| Centre No. | | | | | | Paper Reference | | | | | | | Surname | Initial(s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Candidate No. | | | | | | 7 | 5 | 4 | 0 | / | 0 | 1 | Signature | |

Paper Reference(s)

**7540/01**

Examiner's use only

Team Leader's use only

# London Examinations GCE

## Physics

## Ordinary Level

Paper 1

Wednesday 9 January 2008 – Afternoon

Time: 1 hour 15 minutes

| Question Number | Leave Blank |
|---|---|
| 1 | |
| 2 | |
| 3 | |
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| Total | |

**Materials required for examination**
Nil

**Items included with question papers**
Nil

### Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
Check that you have the correct question paper.
Some questions must be answered with a cross in a box (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

### Information for Candidates

Calculators may be used.
Where necessary, assume the acceleration of free fall, $g = 10\ m/s^2$.
The total mark for this paper is 70. The marks for parts of questions are shown in round brackets: e.g. **(2)**.
This paper has 11 questions. All blank pages are indicated.

### Advice to Candidates

Write your answers neatly and in good English.
In calculations, show **all** the steps in your working.



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**Answer ALL the questions.**

**1.** (a) Put a cross (☒) in the boxes to show which of the following quantities are scalars or vectors.

| Quantity | Scalar | Vector |
|---|---|---|
| Acceleration | ☒ | ☒ |
| Area | ☒ | ☒ |
| Density | ☒ | ☒ |
| Kinetic energy | ☒ | ☒ |
| Mass | ☒ | ☒ |
| Volume | ☒ | ☒ |

**(2)**

(b) Write down a formula that contains both scalar and vector quantities. Identify the scalar and vector quantities in your formula.

Formula .....

.....

Scalar(s) .....

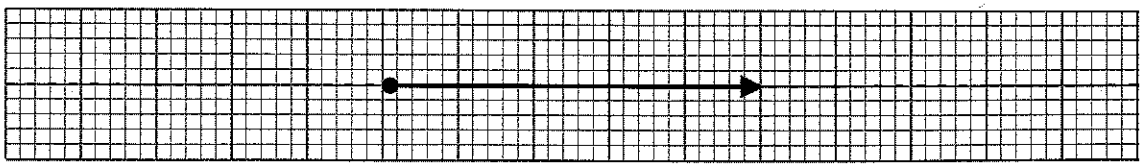
.....

Vector(s) .....

.....

**(2)**

(c) The diagram represents a force of 5 N acting at a point.



Along the dotted line draw a second force acting at the point, to scale, to show a combined force of 3 N.

**(2)**

**Q1**

**(Total 6 marks)**

Leave blank

**2.** (a) A trolley P of mass 4.0 kg moves at 3.0 m/s along a horizontal frictionless surface. Calculate its momentum.

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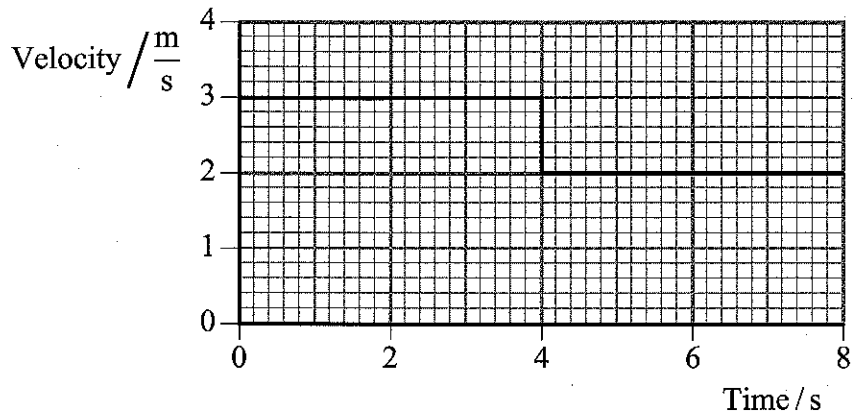
.....

.....

**(2)**

(b) The velocity–time graph below shows the motion of the trolley P before and after colliding with a stationary trolley Q of mass 2.0 kg. After collision the two trolleys stick together.




Show that this collision demonstrates the principle of conservation of linear momentum.

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.....

.....

