Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

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3376120828

PHYSICS **0625/42**

Paper 4 Theory (Extended) **May/June 2019**

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 regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

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1 A bus is travelling between points A and D. There are bus stops at A, B, C and D but the bus does not stop at B and C. Fig. 1.1 is a speed-time graph for the bus.

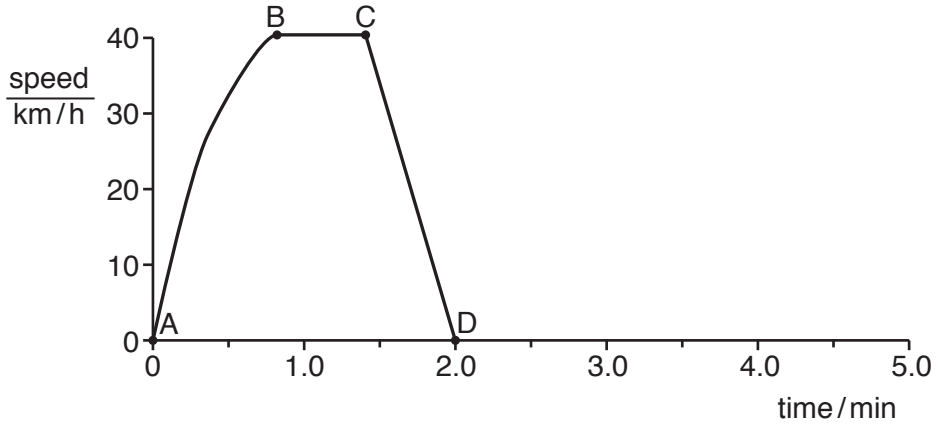


Fig. 1.1

(a) Describe the motion of the bus between each of the bus stops. Select the appropriate description from the list below.

constant acceleration **decreasing acceleration**

increasing acceleration **moving backwards at constant speed**

moving forwards at constant speed **stationary**

1. between A and B .....

2. between B and C .....

3. between C and D .....

[3]

(b) The average speed of the bus between A and D is 23 km / h.

Calculate the distance between A and D.

distance = ... [3]

(c) The bus stops at D for 1 min and then travels at a constant acceleration for 30 seconds.

On Fig. 1.1, sketch a possible graph for this additional motion. Label X when the bus starts to accelerate and label Y for 30 seconds later. [3]

[Total: 9]

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2 Fig. 2.1 shows a model fire engine. Its brakes are applied.

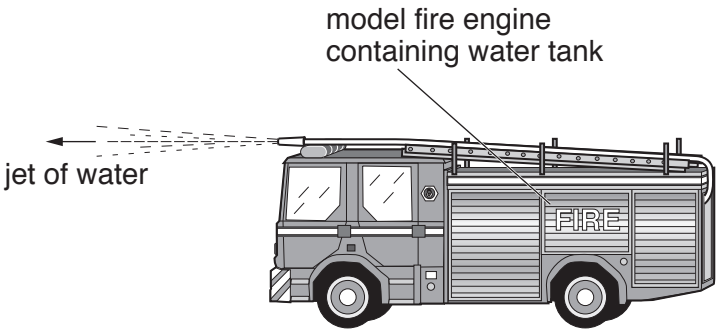


Fig. 2.1

0.80 kg of water is emitted in the jet every 6.0 s at a velocity of 0.72 m / s relative to the model.

(a) Calculate the change in momentum of the water that is ejected in 6.0 s.

momentum = ... [2]

(b) Calculate the magnitude of the force acting on the model because of the jet of water.

force = ... [2]

(c) The brakes of the model are released.

State and explain the direction of the acceleration of the model.

Statement .....

Explanation .....

.....

[2]

(d) In **(c)** the model contains a water tank, which is initially full.

State and explain any change in the magnitude of the initial acceleration if the brakes are first released when the tank is nearly empty.

Statement .....

Explanation .....

.....

.....

