PHYSICS

Paper 3 Extended

0625/03

October/November 2005

1 hour 15 minutes

Candidates answer on the Question Paper.
No Additional Materials are required.

Candidate Name

Centre Number

Candidate Number

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 in the spaces provided on the Question Paper.
You may use a soft pencil for any diagrams, graphs, music or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
At the end of the examination, fasten all your work securely together.
Take the weight of 1 kg to be 10 N (i.e. acceleration of free fall = 10 m/s^2).
The number of marks is given in brackets [ ] at the end of each question or part question.
You may lose marks if you do not show your working or if you do not use appropriate units.

DO NOT WRITE IN THE BARCODE.

DO NOT WRITE IN THE GREY AREAS BETWEEN THE PAGES.

For Examiner's Use	
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11	
Total	

This document consists of **14** printed pages and **2** blank pages.

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International Examinations

[Turn over

1 **(a)** State what is meant by the terms

(i) *weight,* ....

.... [1]

(ii) *density.* ....

.... [1]

(b) A student is given a spring balance that has a scale in newtons. The student is told that the acceleration of free-fall is 10 m/s^2.

(i) Describe how the student could find the mass of an irregular solid object.

....

....

.... [2]

(ii) Describe how the student could go on to find the density of the object.

....

....

....

.... [2]

(c) Fig. 1.1 shows three forces acting on an object of mass 0.5 kg. All three forces act through the centre of mass of the object.
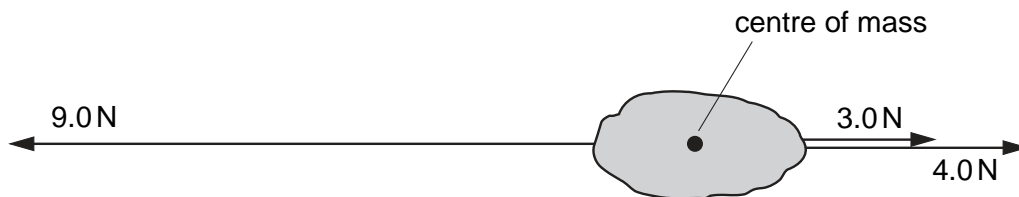
centre of mass

9.0 N   3.0 N

4.0 N

Fig. 1.1

Calculate

(i) the magnitude and direction of the resultant force on the object,

magnitude = ……………… direction .... [2]

(ii) the magnitude of the acceleration of the object.

acceleration =…………………… [2]

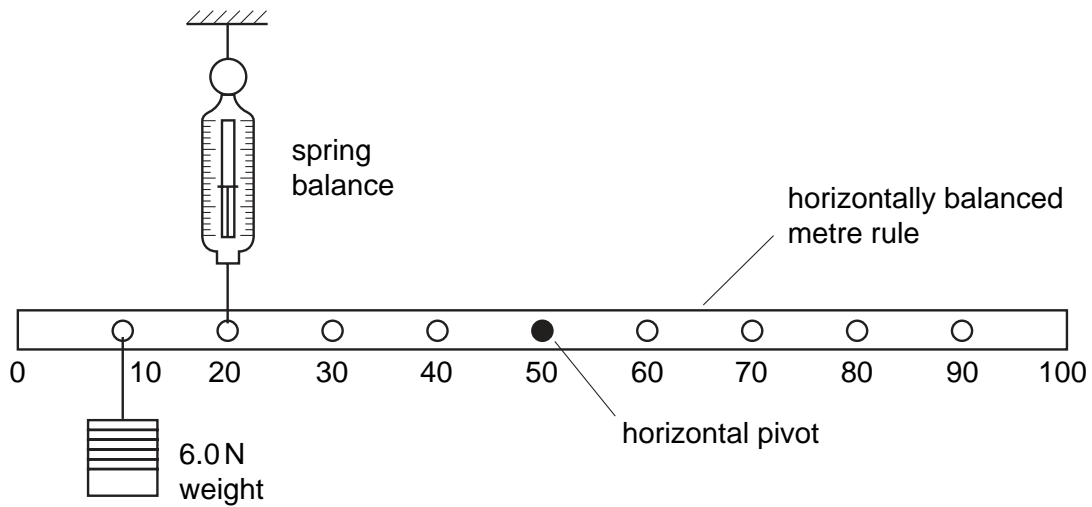**2** Fig. 2.1 shows apparatus for investigating moments of forces.

