Write your name here

Surname	Other names

Centre Number | Candidate Number

Edexcel GCSE

Physics/Additional Science

Unit 2: Physics for Your Future

Foundation Tier

Thursday 7 March 2013 – Morning
Time: 1 hour

Paper Reference
5PH2F/01

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 4 1 9 6 0 A 0 1 2 0

PEARSON

FORMULAE

You may find the following formulae useful.

charge = current × time $Q = I \times t$

potential difference = current × resistance $V = I \times R$

electrical power = current × potential difference $P = I \times V$

energy transferred = current × potential difference × time $E = I \times V \times t$

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}} \qquad a = \frac{(v - u)}{t}$$

force = mass × acceleration $F = m \times a$

weight = mass × gravitational field strength $W = m \times g$

momentum = mass × velocity $P = m \times v$

work done = force × distance moved in the direction of the force $E = F \times d$

$$\text{power} = \frac{\text{work done}}{\text{time taken}} \qquad P = \frac{E}{t}$$

gravitational potential energy = mass × gravitational field strength × vertical height

$\text{GPE} = m \times g \times h$

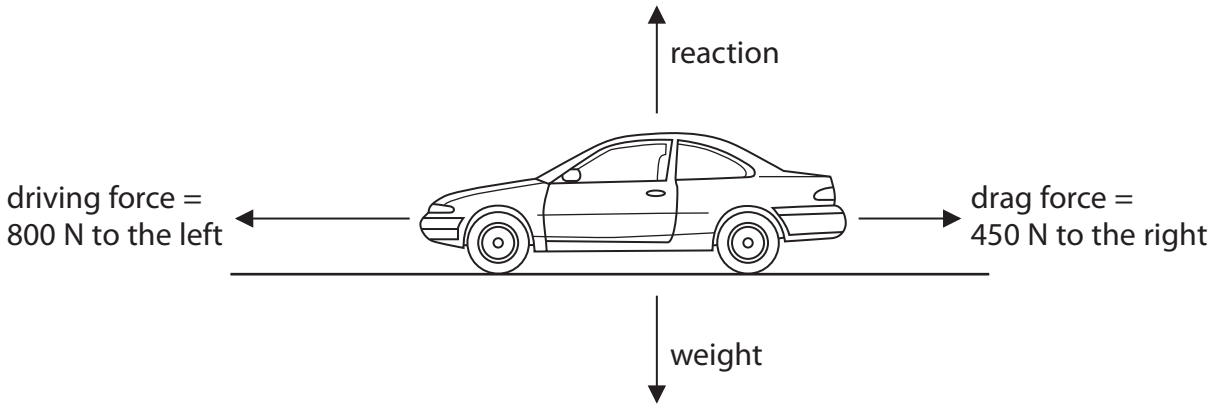
kinetic energy = ½ × mass × velocity^2 $\text{KE} = ½ \times m \times v^2$

Answer ALL questions.

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 ☒.

Motion and forces

1 The diagram shows the forces acting on a car which is travelling along a flat straight road.



(a) (i) The size of the resultant force on the car is 350 N.

In which direction is the resultant force acting?

Put a cross (☒) in the box next to your answer.

(1)

- ☐ **A** down ↓
- ☐ **B** to the left ←
- ☐ **C** to the right →
- ☐ **D** up ↑

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The car is

(1)

- ☐ **A** accelerating
- ☐ **B** decelerating
- ☐ **C** moving at a constant speed
- ☐ **D** not moving

(iii) The mass of the car is 625 kg.

Calculate the weight of the car.

gravitational field strength = 10N/kg

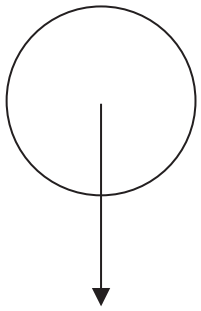
(2)

weight of car = ... N

(b) Forces also act on objects when they fall through the air.

There are two forces acting on this ball as it falls through the air.

The weight is shown on the diagram.



(i) Draw and label an arrow on the diagram to show the other force acting on the ball.

(2)

(ii) Use words from the box to complete the sentences.

(2)

balanced	changing	greater	smaller	zero

After a short time the ball falls at a steady speed.

The forces acting on the ball are now ..... .

The acceleration of the ball is now ..... .

(Total for Question 1 = 8 marks)

Power from the nucleus

2 The fuel in a nuclear power station is an isotope of uranium.

(a) The symbol for a nucleus of this uranium isotope is $^{235}_{92}U$.

(i) How many protons are there in a nucleus of this isotope?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** 92

☒ **B** 143

☒ **C** 235

☒ **D** 327

(ii) Name another particle in a nucleus of this isotope.

(1)

.....

(b) Nuclear fission is the reaction that happens in a nuclear power station.

Explain what happens when nuclear fission occurs.

(2)

.....

.....

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.....

(c) Control rods are used in the nuclear reactor.

Explain how these rods stop the nuclear reaction from getting out of control.

(2)

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.....

.....

.....

(d) Describe how the thermal energy produced by the nuclear reaction is used to produce electricity.

