Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

4817934472

PHYSICS **0625/32**

Paper 3 Extended **February/March 2015**

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 **16** printed pages.

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CAMBRIDGE International Examinations

[Turn over

1 **(a)** A large stone, initially at rest, falls from the top of a building. The stone takes 3.2 s to fall to the ground. For this stone, air resistance can be ignored.

(i) Stating the formula that you use, show that the speed of the stone when it hits the ground is 32 m / s.

[1]

(ii) On Fig. 1.1, draw the speed-time graph for the fall of the stone. Label with an X the line on the graph. [1]

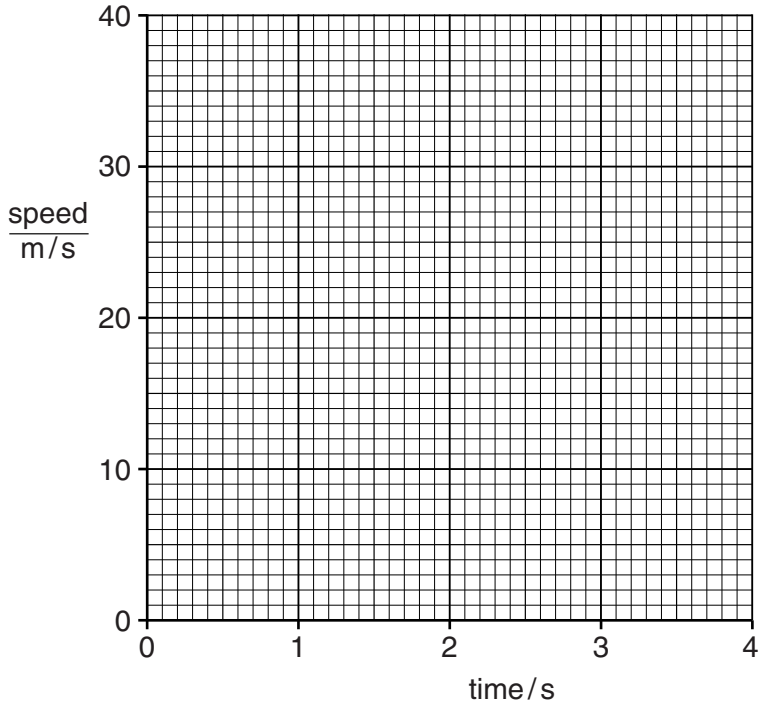


Fig. 1.1

(iii) Use the graph in **(ii)** to determine the height of the building.

height = ... [2]

(b) A smaller stone than the stone in **(a)** falls from the same building. This stone is affected by air resistance.

(i) What happens to the air resistance as the stone falls? Underline your choice of answer.

Air resistance decreases. Air resistance is constant. Air resistance increases. [1]

(ii) On Fig. 1.1, draw a possible speed-time graph for the fall of this stone. Label with a Y this line on the graph. [3]

[Total: 8]

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2 The rocket shown in Fig. 2.1 is about to be launched.

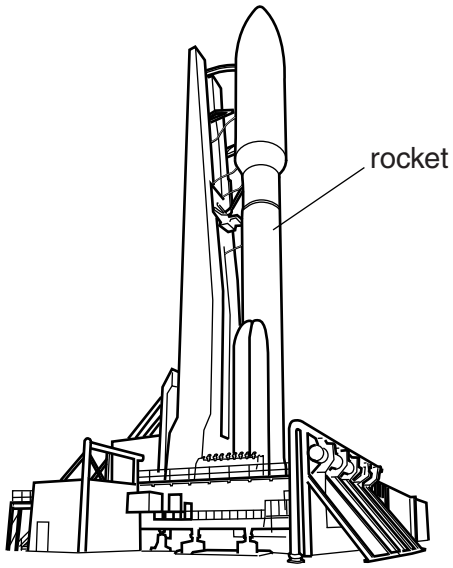


Fig. 2.1

The total mass of the rocket and its full load of fuel is 2.8×10^6 kg. The constant force provided by the rocket's motors is 3.2×10^7 N.

(a) Calculate

(i) the total weight of the rocket and the fuel,

weight = ... [1]

(ii) the resultant force acting on the rocket,

resultant force = ... [2]

(iii) the vertical acceleration of the rocket immediately after lift-off.

acceleration = ... [2]

(b) Suggest why the acceleration of the rocket increases as it rises above the Earth's surface.

