Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

General Certificate of Secondary Education
Foundation Tier
January 2012

Additional Science PHY2F

Unit Physics P2

F

Physics

Unit Physics P2

Monday 30 January 2012 1.30 pm to 2.15 pm

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 45 minutes

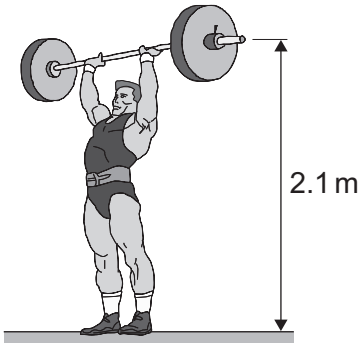
Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- 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.

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

1 A powerlifter lifts a 180 kg bar from the floor to above his head.



1 (a) Use the equation in the box to calculate the weight of the bar.

weight = mass × gravitational field strength

gravitational field strength = 10 N/kg

Show clearly how you work out your answer.

.....

.....

Weight = ... N

(2 marks)

1 (b) The powerlifter uses a constant force to lift the bar a distance of 2.1 m.

Use the equation in the box to calculate the work done by the powerlifter.

work done = force applied × distance moved in direction of force

Show clearly how you work out your answer and give the unit.

Choose the unit from the list below.

joule **newton** **watt**

.....

.....

Work done = ...

(3 marks)

1 (c) At the end of the lift, the powerlifter holds the bar stationary, above his head, for two seconds.

How much work does the powerlifter do on the bar during these two seconds?

Draw a ring around your answer.

0 **90** **360** **900**

Give a reason for your answer.

.....

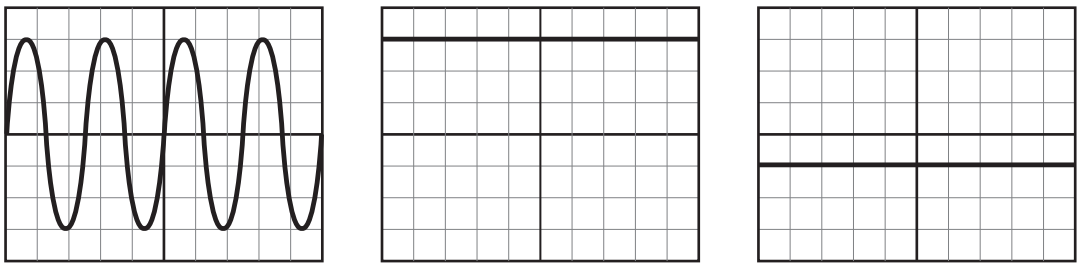
.....

(2 marks)

7

Turn over for the next question

2 (a) The diagram shows the traces produced on an oscilloscope when it is connected across different electricity supplies.



A **B** **C**

Which of the traces could have been produced by the mains electricity supply?

.....

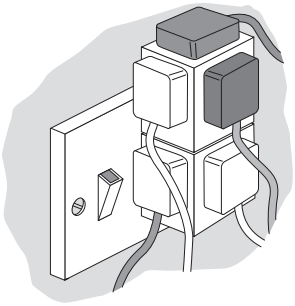
Give a reason for your answer.

.....

.....

(2 marks)

2 (b) The picture shows two adaptors being used to plug five electrical appliances into the same socket.



Explain why it is dangerous to have all five appliances switched on and working at the same time.

.....

.....

.....

.....

(2 marks)

4

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

3 (a) The diagram shows a cricketer bowling a ball.

3 (a) (i) The cricketer bowls the ball at 20 m/s.

How could the kinetic energy of **this** ball have been increased?

.....

(1 mark)

3 (a) (ii) The ball has a mass of 0.16 kg.

Use the equation in the box to calculate the momentum of the ball when it is bowled at 20 m/s.

momentum = mass × velocity

Show clearly how you work out your answer and give the unit.

Choose the unit from the list below.

kg m/s **m/s^2** **Nm**

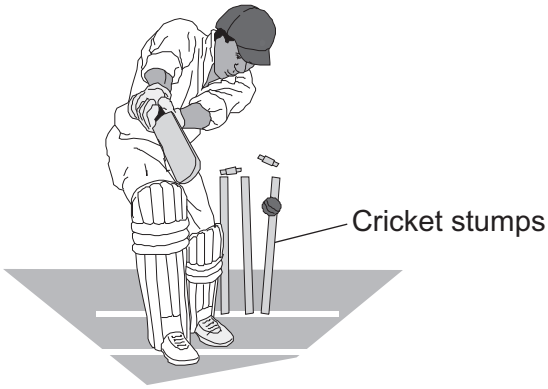
.....

