Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

7907131038

PHYSICS **0625/33**

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 **18** printed pages and **2** blank pages.

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1 Parachutes are used to slow down a certain racing car.

Fig. 1.1 shows the racing car, of total mass 750 kg, slowing down by using parachutes.

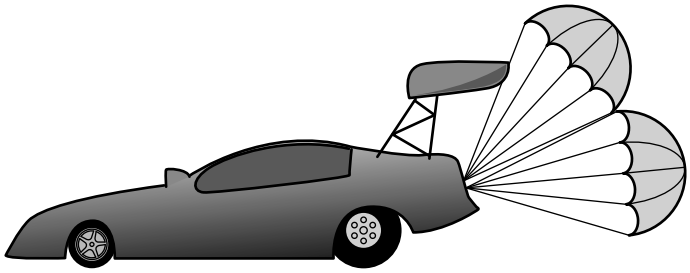


Fig. 1.1

Fig. 1.2 is the speed-time graph for 20 s after the car reaches full speed.

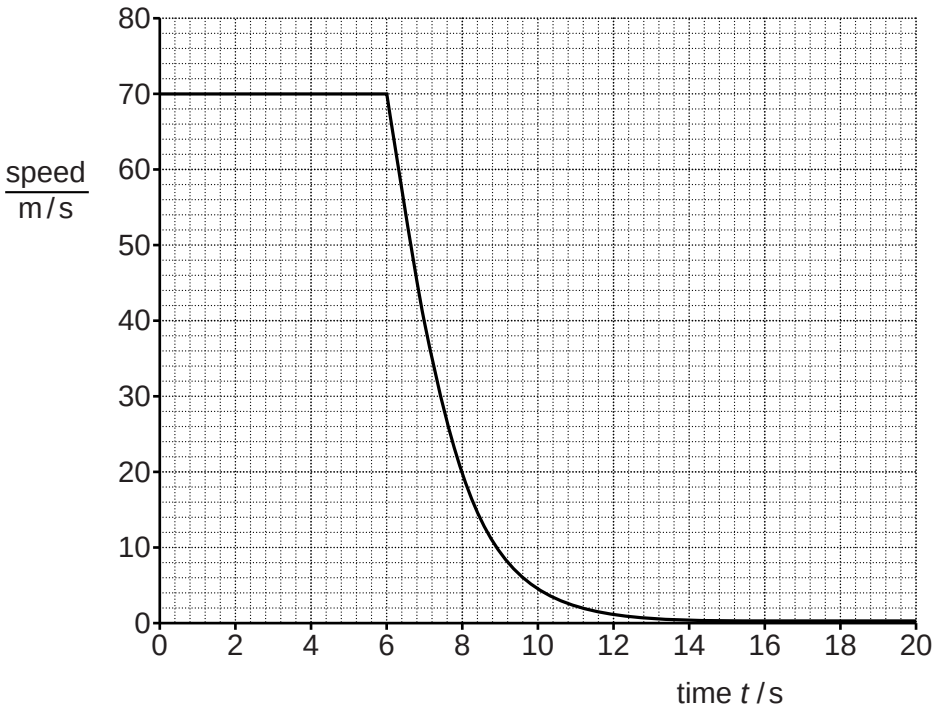


Fig. 1.2

At time t = 6.0 s, the parachutes open.

(a) On Fig. 1.2,

(i) mark a point, labelled A, where the car is moving at constant speed,

(ii) mark a point, labelled B, where the car is decelerating at a uniform rate,

(iii) mark a point, labelled C, where the car is decelerating at non-uniform rate.

[3]

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(b) Calculate

(i) the deceleration of the car at time $t = 6.5\,s$,

deceleration = ... [2]

(ii) the resultant force acting on the car at this time.

resultant force = ... [2]

(c) Explain why there is no resultant force acting on the car at time $t = 4.0\,s$.

.....

..... [1]

[Total: 8]

2 A student wishes to determine the density of a small, irregularly shaped stone.

(a) With the aid of a labelled diagram, describe an experiment to determine the volume of the stone.

.....

.....

.....

.....

..... [4]

(b) **(i)** State the other quantity, apart from the volume, that must be measured in order to determine the density.

..... [1]

(ii) State the formula that is used to calculate the density.

.....

..... [1]

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(c) The student now wishes to determine the volume of a small, irregularly shaped piece of wood that floats in water. He notices that a small lead weight tied to the wood makes it sink in water.

Describe how the student can adapt the experiment in **(a)** to determine the volume of the wood. You may draw a diagram.

.....

.....

.....

.....

.....

.....

..... [2]

[Total: 8]

3 A metre rule balances when the 50 cm mark is directly above a pivot.

(a) State where in the rule its centre of mass is located.

.....