.....

..... [1]

[Total: 6]

3 **(a)** Complete the following statement.

An object is in equilibrium when both the ..... and the

..... on the object are zero. [2]

(b) Fig. 3.1 shows a ladder AB. End A of the ladder rests against a vertical wall. End B rests on rough ground.

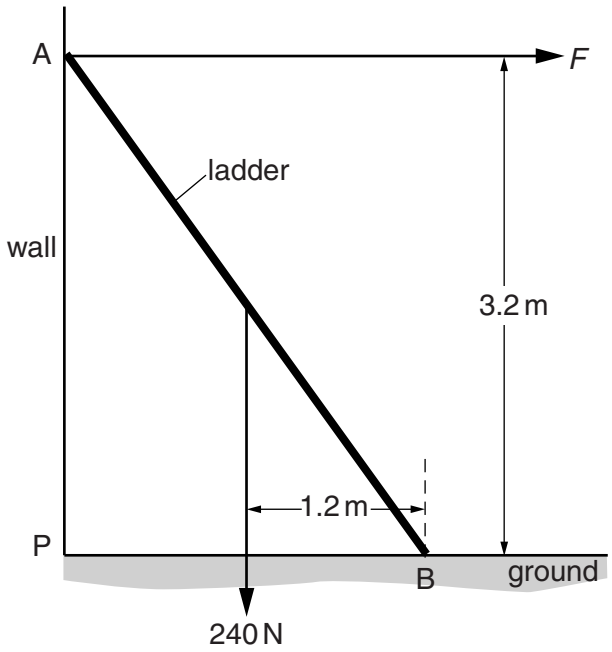


Fig. 3.1

Fig. 3.1 shows two of the forces acting on the ladder. The only force on the ladder at A is *F*, which acts at right-angles to the wall. The weight of the ladder is 240 N acting at the centre of mass of the ladder.

(i) **1.** Calculate the moment of the weight of the ladder about point B.

moment = ... [1]

2. Write an expression, in terms of *F*, for the moment of *F* about point B.

moment = ... [1]

(ii) Use your answers from **(i)** to calculate *F*.

F = ... [2]

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(iii) Explain why there must be an upwards force acting on the ladder at B.

.....

..... [1]

[Total: 7]

4 A scientist finds that the temperature of the water at the bottom of waterfalls is greater than the temperature of the water at the tops of those waterfalls.

(a) (i) State the type of energy that falling water has because of its motion.

..... [1]

(ii) In one waterfall, the water falls 300 m.

Calculate the decrease in the gravitational potential energy (g.p.e.) of 1.0 kg of water as it falls through this distance.

decrease in g.p.e. = ... [2]

(iii) Assume that the increase in internal energy of the 1.0 kg of water is equal to its decrease in g.p.e.

Calculate the rise in temperature of the water. The specific heat capacity of water is 4200 J / (kg °C).

rise in temperature = ... [2]

(iv) Suggest a reason why the actual increase in temperature of the water is less than the value calculated in **(a)(iii)**.

.....

..... [1]

(b) State why the thermometer used to measure the temperature of the water in the scientist's experiment required a high sensitivity.

.....

..... [1]

[Total: 7]

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5 **(a)** State the type of electromagnetic radiation

(i) used in luggage security checks at airports,

.....

(ii) used by remote controls for TV sets.

.....
[2]

(b) **(i)** The electromagnetic waves used in a microwave oven have a frequency of 2.45×10^9 Hz. The speed of the waves is 3.00×10^8 m/s.

Calculate the wavelength of the waves.

wavelength = ... [2]

(ii) A 150 g block of ice at 0 °C is placed in the oven. The input power of the oven is 1100 W. The energy absorbed by the block is 65% of the input energy.