You may draw a diagram to help with your answer.

(2)

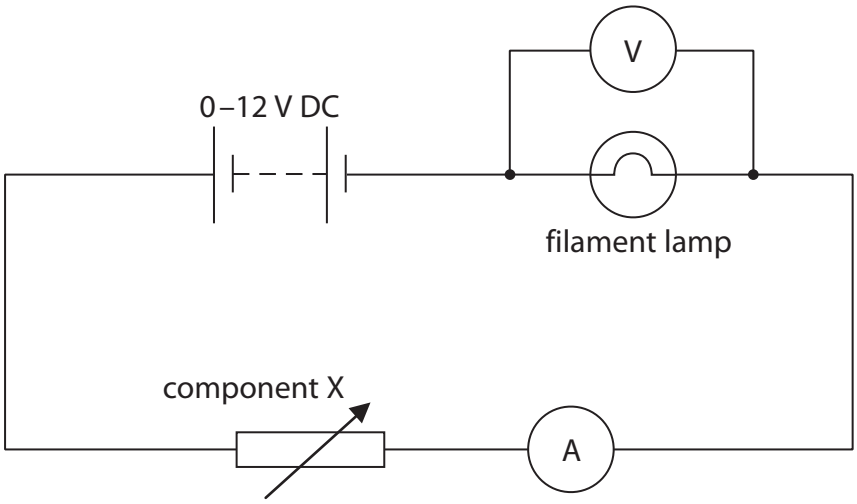
(Total for Question 2 = 8 marks)

Filament lamps

3 A student sets up an experiment to measure the potential difference (voltage) across a filament lamp.

She changes the current through the lamp.

The diagram shows the circuit she used.



(a) Complete the sentences by putting a cross (☒) in the box next to your answer.

(i) The component X in the circuit diagram is a

(1)

☒ **A** diode

☒ **B** fixed resistor

☒ **C** thermistor

☒ **D** variable resistor

(ii) The meter that measures potential difference is

(1)

☒ **A** in parallel with the power supply

☒ **B** in parallel with the lamp

☒ **C** in series with the lamp

☒ **D** in series with the component X

(iii) Describe how the student should increase the current in the lamp.

(2)

.....

.....

.....

.....

(b) The student recorded these readings.

current / A	potential difference / V
0.00	0.0
0.20	2.0
0.31	4.0
0.37	6.0
0.42	8.0
0.44	10.0

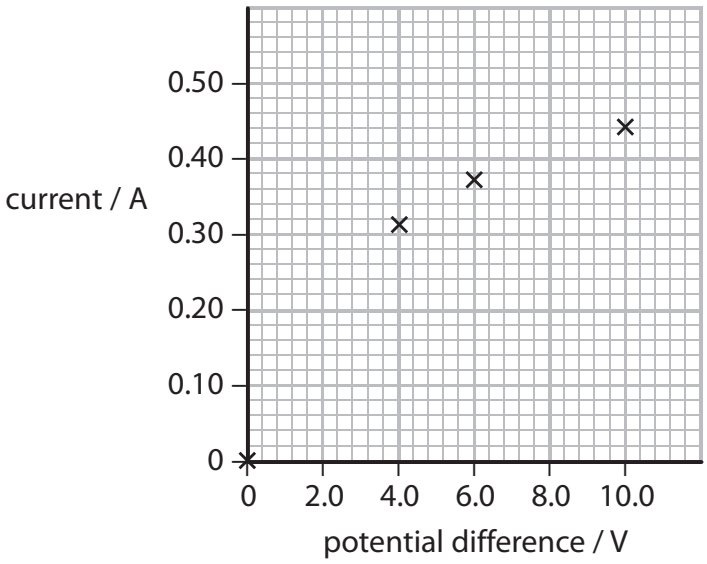
Four points are plotted on the graph.

(i) Plot the points for 2.0 V and 8.0 V.

(1)

(ii) Draw the line of best fit.

(1)



(c) Calculate the resistance of the lamp when the current is 0.44 A and the potential difference is 10.0 V.

(2)

$$R = \frac{V}{I}$$

resistance = ... Ω

(d) Describe the energy transfer that takes place in the lamp.

(2)

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(Total for Question 3 = 10 marks)

Down to Earth

4 A pilot begins to land an aircraft.

(a) The height of the aircraft decreases from 200 m above the ground to 100 m.

(i) What happens to the gravitational potential energy of the aircraft?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** it becomes zero

☒ **B** it decreases

☒ **C** it does not change

☒ **D** it increases

(ii) The velocity of the aircraft remains constant.

What happens to the kinetic energy of the aircraft?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** it becomes zero

☒ **B** it decreases

☒ **C** it does not change

☒ **D** it increases

(b) The aircraft lands with its wheels on the runway as shown.

The aircraft is moving forwards.

(i) Draw an arrow on the diagram to show the direction of the momentum of the aircraft.

(1)

(ii) The velocity of the aircraft when it lands is 75 m/s.

The mass of the aircraft is 130 000 kg.

Calculate the momentum of the aircraft.

(2)

momentum = ... kg m/s

(iii) The aircraft comes to a stop.