Fig. 2.1

The uniform metre rule shown in Fig. 2.1 is in equilibrium.

(a) Write down two conditions for the metre rule to be in equilibrium.

condition 1 ....

....

....

condition 2 ....

....

.... [2]

(b) Show that the value of the reading on the spring balance is 8.0 N.   [2]

(c) The weight of the uniform metre rule is 1.5 N.

Calculate the force exerted by the pivot on the metre rule.

magnitude of force = ………………………………

direction of force ……………………………… [2]

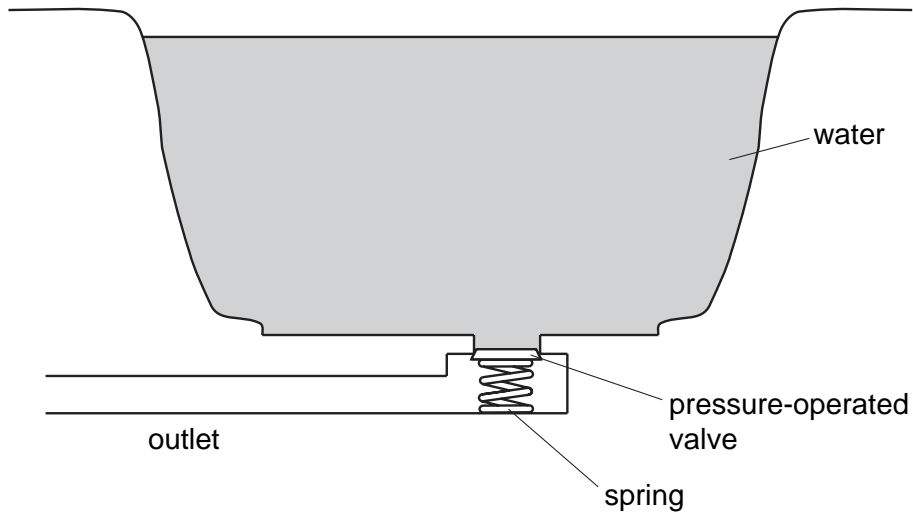**3** Fig. 3.1 shows a pond that is kept at a constant depth by a pressure-operated valve in the base.

Fig. 3.1

(a) The pond is kept at a depth of 2.0 m. The density of water is 1000 kg/m^3.

Calculate the water pressure on the valve.

pressure =…………………….. [2]

(b) The force required to open the valve is 50 N. The valve will open when the water depth reaches 2.0 m.

Calculate the area of the valve.

area = ……………………….. [2]

(c) The water supply is turned off and the valve is held open so that water drains out through the valve.

State the energy changes of the water that occur as the depth of the water drops from 2.0 m to zero.

....

.... [2]

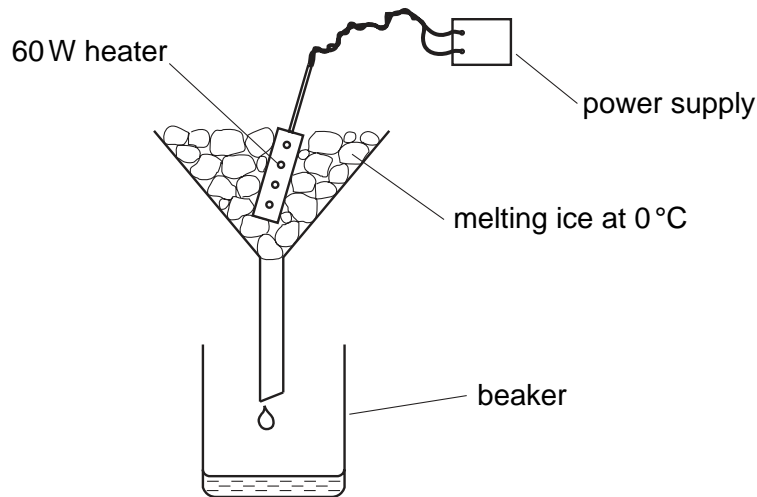4   Fig. 4.1 shows apparatus that could be used to measure the specific latent heat of ice.

Fig. 4.1

(a) Describe how you would use the apparatus. You may assume that ice at 0 °C and a stopwatch are available. State all the readings that would be needed at each stage.

....

....

....

....

.... [4]

(b) In an experiment, 120 g of ice at 0 °C is to be melted. The specific latent heat of ice is 340 J/g. Assume that all the energy from the heater will be used to melt the ice.