Calculate the time taken to melt the ice to water at 0 °C. The specific latent heat of fusion of ice is 330 J/g.

time = ... [4]

[Total: 8]

6 Fig. 6.1 shows a glass block ABCD surrounded by air. A ray of red light, PQ, is incident on face CD of the block.

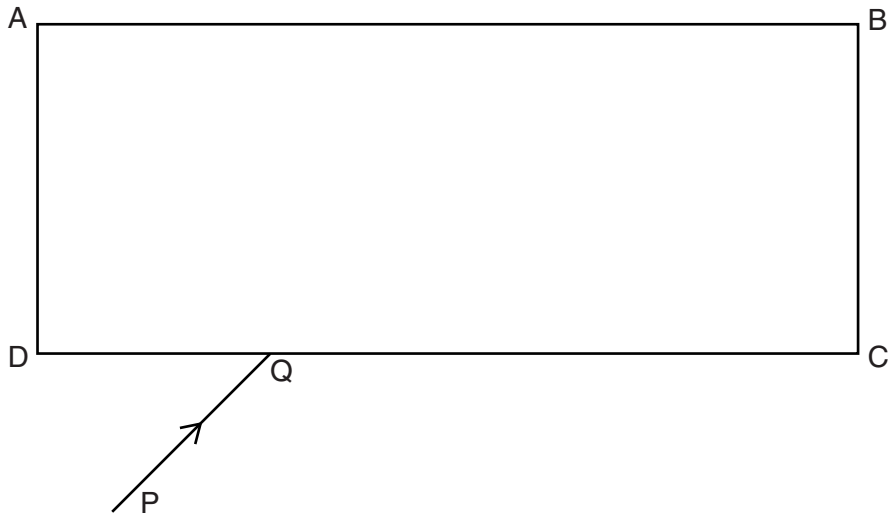


Fig. 6.1

(a) On Fig. 6.1,

(i) draw the normal at Q and the refracted ray inside the block so that it meets face AB,

(ii) draw the ray emerging from face AB of the block and the normal where the ray emerges,

(iii) between the rays and the normals you have drawn, label two equal angles X.

[3]

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(b) The angle of incidence of another red ray is 65°. The refractive index of the glass of block ABCD for red light is 1.62.

(i) Calculate the angle of refraction in the glass for this ray.

angle = ... [2]

(ii) The speed of light in air is 3.0×10^8 m/s.

Calculate the speed of the red light in the glass.

speed = ... [2]

(c) For the same angle of incidence, the angle of refraction of red light in glass is greater than the angle of refraction of violet light.

State the term which describes the separation of red and violet refracted rays in glass.

..... [1]

[Total: 8]

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[Turn over

7 (a) (i) State what is meant by an *electric field*.

.....

..... [1]

(ii) Fig. 7.1 shows a small, positively charged sphere.



Fig. 7.1

On Fig. 7.1, sketch the pattern of the electric field in the space around the sphere. [2]

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(b) Fig. 7.2 shows a metal sphere on an insulating support.

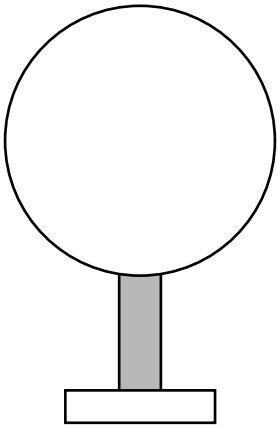


Fig. 7.2

A student has available two rods, one charged positively and one charged negatively. Using one of these rods, she gives the sphere a uniform negative charge by induction.

State which rod she chooses, and describe the procedure she follows.

.....

.....

.....

.....

.....

..... [4]

[Total: 7]

8 **(a)** Fig. 8.1 shows a 12.0 V battery connected to a resistor and a component X in series.

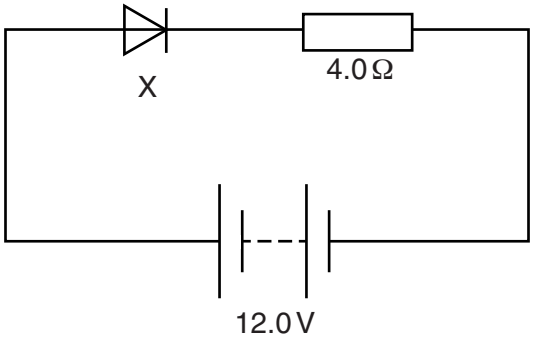


Fig. 8.1

(i) Identify the component X.

..... [1]

(ii) The p.d. across the 4.0 Ω resistor is 11.3 V.