[3]

[Total: 9]

3 Fig. 3.1 shows solar cells used to generate electrical energy.

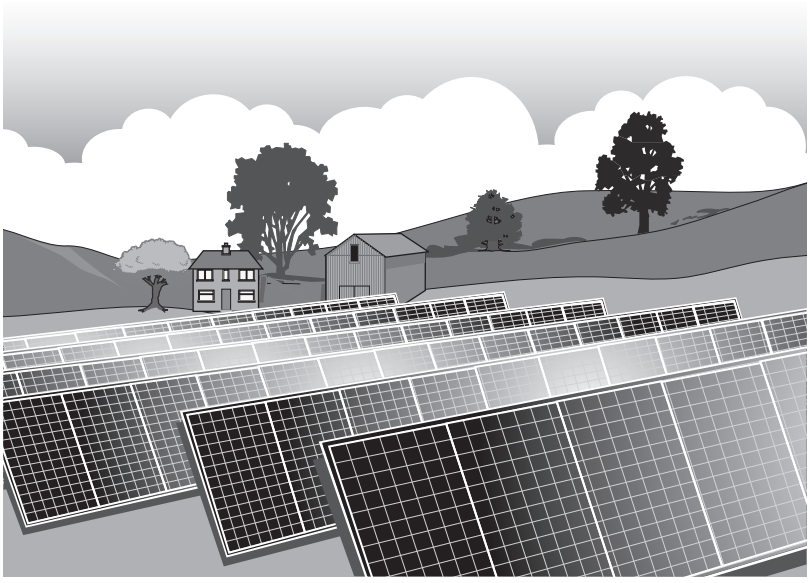


Fig. 3.1

(a) State the main form of energy transferred from the Sun to the solar cells for the generation of electrical energy.

..... [1]

(b) Consider the generation of electrical energy by a large number of solar cells, as shown in Fig. 3.1.

(i) State **one** environmental advantage and **one** environmental disadvantage.

advantage .....

.....

disadvantage .....

.....

[2]

(ii) State and explain whether this source of electrical energy is renewable.

.....

..... [1]

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(c) Each group of solar cells is arranged in a rectangle 1.2 m × 2.8 m. The solar cells are situated in a region where 260 W of solar energy is received per square metre of the cells. The electrical output of each group of solar cells is a current of 2.5 A with a potential difference of 86 V.

Calculate the efficiency of the solar cells.

efficiency = ... % [4]

[Total: 8]

4 **(a)** State and explain, in terms of molecules, any change in the pressure of a gas when the volume is reduced at a constant temperature.

Statement .....

Explanation .....

.....

.....

.....

.....

.....

[3]

(b) Complete Table 4.1 to give the relative order of magnitude of the expansion of gases, liquids and solids for the same increase of temperature.

Write one of these words in each blank space:

gas **liquid** **solid**

Table 4.1

expands most	
expands least	

[2]

[Total: 5]

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5 **(a)** **(i)** A liquid is heated so that bubbles of its vapour rise to the surface and molecules escape to the atmosphere.

State the name of this process ..... [1]

(ii) At a lower temperature than in **(a)(i)**, molecules escape from the surface to the atmosphere.

State the name of this process ..... [1]

(b) **(i)** Fig. 5.1 shows apparatus used to determine the power output of a heater.

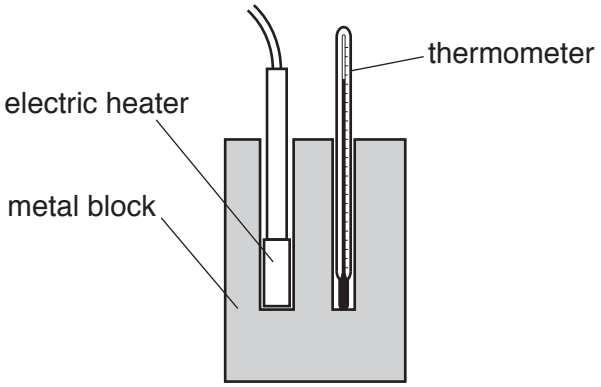


Fig. 5.1

The metal block has a mass of 2.7 kg. The metal of the block has a specific heat capacity of 900 J/(kg °C).

In 2 min 30 s, the temperature of the block increases from 21 °C to 39 °C.

Calculate the power of the heater.

power = ... [4]

(ii) State and explain a precaution that can be taken to improve the accuracy of the experiment.

Statement .....

Explanation .....

.....

