Write your name here

| Surname | Other names |
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**Pearson Edexcel GCSE**

Centre Number | | | | | |

Candidate Number | | | | |

# Physics/Additional Science

## Unit P2: Physics for Your Future

**Foundation Tier**

Friday 12 June 2015 – Afternoon
**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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## 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

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$^2$ $\text{KE} = ½ \times m \times v^2$

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**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 ☒.**

## Investigating motion

**1** Some students investigate the speed of cars.
They measure the time it takes each car to travel a distance of 80 m.

(a) State **two** measuring instruments the students should use.

**(2)**

1 .....

2 .....

(b) The table shows some of their results.

| colour of car | distance travelled / m | time / s |
|---|---|---|
| green | 80 | 5.0 |
| red | 80 | 4.0 |
| blue | 80 | 5.5 |
| black | 80 | 4.3 |
| white | 80 | 5.6 |

(i) State the colour of the slowest car.

**(1)**

colour of the slowest car .....

(ii) Calculate the speed of the black car.

**(2)**

speed of the black car = ..... m/s

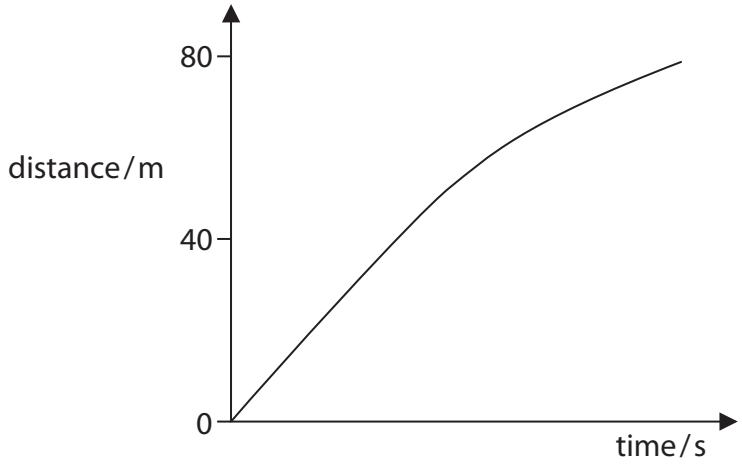
(iii) 20 miles per hour is approximately 9 m/s.

Estimate the speed, in miles per hour, of the black car.

**(1)**

speed of the black car = ..... miles per hour

(c) The distance-time graph for another car is shown below.




Describe what the graph shows about the speed of the car as it travels the 80 m.

**(2)**

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.....

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**(Total for Question 1 = 8 marks)**

## Electric charge

**2** (a) A plastic rod and a piece of cloth are both uncharged.

A student rubs the plastic rod with the cloth.

The plastic rod becomes negatively charged.

(i) Compared with the plastic rod, which row of the table is correct for the charge on the cloth?

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

**(1)**

| | sign of charge | size of charge |
|---|---|---|
| ☒ **A** | positive | equal |
| ☒ **B** | negative | equal |
| ☒ **C** | positive | bigger |
| ☒ **D** | negative | bigger |

(ii) Explain how the plastic rod becomes negatively charged.

**(2)**

.....

.....

.....

.....

(iii) The student then holds the plastic rod near to a stream of water coming from a tap.

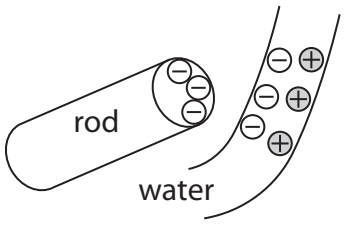
The stream of water bends towards the plastic rod.



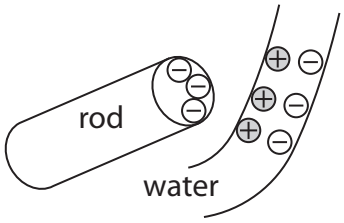
Which picture shows the correct arrangement of charges in the stream of water?

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

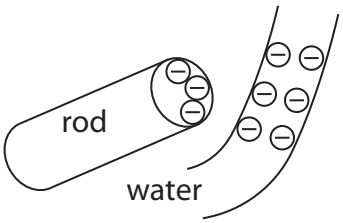
**(1)**



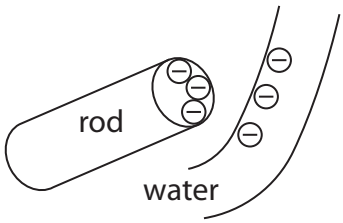

☒ **A**




☒ **B**




☒ **C**




☒ **D**

(iv) The student puts the plastic rod into the stream of water and pulls it out.

Now, when he holds the plastic rod near the stream of water, the stream of water does not bend.

Suggest why the stream of water does not bend.

**(1)**

.....