Calculate

1. the p.d. across component X,

p.d. = ... [1]

2. the current in the 4.0 Ω resistor.

current = ... [2]

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(b) The circuit in Fig. 8.1 is now modified as shown in Fig. 8.2.

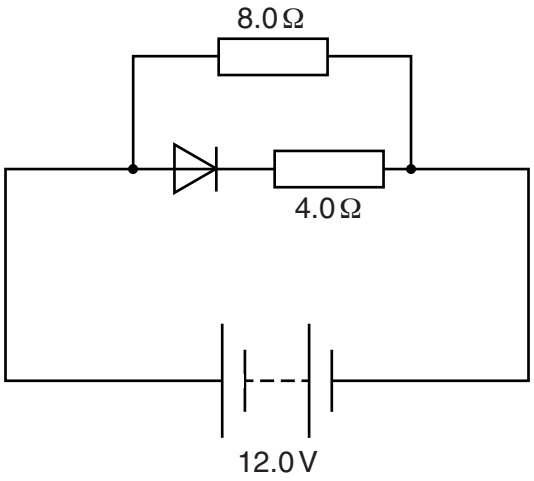


Fig. 8.2

(i) Calculate

1. the current in the 8.0 Ω resistor,

current = ... [1]

2. the current in the battery.

current = ... [1]

(ii) The battery is now reversed.

State the current in the battery.

current = ... [1]

[Total: 7]

9 Fig. 9.1 shows a simple electric motor with a single rectangular coil between magnetic poles X and Y.

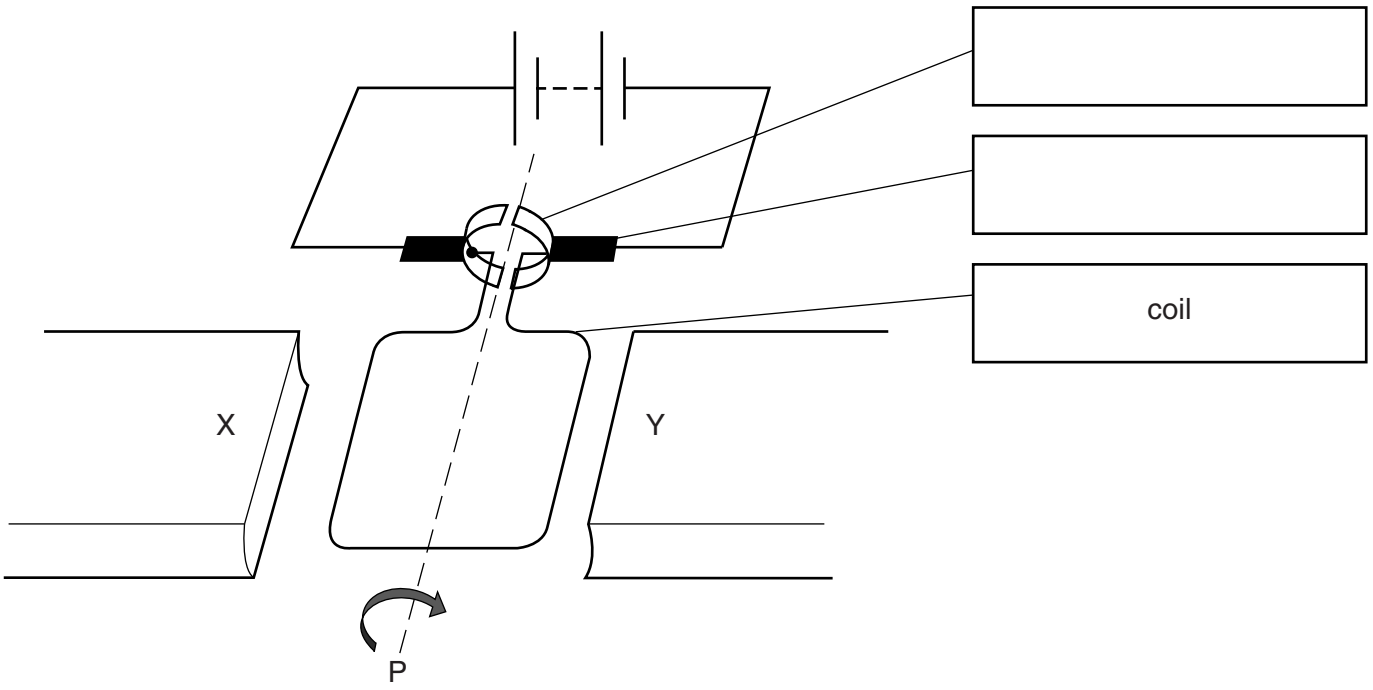


Fig. 9.1

(a) **(i)** Add labels to the empty boxes to the right of Fig. 9.1, to identify the parts indicated. [2]