**(3)**

(c) The experiment is repeated. This time the surface after the collision is still horizontal but is not frictionless.

(i) Add a line to the axes above to show the velocity of the two trolleys after the collision.

**(2)**

(ii) State the energy change taking place after the collision.

..... energy to ..... energy

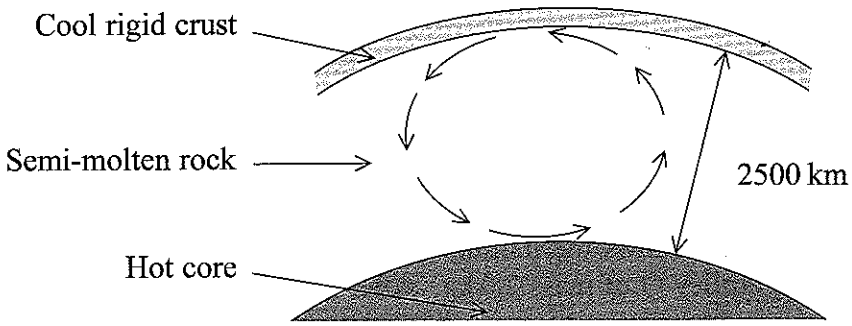
**(1)**

**(Total 8 marks)**

**Q2**

Leave blank

**3.** (a) The Earth has a cool rigid crust on the surface and a hot core below. In between the crust and the core there is semi-molten rock which behaves like a liquid. The diagram shows a convection current in the semi-molten rock.




Explain the process of convection.

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.....

**(3)**

(b) Calculate the increase of gravitational potential energy for 2.0 kg of this semi-molten rock as it moves from the top of the hot core to the bottom of the cool rigid crust.

.....

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.....

.....

**(2)**

(c) Explain why your answer in (b) may be larger than the actual value.

.....

.....

.....

.....

**(2)**

**Q3**

**(Total 7 marks)**

Leave blank

**4.** Draw a line from each of the actions to its corresponding outcome.

| Action | Outcome |
| --- | --- |
| Observe the behaviour of smoke particles in a gas | Reduces the average speed of gas molecules |
| Reduce the temperature of a gas | Changes a gas to a liquid |
| Reduce the pressure of a gas with temperature at constant volume | Increases gas pressure |
| Increase the temperature of a gas at constant volume | Can be used to establish an absolute zero of temperature |
| | Shows that gas molecules move randomly |

**Q4**

**(Total 4 marks)**

Leave blank

**5.** Fill in the spaces in the paragraph below.

When electric charges are moving, they form a ..... This is measured in a unit called the ..... In a metal, charge is transferred by particles called ..... which are ..... charged. If one joule of energy is needed to move one ..... of charge between two points in a circuit, then the potential difference between the two points is .....

**Q5**

**(Total 6 marks)**

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**6.** (a) Diagram 1 shows a fisherman catching a fish. The fisherman exerts an upward force ***F*** on the fishing rod. The fish has a weight of 6.0 N.

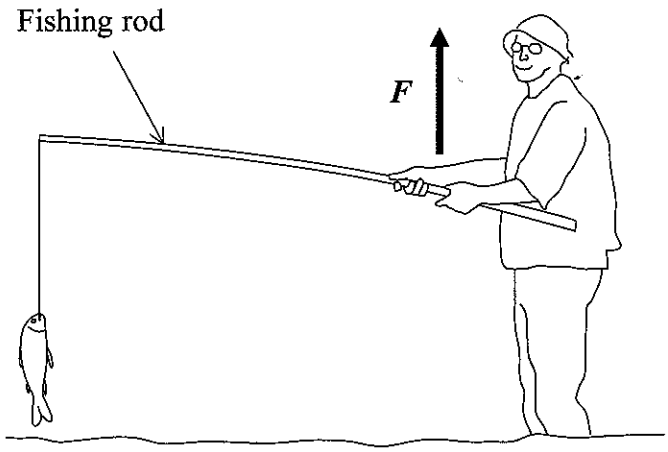



**Diagram 1**

Diagram 2 is a simplified diagram of the forces and distances involved.