State the momentum change of the aircraft from when it lands to when it stops.

(1)

change in momentum = ... kg m/s

(c) When the aircraft lands, the momentum of each passenger also changes.

(i) Explain why it is more comfortable for a passenger if the aircraft takes a longer time to slow down.

(2)

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(ii) Suggest why some aircraft need a very long runway to land safely.

(2)

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(Total for Question 4 = 10 marks)

Living with radioactivity

5 Everyone is exposed to background radiation. Some of this radiation comes from natural sources.

(a) (i) One example of a source of background radiation that does not occur naturally is radiotherapy.

State **one** other source of background radiation that does not occur naturally.

(1)

.....

.....

(ii) Radon gas is a natural source of background radiation.

In some parts of the country, a lot of the background radiation comes from radon gas.

Explain why there is no radon gas in some other parts of the country.

(2)

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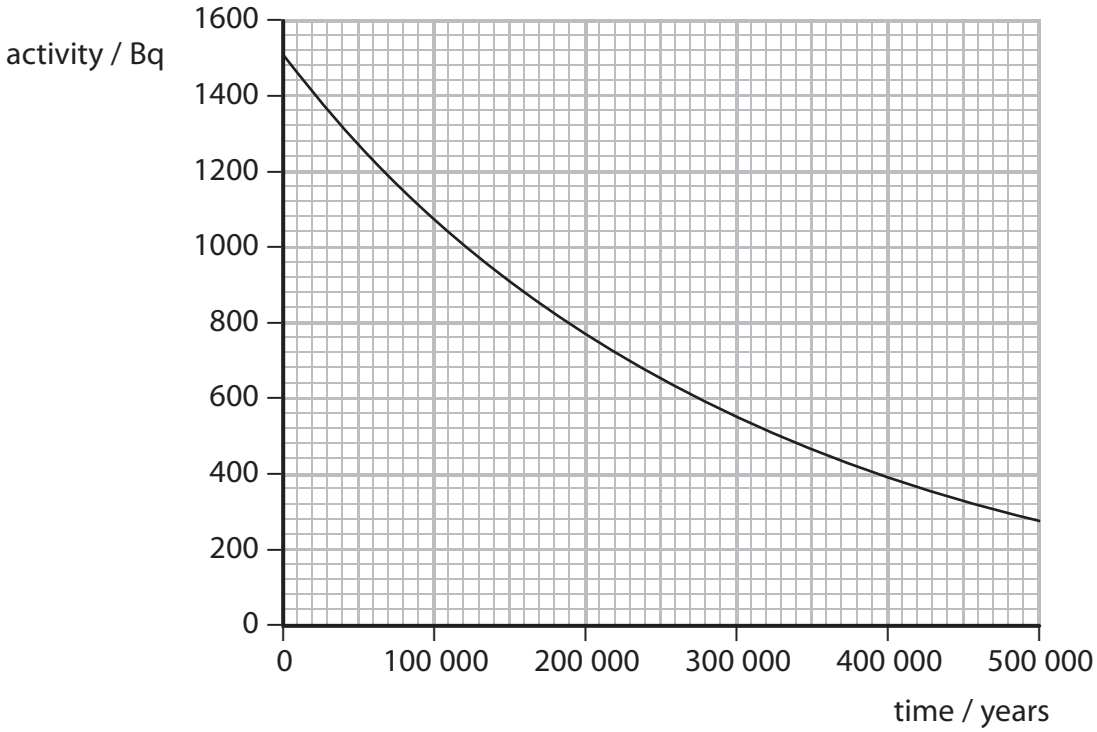
(b) Technetium-99 is one of the radioactive isotopes in nuclear waste.

The graph shows the decay curve for technetium-99.



(i) Use the graph to show that the half-life of technetium-99 is about 200 000 years.

(2)

(ii) Technetium-99 emits beta particles.

Give **one** reason that beta particles can cause harm to people.

(1)

.....

.....

*(c) There are many radioactive isotopes in nuclear waste.

Technetium-99 is just one of these isotopes.

People are worried about how we should deal with nuclear waste.

Explain why it is difficult to deal with nuclear waste safely.

(6)

(Total for Question 5 = 12 marks)

Static electricity

6 An atom contains electrons, neutrons and protons.

(a) Use words from the box to complete the sentences.

neutral	negative
much larger than a neutron	much smaller than a neutron
positive	the same size as a neutron

(i) The charge on an electron is .....

(1)

(ii) An electron has a mass that is .....

(1)

(b) At a petrol station, a pipe is used to transfer petrol to the storage tanks.

The pipe is earthed.

There is friction between the petrol and the end of the pipe.

(i) Explain why it is dangerous **not** to earth the pipe.

(2)

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.....

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.....

(ii) Explain how earthing the pipe makes this process much safer.

(2)

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.....

.....

*(c) The photographs show some electrostatic effects.

positively charged balloon near hair

positively charged rod near some paper

positively charged balloon near a thin stream of water

Explain in terms of electric charges how **one** of these effects is caused.

You may include diagrams to help with your answers.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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