

Centre Number	Candidate Number	Name
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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

**PHYSICS**

**0625/03**

Paper 3

May/June 2004

**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 in the spaces provided on the Question Paper.  
You may use a soft pencil for any diagrams, graphs 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.  
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.

For Examiner's Use	
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<b>Total</b>	

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

This document consists of **13** printed pages and **3** blank pages.



1 Fig. 1.1 shows a cycle track.

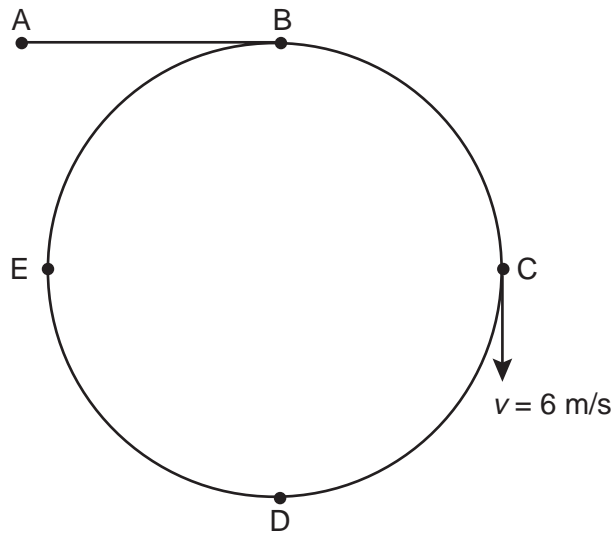


Fig. 1.1

A cyclist starts at A and follows the path ABCDEB.

The speed-time graph is shown in Fig. 1.2.

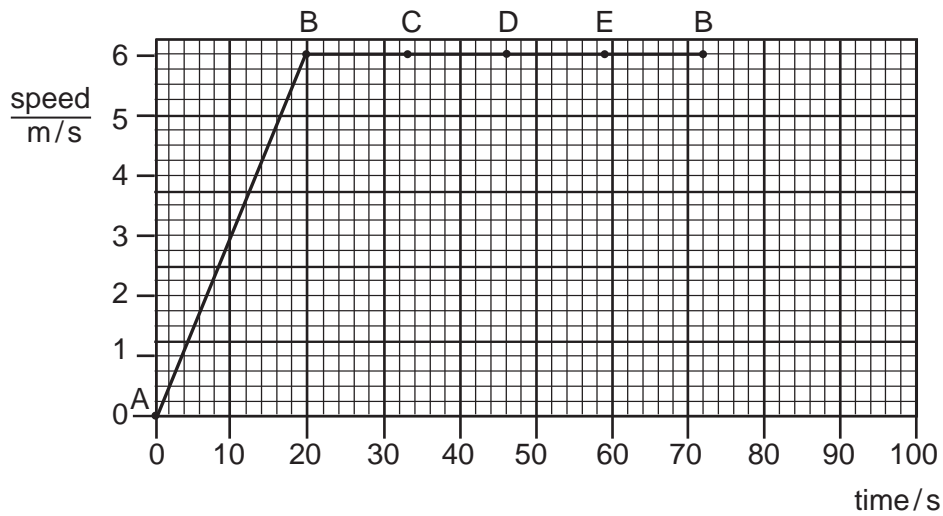


Fig. 1.2

(a) Use information from Fig. 1.1 and Fig. 1.2 to describe the motion of the cyclist

(i) along AB,

.....

(ii) along BCDEB.

.....

.....

[4]

(b) The velocity  $v$  of the cyclist at C is shown in Fig. 1.1.

State one similarity and one difference between the velocity at C and the velocity at E.

similarity .....

difference .....[2]

(c) Calculate

(i) the distance along the cycle track from A to B,

distance = .....

(ii) the circumference of the circular part of the track.

circumference = .....