.....

Momentum = ...

(3 marks)

3 (b) The batsman misses the ball and the ball hits the cricket stumps.



As the ball hits the stumps, the ball loses both kinetic energy and momentum.

3 (b) (i) What happens to the kinetic energy lost by the ball?

.....

.....

(1 mark)

3 (b) (ii) Even though the ball loses momentum, the total momentum of the ball **and** stumps just before the ball hits the stumps is the same as the total momentum of the ball **and** stumps just after the collision.

Explain how this is possible.

.....

.....

.....

.....

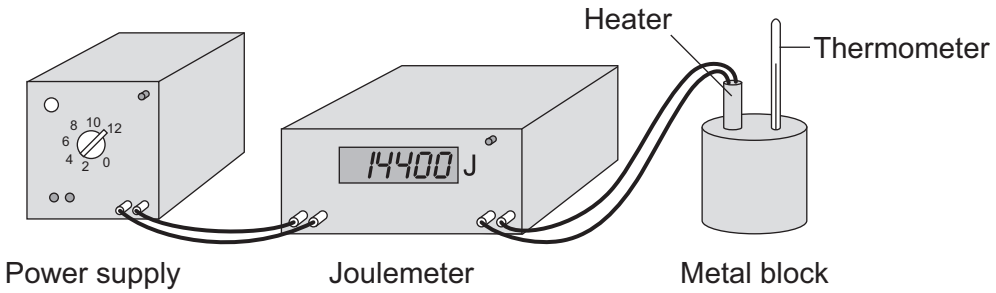
.....

(2 marks)

7

Turn over for the next question

4 A student used an electric heater to heat a metal block. The student measured the energy input to the heater with a joulemeter.



Before starting the experiment, the student reset the joulemeter to zero. The student switched the power supply on for exactly 10 minutes. During this time, the reading on the joulemeter increased to 14 400.

4 (a) (i) Calculate the energy transferred each second from the power supply to the heater.

Show clearly how you work out your answer.

.....

.....

Energy transferred each second = ... J/s

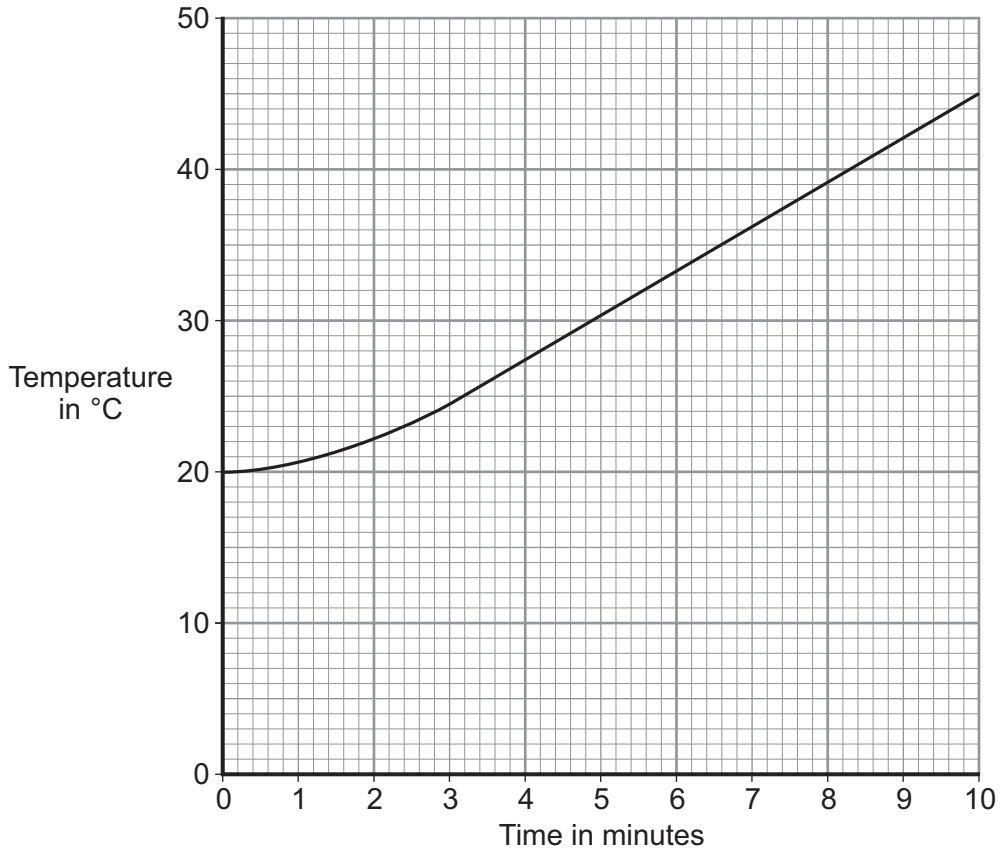
(2 marks)