(ii) The coil rotates in a clockwise direction when viewed from point P.

State which of the magnetic poles, X or Y, is the N-pole. ..... [1]

(b) **(i)** Suggest two changes that cause the motor to spin faster.

1. .....

2. .....
[2]

(ii) State the effect on the motor of reversing the connections to the battery.

..... [1]

(c) The battery in Fig. 9.1 is replaced with a resistor. The coil is made to rotate by an external mechanism.

Explain why there is a current in the resistor.

.....

.....

.....[2]

[Total: 8]

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10 Some older types of oscilloscope contain a cathode-ray tube.

(a) In a cathode-ray tube,

(i) **1.** state the purpose of the heater,

.....

2. identify the electrode that emits electrons,

.....

3. identify the electrode that accelerates electrons.

.....
[3]

(ii) Explain why the space inside the tube is a vacuum.

.....

..... [1]

(b) The trace shown in Fig. 10.1 is seen on the screen of the tube.

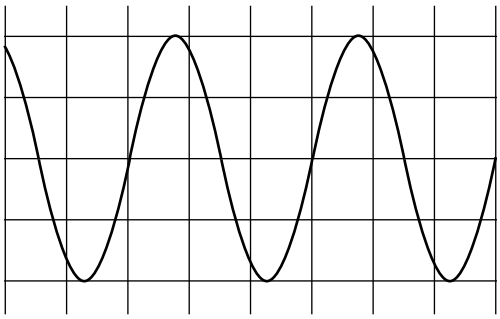


Fig. 10.1

State

(i) what causes the up and down movement of the electron beam,

.....

..... [2]

(ii) what causes the horizontal movement of the electron beam,

.....

..... [1]

(iii) how the peak-to-peak height of the trace on the screen can be reduced.

..... [1]

[Total: 8]

11 In a famous experiment, a beam consisting of a very large number of α-particles was projected, in a vacuum, at a very thin gold foil.

Fig. 11.1 shows the paths of three of the α-particles A, B and C travelling towards the foil.

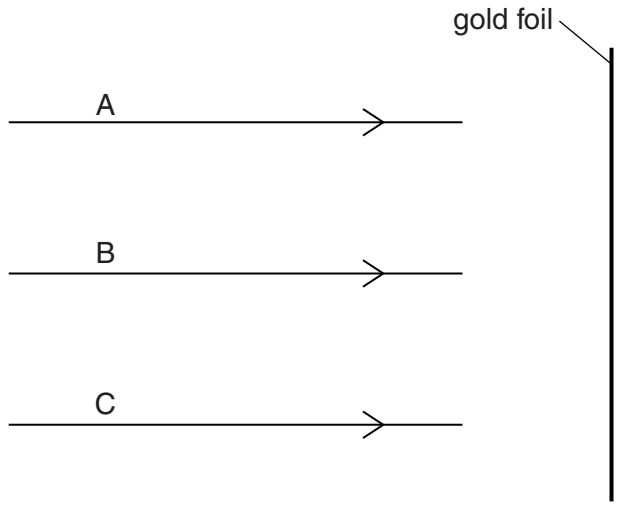


Fig. 11.1

α-particle A is travelling along a line which does not pass very close to a gold nucleus.
α-particle B is travelling along a line which passes close to a gold nucleus.
α-particle C is travelling directly towards a gold nucleus.

(a) Explain why an α-particle and a gold nucleus repel each other.

..... [1]

(b) On Fig. 11.1, draw lines with arrows to show the continuation of the paths of α-particles A, B and C. [3]

(c) State two conclusions, about gold atoms, which resulted from the experiment.

.....

.....

.....

..... [2]

[Total: 6]

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