Centre No.						Surname	Initial(s)
Candidate No.						Signature	

Paper Reference(s)

7540/01

London Examinations GCE

Physics

Ordinary Level

Paper 1

Thursday 25 January 2007 – Morning

Time: 1 hour 15 minutes

Materials required for examination

Four-figure mathematical tables may be issued to candidates requesting them

Items included with question papers

Nil

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total	

Instructions to Candidates

Answer ALL questions.
In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.

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. There are no blank pages.

Advice to Candidates

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

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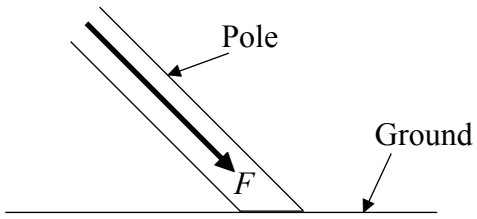
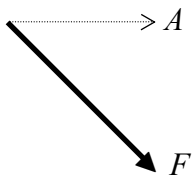
1. A farmer pushes a pole into the ground. Diagram 1 shows the force *F* exerted by the pole on the ground. The arrow represents force *F* in both magnitude and direction. The pole is not moving.

Diagram 1



(a) The force *F* can be resolved into two perpendicular forces *A* and *B*.
An arrow representing force *A* is shown in diagram 2.

Diagram 2

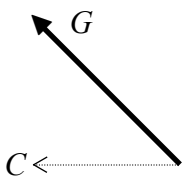


Add an arrow to diagram 2 to represent force *B*.

(2)

(b) The force *G* exerted by the ground on the pole is shown in diagram 3. Also shown is *C*, one of the perpendicular parts of force *G*.

Diagram 3



Give two reasons why forces *G* and *A* are not a Newton's Third Law pair.

1 .....

2 .....

(2)

(c) (i) State the type of force that prevents the pole moving towards the right.

.....

(1)

(ii) Which of the forces shown in the diagrams could represent this force?

.....

(1) **Q1**

(Total 6 marks)

Leave blank

2. (a) Weightlessness is experienced when someone falls with the acceleration of free fall. During a fall on a film set a stuntman reaches a speed of 20 m/s in 3.0 seconds after starting from rest.

(i) Calculate the acceleration of the stuntman.

.....

.....

(2)

(ii) Does the stuntman experience weightlessness?

.....

(1)

(iii) Explain your answer.

.....

(1)

(iv) What happens to the value of the stuntman's mass during the fall?

.....

(1)

(v) Calculate the distance fallen by the stuntman during these 3.0 seconds.

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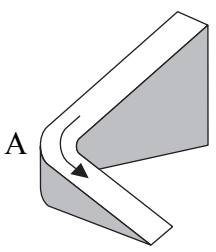
.....

.....

(2)

(b) Another stuntman slides down a slope without changing his speed. The slope is shown below.



Explain why he has an acceleration at the corner of the slope at A.

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.....

(1)

Q2

(Total 8 marks)

Leave blank

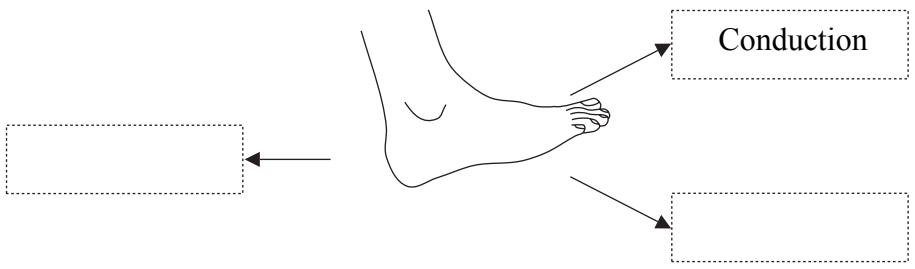
3. (a) The flow of heat energy from a human foot into a room is 2.0 W.
Calculate the amount of heat energy flowing from the foot into the room during five minutes.

.....

