Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

4923685292

PHYSICS **0625/31**

Paper 3 Extended **May/June 2014**

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
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.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **12** printed pages.

DC (NF/SW) 81293/4

CAMBRIDGE International Examinations

1 **(a)** Fig. 1.1 shows a liquid-in-glass thermometer.

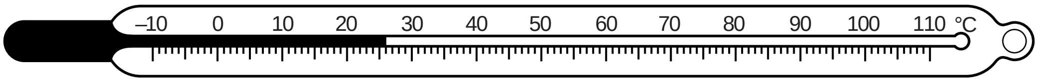

Fig. 1.1

(i) In the process of making the thermometer, the scale divisions were spaced equally.

What assumption was made about the liquid?

....

.... [1]

(ii) Suggest **two** changes to the thermometer that would require the spacing of the scale divisions to be larger.

1. ....

2. ....
[2]

(iii) As a result of the changes in **(ii)**, what other change is needed to enable the thermometer to be used for the same temperature range?

.... [1]

(b) The expansion of a liquid is an example of a physical property that may be used to measure temperature.

State **two** other physical properties that may also be used to measure temperature.

1. the .... of ....

2. the .... of ....
[2]

[Total: 6]

2 A student has a large number of coins of different diameters, all made of the same metal. She wishes to find the density of the metal by a method involving placing the coins in water.

(a) State the formula needed to calculate the density.

.... [1]

(b) Describe how the measurements of the required quantities are carried out.

....

....

....

....

....

....

....

....

....

....

.... [5]

(c) State **one** precaution taken when carrying out the measurements in **(b)** to ensure that the result is as accurate as possible.

....

.... [1]

[Total: 7]

3 **(a)** On a day with no wind, a fountain in Switzerland propels 30 000 kg of water per minute to a height of 140 m.

Calculate the power used in raising the water.

power = ... [4]

(b) The efficiency of the pump which operates the fountain is 70%.

Calculate the power supplied to the pump.

power = ... [3]

(c) On another day, a horizontal wind is blowing. The water does not rise vertically.

Explain why the water still rises to a height of 140 m.

....

.... [1]

[Total: 8]

4 Fig. 4.1 shows a heavy ball B of weight *W* suspended from a fixed beam by two ropes P and Q.

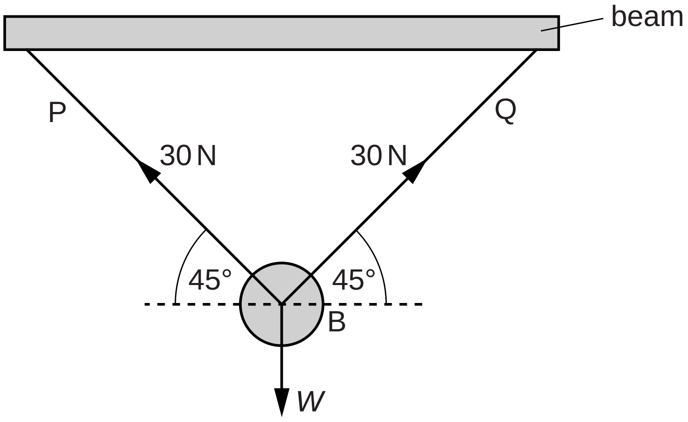

Fig. 4.1

P and Q are both at an angle of 45° to the horizontal. The tensions in P and Q are each 30 N.

(a) In the space below, draw a scale diagram to find the resultant of the tensions in P and Q. Use a scale of 1.0 cm to represent 5.0 N. Label the forces and show their directions with arrows.

resultant = ... [4]

(b) State the direction of the resultant. .... [1]

(c) State the magnitude of *W*. magnitude of *W* = ... [1]

[Total: 6]

5 **(a)** A water tank has a rectangular base of dimensions 1.5 m by 1.2 m and contains 1440 kg of water.

Calculate

(i) the weight of the water,

weight = ... [1]

(ii) the pressure exerted by the water on the base of the tank.

pressure = ... [2]

(b) Fig. 5.1 shows two water tanks **P** and **Q** of different shape. Both tanks are circular when viewed from above. The tanks each contain the same volume of water. The depth of water in both tanks is 1.4 m.

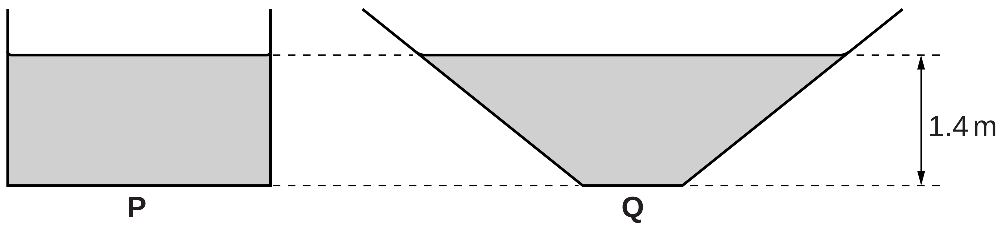

Fig. 5.1

(i) The density of water is 1000 kg / m^3. The pressures exerted by the water on the base of the two tanks are equal.