.....

(b) A torch has a battery and a bulb.

The current in its circuit is 0.08 A.

Calculate the amount of charge passing a point in this circuit in 2 minutes.

**(3)**

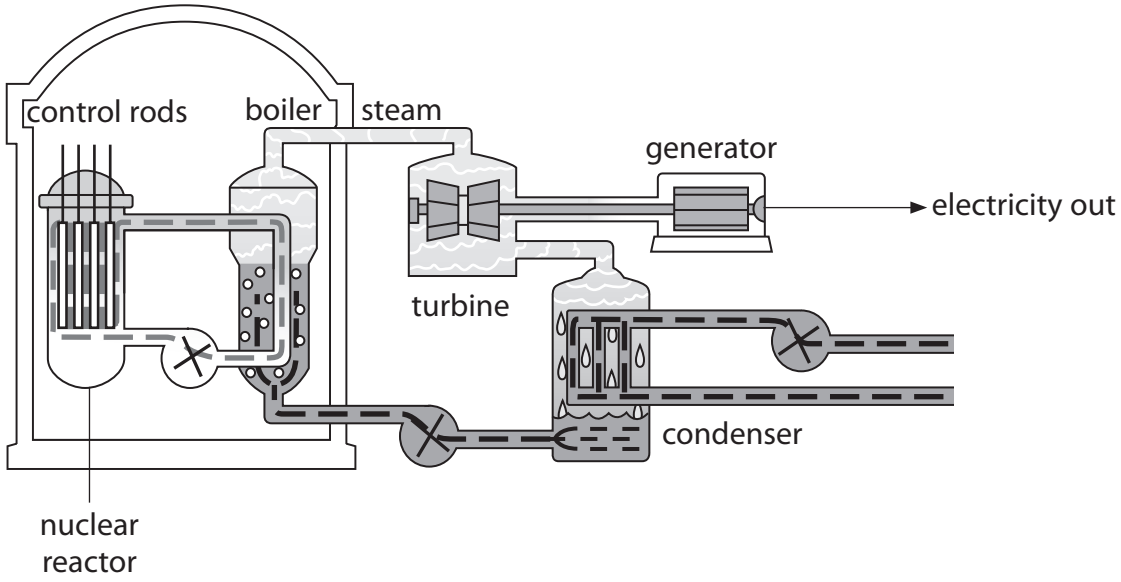
charge = ..... coulombs

**(Total for Question 2 = 8 marks)**

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## Nuclear fission and radiation

**3** The diagram shows parts of a nuclear power station.




(a) (i) Which part of the power station provides thermal (heat) energy from a chain reaction?

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

**(1)**

- ☒ **A** nuclear reactor
- ☒ **B** turbine
- ☒ **C** generator
- ☒ **D** condenser

(ii) Which part of the power station transfers kinetic energy into electrical energy?

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

**(1)**

- ☒ **A** nuclear reactor
- ☒ **B** boiler
- ☒ **C** turbine
- ☒ **D** generator

(b) An isotope of krypton, krypton-89, is produced in the nuclear reactor.
A nucleus of this isotope can be represented as

$$^{89}_{36}Kr$$

Describe the structure of a nucleus of krypton-89.

**(4)**

(c) Use words from the box to complete the following sentence.

The words may be used once, more than once, or not at all.

**(2)**

| | | |
|---|---|---|
| alpha | atom | beta |
| molecule | neutron | nucleus |

During nuclear fission, a uranium-235 ..... splits

when it absorbs a slow moving .....

(d) There are many control rods in a nuclear reactor.

Explain how control rods are used to reduce the number of nuclear reactions in the reactor.

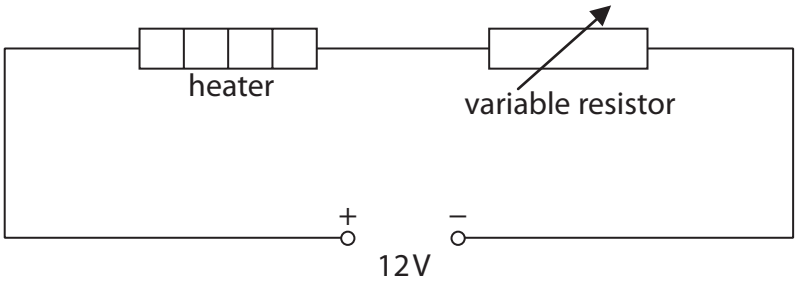
**(2)**

**(Total for Question 3 = 10 marks)**

## Controlling and using electric current

**4** (a) A technician investigates the potential difference (voltage) across an electrical heater.

This circuit diagram shows the circuit the technician uses.




(i) Add a voltmeter to the circuit which will measure the potential difference (voltage) across the heater.

**(2)**

(ii) The resistance of the heater is 15 Ω.

