Write your name here

Surname	Other names

Pearson
Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Physics/Additional Science

Unit P2: Physics for Your Future

Foundation Tier

Friday 16 June 2017 – 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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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

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 a cyclist during a race.

(a) (i) Many quantities can be measured during the race.

Which of these quantities is a vector quantity?

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

(1)

- ☒ **A** velocity
- ☒ **B** mass
- ☒ **C** kinetic energy
- ☒ **D** distance

(ii) The total mass of the cyclist and the bicycle is 70.0 kg.

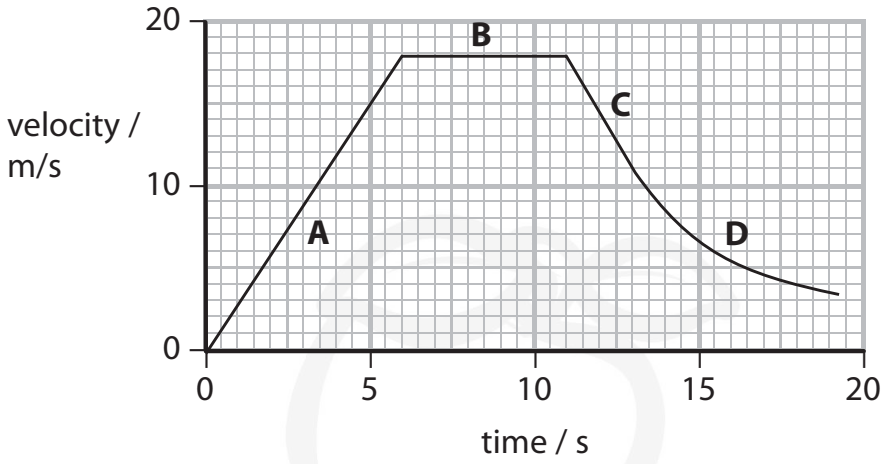
The cyclist is accelerating at 2.4 m/s^2.

Calculate the size of the resultant force that produces this acceleration.

(2)

force = ... N

(b) The velocity/time graph shows how the cyclist's velocity changes during part of the race.



(i) During which part of the race is the resultant force on the cyclist zero?

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

(1)

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(ii) Calculate the acceleration of the cyclist during the first 4.0 s.

(2)

acceleration = ... m/s^2

(c) The diagram shows the horizontal forces acting on the cyclist in another part of the race.

Not to scale

Calculate the resultant force on the cyclist and state its direction.

(2)

force = ... N

direction = ...

(Total for Question 1 = 8 marks)

Electric charges

2 (a) Complete this table for the three particles in an atom.

The first row has been done for you.

(3)

particle name	charge	mass / mass unit
proton	+1 (positive)	1
neutron		
		$\frac{1}{1836}$

(b) A plastic rod is rubbed with a cloth.

The plastic rod and the cloth become charged.

(i) Describe how you could show that the rod is charged.

(2)

.....

.....

.....

.....

(ii) The plastic rod becomes positively charged.

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

(1)

Compared with the rod, the cloth has

☒ **A** an equal positive charge

☒ **B** an equal negative charge

☒ **C** a larger positive charge

☒ **D** a larger negative charge

(iii) Explain how friction between the cloth and the rod gives the rod a positive charge.

(2)

.....

.....

.....

.....

(Total for Question 2 = 8 marks)

Cars, power, work and energy

3 A car is travelling along a straight road.

(a) (i) The driver has to brake suddenly.

The thinking distance is 18 m and the braking distance is 55 m.

Calculate the stopping distance of the car.

(1)

stopping distance = ... m

(ii) State **one** factor that could increase the driver's reaction time.

(1)

.....

(iii) State **one** factor that could increase the braking distance of the car.

(1)

.....

(b) Air bags help to reduce injuries in a collision.