..... [1]

(b) Fig. 3.1 shows an apple and a 0.40 N weight placed on the rule so that the rule remains balanced at the 50 cm mark.

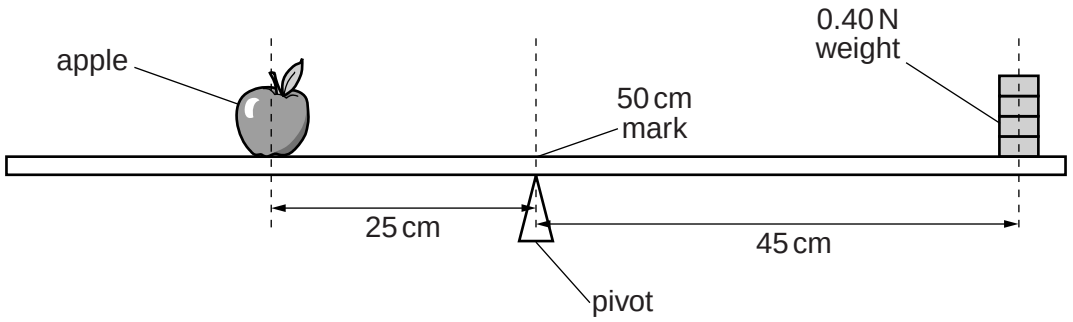


Fig. 3.1 (not to scale)

The centre of mass of the apple is 25 cm from the pivot and the centre of mass of the weight is 45 cm from the pivot.

Calculate

(i) the weight of the apple,

weight = ... [2]

(ii) the mass of the apple.

mass = ... [1]

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(c) The apple is not moved. The weight is removed from the rule and the pivot is moved to the left until the rule balances as shown in Fig. 3.2.

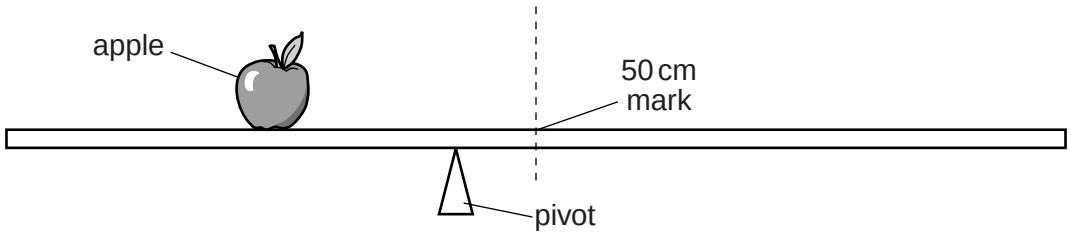


Fig. 3.2 (not to scale)

(i) Explain why the arrangement in Fig. 3.2 balances.

.....

.....

..... [2]

(ii) The pivot in Fig. 3.2 is closer to the 50 cm mark than to the centre of mass of the apple.

Compare the weight of the rule to the weight of the apple.

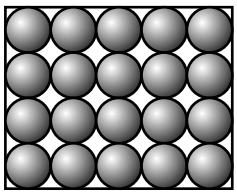
.....

..... [1]

[Total: 7]

4 A teacher shows a class examples of three states of matter. These are a solid metal block resting on the bench, a liquid in a glass beaker and a gas in a clear balloon in the laboratory.

Fig. 4.1a represents the arrangement of molecules in the solid.



solid

Fig. 4.1a



liquid

Fig. 4.1b



gas

Fig. 4.1c

(a) (i) Complete Fig. 4.1b, to show the arrangement of molecules in the liquid.

(ii) Complete Fig. 4.1c, to show the arrangement of molecules in the gas.

[3]

(b) (i) In the list below, draw a ring around the state of matter that is the easiest to compress.

the solid **the liquid** **the gas**

[1]

(ii) In terms of its molecules, explain why this state of matter is the easiest to compress.

.....

.....

..... [2]

[Total: 6]

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5 During both boiling and evaporation, liquid water is converted into water vapour.

The rate at which the mass of **boiling** water decreases depends only on the rate at which the water is gaining thermal energy.

(a) The specific latent heat of vaporisation of water is 2.3×10^6 J/kg. Thermal energy is supplied to boiling water in a kettle at a rate of 460 W.

Calculate the mass of water that is boiled away in 180 s.

mass = ... [2]

(b) The rate at which the mass of **evaporating** water decreases depends on other factors.

(i) State two of these factors.

1. .....

2. .....
[2]

(ii) State two other ways in which evaporation is different from boiling.

1. .....

2. .....
[2]

[Total: 6]

6 The liquids in five liquid-in-glass thermometers A, B, C, D and E expand linearly with temperature. All the thermometers have scales marked in °C. Fig. 6.1 accurately represents the scales of these five thermometers.

