Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
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8192377735 8

PHYSICS **0625/41**

Paper 4 Theory (Extended) **October/November 2018**

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 1.0 kg to be 10 N (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 syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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1 A train of mass 5.6×10^5 kg is at rest in a station.

At time $t = 0$ s, a resultant force acts on the train and it starts to accelerate forwards.

Fig. 1.1 is the distance-time graph for the train for the first 120 s.

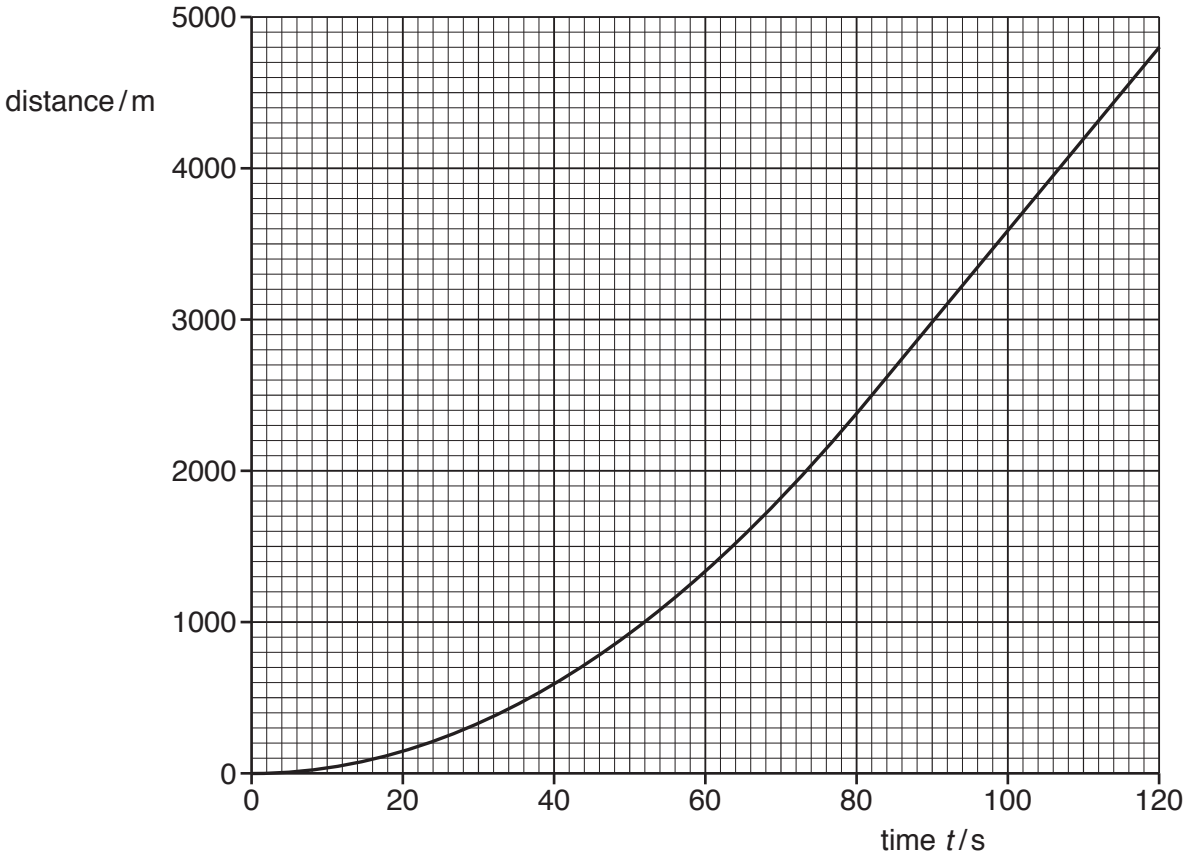


Fig. 1.1

(a) (i) Use Fig. 1.1 to determine:

1. the average speed of the train during the 120 s

average speed = ...[1]

2. the speed of the train at time $t = 100$ s.

speed = ...[2]

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(ii) Describe how the acceleration of the train at time $t = 100\,s$ differs from the acceleration at time $t = 20\,s$.

.....

.....

.....[2]

(b) (i) The initial acceleration of the train is $0.75\,m/s^2$.