Calculate this pressure.

pressure = ... [2]

(ii) Equal small volumes of water are removed from each tank.

State which tank, **P** or **Q**, now has the greater water pressure on its base. Explain your answer.

....

....

.... [2]

[Total: 7]

6 Fig. 6.1 shows a quantity of gas in a cylinder fitted with a piston P.

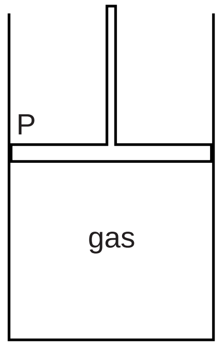

Fig. 6.1

(a) Describe the motion of the molecules of the gas.

....

....

....

....

.... [3]

(b) The piston is now slowly pushed down to decrease the volume of the gas. The temperature of the gas does not change.

(i) State and explain, in terms of molecules, what happens to the pressure of the gas.

....

....

.... [2]

(ii) Before pushing the piston down, the pressure of the gas was 1.0×10^5 Pa. Pushing the piston down reduces the volume of the gas from 500 cm^3 to 240 cm^3.

Calculate the final pressure of the gas.

pressure = ... [2]

[Total: 7]

7 **(a)** The following are three statements about boiling.

- A liquid boils at a fixed temperature.
- During boiling, vapour can form at any point within the liquid.
- Without a supply of thermal energy, boiling stops.

Complete the following equivalent statements about evaporation.

- A liquid evaporates at ....

  ....

- During evaporation ....

  ....

- Without a supply of thermal energy, evaporation ....

[3]

(b) A pan containing water boiling at 100 °C is standing on an electrically heated hot-plate. In 20 minutes, 0.075 kg of water is lost as steam. The specific latent heat of vaporisation of water is 2.25×10^6 J / kg.

(i) Calculate the energy used in converting 0.075 kg of boiling water to steam.

energy = ... [2]

(ii) The hot-plate operates at 240 V, 0.65 A.

Calculate the energy supplied to the hot-plate in 20 minutes.

energy = ... [2]

(iii) Suggest why the answers to **(b)(i)** and **(b)(ii)** are not the same.

....

.... [1]

[Total: 8]

8 **(a)** Draw a straight line from each quantity on the left-hand side to a speed on the right-hand side which is typical for that quantity.

	30 m / s
speed of sound in gas	300 m / s
	3000 m / s
speed of sound in solid	30 000 m / s
	300 000 m / s

[2]

(b) Explain why sound waves are described as *longitudinal*.

....

.... [2]

(c) Fig. 8.1 shows how the displacement of air molecules, at an instant of time, varies with distance along the path of a sound wave.

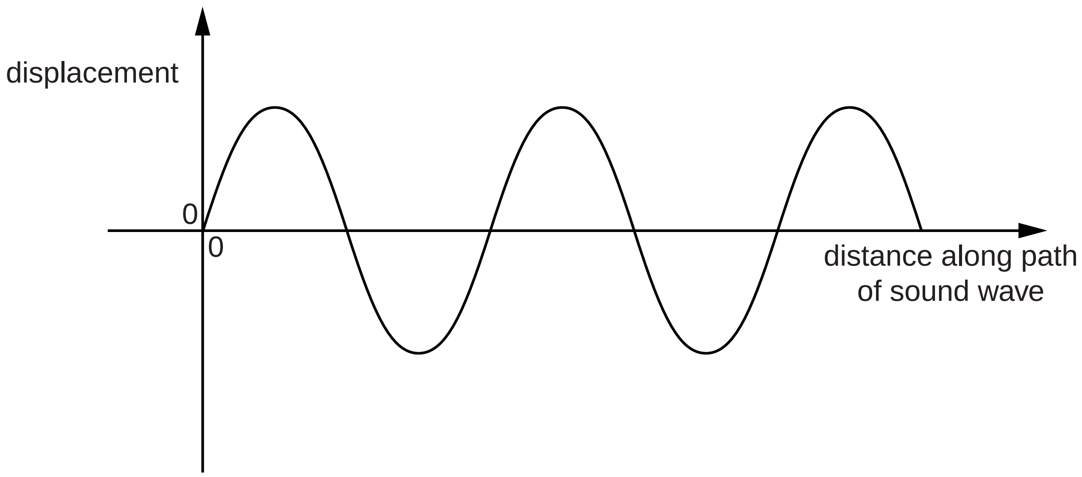

Fig. 8.1

(i) On Fig. 8.1, sketch two cycles of a sound wave that has a shorter wavelength **and** a greater amplitude. [2]

(ii) State **two** changes in the sound heard from this wave compared with the original wave.

1. ....

2. ....

[2]

[Total: 8]

9 In the circuit shown in Fig. 9.1, resistors can be connected between terminals P and Q. The e.m.f. of the battery is 6.0 V.