[4]

2 Fig. 2.1 shows a rock that is falling from the top of a cliff into the river below.

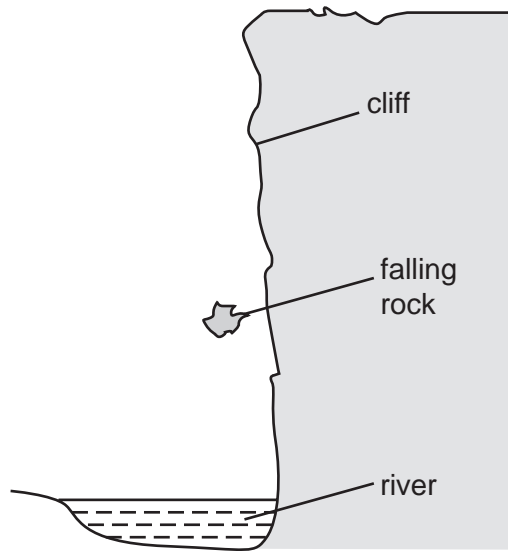


Fig. 2.1

- (a) The mass of the rock is 75 kg. The acceleration of free fall is  $10 \text{ m/s}^2$ . Calculate the weight of the rock.

weight = .....[1]

- (b) The rock falls from rest through a distance of 15 m before it hits the water. Calculate its kinetic energy just before hitting the water. Show your working.

kinetic energy = .....[3]

- (c) The rock hits the water. Suggest what happens to the kinetic energy of the rock during the impact.

.....  
 .....  
 .....[3]

- 3 A large spring is repeatedly stretched by an athlete to increase the strength of his arms. Fig. 3.1 is a table showing the force required to stretch the spring.

extension of spring/m	0.096	0.192	0.288	0.384
force exerted to produce extension/N	250	500	750	1000

**Fig. 3.1**

- (a) (i) State Hooke's law.

.....  
 .....[1]

- (ii) Use the results in Fig. 3.1 to show that the spring obeys Hooke's law.

[1]

- (b) Another athlete using a different spring exerts an **average** force of 400 N to enable her to extend the spring by 0.210 m.

- (i) Calculate the work done by this athlete in extending the spring once.

work done = .....

- (ii) She is able to extend the spring by this amount and to release it 24 times in 60 s. Calculate the power used by this athlete while doing this exercise.

power = .....  
 [4]

- 4 (a) Two identical open boxes originally contain the same volume of water. One is kept at 15 °C and the other at 85 °C for the same length of time.

Fig. 4.1 shows the final water levels.



Fig. 4.1

With reference to the energies of the water molecules, explain why the levels are different.

.....

.....

.....

.....[3]

- (b) In an experiment to find the specific latent heat of vaporisation of water, it took 34 500 J of energy to evaporate 15 g of water that was originally at 100 °C.

A second experiment showed that 600 J of energy was lost to the atmosphere from the apparatus during the time it took to evaporate 15 g of water.

Calculate the specific latent heat of vaporisation of water that would be obtained from this experiment.

specific latent heat = .....[3]

- 5 (a) Fig. 5.1 shows two identical metal plates. The front surface of one is dull black and the front surface of the other is shiny silver. The plates are fitted with heaters that keep the surfaces of the plates at the same temperature.



Fig. 5.1

- (i) State the additional apparatus needed to test which surface is the best emitter of heat radiation.

.....

- (ii) State one precaution that is needed to ensure a fair comparison.

.....

.....

- (iii) State the result that you expect.

.....

- (iv) Write down another name for heat radiation.

.....

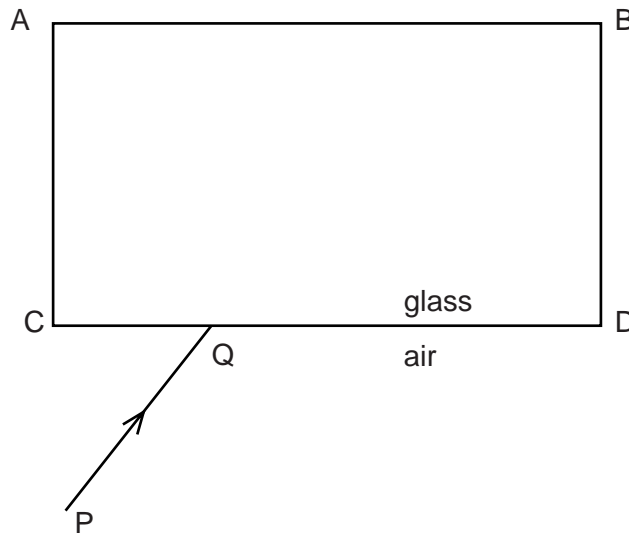
[4]

- (b) In the space below, draw a labelled diagram of an everyday situation in which a convection current occurs.