4 (a) (ii) What is the power of the heater?

.....

(1 mark)

4 (b) The student measured the temperature of the metal block every minute. The data obtained by the student is displayed in the graph.



4 (b) (i) What range of temperatures did the student measure?

From ..... °C to ..... °C *(1 mark)*

4 (b) (ii) Before starting the experiment, the student had calculated that the temperature of the block would go up by 36 °C.

The student's data shows a smaller increase.

Which **one** of the following statements gives the most likely reason for this?

Put a tick (✓) in the box next to your answer.

The student does not read the thermometer accurately. ☐

The block transfers energy to the surroundings. ☐

The power supply is not connected correctly to the joulemeter. ☐

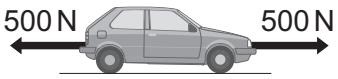
(1 mark)

5

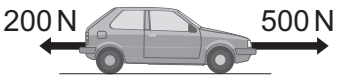
5 (a) The diagrams, **A**, **B** and **C**, show the horizontal forces acting on a **moving** car.

Draw a line to link each diagram to the description of the car's motion at the moment when the forces act.

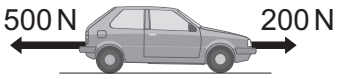
Draw only **three** lines.



A



B

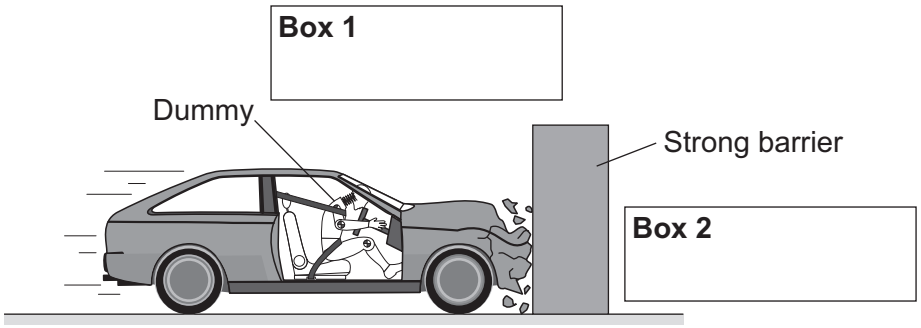


C

stationary	
constant speed	
slowing down	
accelerating forwards	

(3 marks)

5 (b) The front crumple zone of a car is tested at a road traffic laboratory. This is done by using a remote control device to drive the car into a strong barrier. Electronic sensors are attached to a dummy inside the car.



5 (b) (i) Draw an arrow in **Box 1** to show the direction of the force that the car exerts on the barrier.

(1 mark)

5 (b) (ii) Draw an arrow in **Box 2** to show the direction of the force that the barrier exerts on the car.

(1 mark)

5 (b) (iii) Complete the following by drawing a ring around the correct line in the box.

The car exerts a force of 5000N on the barrier. The barrier does not move. The force exerted by the barrier on the car will be

more than
equal to
less than

5000N.

(1 mark)

5 (b) (iv) Which **one** of the following gives the most likely reason for attaching electronic sensors to the dummy?

Put a tick (✓) in the box next to your answer.