Calculate the expected time for which the 60 W heater is switched on.

expected time = ... [2]

(c) When the experiment is carried out, the ice melts in slightly less time than the expected time.

    (i) State one reason why this happens.

    ....

    .... [1]

    (ii) Suggest one modification to the experiment that would reduce the difference between the experimental time and the expected time.

    ....

    .... [1]

       [Turn over

5 Fig. 5.1 shows a way of indicating the positions and direction of movement of some molecules in a gas at one instant.
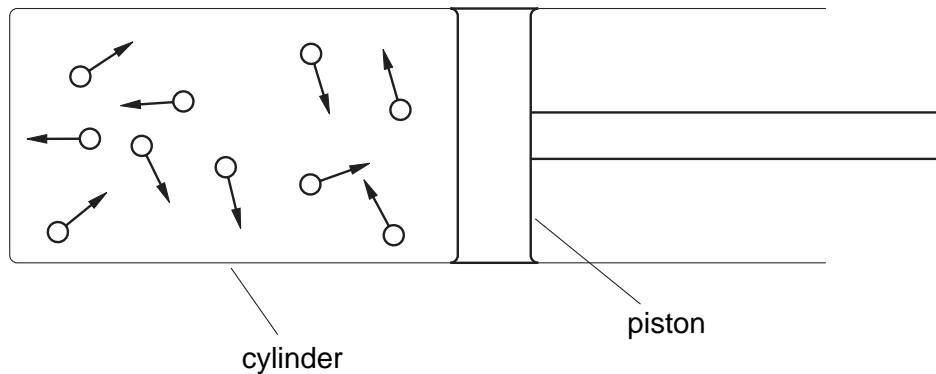

Fig. 5.1

(a) (i) Describe the movement of the molecules.

.... [1]

(ii) Explain how the molecules exert a pressure on the container walls.

....

.... [1]

(b) When the gas in the cylinder is heated, it pushes the piston further out of the cylinder.

State what happens to

(i) the average spacing of the molecules,

.... [1]

(ii) the average speed of the molecules.

.... [1]

(c) The gas shown in Fig. 5.1 is changed into a liquid and then into a solid by cooling.

Compare the gaseous and solid states in terms of

(i) the movement of the molecules,

....

.... [1]

(ii) the average separation of the molecules.

....

.... [1]

6 Fig. 6.1 shows the path of a sound wave from a source X.

X •

path of sound wave

Y •

wall
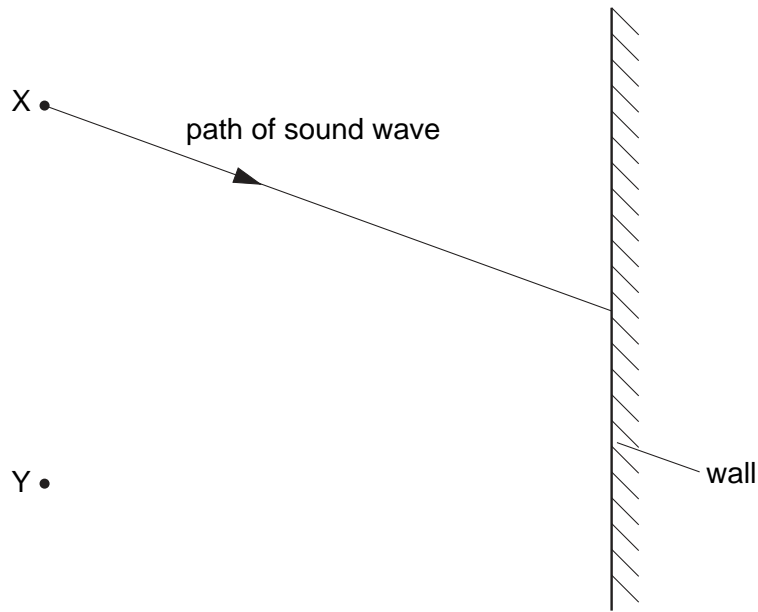
Fig. 6.1

(a) State why a person standing at point Y hears an echo.

.... [1]

(b) The frequency of the sound wave leaving X is 400 Hz. State the frequency of the sound wave reaching Y.

frequency = ……………….. [1]

(c) The speed of the sound wave leaving X is 330 m/s. Calculate the wavelength of these sound waves.

wavelength = ……………………….. [2]

(d) Sound waves are longitudinal waves.

State what is meant by the term *longitudinal*.