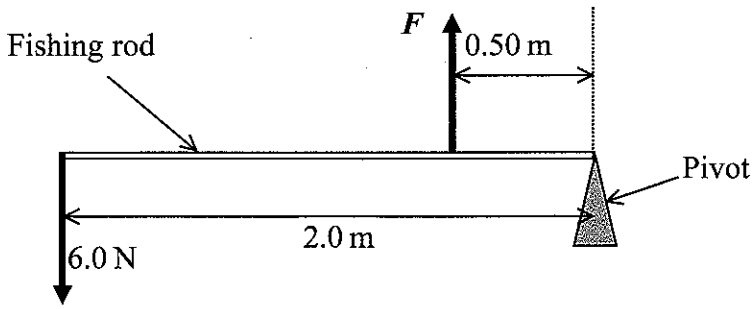



**Diagram 2**

(i) Calculate the anticlockwise moment about the pivot.

.....

.....

**(2)**

(ii) The fishing rod is balanced. State the value of the clockwise moment about the pivot.

.....

**(1)**

(iii) Calculate the upward force ***F*** exerted by the fisherman.

.....

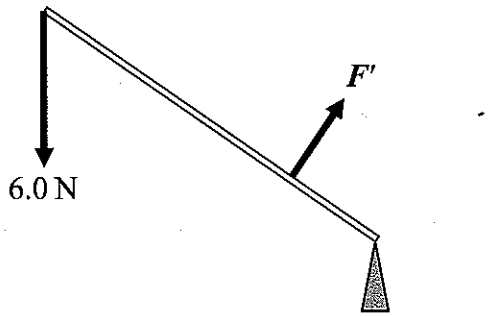
.....

.....

**(2)**

Leave blank

(b) The fisherman lifts the fishing rod and balances it in the position shown.




State and explain how the new position of the fishing rod affects the size of the new force ***F′*** exerted by the fisherman.

.....

.....

.....

**(2)** **Q6**

**(Total 7 marks)**

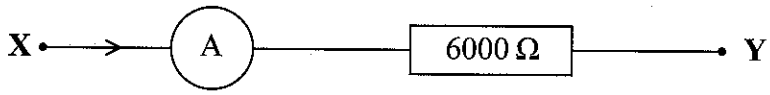
Leave blank

7. (a) What assumption is usually made about the resistance of an ammeter?

.....

**(1)**

(b) An ammeter is connected in series with a 6000 Ω resistor.




What is the potential difference between points **X** and **Y** when the reading on the ammeter is 2.0 mA (0.0020 A)?

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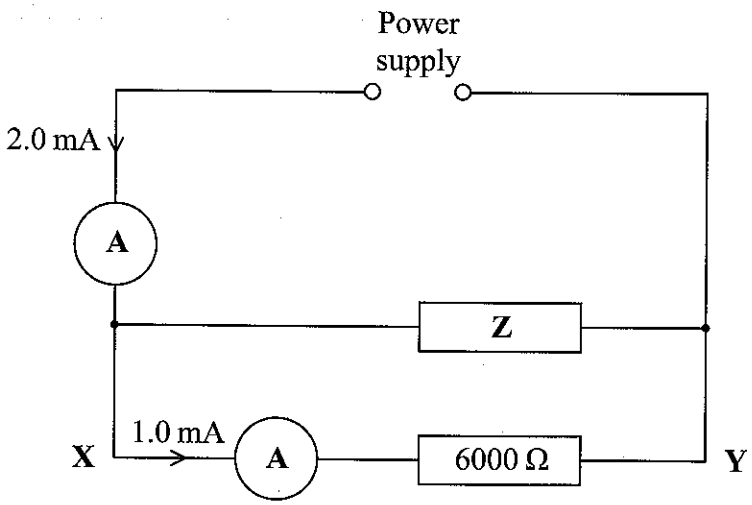
.....

**(2)**

(c) The circuit below is connected as shown.



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(i) What is the current through resistor **Z**?

.....

.....

**(1)**

(ii) What is the resistance of resistor **Z**?

.....

.....

**(1)**

(iii) Explain your answer.

.....

.....

.....

.....