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

(1)

Air bags reduce injuries to drivers in a collision by

☒ **A** decreasing the kinetic energy of the car

☒ **B** increasing the time a resultant force acts on the driver

☒ **C** decreasing the driver's thinking time

☒ **D** increasing the rate of change of momentum of the driver

(c) During braking, the car's brakes produce an average braking force of 14 500 N.

Calculate the work done by the brakes over a braking distance of 5.0 m.

(2)

work done = ... J

(d) After braking, the car accelerates.

The car's engine does 800 000 J of work in a time of 12.5 s.

Calculate the power output of the engine.

(2)

power output = ... W

(e) The car has a mass of 1600 kg.

Calculate the kinetic energy of the car when its velocity is 30 m/s.

(2)

kinetic energy = ... J

(Total for Question 3 = 10 marks)

Lamps in a circuit

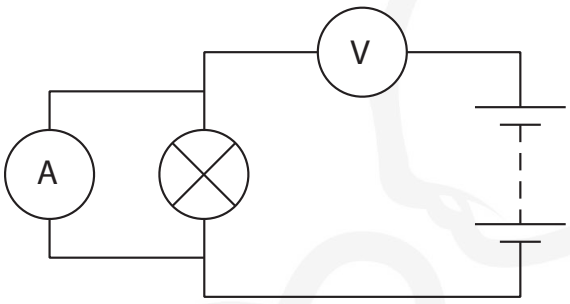
4 A student experiments with filament lamps in a circuit.

(a) She starts with one lamp.

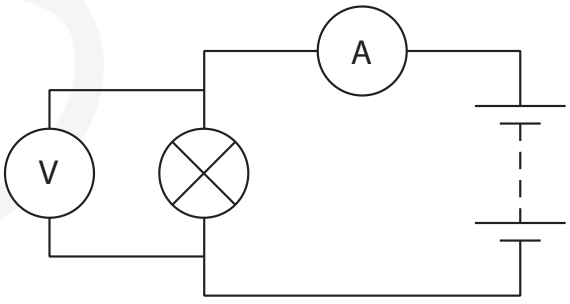
Which of these circuits will let her measure the current in the circuit and the potential difference (voltage) across the lamp?

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

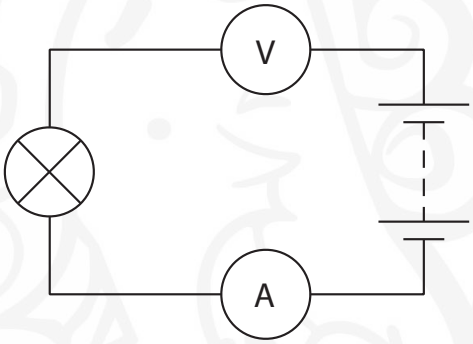
(1)



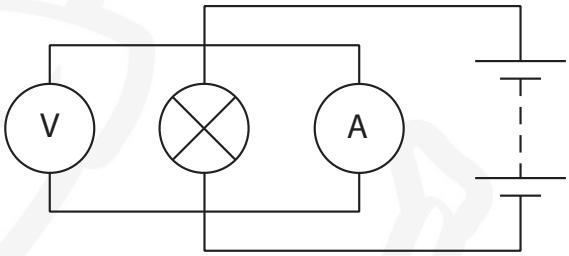
☒ **A**



☒ **B**



☒ **C**



☒ **D**

(b) The student finds that the current in the lamp is 0.80 A.

(i) Calculate the amount of charge that passes through the lamp in 4.0 minutes.

(3)

charge = ... C

(ii) The student also finds that the potential difference across the lamp is 3.0 V.

Calculate the power of the lamp.

(2)

power = ... W

(c) The student replaces the lamp in the circuit with a different one.

The current in this lamp is 0.60 A when the potential difference across it is 3.0 V.

