| Surname | | Other Names | |
|---|---|---|---|
| Centre Number | | | Candidate Number | | | | |
| Candidate Signature | | | | | | | | | |

For Examiner's Use

General Certificate of Secondary Education
January 2008

**ADDITIONAL SCIENCE**
**Unit Physics P2**

**PHY2F**
**F**

**PHYSICS**
**Unit Physics P2**

**Foundation Tier**

Monday 21 January 2008 1.30 pm to 2.15 pm

**For this paper you must have:**
- a ruler.

You may use a calculator.

Time allowed: 45 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.
- Do all rough work in this book. Cross through any work you do not want to be marked.

**Information**
- The maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

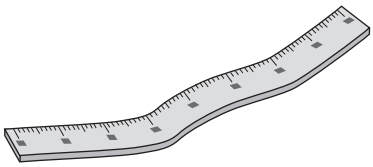
**Advice**
- In all calculations, show clearly how you work out your answer.

| For Examiner's Use | | | |
|---|---|---|---|
| Question | Mark | Question | Mark |
| 1 | | 6 | |
| 2 | | 7 | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| | | | |
| | | | |
| | | | |
| Total (Column 1) → | | | |
| Total (Column 2) → | | | |
| TOTAL | | | |
| Examiner's Initials | | | |

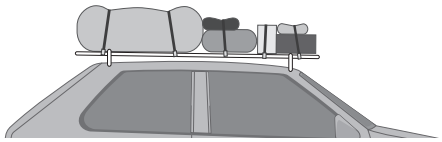
**There are no questions printed on this page**

Answer **all** questions in the spaces provided.

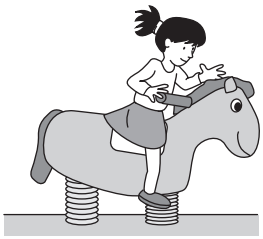
**1** (a) The pictures show four objects. Each object has had its shape changed.



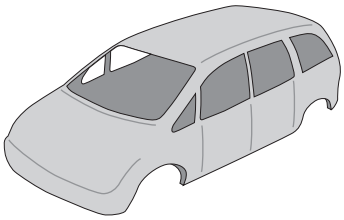
Bent metal ruler
**A**



Stretched bungee cords
**B**



Springs on a playground ride
**C**



Moulded plastic model car body
**D**

Which of the objects are storing elastic potential energy?

.....

Explain the reason for your choice or choices.

.....

.....

.....

.....

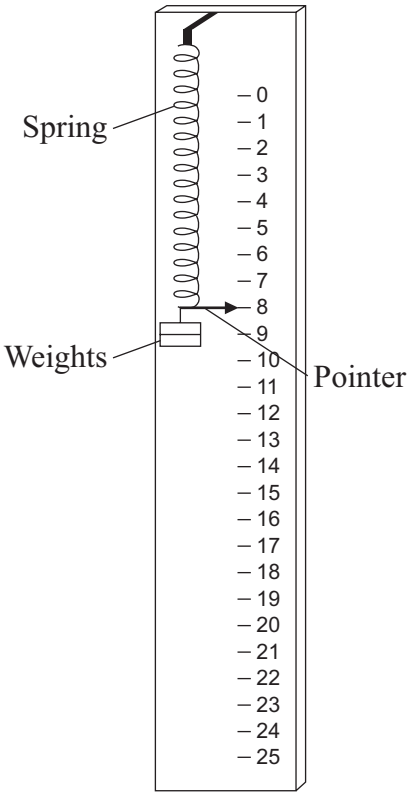
.....

.....

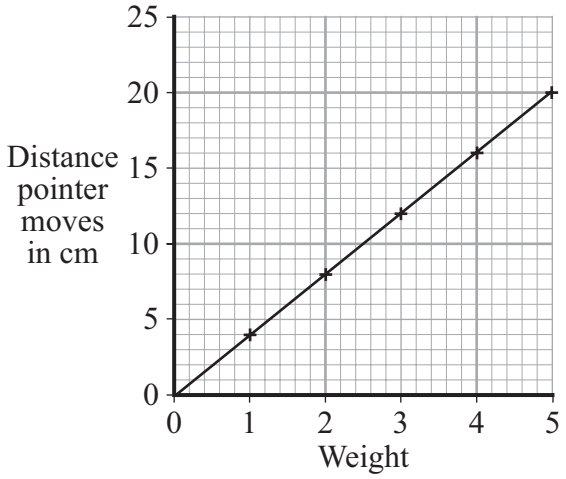
*(3 marks)*

**Question 1 continues on the next page**

(b) A student makes a simple spring balance. To make a scale, the student uses a range of weights. Each weight is put onto the spring and the position of the pointer marked.