Calculate the resultant force that acts on the train at this time.

resultant force = ...[2]

(ii) At time $t = 120\,s$, the train begins to decelerate.

State what is meant by *deceleration*.

.....

.....[1]

[Total: 8]

2 Fig. 2.1 shows a uniform plank AB of length 2.0 m suspended from two ropes X and Y.

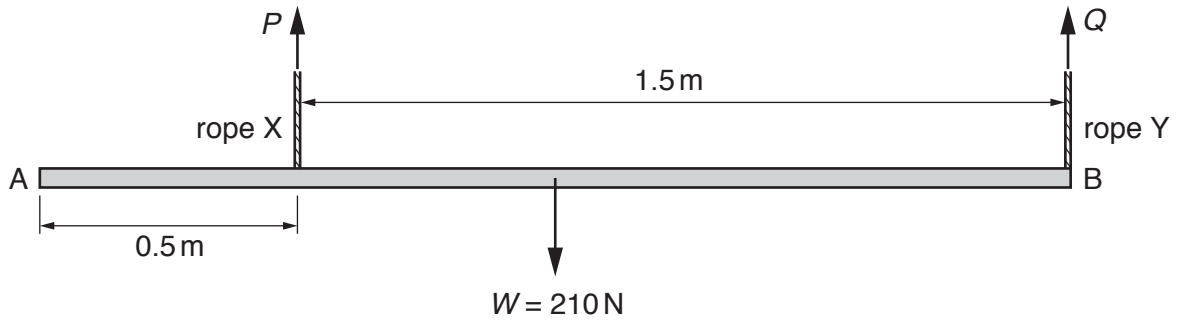


Fig. 2.1

The weight W of the plank is 210 N. The force in rope X is P. The force in rope Y is Q.

(a) State, in terms of P, the moment of force P about B.

.....[1]

(b) Calculate:

(i) the moment of W about B

moment = ...[1]

(ii) the force P

force P = ...[2]

(iii) the force Q.

force Q = ...[2]

[Total: 6]

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3 **(a)** State what is meant by *the principle of conservation of energy*.

.....

.....[1]

(b) Fig. 3.1 shows a girl throwing a heavy ball.

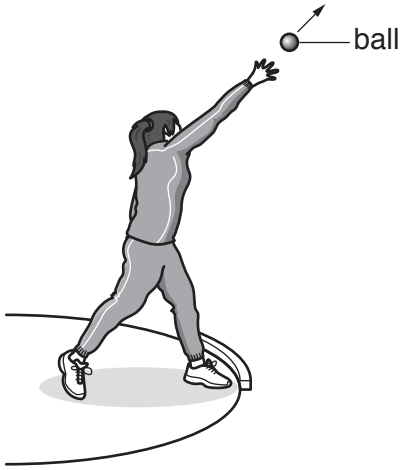


Fig. 3.1

(i) State the energy changes that take place from when the girl begins to exert a force on the ball until the ball hits the ground and stops moving.

.....

.....

.....

.....

.....[2]

(ii) The mass of the ball is 4.0 kg. The girl exerts a force on the ball for 0.60 s. The speed of the ball increases from 0 m/s to 12 m/s before it leaves the girl's hand.

Calculate:

1. the momentum of the ball on leaving the girl's hand

momentum = ...[2]

2. the average resultant force exerted on the ball.

average resultant force = ...[2]

[Total: 7]

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4 **(a)** Fig. 4.1 shows liquid in a cylinder.

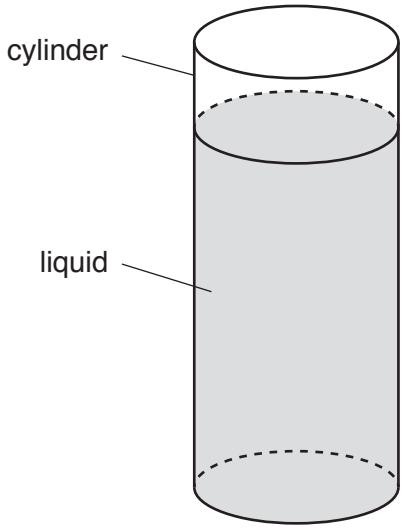


Fig. 4.1

The depth of the liquid is 10 cm and the radius of the cylinder is 3.0 cm. The weight of the liquid in the cylinder is 2.5 N.