To measure the speed of the car just before the impact. ☐

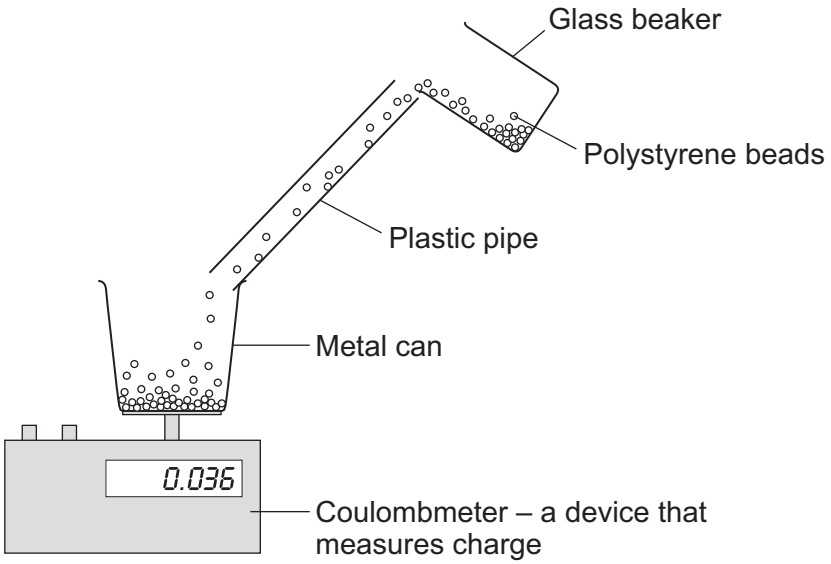
To measure the forces exerted on the dummy during the impact. ☐

To measure the distance the car travels during the impact. ☐

(1 mark)

7

6 (a) Fine powders poured through a pipe can become charged. The diagram shows the apparatus used by a student to investigate this effect.



The student poured 75 cm^3 of polystyrene beads down the pipe. The beads fell into a metal can and the charge on them was measured directly using a coulombmeter.

The student repeated this twice more, but each time used 75 cm^3 of beads of a different size.

6 (a) (i) When they fell through the pipe, the polystyrene beads became negatively charged.

Explain how this happened.

.....

.....

.....

.....

.....

.....

(3 marks)

6 (a) (ii) Give **one** control variable in the student's investigation.

.....

.....

(1 mark)

6 (b) The results obtained by the student are shown in the table.

Diameter of polystyrene beads in mm	Charge in microcoulombs
1.0	0.080
2.0	0.044
3.0	0.012

(1 000 000 microcoulombs = 1 coulomb)

6 (b) (i) Describe the connection between the size of the polystyrene beads and the total charge on the beads.

.....

.....

(1 mark)

6 (b) (ii) Explain how these results might be different if the student had used a shorter pipe.

.....

.....

.....

.....

(2 marks)

Question 6 continues on the next page

6 (c) In industry, powders are often pumped through pipes. If the static charge caused a spark, the powder could ignite and cause an explosion.

6 (c) (i) Is an explosion more likely to happen when pumping very fine powders or when pumping powders that consist of much larger particles?

.....

Give a reason for your answer.

.....

.....

(1 mark)

6 (c) (ii) Suggest **one** way that the risk of an explosion could be reduced.

.....

.....

(1 mark)

6 (d) The table gives the minimum ignition energy (MIE) value for a number of fine powders. The MIE is the minimum amount of energy required to cause a fine powder to ignite.

Type of powder	MIE in millijoules
Coal dust	60.00
Aluminium powder	10.00
Cornstarch dust	0.30
Iron powder	0.12

The MIE values for different substances are all measured in the same way and under the same conditions of pressure and temperature.

Why is this important?

.....

.....

(1 mark)

10

7 (a) Nuclear fission is used in nuclear power stations to generate electricity. Nuclear fusion happens naturally in stars.

7 (a) (i) Explain briefly the difference between *nuclear fission* and *nuclear fusion*.

.....

.....

.....

.....

.....

(2 marks)

7 (a) (ii) What is released during both nuclear fission and nuclear fusion?

.....

(1 mark)

7 (b) Plutonium-239 is used as a fuel in some nuclear reactors.

7 (b) (i) Name another substance used as a fuel in some nuclear reactors.

.....

(1 mark)

7 (b) (ii) There are many isotopes of plutonium.

What do the nuclei of different plutonium isotopes have in common?

.....

(1 mark)

5

END OF QUESTIONS

There are no questions printed on this page

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