.....

(2)

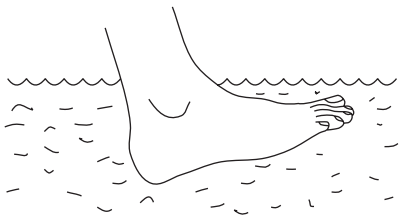
(b) The diagram names one of the processes by which heat energy is transferred from the foot to the surroundings.



Fill in the other boxes with the names of the other heat transfer processes.

(2)

(c) When a foot is placed in water it feels colder than it does when it is in air at the same temperature. Explain why this is so.



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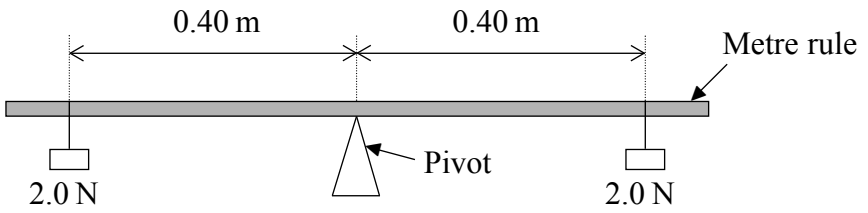
(2) **Q3**

(Total 6 marks)

Leave blank

4. (a) A uniform metre rule is placed on a pivot at its centre of gravity. Two 2.0 N weights are hung from the metre rule as shown. The metre rule is balanced.



Calculate the clockwise moment acting about the pivot.

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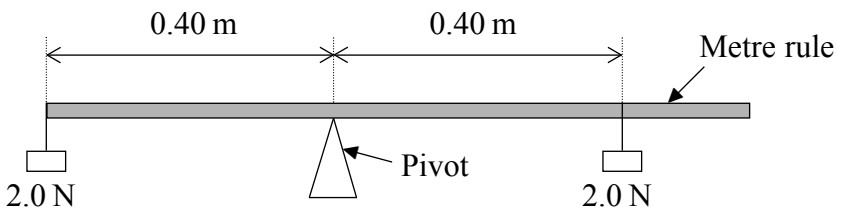
.....

(2)

(b) The pivot and both the weights are moved 0.10 m to the left to new positions as shown below.



The rule is no longer balanced. Explain why it tilts in a clockwise direction.

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(2)

(c) The metre rule has a weight of 1.0 N. Where would a 0.5 N weight be placed to restore balance?

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.....

(3)

Q4

(Total 7 marks)

Leave blank

5. Fill in the spaces in the paragraph below.

In a gas the molecules are moving around in a ..... manner. The spacing between the molecules is ..... than in a liquid.

As the temperature of the gas is lowered, the average speed of the molecules ..... . At a certain temperature the motion of the molecules ceases. This temperature is known as ..... and the value of this temperature is .....

Q5

(Total 5 marks)

Leave blank

6. (a) (i) How can a polythene strip be charged?

.....

(1)

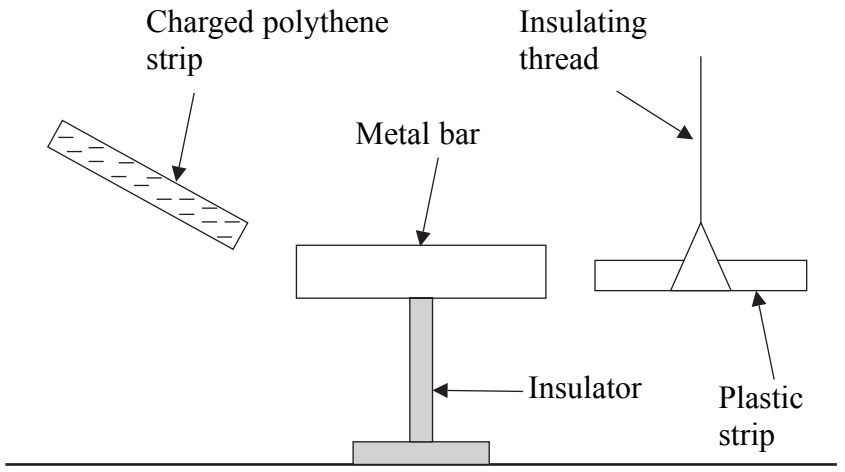
(ii) Explain your answer in terms of the movement of electrons.