....

.... [1]

7 **(a)** Fig. 7.1 shows two rays of light from a point O on an object. These rays are incident on a plane mirror.
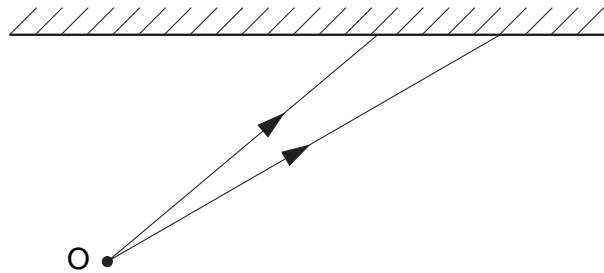

Fig. 7.1

(i) On Fig. 7.1, continue the paths of the two rays after they reach the mirror. Hence locate the image of the object O. Label the image I. [2]

(ii) Describe the nature of the image I.

....

.... [2]

(b) Fig. 7.2 is drawn to scale. It shows an object PQ and a convex lens.
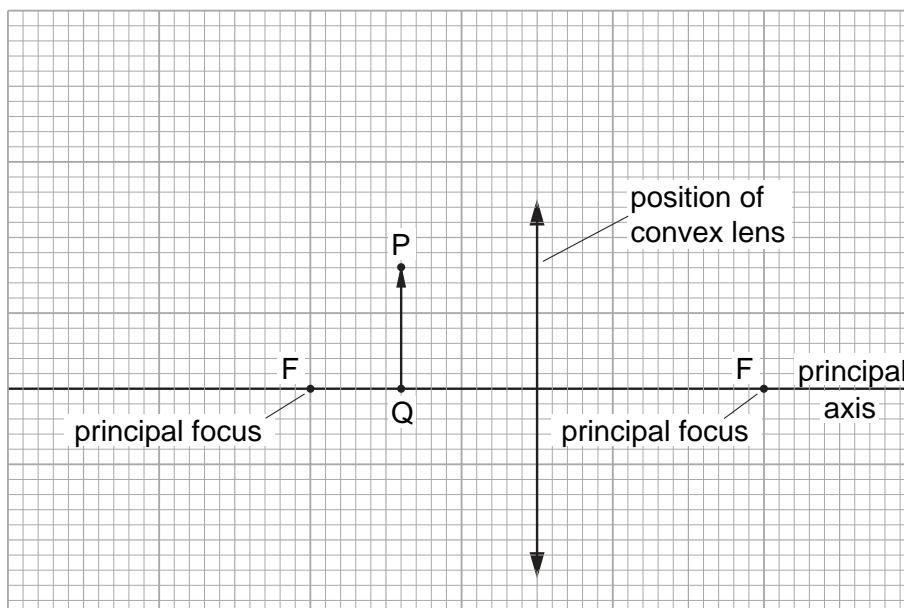

Fig. 7.2

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(i) On Fig. 7.2, draw two rays from the top of the object P that pass through the lens. Use these rays to locate the top of the image. Label this point T. [3]

(ii) On Fig. 7.2, draw an eye symbol to show the position from which the image T should be viewed. [1]

8   Fig. 8.1 shows a high-voltage supply connected across two metal plates.
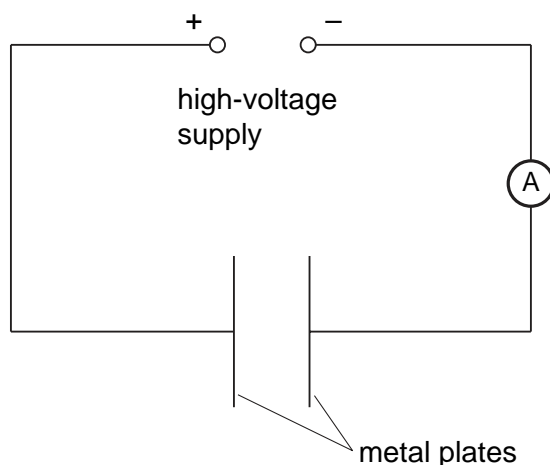

Fig. 8.1

When the supply is switched on, an electric field is present between the plates.

(a) Explain what is meant by an *electric field*.