[2]

[Total: 8]

6 **(a)** Fig. 6.1 shows a water wave in a ripple tank.

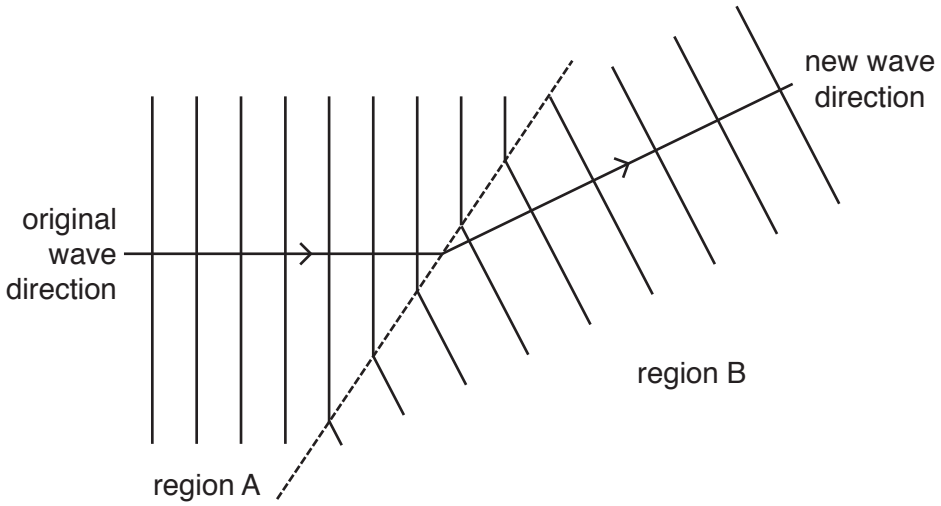


Fig. 6.1

(i) State the name of the process that occurs as the wave moves from region A to region B.

..... [1]

(ii) Suggest a cause for the change in direction of the wave.

..... [1]

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(b) Fig. 6.2 shows a transverse wave.

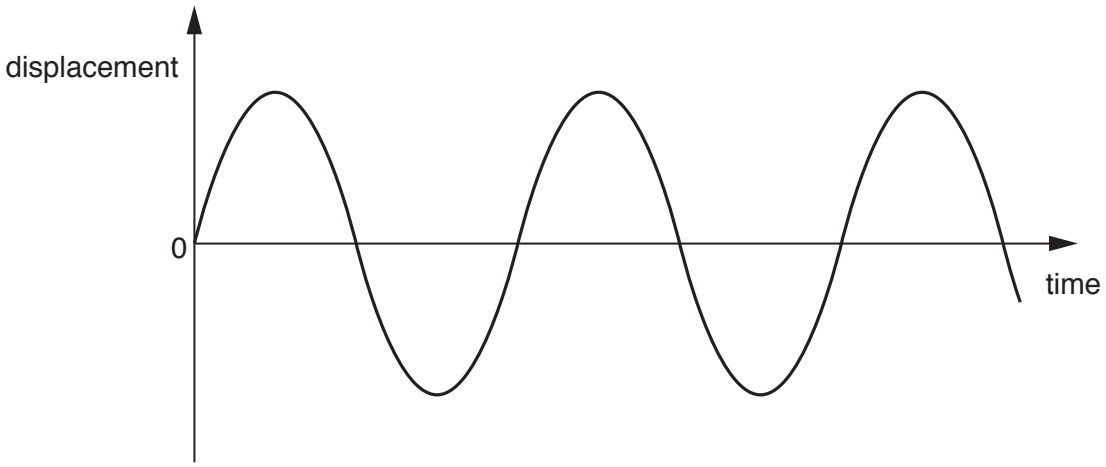


Fig. 6.2

On Fig. 6.2, draw a wave which has half the amplitude and a greater frequency than the wave shown. [2]

(c) A train travels along steel rails. A person waiting at a station hears the sound of the train through the rails before he hears the sound through the air.

(i) Explain why this happens.

.....

..... [1]

(ii) The speed of sound in the rails is 5800 m / s.

Calculate the wavelength of sound of frequency 1100 Hz travelling at this speed.

wavelength = ... [2]

[Total: 7]

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7 **(a)** In Fig. 7.1, a converging lens projects a sharp image of an object O on to a screen.