The graph below shows how increasing the weight made the pointer move further.



(i) Which **one** of the following is the unit of weight?

Draw a ring around your answer.

**joule** **kilogram** **newton** **watt**

*(1 mark)*

(ii) What range of weights did the student use?

.....

*(1 mark)*

(iii) How far does the pointer move when 4 units of weight are on the spring?

.....

*(1 mark)*

(iv) The student ties a stone to the spring. The spring stretches 10 cm.

What is the weight of the stone?

.....

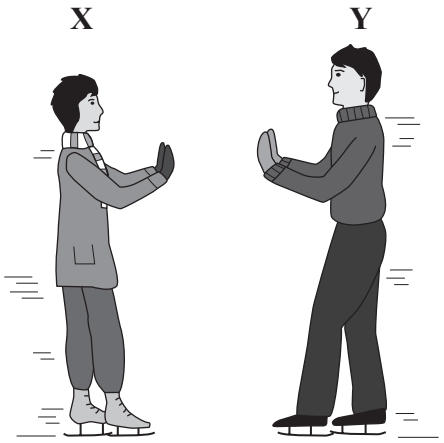
*(1 mark)*

7

**Turn over for the next question**

**2** The picture shows two children, **X** and **Y**, skating towards each other at an ice rink.

The children collide with each other, fall over and stop.




(a) Before the collision the children had different amounts of kinetic energy.

(i) What are the **two** factors that determine the kinetic energy of the children?

1 .....

2 .....

*(2 marks)*

(ii) What was the total kinetic energy of the children after they had fallen over and stopped?

.....

*(1 mark)*

(b) The total momentum of the children before and after the collision is zero.

(i) Use the equation in the box and the data given in the diagram to calculate the momentum of child **Y** before the collision.

momentum = mass × velocity

Show clearly how you work out your answer.

.....

.....

Momentum = ..... kg m/s
*(2 marks)*

(ii) Complete the following sentence using one of the words in the box.

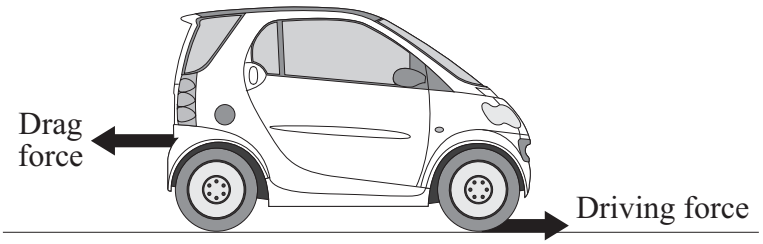
| **conserved** | **decreased** | **increased** |
|---|---|---|

The total momentum of the two children was ..... .
*(1 mark)*

6

**Turn over for the next question**

**3** The diagram shows the horizontal forces acting on a car travelling along a straight road.




(a) Complete the following sentences by drawing a ring around the correct word in each box.

(i) When the driving force equals the drag force, the speed of the car is

| |
|---|
| decreasing |
| constant |
| increasing |

.

*(1 mark)*

(ii) Putting the brakes on transforms the car's kinetic energy mainly into

| |
|---|
| heat |
| light |
| sound |

.