Mark the path of the current with a line and show its direction with arrows.

[3]

- 6 Fig. 6.1 shows a ray PQ of blue light incident on the side of a rectangular glass block.



**Fig. 6.1**

- (a) (i) By drawing on Fig. 6.1, continue the ray PQ through and beyond the block.
- (ii) Mark the angle of incidence at CD with the letter  $i$  and the angle of refraction at CD with the letter  $r$ .

[3]

- (b) The speed of light in air is  $3.0 \times 10^8$  m/s and the speed of light in glass is  $2.0 \times 10^8$  m/s.

- (i) Write down a formula that gives the refractive index of glass in terms of the speeds of light in air and glass.

refractive index =

- (ii) Use this formula to calculate the refractive index of glass.

refractive index = .....

[2]

- (c) The frequency of the blue light in ray PQ is  $6.0 \times 10^{14}$  Hz.  
Calculate the wavelength of this light in air.

wavelength = .....[2]



- 7 Fig. 7.1 shows the cone of a loudspeaker that is producing sound waves in air. At any given moment, a series of compressions and rarefactions exist along the line XY.

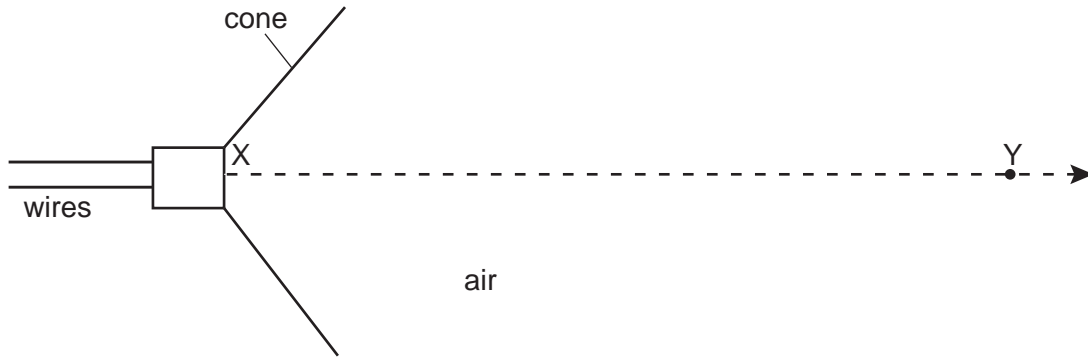


Fig. 7.1

- (a) On Fig. 7.1, use the letter C to mark **three** compressions and the letter R to mark **three** rarefactions along XY. [1]

- (b) Explain what is meant by

(i) a *compression*,

.....  
 .....

(ii) a *rarefaction*.

.....  
 .....

[2]

- (c) A sound wave is a longitudinal wave. With reference to the sound wave travelling along XY in Fig. 7.1, explain what is meant by a *longitudinal* wave.

.....  
 .....[2]

- (d) There is a large vertical wall 50 m in front of the loudspeaker. The wall reflects the sound waves.

The speed of sound in air is 340 m/s.

Calculate the time taken for the sound waves to travel from X to the wall and to return to X.

time = .....[2]

- 8 Fig. 8.1 shows a 240 V a.c. mains circuit to which a number of appliances are connected and switched on.

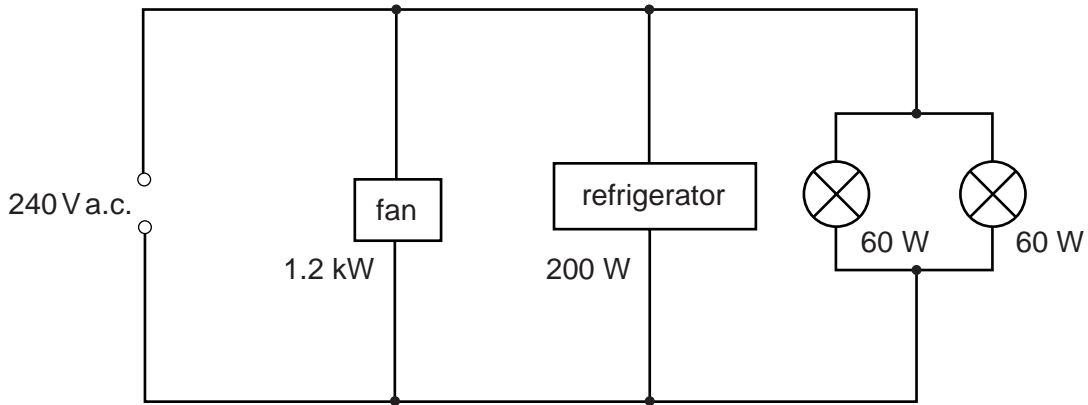


Fig. 8.1

- (a) Calculate the power supplied to the circuit.

power = .....[1]

- (b) The appliances are connected in parallel.