Calculate the density of the liquid.

density = ...[3]

(b) Fig. 4.2 shows a device that measures the pressure of a gas supply.

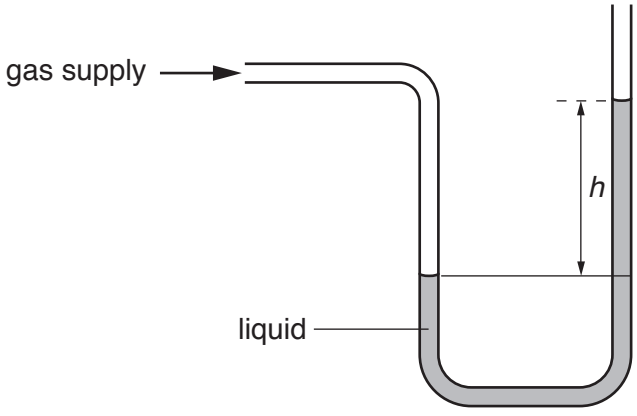


Fig. 4.2

(i) State the name of the device. .....[1]

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(ii) The difference h between the two liquid levels is 2.0 cm. The density of the liquid is 800 kg / m^3.

Calculate the difference between the pressure of the gas and atmospheric pressure.

pressure difference = ...[2]

(iii) A similar device with a tube of smaller cross-sectional area is connected to a gas supply at the same pressure.

State and explain any effect on the value of h.

.....

.....

.....[2]

[Total: 8]

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5 **(a)** **(i)** In the space below, draw a labelled diagram of the structure of a thermocouple thermometer. Include the device from which a reading is taken.

[3]

(ii) A thermocouple thermometer is used to measure the temperature of the flame of a small candle.

State **two** reasons why the thermocouple thermometer is suitable for this application.

1. .....

.....

2. .....

.....

[2]

(b) State and explain any effect on the sensitivity of a liquid-in-glass thermometer of:

(i) reducing the diameter of the capillary tube

.....

.....

.....[2]

(ii) increasing the volume of the liquid-filled bulb.

.....

.....

.....[2]

[Total: 9]

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6 **(a)** State **three** factors that determine the rate of evaporation of water.

1. .....

2. .....

3. .....

[3]

(b) A person climbs out of a swimming pool and stands in the open air.

Explain why evaporation of water from the surface of the person's body causes the person to feel cold.

.....

.....

.....

.....[2]

[Total: 5]

7 **(a)** A laser produces a beam of monochromatic light. State what is meant by the term *monochromatic*.

.....[1]

(b) A wave, in air, is incident on a glass block. Fig. 7.1 shows the wavefronts at the air-glass boundary. The arrow shows the direction of travel of the wavefronts.

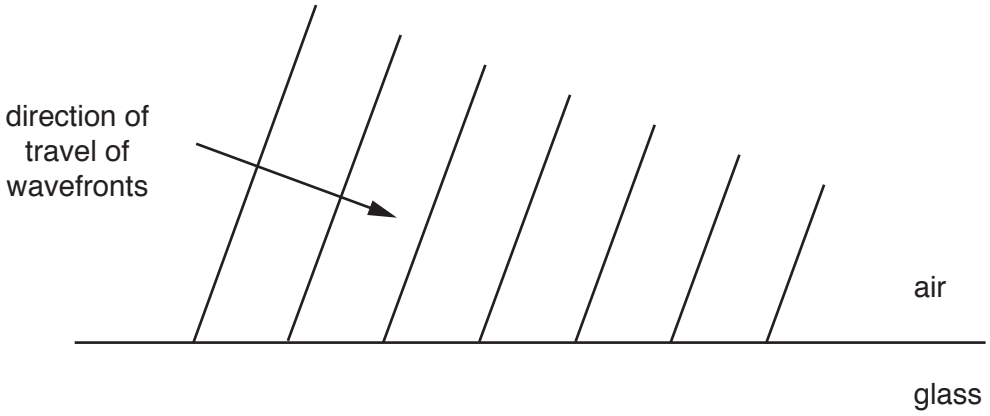


Fig. 7.1

The wave undergoes reflection and refraction at the air-glass boundary.