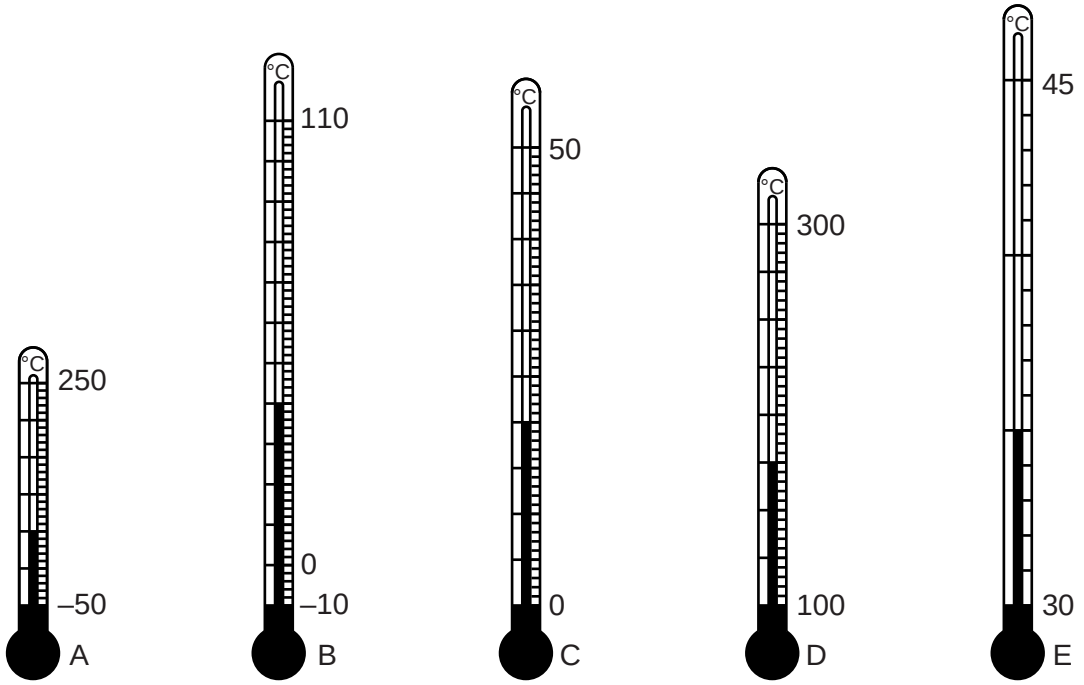


Fig. 6.1

(a) **(i)** Use information from the scales of the thermometers in Fig. 6.1 to state which thermometer has the greatest range.

..... [1]

(ii) State and explain which thermometer has the greatest sensitivity.

.....

..... [1]

(b) Suggest two design features that would cause a liquid-in-glass thermometer to have a large sensitivity.

1. .....

2. .....

[2]

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(c) The distance on thermometer B between the 110 °C mark and the −10 °C mark is 18 cm.

Calculate the length of the liquid thread above the −10 °C mark when the temperature recorded by B is 70 °C.

length = ... [2]

[Total: 6]

7 **(a)** State how a longitudinal wave differs from a transverse wave.

.....

.....

..... [2]

(b) A sound wave of frequency 7.5 kHz travels through a steel beam at a speed of 6100 m / s.

(i) Calculate the wavelength of this sound wave in the steel beam.

wavelength = ... [2]

(ii) The sound wave passes from the end of the beam into air.

State

1. the effect on the speed of the sound,

..... [1]

2. the effect on the wavelength of the sound.

..... [1]

[Total: 6]

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8 A lamp in a large room is suspended below a horizontal mirror that is fixed to the ceiling. Fig. 8.1 is a scale diagram of the lamp and mirror.

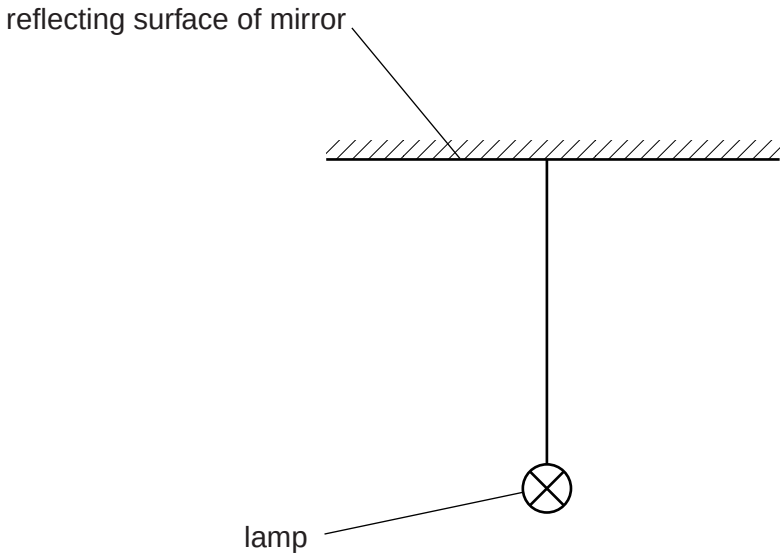


Fig. 8.1

An image of the lamp is formed by the mirror.