The current in the heater is 0.56 A.

Calculate the potential difference (voltage) across the heater.

**(2)**

potential difference = ..... V

(iii) The technician changes the value of the variable resistor.

She measures the new voltage across the heater and the new current in it.

Here are her results:

voltage = 6.0 V  current = 0.40 A.

Calculate the amount of electrical energy transferred in 30 s by the heater.

**(2)**

energy transferred = ..... J

(iv) The total energy supplied by the battery in 30 s is 144 J.

Explain why your answer in (iii) is not the same as the total energy supplied by the battery.

**(2)**

.....

.....

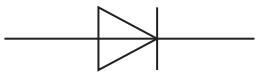
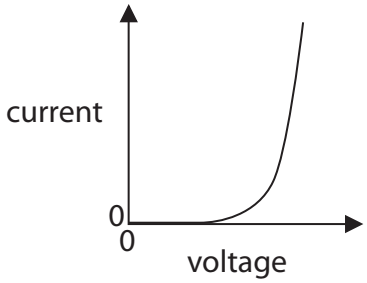
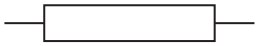
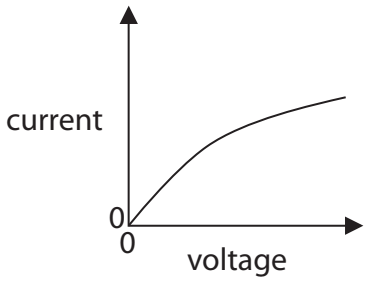
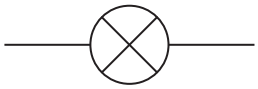
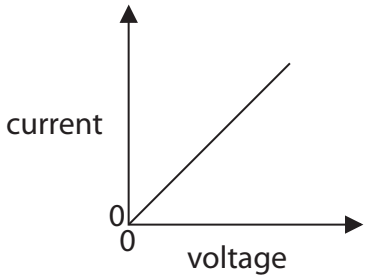
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(b) The graphs show how the current in a component changes with the voltage applied across the component.

Draw a line from each component to its correct graph.

**(2)**

| **component** | **graph** |
|---|---|
|  diode |   |
|  resistor |   |
|  lamp |   |

**(Total for Question 4 = 10 marks)**

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## Cars and safety

**5** (a) Which of these situations can increase the reaction time of a driver?

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

**(1)**

- ☒ **A** an icy road
- ☒ **B** worn tyres on his car
- ☒ **C** stopping for a cup of coffee
- ☒ **D** driving for a long time without taking a break

(b) (i) A car engine produces an average driving force of 1200 N.

The car travels 8.0 m.

Calculate the work done by the force over this distance.

**(2)**

work done = ..... J

(ii) The car has a mass of 1400 kg and travels at a velocity of 25 m/s.

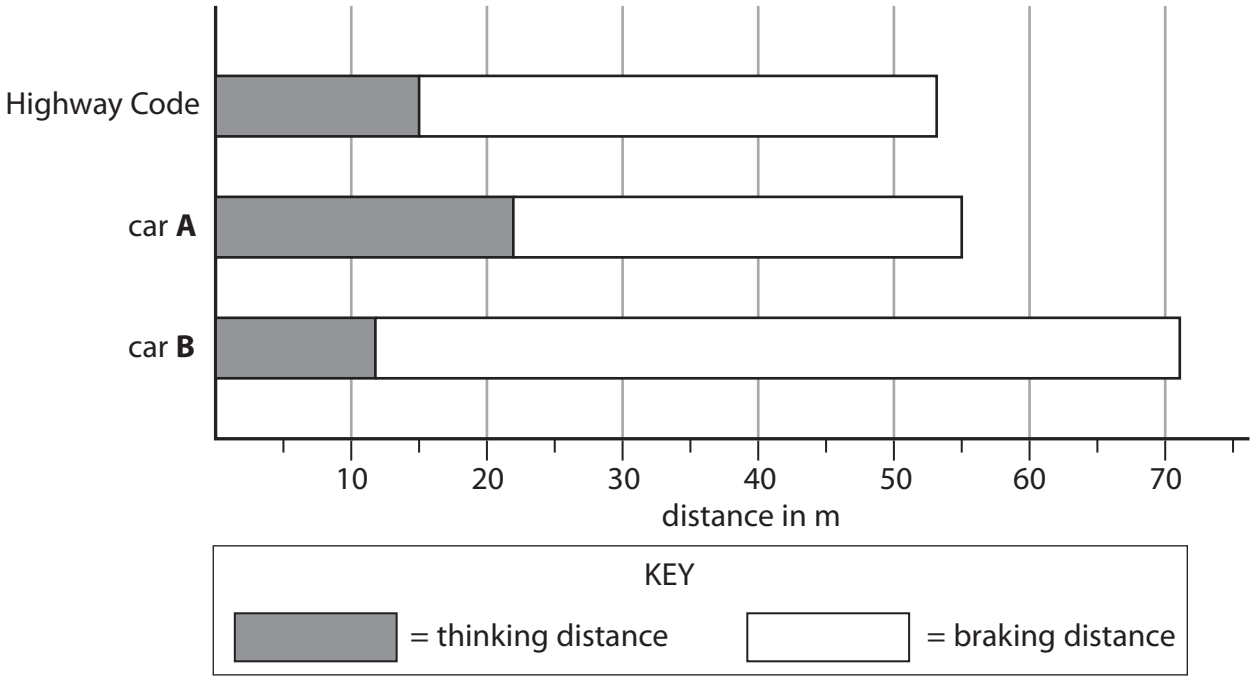
Calculate the kinetic energy of the car.