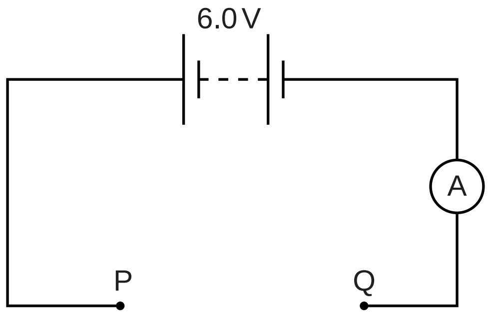

Fig. 9.1

(a) Calculate the current shown by the ammeter when a 12.0 Ω resistor and a 4.0 Ω resistor are

(i) connected in series between P and Q,

current = ... [2]

(ii) connected in parallel between P and Q.

current = ... [3]

(b) State the relationship between

(i) the resistance *R* and the length *l* of a wire of constant cross-sectional area,

....

(ii) the resistance *R* and the cross-sectional area *A* of a wire of constant length.

....
[2]

(c) The 12.0 Ω and 4.0 Ω resistors in **(a)** are wires of the same length and are made of the same alloy.

Calculate the ratio: $\dfrac{\text{cross-sectional area of 12.0}\,\Omega\text{ resistor}}{\text{cross-sectional area of 4.0}\,\Omega\text{ resistor}}$

ratio = ... [1]

[Total: 8]

10 Fig. 10.1 shows a coil of wire rotating steadily in the magnetic field between the poles of a permanent magnet. The current generated in the coil is to pass through resistor R.

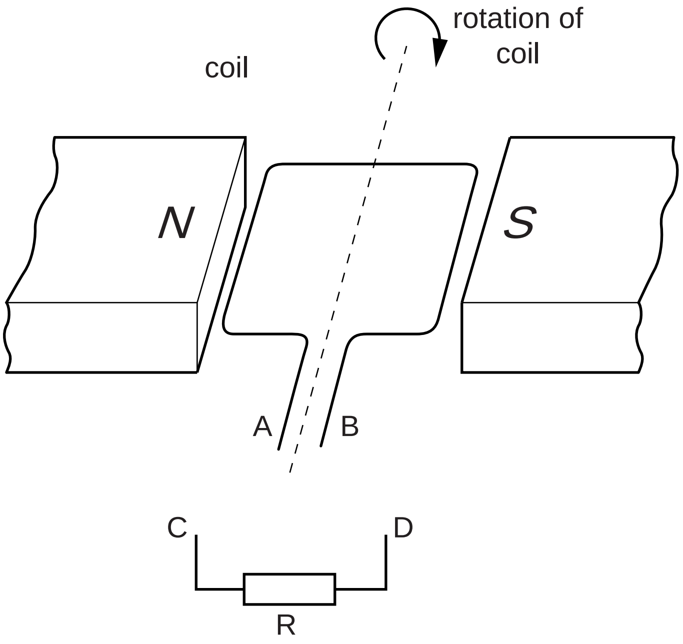

Fig. 10.1

(a) The apparatus in Fig. 10.1 is part of an a.c. generator. What is connected between the ends A and B of the coil and the connections C and D?

.... [1]

(b) **(i)** On Fig. 10.2, sketch a graph to show the variation with time of the current through R. [1]

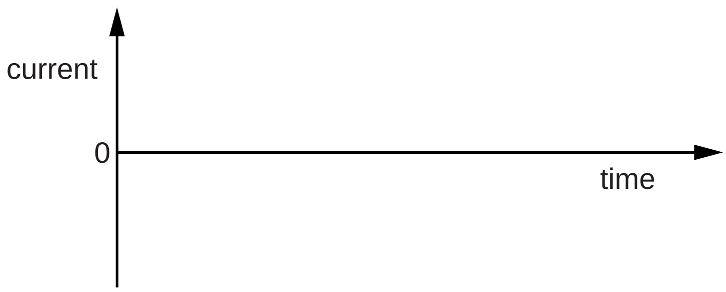

Fig. 10.2

(ii) On Fig. 10.2, show the time *T* corresponding to one complete rotation of the coil. [1]

(iii) State **two** ways in which the graph would be different if the coil spins at a faster rate.

1. ....

2. .... [2]

(c) Suggest what could be connected between C and R so that the current in R is always in the same direction.

.... [1]

[Total: 6]

11 **(a)** Complete the table below for the three types of radiation.

radiation	nature	charge	stopped by
γ	electromagnetic radiation		
β		negative	
α			thick paper

[3]

(b) An isotope of strontium is represented in nuclide notation as ${}^{90}_{38}\mathrm{Sr}$.

For a neutral atom of this isotope, state

(i) the proton number, ...

(ii) the nucleon number, ...

(iii) the number of neutrons, ...

(iv) the number of electrons. ....

[3]

(c) A sample of a radioactive material is placed near a radiation detector. A count-rate of 4800 counts / s is detected from the sample. After 36 hours the count-rate has fallen to 600 counts / s.

Calculate how many more hours must pass for the count-rate to become 150 counts / s.

number of hours = ... [3]

[Total: 9]