(a) **(i)** On Fig. 8.1, draw two rays from the centre of the lamp that strike the mirror. Use these rays to locate the image. Label the image I. [3]

(ii) State **two** characteristics of this image.

1. .....

2. .....
[2]

(b) Suggest an advantage of positioning a mirror above the lamp.

.....

..... [1]

[Total: 6]

9 Fig. 9.1 represents two identical metal plates, positioned horizontally, one above the other in a vacuum.



Fig. 9.1

A negative charge of 0.000 000 042 C (4.2×10^{-8} C) is transferred to the upper plate, leaving the lower plate with a positive charge of the same size.

(a) On Fig. 9.1, draw the pattern of the electric field between the two plates and indicate the direction of the lines of force. [3]

(b) **(i)** A conducting copper wire is used to connect the two plates and this leaves the plates uncharged. Charge flows in the wire for 0.000 000 035 s (3.5×10^{-8} s).

Calculate the average current in the wire during this time.

current = ... [3]

(ii) State, in terms of its atomic structure, why the copper wire is an electrical conductor.

.....

.....

..... [2]

[Total: 8]

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10 The electric circuit in a clothes dryer contains two heaters X and Y in parallel. Fig. 10.1 shows the circuit connected to a 230 V power supply.

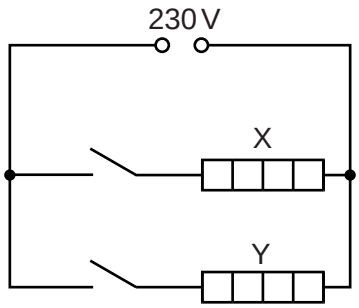


Fig. 10.1

When both switches are closed, the current in X is 3.5 A.

(a) Calculate the power developed in heater X.

power = ... [2]

(b) The resistance of X is double that of Y.

Determine the total resistance of X and Y in parallel.

resistance = ... [4]

[Total: 6]

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11 A battery charger includes a transformer and a rectifier.

Fig. 11.1 represents the transformer, consisting of an iron core with two coils P and Q wound on to the core.

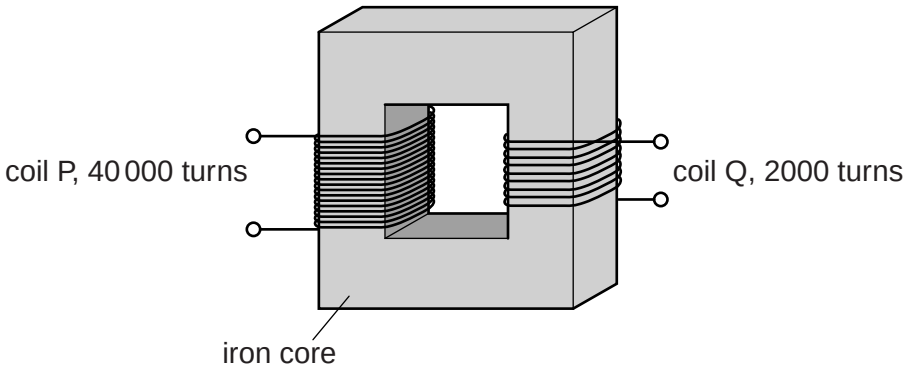


Fig. 11.1

P consists of 40 000 turns and Q consists of 2000 turns.

When P is connected to a 230 V a.c. supply, there is an e.m.f. across the terminals of Q.

(a) (i) Calculate the size of this e.m.f.

e.m.f. = ... [2]

(ii) Explain how this e.m.f. is generated.

.....

.....

.....

.....

..... [3]

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(b) The output of Q is connected to the rectifier circuit.

State

(i) the name of the circuit component that is used in a rectifier circuit to rectify the a.c. (alternating current),

..... [1]

(ii) the property of this component that is used to rectify the current.

..... [1]

[Total: 7]

12 Overhead power cables supply electrical power to a town that is a considerable distance from the power station.

The voltage at which the power is transmitted in the cables is very much greater than the voltage at the power station and the voltage of the mains supply in the town.

(a) Explain the advantage of transmitting electrical power at a very high voltage.

.....

.....

.....

.....

..... [3]

(b) It is suggested that the resistance of the cables can be changed by doubling their diameter.

(i) Explain the effect of this change on the resistance of the cables.

.....

.....

..... [2]

(ii) Suggest one disadvantage of doubling the diameter of the cables.

.....

..... [1]

[Total: 6]

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