

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education
June 2006

PHYSICS (MODULAR) SPECIFICATION A
Written Paper
Foundation Tier

3453/F

F



Friday 16 June 2006 9.00 am to 10.30 am

<p>For this paper you must have:</p> <ul style="list-style-type: none"> a ruler <p>You may use a calculator.</p>
--

Time allowed: 1 hour 30 minutes

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- Show all your working in calculations.

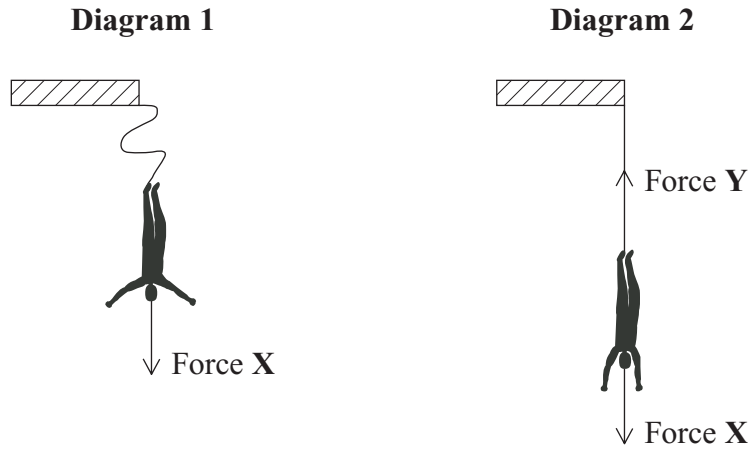
Information

- The maximum mark for this paper is 90.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use			
Number	Mark	Number	Mark
1		9	
2		10	
3		11	
4		12	
5		13	
6		14	
7			
8			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

FORCES

1 The diagrams show two stages in a bungee jump.



(a) Complete the sentence by choosing the correct word from the box.

- | | | | | |
|-----------------------|-----------------|-------------|----------------|---------------|
| air resistance | friction | mass | tension | weight |
|-----------------------|-----------------|-------------|----------------|---------------|

Force **X** is
(1 mark)

(b) Describe the motion of the bungee jumper in **diagram 1**.

.....

.....

.....
(2 marks)

(c) In **diagram 2** the bungee jumper has stopped moving.

- (i) Use the equation below to calculate the weight, in newtons, of a bungee jumper whose mass is 55 kg.

weight (newton, N)	=	mass (kilogram, kg)	×	gravitational field strength (newton/kilogram, N/kg)
-----------------------	---	------------------------	---	---

.....

.....

.....

.....

Weight = N
(2 marks)

- (ii) What is the size, in newtons, of force **Y**?

Force **Y** = N
(1 mark)

6

Turn over for the next question

Turn over ▶

- 2 The diagram shows some of the objects that may be seen in the sky at night.
The diagram is not to scale.



- (a) Which of the objects:

- (i) orbits the Earth;
- (ii) orbits the Sun in a slightly squashed circle (ellipse);
- (iii) orbits the Sun in an orbit which is far from circular;
- (iv) is a galaxy?
- (4 marks)*

- (b) There are many artificial satellites in orbit round the Earth.

- (i) Name the force which keeps satellites in orbit round the Earth.

.....

- (ii) If too many satellites are in geostationary orbits round the Earth, they interfere with each other's signals.

Approximately how many geostationary satellites are allowed?

Tick (✓) the correct answer.

- | | |
|--------|--|
| 4 | |
| 40 | |
| 400 | |
| 4 000 | |
| 40 000 | |

(2 marks)

Turn over for the next question

Turn over ►

WAVES AND RADIATION

3 When waves travel across the surface of water they may set up regular disturbances.

(a) Choose words from the list to complete the sentences.

amplitude	energy	frequency	longitudinal	transverse	wavelength
------------------	---------------	------------------	---------------------	-------------------	-------------------

(i) The maximum disturbance caused by a wave is called its

..... .

(ii) The distance between one crest and the next crest of a wave is called the

..... .