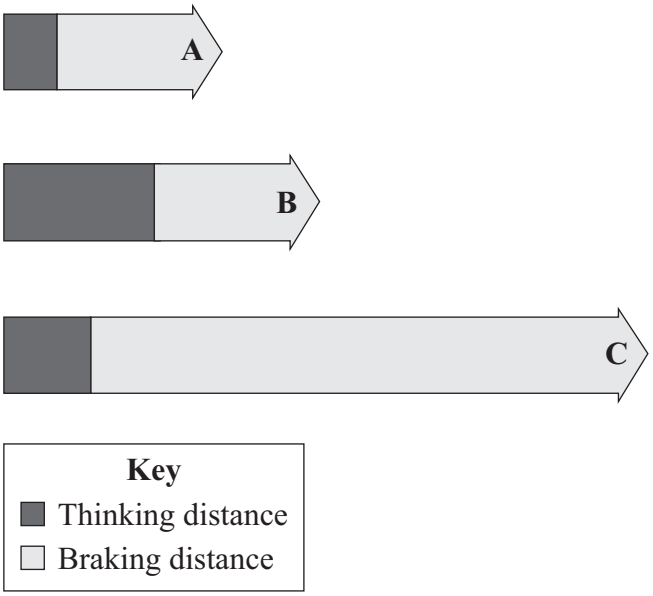
*(1 mark)*

(b) The charts, **A**, **B** and **C** give the thinking distance and the braking distance for a car driven under different conditions.

(i) Draw straight lines to match each chart to the correct conditions.

Draw only **three** lines.

| **Conditions** | **Charts** |
|---|---|
| Speed = 22 m/s driver wide awake | |
| Speed = 13 m/s driver wide awake | |
| Speed = 13 m/s driver very tired | |




*(2 marks)*

(ii) The three charts above all apply to dry road conditions.

How would the braking distances be different if the road were wet?

.....

.....

*(1 mark)*

5

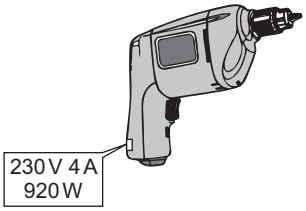
**Turn over for the next question**

**4** (a) Look at this electrical safety information poster.

**Get it right!**
**Choose the right fuse.**

Most fuses are 3 A or 13 A.

To choose the right fuse you must know the power of the appliance.




Power is marked on the information plate.

| Power over 700 W use a 13 A fuse. | Power under 700 W use a 3 A fuse. |
|---|---|
| • Fan heaters<br>• Kettles<br>• Dishwashers<br>• Washing machines | • Radios<br>• Table lamps<br>• Portable TVs<br>• Electric blankets |

(i) Complete the table to show which size fuse, 3 A or 13 A, should be fitted to each of the appliances.

| Appliance | Power rating | Fuse |
|---|---|---|
| Hairdryer | 1600 W | |
| Electric saw | 350 W | |
| Food mixer | 1200 W | |

*(2 marks)*

(ii) The plug of an electric kettle has been wrongly fitted with a 3 A fuse.

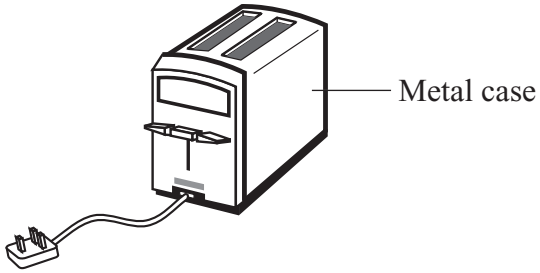
What will happen to the fuse when the kettle is switched on?

.....

.....

*(1 mark)*

(b) The drawing shows a toaster, which takes a current of 4 A from the 230 V mains electricity supply.




(i) Use the equation in the box to calculate the power of the toaster.

| Power (watt, W) | = | current (ampere, A) | × | potential difference (volt, V) |
|---|---|---|---|---|

Show clearly how you work out your answer.

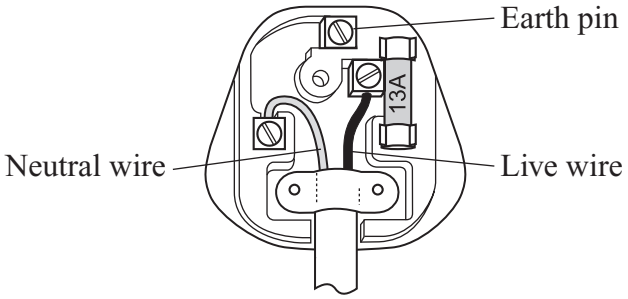
.....

.....

Power = ..... W

*(2 marks)*

(ii) A householder rewires the toaster with a new cable and plug. The diagram shows how the new cable has been connected to the plug.




Explain why the toaster may **not** be safe to use.

.....

.....