Complete the paths of the two rays from the object to the screen.

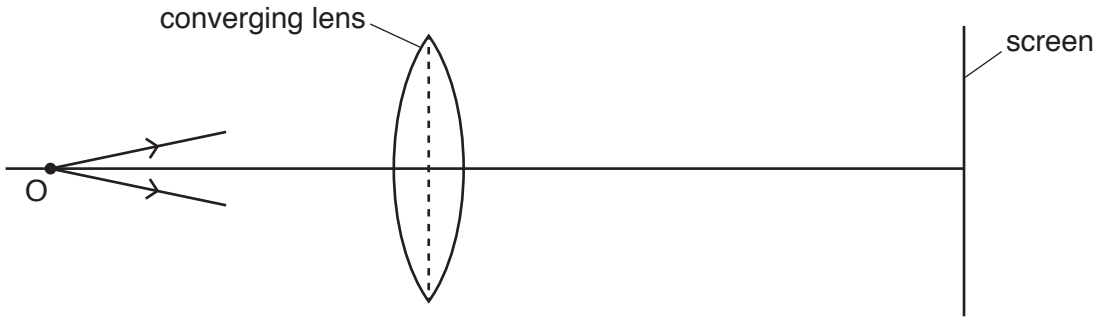


Fig. 7.1 [2]

(b) The converging lens in **(a)** is replaced with a thinner converging lens. The object O and the screen remain in the same positions as in **(a)**. The thinner converging lens has a longer focal length than the converging lens in **(a)**.

Complete the paths of the two rays from the object to the screen in Fig. 7.2.

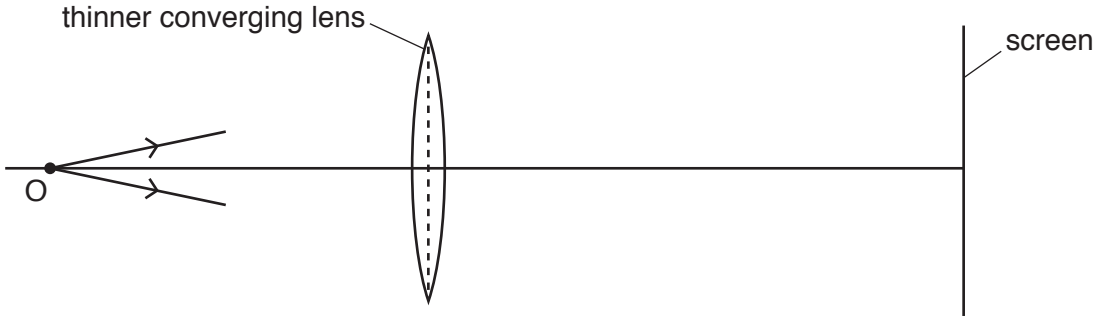


Fig. 7.2 [2]

(c) A converging lens is used as a magnifying glass.
The focal length of the lens is 10 cm.

(i) Describe the position of the object in relation to the lens.

.....

..... [1]

(ii) Describe the position of the image in relation to the lens and the object.

.....

..... [1]

(iii) Give three properties of the image formed by a magnifying glass.

.....

.....

..... [2]

[Total: 8]

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8 **(a)** A conducting sphere is mounted on an insulating stand. Explain how you would use a positively charged rod of insulating material to charge the sphere by induction.

.....

.....

.....

.....

..... [3]

(b) Fig. 8.1 shows an electronic component.

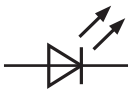


Fig. 8.1

State the name of the component shown in Fig. 8.1 ..... [1]

(c) In the space below, write down the truth table for a NAND gate.

[2]

(d) Fig. 8.2 shows the connections to two logic gates.

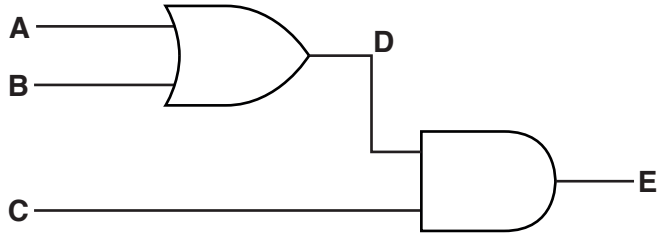


Fig. 8.2

Table 8.1 shows part of the truth table for the arrangement of logic gates in Fig. 8.2.