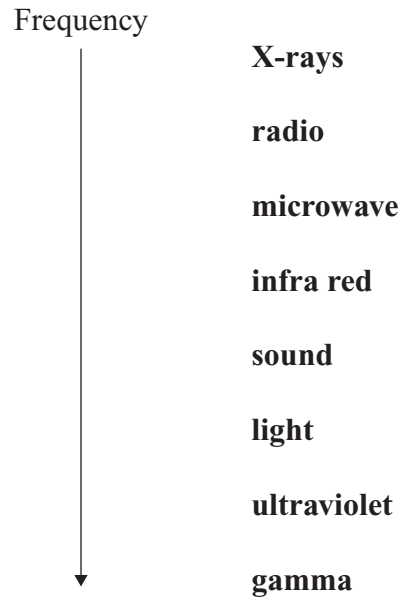
(iii) The number of waves passing a point in one second is called the

..... .

(iv) Waves transfer

(4 marks)

- (b) A student makes a list of the types of electromagnetic wave. He writes them down in order of increasing frequency. He makes **two** mistakes.



- (i) Which type of wave in the list is not electromagnetic?

- (ii) Which other type of wave is in the wrong place in the list?

- (iii) Cross out the type of wave that is in the wrong place in the list. Write this type of wave in the correct place.
(3 marks)
- (c) Which type of electromagnetic wave is used:
- (i) in sunbeds to give a suntan;
- (ii) to produce shadow pictures of bones?
- (2 marks)

4 Some materials are radioactive.

(a) (i) Name the **three** types of radiation emitted by radioactive materials.

- 1
- 2
- 3

(ii) Which type of radiation is most penetrating?

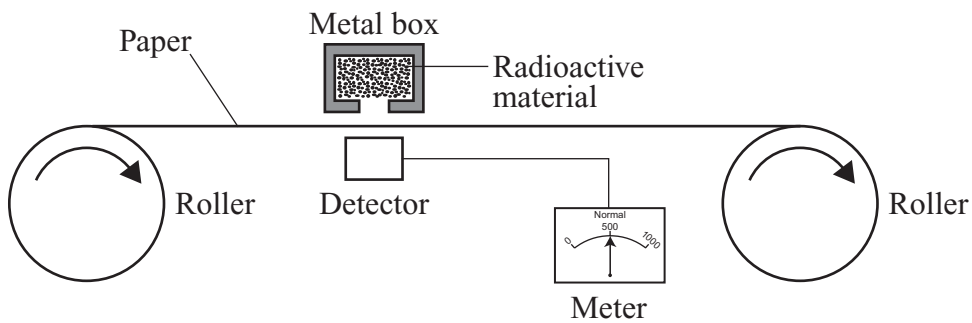
.....

(iii) Which type of radiation can be stopped by a thin piece of paper?

.....

(3 marks)

(b) The diagram shows a way of testing the thickness of paper in a factory.



(i) Which is the best type of radiation to use?

.....

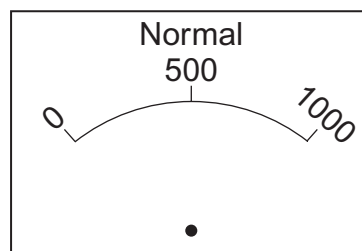
(ii) Which part of the atom does the radiation come from?

.....

(iii) The meter measures the count rate.

The needle points to 500 when the paper is of normal thickness.

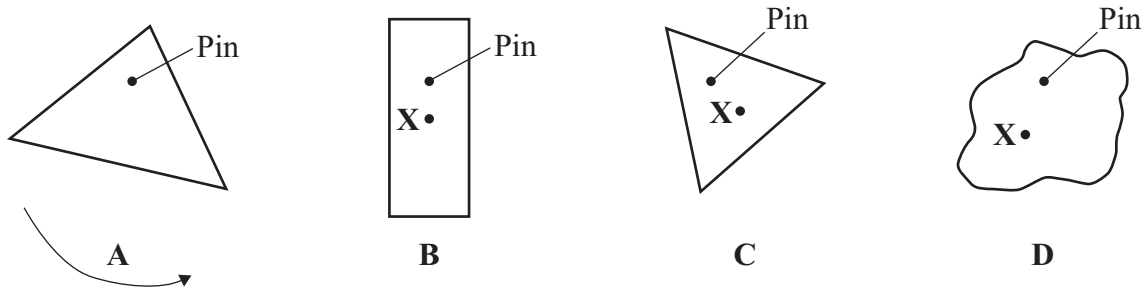
Draw a possible position of the needle when the paper becomes thicker than normal.