On Fig. 7.1 draw:

(i) the wavefronts of the reflected wave [3]

(ii) the wavefronts of the refracted wave. [3]

(c) A transverse wave is produced in a long, horizontal rope. The rope is much longer than the wavelength of the wave.

In the space below, sketch a diagram to show the appearance of the rope as the wave passes along it. Label **two** important features of the wave.

[2]

[Total: 9]

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8 A vibrating source on a ship produces a sound wave that travels through the ocean. The wave produced is a longitudinal wave.

(a) Explain what is meant by the term *longitudinal wave*.

.....

.....

.....

.....[3]

(b) The frequency of the sound wave is 800 Hz.

(i) The speed of sound in air is 330 m / s.

State a typical value for the speed of sound in a liquid.

..... [1]

(ii) Using your value from **(b)(i)**, calculate the wavelength of the sound wave in the ocean.

wavelength = ...[2]

[Total: 6]

9 Fig. 9.1 shows the symbol for a 12 V battery.

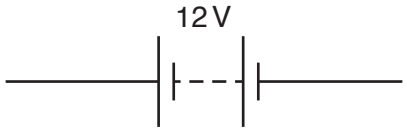


Fig. 9.1

(a) Two lamps are connected in parallel with the battery. On Fig. 9.1, using the correct symbols, complete the circuit diagram. [1]

(b) One of these lamps has a resistance of 6.0 Ω.

Calculate, for this lamp:

(i) the current

current = ...[1]

(ii) the power.

power = ...[2]

(c) The power of the other lamp is 36 W.

Calculate the total energy delivered to this lamp in 20 hours.

energy = ...[3]

[Total: 7]

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10 A transformer consists of two coils of wire wound on a metal core. Fig. 10.1 represents the transformer.

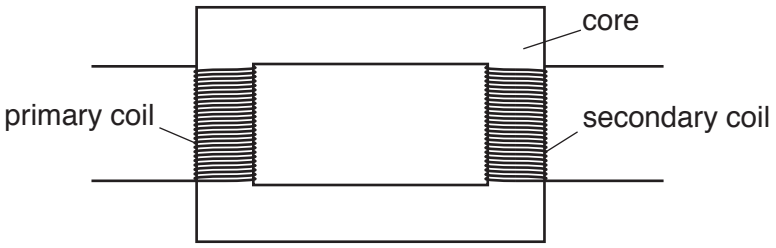


Fig. 10.1

(a) State the name of the metal from which the core is made.

.....[1]

(b) The primary coil of the transformer is connected to the output voltage of an a.c. generator which supplies an alternating current.

(i) Explain why there is a voltage between the two terminals of the secondary coil.

.....

.....

.....

.....[3]

(ii) There are 560 turns on the primary coil and 910 turns on the secondary coil of the transformer. The voltage between the two terminals of the secondary coil is 78 V.

Calculate the voltage supplied by the a.c. generator.

generator voltage = ...[2]

(c) Transformers are used to increase the voltage when electrical energy is transmitted in cables across long distances.

Explain why power losses in the cables are lower when the voltage is high.

.....

.....

.....[2]

[Total: 8]

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[Turn over

11 (a) Fig. 11.1 shows data about nine elements.

proton number	element	symbol
2	helium	He
3	lithium	Li
4	beryllium	Be
5	boron	B
6	carbon	C
7	nitrogen	N
8	oxygen	O
9	fluorine	F
10	neon	Ne

Fig. 11.1

Carbon-14 is a radioactive isotope with a nucleon number of 14. It decays by emitting β-particles.

Use any data you need from Fig. 11.1 to write down the nuclide equation for this decay.

[4]

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(b) A radioactive sample is placed close to a detector. The radioactive isotope in the sample has a long half-life. The detector records a count rate of 597 counts/s.

Fig. 11.2 shows the readings when different materials are placed between the radioactive sample and the detector.

material	$\frac{\text{count rate}}{\text{counts/s}}$
a sheet of paper	602
a piece of thin aluminium	598
a piece of thin lead	510

Fig. 11.2

Explain whether any α-particles, β-particles or γ-rays are emitted by the radioactive sample.

α-particles .....

.....

β-particles .....

.....

γ-rays .....

.....

[3]

[Total: 7]

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