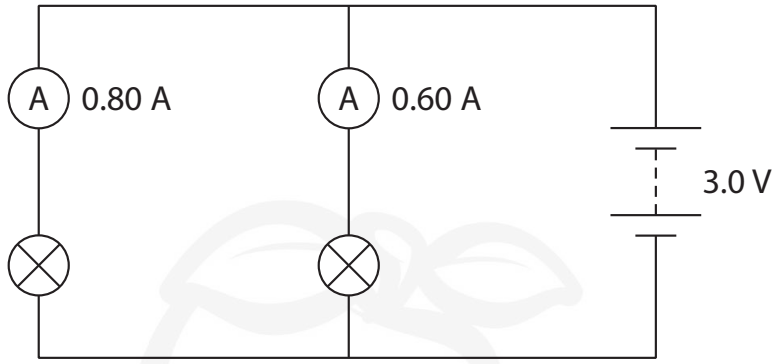
State how the resistance of this lamp compares to the resistance of the first lamp.

(1)

.....

.....

(d) The student connects both lamps in parallel to the 3.0 V battery as shown in the diagram.



What is the size of the current in the battery?

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

(1)

- ☒ **A** 0.2 A
- ☒ **B** 0.7 A
- ☒ **C** 1.4 A
- ☒ **D** 1.8 A

(e) A filament lamp is one example of a component in a circuit.

A light-dependent resistor (LDR) can be another component in a circuit.

A light is shone on a light-dependent resistor (LDR) in a circuit.

Explain how this changes the current in the circuit.

(2)

.....

.....

.....

.....

(Total for Question 4 = 10 marks)

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Radioactivity and nuclear energy

5 (a) One isotope of uranium is U-235.

The nucleus can be represented as $^{235}_{92}U$.

Complete the following sentence.

(2)

A nucleus of U-235 contains ..... protons and ..... neutrons.

(b) Uranium-235 decays by emitting an alpha particle.

(i) The table gives information about different types of radiation.

Tick (✓) **two** lines that are correct for an alpha particle.

(2)

information about radiation	**tick (✓)**
is an electron	
is electromagnetic radiation	
is two protons and two neutrons	
has a positive charge	
has a negative charge	
has no charge	

(ii) Describe the ionising **and** penetrating abilities of alpha particles.

(2)

.....

.....

.....

.....

*(c) Uranium-235 can be used in nuclear fission reactions but not in nuclear fusion reactions.

Describe a nuclear fission reaction and a nuclear fusion reaction.

Your answer should identify the differences between the two types of nuclear reaction.

(6)

(Total for Question 5 = 12 marks)

Uses and dangers of radioactivity

6 (a) Medical supplies, such as the bandage shown in the photograph, have to be sterilised before they are sold.

There are two ways of sterilising medical supplies:

- they can be heated to a high temperature in an oven
- they can be irradiated using a radioactive isotope.

(i) Suggest **one** advantage of using radiation rather than high temperatures to sterilise medical supplies.

(1)

.....

(ii) Cobalt-60 is a radioactive isotope used to sterilise medical supplies.

Cobalt-60 has a half-life of 5 years.

Calculate how long it takes for the activity of a sample of cobalt-60 to fall to one quarter (25%) of its original value.

(2)

time = ... years

(b) This is part of an article in a newspaper:

> A truck carrying a large quantity of cobalt-60 was stolen by thieves.
> The next day, a farmer found the stolen truck in his field.
> The cobalt-60 was on the ground, with its protective shielding removed.
> The cobalt-60 was later recovered by radiation specialists.

(i) State **one** way that the cobalt-60 could be a danger to the health of the farmer.

(1)

.....

.....

(ii) Suggest **two** precautions the radiation specialists should take when they recover the stolen cobalt-60.

(2)

1 .....

.....

2 .....

.....

*(c) The table shows information about cobalt-60 and two other radioactive isotopes.

isotope	type of radiation emitted	half-life
cobalt-60	gamma	5 years
radium-223	alpha	11 days
sodium-24	gamma	15 hours

Medical supplies in cardboard boxes are sterilised using radiation.

Use the information in the table to explain why cobalt-60 is better than the other two isotopes for this purpose.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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