(3 marks)

FORCES AND MOTION

- 5 The diagram shows four sheets of metal, **A**, **B**, **C** and **D**.
 Each sheet of metal is hanging from a pin.
 The arrow below sheet **A** shows which way the sheet moves when released and allowed to swing freely.
 The points labelled **X** on sheets **B**, **C** and **D** show the position of the centre of mass.



- (a) Complete the sentence.

The centre of mass is the point through which its acts.
 (1 mark)

- (b) (i) Draw an arrow below sheet **C** to show which way it moves when allowed to swing freely.
 (ii) Draw an arrow below sheet **D** to show which way it moves when allowed to swing freely.

(2 marks)

- (c) Sheet **B** does not move.

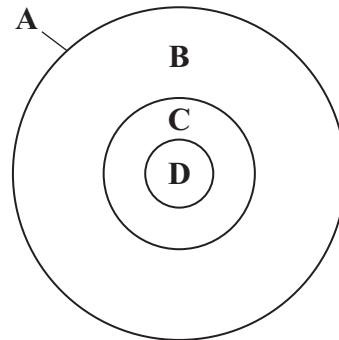
Explain, as fully as you can, why sheet **B** does not move.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....

(3 marks)

6 The diagram shows the layered structure of the Earth.



(a) Which part, **A**, **B**, **C** or **D**, is:

- (i) the mantle;
- (ii) the crust;
- (iii) the inner core?

(3 marks)

(b) Part **D** contains two metals.

Name these metals.

- 1
- 2

(2 marks)

(c) Part **A** is made of rocks.

The average density of the whole Earth is larger than the average density of the rocks in part **A**.

This indicates that the density of the interior of the Earth is:
(Tick (✓) the correct answer)

smaller than the density of **A**

the same as the density of **A**

larger than the density of **A**

(1 mark)

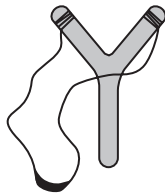
6

QUESTIONS RELATING TO PREVIOUSLY TESTED MODULES

- 7 The devices shown on the left of the diagram are used to transfer energy. The boxes on the right give the useful energy transfers.

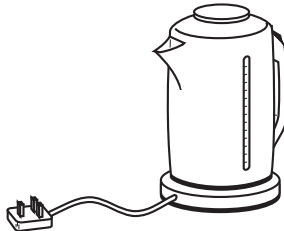
Draw a straight line from each device to its useful energy transfer. One has been done for you.

Catapult



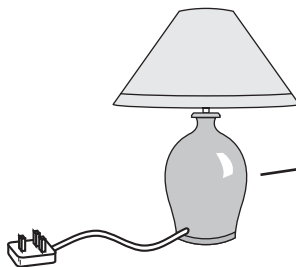
Electrical to heat

Kettle



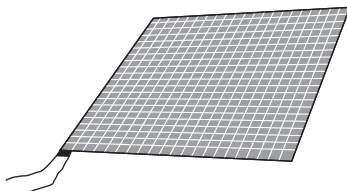
Elastic potential to kinetic

Lamp



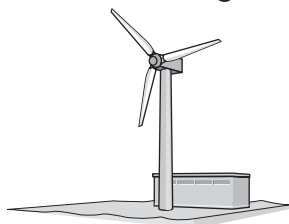
Electrical to light

Solar cell



Kinetic to electrical

Wind turbine and generator



Light to electrical

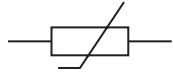
(4 marks)

4

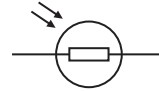
Turn over ►

8 Symbols are used in circuit diagrams to represent components.

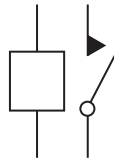
(a) Name the components **P**, **Q**, **R** and **S**.



