i) The open switch is now closed.

State what happens to

1. the iron rod,

..... [1]

2. a small steel pin held close to one end of the iron rod,

..... [1]

3. the needle of the millivoltmeter.

.....

..... [2]

(ii) The switch is opened again.

State what happens to the needle of the millivoltmeter.

.....

..... [1]

(b) You are given an iron bar, a length of insulated wire, a battery and a variable resistor.

You are to make an electromagnet whose strength can be varied.

(i) In the space below, draw a diagram of the electromagnet that includes the circuit. [2]

(ii) What is the setting of the variable resistor that gives the strongest magnetism of the electromagnet?

..... [1]

[Total: 8]

10 The circuit in Fig. 10.1 is connected. The potential difference across resistor R is measured as 8.0 V.

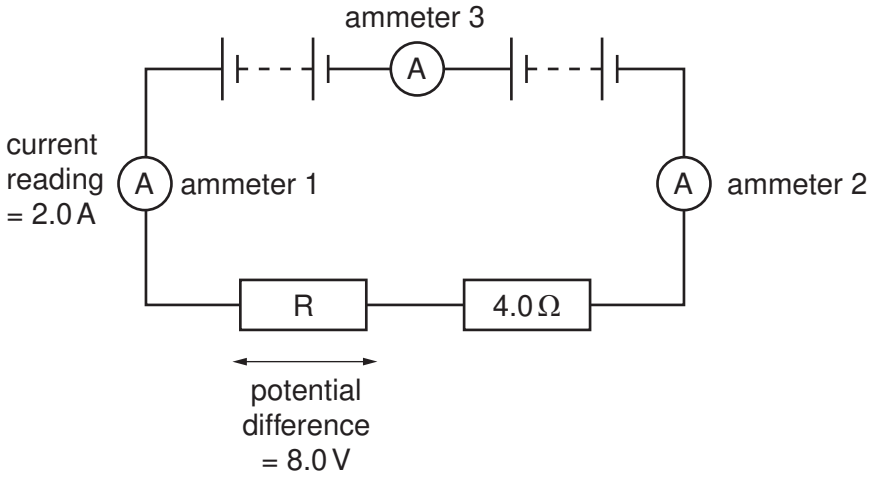

Fig. 10.1

(a) **(i)** What instrument is used to measure the potential difference across R?

..... [1]

(ii) On Fig. 10.1, draw this instrument in position in the circuit, using the correct circuit symbol. [2]

(b) The reading on ammeter 1 is 2.0 A. State

(i) the reading on ammeter 2, ...

(ii) the reading on ammeter 3. ..... [2]

(c) Using the values on Fig. 10.1, calculate

(i) the resistance of R,

resistance = ... Ω [3]

(ii) the total resistance of the circuit.

total resistance = ... Ω [1]

(d) State the value of the potential difference across the 4.0 Ω resistor.

potential difference = ... [1]

[Total: 10]

11 The count rate from a sample of radioactive material is measured every 20 minutes for 2 hours.

The results, suitably corrected for background radiation, are shown in the table.

time / s	0	20	40	60	80	100	120
count rate / counts / s	280	210	164	122	88	72	54

(a) Suggest one possible source for the background radiation.

..... [1]

(b) Name the two types of particle that the radioactive material might be emitting.

1. .....

2. ..... [2]

(c) From the table, without attempting a graph, estimate the half-life of the radioactive material.

half-life = ... s [1]

(d) A similar experiment is carried out, using a larger quantity of the same radioactive material.

State what effect, if any, this has on

(i) the readings in the table,

..... [1]

(ii) the half-life of the material.

..... [1]

(e) State one precaution that should be taken for safe handling of the radioactive material.

.....

..... [1]

[Total: 7]

Question 12 is on the next page.

12 Fig. 12.1 represents the radioactive decay of a $^{238}_{92}U$ nucleus.

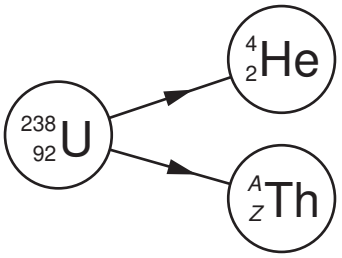

Fig. 12.1

(a) In the space below, write the nuclear equation for this decay, including the numerical values of *A* and *Z*. [3]

(b) What does the letter *A* stand for?

..... [1]

(c) What does the letter *Z* stand for?

..... [1]

[Total: 5]