.....

.....

(2)

(b) A negatively-charged polythene strip is brought near the left end of an uncharged metal bar. This makes a plastic strip suspended near the right end of the metal bar move away from the metal bar.



(i) How does the charged polythene strip affect the electrons in the metal bar? Explain your answer.

.....

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(2)

(ii) Why does the plastic strip move away from the right end of the uncharged metal bar?

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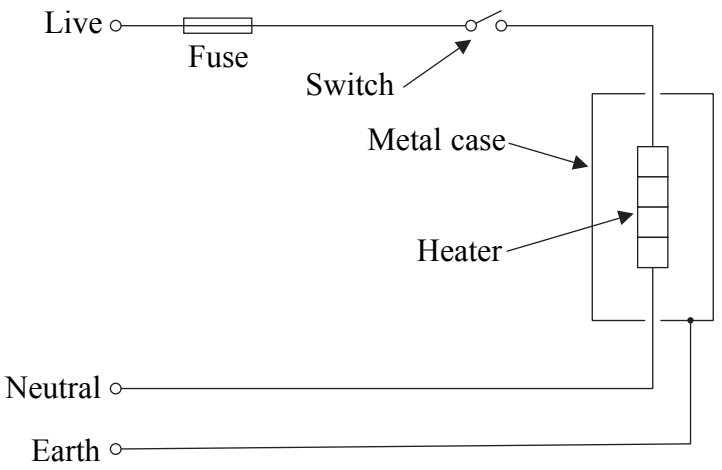
(2) **Q6**

(Total 7 marks)

Leave blank

7. The circuit shows a heater connected to a 230 V mains supply.



(a) The heater is marked 230 V 2.5 kW.

(i) Calculate the current in the circuit when the switch is closed.

.....

.....

(2)

(ii) Calculate, in kilowatt-hours, the electrical energy transferred when the heater is used for 12 hours.

.....

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(2)

(b) The live wire comes loose and touches the metal case. Explain how the earth wire and fuse together make the heater electrically safe.

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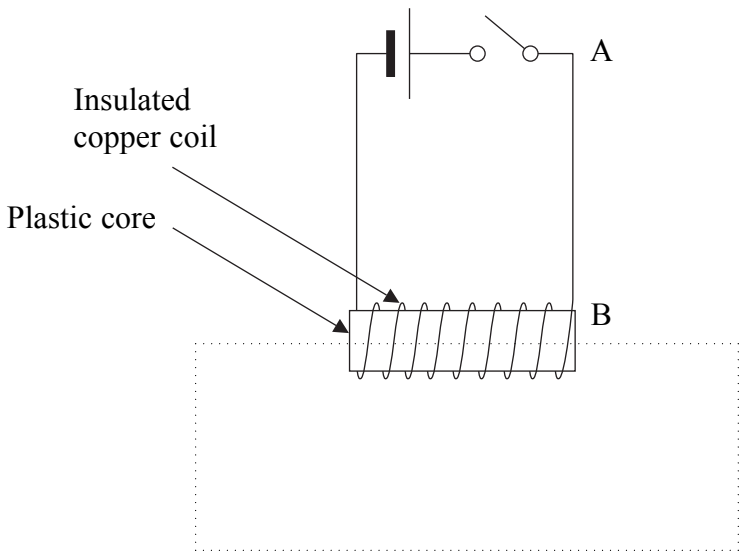
(3)

Q7

(Total 7 marks)

Leave blank

8. The diagram shows an insulated copper coil wound on a plastic core and connected to a cell and a switch.



(a) (i) Add an arrow to the wire AB to show the direction of the current when the switch is closed.