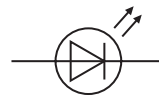
P



Q



R



S

(4 marks)

(b) Which component, **P**, **Q**, **R** or **S**, can be used as:

- (i) an input sensor to detect changes in light intensity;
- (ii) an input sensor to detect changes in temperature;
- (iii) an output device?

(3 marks)

7

FORCES

9 This was a newspaper headline in September 2004:

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The newspaper reported an unexplained radio signal.
The signal was said to be the first contact by an intelligent alien civilisation.
The signal was detected in Puerto Rico.

(a) (i) Some scientists have been searching for signals such as this for over forty years.

What is this search called?

.....

(ii) Name the device which was used to detect the signals.

.....

(2 marks)

(b) Scientists have sent probes to investigate planets in our own solar system. The probes were looking for evidence that there is, or has been, life on another planet.

What kind of evidence were they looking for?

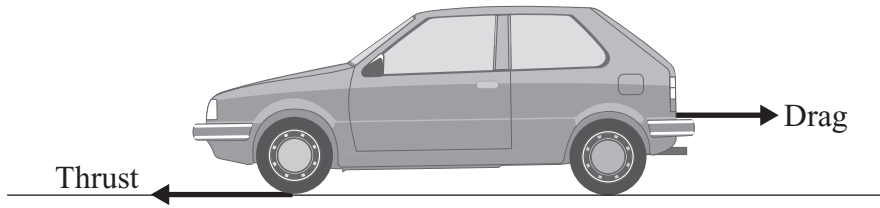
.....
.....
.....
.....
.....
.....

(3 marks)

5

Turn over ▶

10 The diagram shows the horizontal forces acting on a car travelling along a straight level road.



(a) What is happening to the speed of the car when the thrust is:

(i) larger than the drag;

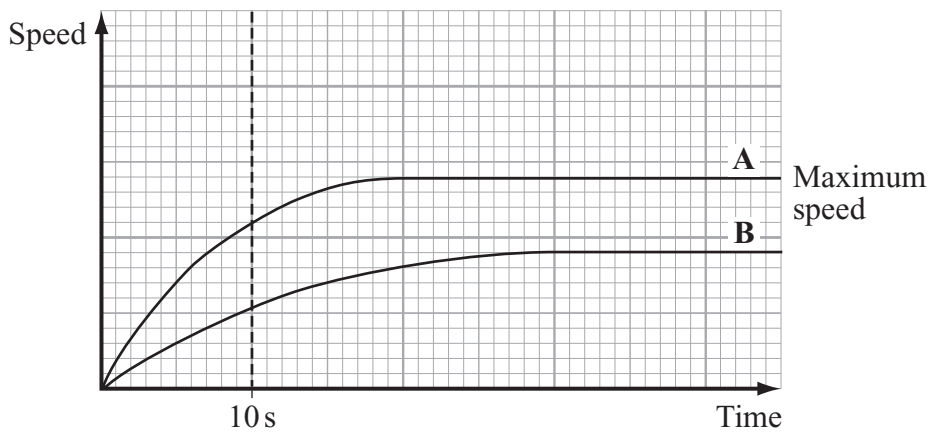
.....

(ii) smaller than the drag?

.....

(2 marks)

(b) The graph shows how the speed of two cars, **A** and **B**, changes with time.



(i) Which car, **A** or **B**, has the greater acceleration over the first 10 seconds?
Explain your answer.

Car with greater acceleration

Explanation

.....

.....

.....

(2 marks)

- (ii) Explain, in terms of the forces acting on the car, why a car reaches a maximum speed.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....

.....

.....

.....

.....

.....