Complete Table 8.1 for the input values shown.

Table 8.1

inputs			intermediate point	output
A	**B**	**C**	**D**	**E**
0	0	1		
0	1	1		
1	1	0		
1	1	1		

[3]

[Total: 9]

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9 **(a)** Describe how to demagnetise a bar magnet using alternating current (a.c.) in a coil.

.....

.....

.....

..... [3]

(b) Fig. 9.1 shows a simple direct current (d.c.) motor.

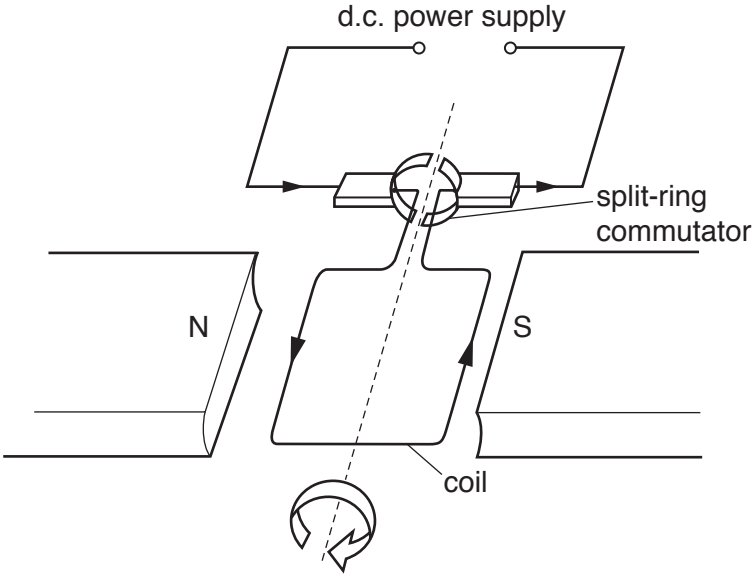


Fig. 9.1

(i) Explain the purpose of the split-ring commutator.

.....

.....

.....

..... [3]

(ii) The voltage of the power supply is increased.

State the effect this has on the motor.

..... [1]

[Total: 7]

10 Fig. 10.1 shows a circuit containing a filament lamp of resistance 0.30 Ω and two resistors, each of resistance 0.20 Ω.

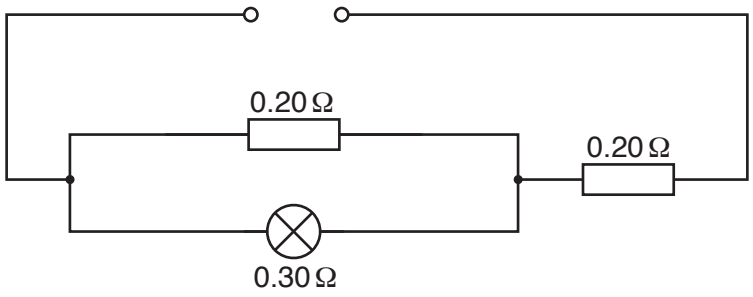


Fig. 10.1

(a) Calculate the combined resistance of the lamp and the two resistors.

resistance = ... [3]

(b) The potential difference (p.d.) of the supply is increased so that the current in the lamp increases.

State and explain any change in the resistance of the lamp.

Statement .....

Explanation .....

.....

[2]

[Total: 5]

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11 **(a)** A radon-222 nucleus contains 86 protons and 136 neutrons. It decays by emitting an α-particle and becomes a nucleus of an isotope of polonium. The symbol for radon is Rn and the symbol for polonium is Po.

Write down the nuclide equation for this decay.

[3]

(b) Carbon-14 is radioactive with a half-life of 5700 years. An animal bone is dug up in an archaeological excavation. The quantity of carbon-14 in the bone is 25% of what it was when the bone was buried.

Calculate the time that has elapsed since it was buried.

time = ... years [2]

[Total: 5]

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