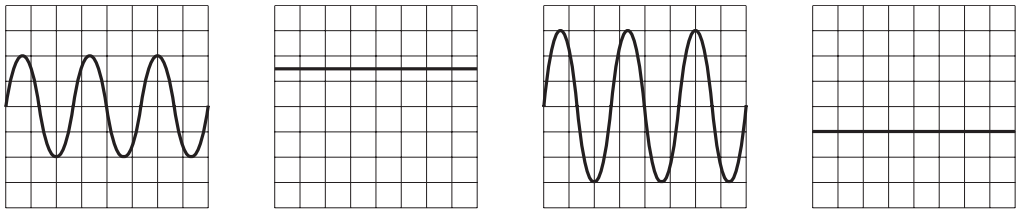
.....

.....

*(2 marks)*

**Question 4 continues on the next page**

(c) The diagram shows the oscilloscope traces produced by four different electricity supplies. The settings on the oscilloscope are the same for each electricity supply.



**K** **L** **M** **N**

(i) Which **two** supplies give a direct current (d.c)?

..... and .....
*(1 mark)*

(ii) Supply **K** provides a peak potential difference of 6 V.

What is the peak potential difference provided by supply **M**?

.....
*(1 mark)*

9

**5** The table shows the average background radiation dose from various sources that a person living in Britain receives in one year.

| Source of background radiation | Average amount each year in dose units |
|---|---|
| Buildings | 50 |
| Food and drink | 300 |
| Medical treatments (including X-rays) | 300 |
| Radon gas | 1250 |
| Rocks | 360 |
| Space (cosmic rays) | 240 |
| TOTAL | 2500 |

(a) Only **two** of the following statements are true.

Tick (✓) the boxes next to the true statements.

Half the average background radiation dose comes from radon gas. ☐

Everyone receives the same background radiation dose. ☐

Cosmic rays produce less background radiation than food and drink. ☐

*(1 mark)*

(b) Most sources of background radiation are natural but some are artificial (man-made).

Which source of background radiation given in the table is artificial?

.....

*(1 mark)*

(c) Each time a dental X-ray is taken, the patient receives about 20 units of radiation.

How many dental X-rays would give the yearly average dose for medical treatments?

.....

.....

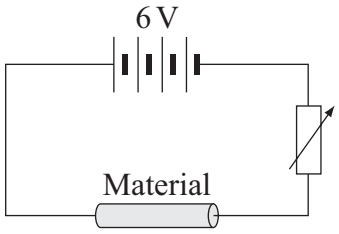
Number of X-rays = .....

*(2 marks)*

4

**Turn over for the next question**

**6** (a) The diagram shows the circuit used to investigate the resistance of a material. The diagram is incomplete; the ammeter and voltmeter are missing.




(i) Draw the symbols for the ammeter and voltmeter on the diagram in the correct places. *(2 marks)*

(ii) How can the current through the material be changed?

.....

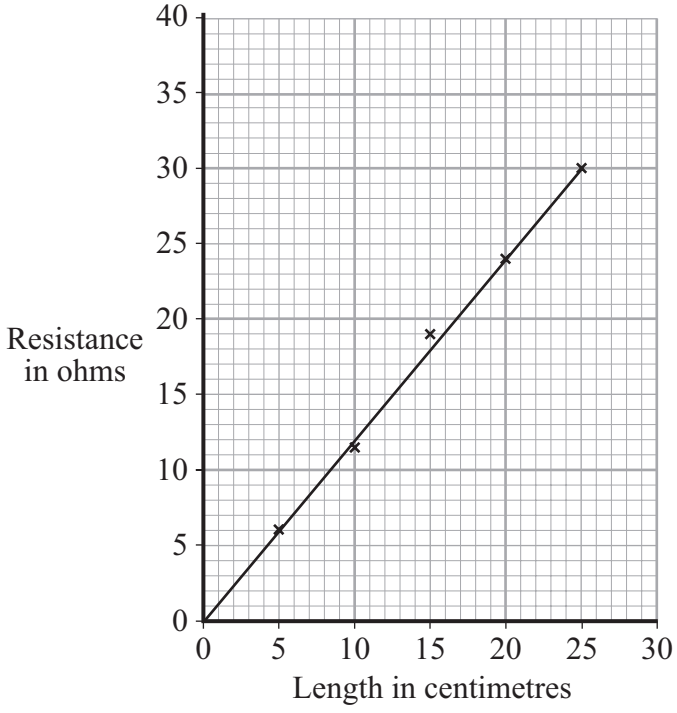
.....