(3 marks)

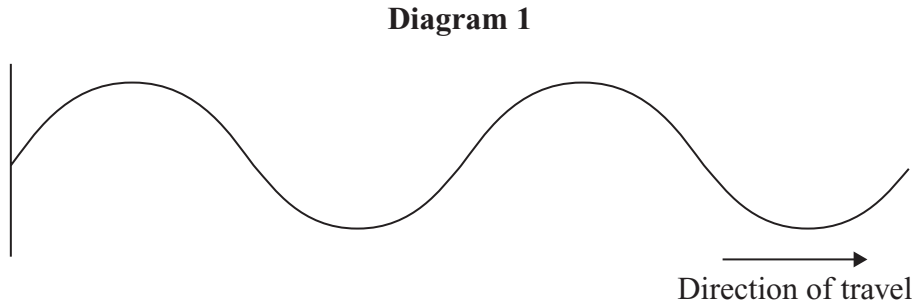
7

Turn over for the next question

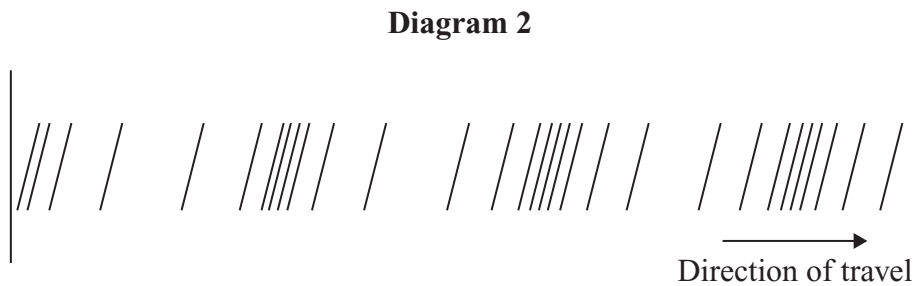
Turn over ►

WAVES AND RADIATION

- 11** A wave can travel along a rope when one end is disturbed.
This type of wave is shown in **diagram 1**.



A different type of wave can travel along a spring when one end is disturbed.
This type of wave is shown in **diagram 2**.



(a) What type of wave is shown in:

(i) **diagram 1**;

(ii) **diagram 2**?

(2 marks)

(b) Microwaves are used for cooking.

Explain, as fully as you can, how microwaves cook food.

.....

.....

.....

.....

(2 marks)

(c) Infra red radiation is also used for cooking.

State **two** ways in which microwaves are similar to infra red radiation.

1

.....

2

.....

(2 marks)

(d) Microwave ovens should be checked for leaks, because microwaves are dangerous.

How are microwaves dangerous?

.....

.....

.....

.....

(2 marks)

8

Turn over for the next question

Turn over ►

FORCES AND MOTION

12

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8

Turn over for the next question

Turn over ►

13 In the early part of the twentieth century, Alfred Wegener suggested that South America and Africa could once have been joined.



(a) (i) Give **two** pieces of evidence which suggest that South America and Africa were once joined.

- 1.....
 - 2.....
- (2 marks)

(ii) Before Wegener suggested his theory, how did most scientists explain the shape of the continents?

-
 -
 -
- (2 marks)

(b) In the past, many scientists believed that the continents were too big to move. They did not accept Wegener’s theory.

Scientists now believe that the movement of continents can be explained in terms of the movement of *tectonic plates*.

(i) What are *tectonic plates*?

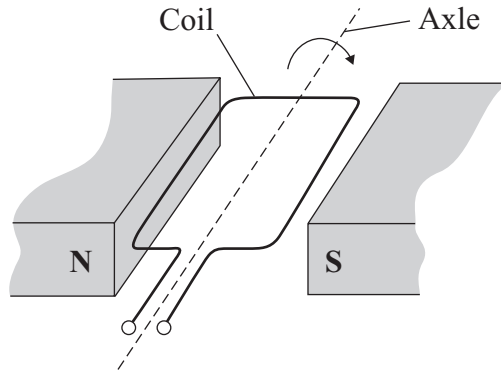
-
 -
- (1 mark)

(ii) What causes *tectonic plates* to move?

-
 -
 -
- (2 marks)

QUESTIONS RELATING TO PREVIOUSLY TESTED MODULES

- 14** The diagram shows part of a simple a.c. generator.
When the coil rotates, a potential difference (voltage) is induced across the ends of the coil.



- (a) Suggest **three** ways of increasing the induced potential difference.

- 1
- 2
- 3

(3 marks)

- (b) Power stations generate electricity on a large scale.
Many power stations burn fossil fuels.

Give **two** environmental problems caused by burning fossil fuels.

- 1
-
- 2
-

(2 marks)

5

END OF QUESTIONS

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