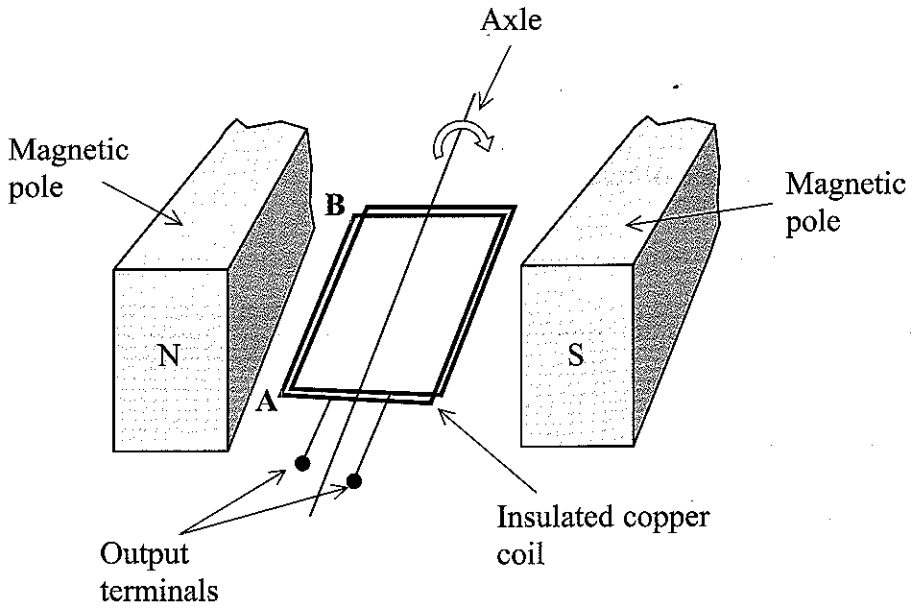
**(2)**

**Q7**

**(Total 7 marks)**

Leave blank

**8.** The diagram shows a simple a.c. generator. An insulated copper coil rotates clockwise between opposite magnetic poles.




(a) When the coil reaches the position shown, current moves from **A** to **B**.

(i) When the coil has rotated through 180°, in what direction will the current move in side **AB** of the coil?

.....

**(1)**

(ii) Give a reason for your answer.

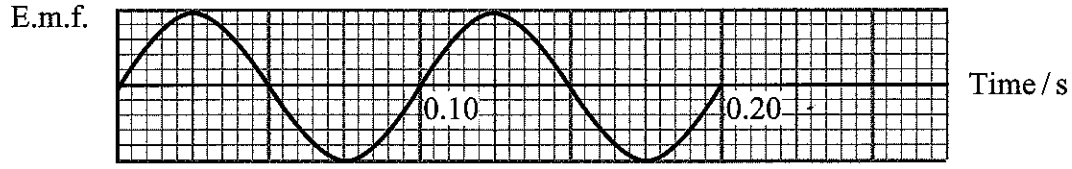
.....

.....

**(1)**

Leave blank

(b) The graph shows how the e.m.f. at the output terminals varies with time.




(i) How many revolutions has the coil made in the 0.20 s interval shown?

.....

**(1)**

(ii) Calculate the frequency of the e.m.f. shown by the graph.

.....

.....

.....

**(2)**

(c) The coil is now rotated twice as fast. What effect will this have on:

(i) the frequency of the e.m.f. produced

.....

**(1)**

(ii) the peak value of the e.m.f. produced?

.....

**(1)**

**Q8**

**(Total 7 marks)**

Leave blank

**9.** Polonium-216 ($^{216}_{84}Po$) is an isotope that emits alpha particles.

(a) What is the composition of an alpha particle?

.....

.....

**(2)**

(b) People carrying out experiments with polonium-216 are given the following rules:

(1) Keep the source at least 10 cm away from any part of your body

(2) Do not eat or drink whilst carrying out experiments.

Explain the reasons for these rules.

Rule 1 .....

.....

.....

**(1)**

Rule 2 .....

.....

.....

.....

**(2)**

(c) People carrying out experiments with a different isotope are given the following rules:

(1) Keep a 4 cm thick sheet of lead between the source and any part of your body

(2) Do not eat or drink whilst carrying out the experiments.

Give a reason why Rule 1 has been changed for people using this different isotope.