.... [2]

(b) On Fig. 8.1, draw the electric field lines between the plates and indicate their direction
by arrows. [2]

(c) The metal plates are now joined by a high-resistance wire. A charge of 0.060 C passes
along the wire in 30 s.
Calculate the reading on the ammeter.

ammeter reading = ……………………… [2]

(d) The potential difference of the supply is re-set to 1500 V and the ammeter reading
changes to 0.0080 A. Calculate the energy supplied in 10 s. Show your working.

energy = ……………… [3]

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9 **(a)** In the space provided, draw the symbol for a NOR gate. Label the inputs and the output.

[2]

(b) State whether the output of a NOR gate will be high (ON) or low (OFF) when

(i) one input is high and one input is low,

....

(ii) both inputs are high.

....
[1]

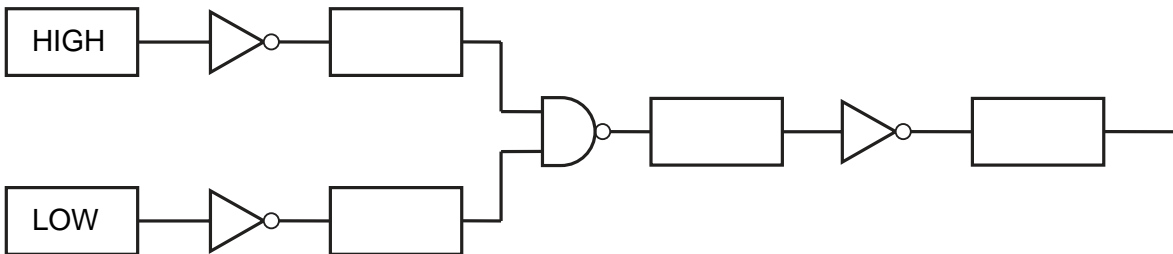**(c)** Fig. 9.1 shows a digital circuit made from three NOT gates and one NAND gate.

Fig. 9.1

(i) Write HIGH or LOW in each of the boxes on Fig. 9.1. [2]

(ii) State the effect on the output of changing both of the inputs.

....

.... [1]

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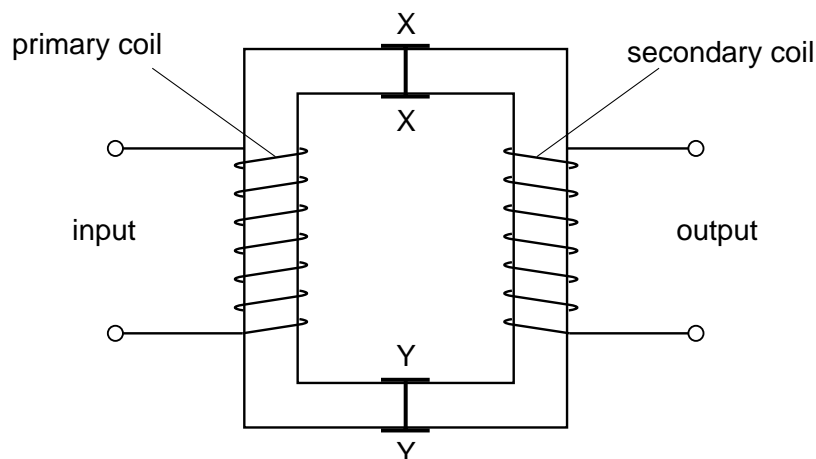**10** Fig. 10.1 shows the basic parts of a transformer.

Fig. 10.1

(a) Use ideas of electromagnetic induction to explain how the input voltage is transformed into an output voltage. Use the three questions below to help you with your answer.

What happens in the primary coil?

....

....

....

....

What happens in the core?

....

....

What happens in the secondary coil?

....

....

.... [5]

(b) State what is needed to make the output voltage higher than the input voltage.

.... [1]

(c) The core of this transformer splits along XX and YY. Explain why the transformer would not work if the two halves of the core were separated by about 30 cm.

....

.... [1]

(d) A 100% efficient transformer is used to step up the voltage of a supply from 100 V to 200 V. A resistor is connected to the output. The current in the primary coil is 0.4 A.

Calculate the current in the secondary coil.

current = …………………… [2]

11 A radioactive source emits only β-particles.

(a) A scientist wishes to investigate the deflection of β-particles by an electric field. Draw a labelled diagram to suggest a suitable experimental arrangement.

[3]

(b) State how the apparatus would be used to show the deflection of the β-particles by the electric field.

....

....

.... [2]

(c) State how the results would show the deflection of the β-particles.

....

.... [1]

(d) Explain the direction of the deflection obtained.

....

.... [1]

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