(1)

(ii) In the dotted box, add two lines to represent the shape and direction of the magnetic field when the current passes through the coil.

(2)

(b) List three ways in which the strength of the magnetic field produced could be increased.

1 .....

2 .....

3 .....

(3)

Q8

(Total 6 marks)

Leave blank

9. Houses built over granite rocks may trap a radioactive gas which escapes from the rocks. The gas is radon-222 ($^{222}_{86}Rn$) which emits alpha particles.

(a) (i) How many neutrons are there in a nucleus of radon-222?

.....

(1)

(ii) How many electrons are there in a neutral atom of radon-222?

.....

(1)

(b) People who live in houses that trap radon gas may be exposed to a high level of background radiation.

(i) What is meant by background radiation?

.....

.....

(1)

(ii) Describe how you could use a G-M detector to check whether the background radiation in a house is above the normal level.

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(3)

Q9

(Total 6 marks)

Leave blank

10. A student draws the table below to show the order of the parts of the electromagnetic spectrum. The order is incorrect and one part has not been filled in.

Part	Radio waves	X-Rays	Infra-red		Visible light	Micro-waves	Gamma rays
Typical wavelength /m	10^{3}	10^{-2}	10^{-5}	10^{-7}	10^{-8}	10^{-10}	10^{-14}

(a) Complete the table below by filling in all the parts in the correct order.

Part	Radio waves						Gamma rays
Typical wavelength /m	10^{3}	10^{-2}	10^{-5}	10^{-7}	10^{-8}	10^{-10}	10^{-14}

(3)

(b) All electromagnetic waves travel at 3×10^{8} m/s in a vacuum.

(i) State one other property common to all electromagnetic waves.

.....

.....

(1)

(ii) Calculate the frequency of radio waves with a wavelength of 2×10^{3} m.

.....

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(2)

Q10

(Total 6 marks)

QUESTION 11 IS ON THE NEXT PAGE

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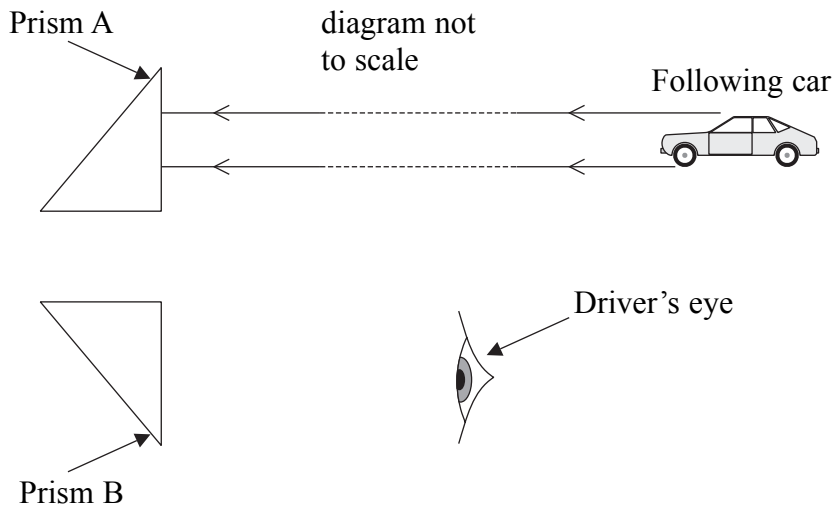
11. When a car is towing a caravan the driver cannot see any following cars using the normal mirrors. The diagram shows the design of a periscope which would allow the driver to see a following car. Two rays of light from a following car are shown.



(a) Complete the diagram to show the path of the two rays as they pass through each of the two prisms and travel to the driver's eye.

(2)

(b) (i) On the diagram, label with a T one place on each prism where total internal reflection occurs.

(1)

(ii) Explain why total internal reflection takes place at the points marked on the prisms.

.....

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(2)

(c) State one problem with the image of the following car as seen by the driver.

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.....

(1) **Q11**

(Total 6 marks)

TOTAL FOR PAPER: 70 MARKS

END