*(1 mark)*

(b) The material, called conducting putty, is rolled into cylinders of different lengths but with equal thicknesses.

**Graph 1** shows how the resistance changes with length.

**Graph 1**



(i) Why has the data been shown as a line graph rather than a bar chart?

.....

.....

*(1 mark)*

(ii) The current through a 30 cm length of conducting putty was 0.15 A.

Use **Graph 1** to find the resistance of a 30 cm length of conducting putty.

Resistance = ..... ohms

*(1 mark)*

(iii) Use your answer to (b)(ii) and the equation in the box to calculate the potential difference across a 30 cm length of conducting putty.

| potential difference = current × resistance |
|---|

Show clearly how you work out your answer.

.....

.....

.....

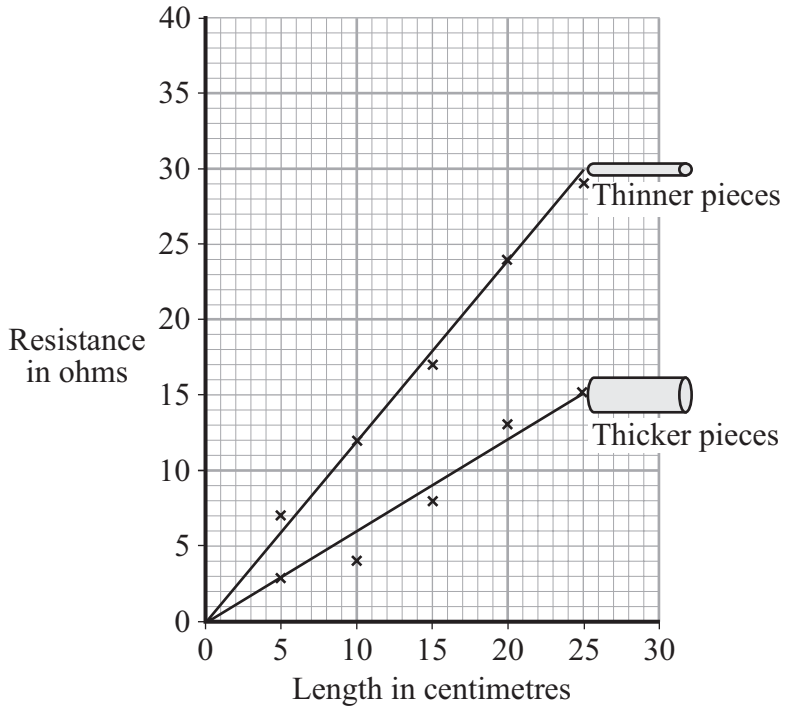
Potential difference = ..... volts

*(2 marks)*

**Question 6 continues on the next page**

(c) A second set of data was obtained using thicker pieces of conducting putty. Both sets of results are shown in **Graph 2**.

**Graph 2**




(i) What is the relationship between the resistance and the thickness of the conducting putty?

.....

.....

*(1 mark)*

(ii) Name **one** error that may have reduced the accuracy of the results.

.....

*(1 mark)*

(iii) How could the reliability of the data have been improved?

.....

.....

*(1 mark)*

**10**

**7** During car journeys, the driver will often become electrostatically charged. This is more noticeable on dry days than on damp, humid days.

(a) Explain what happens to cause the driver to become charged.

.....

.....

.....

.....

*(2 marks)*

(b) Scientists were asked to find out whether the build-up of charge on the driver depends on the type of material used to make the driver's clothes. The results of the investigation are given in the table.

| Material | Humidity | Temperature in °C | Charge on the driver in millicoulombs |
|---|---|---|---|
| Nylon | 48% | 18 | 3.0 to 3.2 |
| Wool | 48% | 18 | 2.4 to 2.5 |
| Cotton | 48% | 18 | 1.4 to 1.7 |

Humidity is a measure of how much water vapour the air can hold.

(i) Why was it important that the scientists controlled the humidity?

.....

.....

*(1 mark)*

(ii) Does the data in the table show that the charge on the driver would always be less if they were to wear cotton clothing?

Give a reason for your answer.

.....

.....

*(1 mark)*

4

**END OF QUESTIONS**

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