**(3)**

kinetic energy = ..... J

*(c) The chart shows the thinking, braking and stopping distances for an average car and driver stopping from 50 miles per hour as shown in the Highway Code.

It also shows the thinking, braking and stopping distances for drivers of cars **A** and **B**, both stopping from 50 miles per hour.




**A** and **B** are different cars on different roads.

Use the factors that can affect thinking and braking distances to explain the differences in stopping distances for cars **A** and **B**.

**(6)**

**(Total for Question 5 = 12 marks)**

## Using radiation in hospitals

**6** Hospitals use ionising radiation for many purposes.

(a) State **one** use of ionising radiation in a hospital.

**(1)**

.....

(b) An isotope of technicium, technicium-99, has a half-life of 6 hours.

A hospital has a sample which contains 40 mg of technicium-99.

Calculate how much technicium-99 will be in this sample after 12 hours.

**(2)**

amount remaining = ..... mg

(c) Every hospital radiographer who works with radiation wears a radiation badge.

The badge is used to monitor the amount of radiation the radiographer absorbs each month.

(i) Explain why it is important to monitor the amount of radiation a radiographer absorbs each month.

**(2)**

.....

.....

.....

.....

(ii) Radiographers are restricted to a smaller annual dose of radiation nowadays compared to 50 years ago.

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

This is because nowadays,

**(1)**

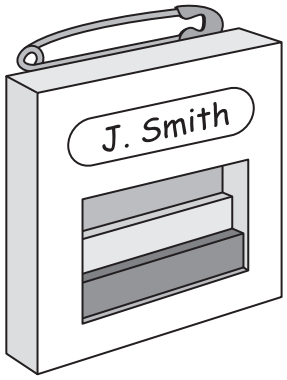
☒ **A** the radioactive sources have decayed

☒ **B** we can measure radiation more accurately

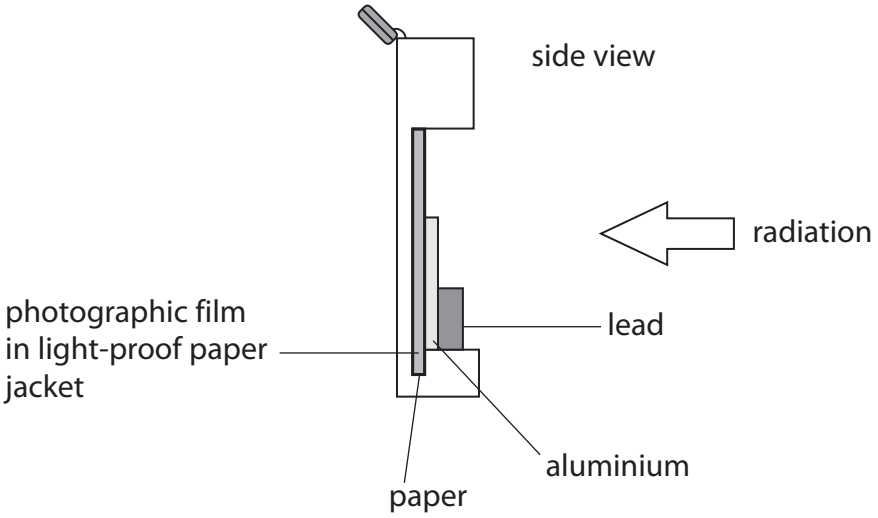
☒ **C** we have a better understanding of the risks from radiation

☒ **D** we have more effective ways of shielding against radiation

*(iii) The radiation badge contains a photographic film which is sensitive to radiation.




radiation badge




The radiation badge is sent to a laboratory after a month and the film is checked.

Explain how the badge shows the amount of different types of radiation that the radiographer has been exposed to.

**(6)**

**(Total for Question 6 = 12 marks)**

**TOTAL FOR PAPER = 60 MARKS**

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