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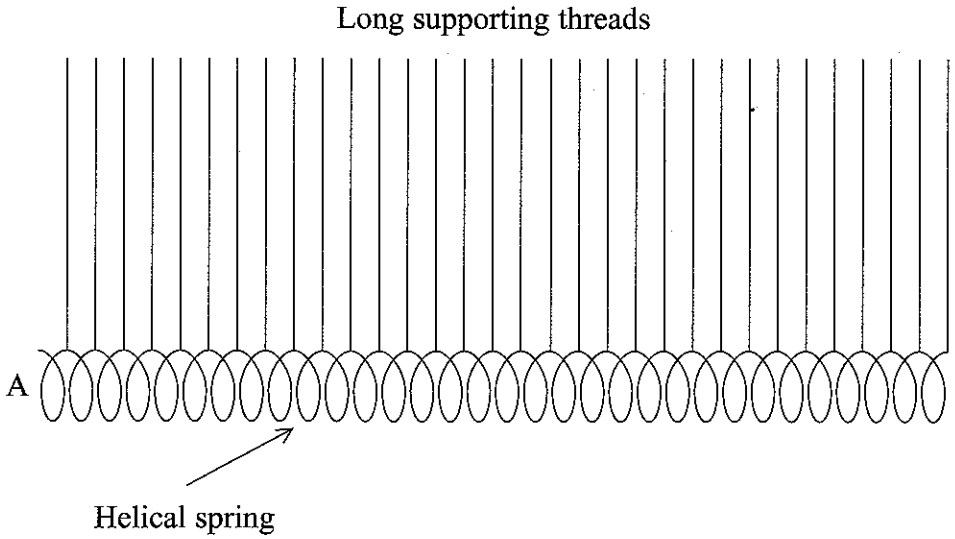
**(1)**

**Q9**

**(Total 6 marks)**

Leave blank

**10.** A long helical spring is suspended by long supporting threads as shown.




(a) (i) How would you send a 2.0 Hz longitudinal wave along the spring?

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.....

.....

**(3)**

(ii) How would you find the wavelength of the longitudinal wave produced?

.....

.....

.....

**(2)**

(b) A 2.0 Hz longitudinal wave travelling along such a helical spring has a wavelength 0.75 m.
Calculate the speed of this wave.

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.....

.....

**(2)**

**Q10**

**(Total 7 marks)**

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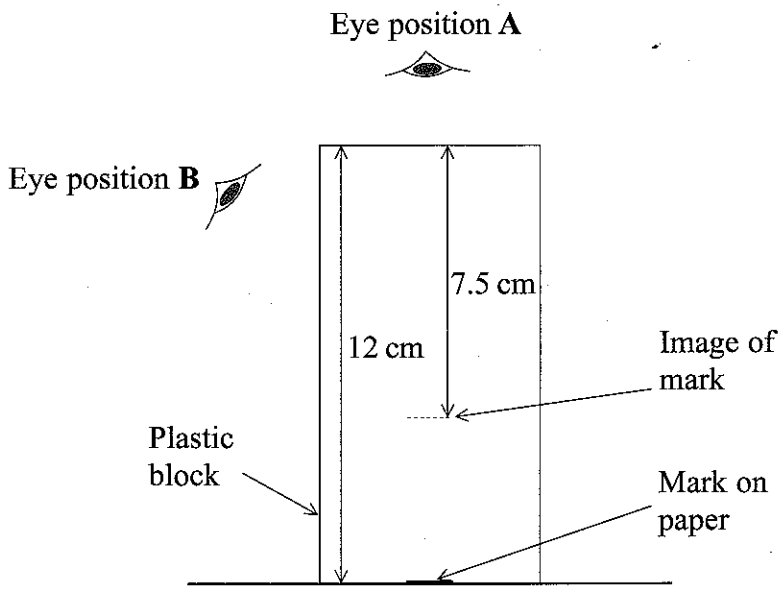
**11.** A student wishes to measure the refractive index of the plastic in a rectangular block. She stands the block over a mark on a sheet of paper as shown. She looks vertically down from position **A** and estimates the position of the image of the mark.




(a) Use the data on the diagram to calculate the refractive index of this plastic.

.....

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.....

**(2)**

(b) When the student looks through the vertical side of the block from eye position **B** she is unable to see the mark. She decides that this is because no light from the mark is able to emerge through the vertical side of the block.

(i) Name the effect that prevents light emerging from the vertical side of the block.

.....

**(1)**

(ii) Explain why this effect occurs.

.....

.....

.....

**(2)**

Q11

**(Total 5 marks)**

**TOTAL FOR PAPER: 70 MARKS**

**END**