- (i) Explain what connected *in parallel* means.

.....  
 .....

- (ii) State two advantages of connecting the appliances in parallel rather than in series.

advantage 1 .....

advantage 2 .....

[3]

- (c) Calculate

- (i) the current in the refrigerator,

current = .....

- (ii) the energy used by the fan in 3 hours,

energy = .....

- (iii) the resistance of the filament of one lamp.

resistance = .....

[7]

9 Electromagnetic induction can be demonstrated using a solenoid, a magnet, a sensitive ammeter and connecting wire.

(a) In the space below, draw a labelled diagram of the apparatus set up to demonstrate electromagnetic induction. [2]

(b) State one way of using the apparatus to produce an induced current.

.....  
.....[1]

(c) Explain why your method produces an induced current.

.....  
.....  
.....[2]

(d) Without changing the apparatus, state what must be done to produce

(i) an induced current in the opposite direction to the original current,

.....  
.....

(ii) a larger induced current.

.....  
.....[2]

- 10 (a) Fig. 10.1 shows the faces of two ammeters. One has an analogue display and the other a digital display.

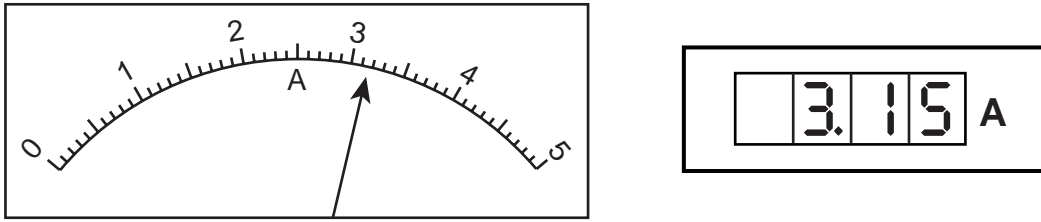


Fig. 10.1

State what is meant by the terms *analogue* and *digital*.

.....  
 .....  
 ..... [2]

- (b) (i) Name the components from which logic gates are made.

..... [1]

- (ii) In the space below, draw the symbol for an AND gate.  
 Label the inputs and the output.

[1]

- (iii) Describe the action of an AND gate with two inputs.

[2]

11 (a)  $\alpha$ -particles can be scattered by thin gold foils.

Fig. 11.1 shows part of the paths of three  $\alpha$ -particles.  
Complete the paths of the three  $\alpha$ -particles.

[3]

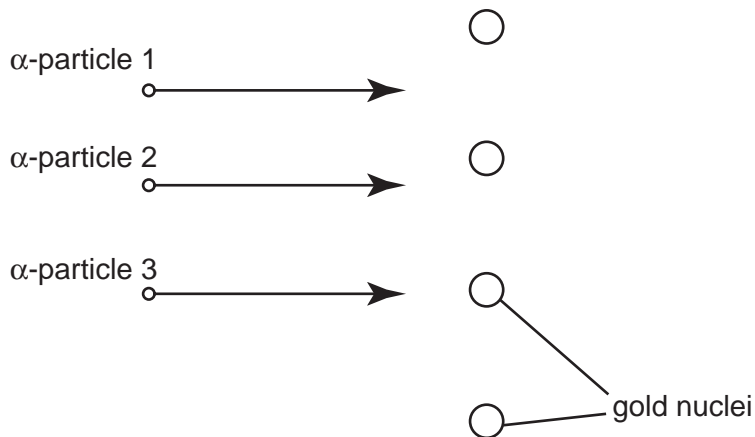


Fig. 11.1

(b) What does the scattering of  $\alpha$ -particles show about atomic structure?

.....  
 .....  
 .....[2]

(c) State the nucleon number (mass number) of an  $\alpha$ -particle.

nucleon number = .....[1]





