Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number | Candidate Number

Wednesday 22 May 2019

Afternoon (Time: 1 hour 10 minutes) | Paper Reference **1SC0/1PF**

Combined Science

Paper 3: Physics 1

Foundation Tier

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.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

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.*
- In questions marked with an asterisk (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.
- A list of equations is included at the end of this exam paper.

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

Pearson

Answer ALL questions. Write your answers in the spaces provided.

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 ☒.

1 (a) Figure 1 shows a speed/time graph for a car.

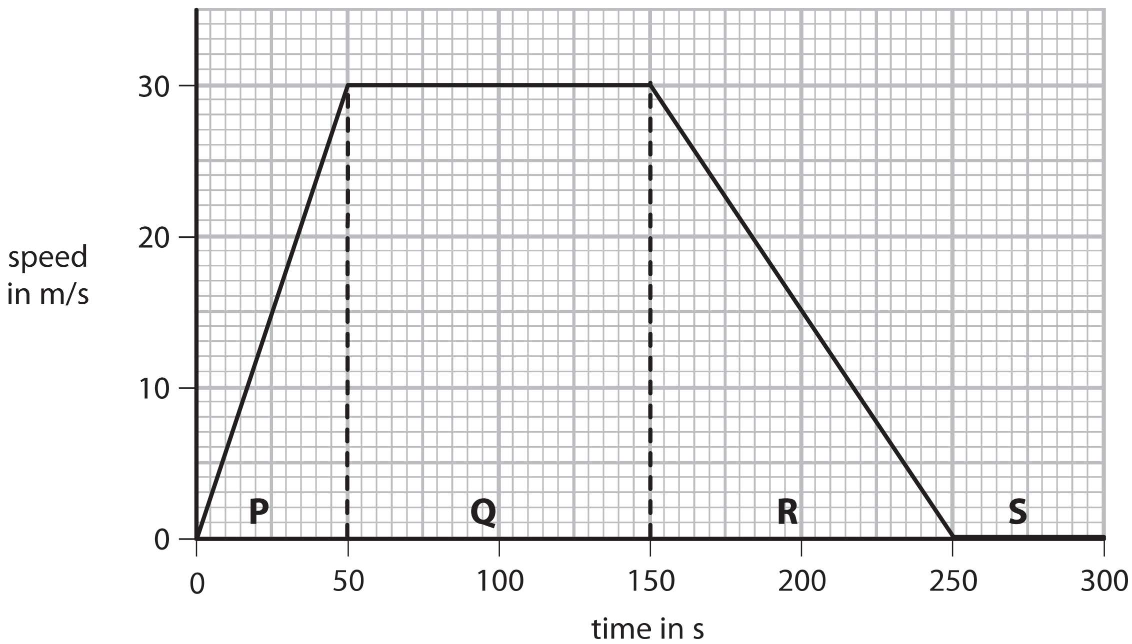

Figure 1

(i) The graph in Figure 1 is divided into four parts, **P**, **Q**, **R** and **S**.

Draw a line from the letter for each **part** to the correct **description of the motion** during that part.

One line has been drawn for you.

(2)

part	**description of the motion**
P	the car is standing still
Q	the car is accelerating
R	the car is decelerating
S	the car is travelling at constant speed

(ii) In two parts of the graph in Figure 1 the forces are balanced.

State the letters of the two parts of the graph where the horizontal forces acting on the car are balanced.

(2)

part .... and part ....

(iii) Calculate the distance travelled by the car in part Q.

Use the equation

$$\text{distance travelled} = \text{average speed} \times \text{time}$$

(2)

distance travelled = ... m

(b) A car with a mass of 1800 kg is accelerating at 1.2 m/s^2.

Calculate the force used to accelerate the car.

Use the equation

$$\text{force} = \text{mass} \times \text{acceleration}$$

(2)

force = ... N

(Total for Question 1 = 8 marks)

2 (a) Figure 2 shows an energy transfer diagram for a steam engine.

The diagram shows the amounts of energy transferred each second by the steam engine.

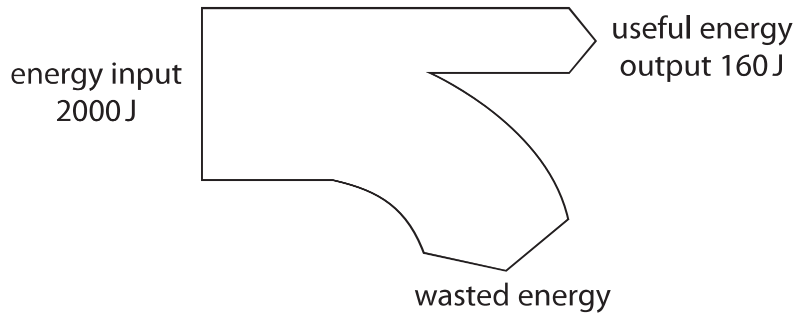

Figure 2

(i) Calculate the amount of wasted energy.

(1)

wasted energy = ... J

(ii) Calculate the efficiency of the steam engine.

Use the equation

$$\text{efficiency} = \frac{\text{(useful energy transferred by the steam engine)}}{\text{(total energy supplied to the steam engine)}}$$

(2)

efficiency = ...

(iii) State what happens to the wasted energy.

(1)

....

....

(iv) Coal is a fossil fuel that is burnt in some steam engines.

State **two** ways that the use of coal might be harmful to the environment.

(2)

1 ....

....

2 ....

....

(b) A model train has a mass of 8.0 kg.
It travels at a speed of 1.5 m/s.

Calculate the kinetic energy of the model train.

Use the equation

$$\text{kinetic energy} = \tfrac{1}{2} \times \text{mass} \times (\text{speed})^2$$

(3)

kinetic energy = ... J

(Total for Question 2 = 9 marks)

3 (a) (i) Use words from the box to complete the sentences below about ions.

absorbing	gaining	inner	losing	outer

(2)

Atoms may form positive ions by .... electrons.

The electrons involved in forming positive ions are the .... electrons.

(ii) Which of these radiations is both electromagnetic and ionising?

(1)

☒ **A** alpha

☒ **B** beta minus

☒ **C** gamma

☒ **D** neutron

(iii) Which type of radiation will travel the shortest distance in air?

(1)

☒ **A** alpha

☒ **B** beta minus

☒ **C** beta plus

☒ **D** gamma

(b) Lead-214 is a radioactive isotope.

(i) State **one** way in which radioactive isotopes can be harmful to people.

(1)

....

....

(ii) Lead-214 emits β^- particles.

Describe what happens to the nucleus of a lead-214 atom when it emits a β^- particle.

(2)

....

....

....

....

(c) The typical size of an atom is

(1)

- ☒ **A** 10^{-5} m
- ☒ **B** 10^{-10} m
- ☒ **C** 10^{-15} m
- ☒ **D** 10^{-20} m

(d) The mass of a proton is 1.6726×10^{-27} kg.
The mass of an electron is 9.1094×10^{-31} kg.

Calculate how many times the mass of a proton is greater than the mass of an electron.

Give your answer to two significant figures.

(3)

.... times

(Total for Question 3 = 11 marks)

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P 6 0 2 4 8 A 0 8 2 0

4 (a) (i) Which of these would be a typical speed for a racing cyclist travelling down a steep straight slope?

(1)

☒ **A** 0.2 m/s

☒ **B** 2 m/s

☒ **C** 20 m/s

☒ **D** 200 m/s

(ii) A cyclist travels down a slope.
The top of the slope is 20 m vertically above the bottom of the slope.
The cyclist has a mass of 75 kg.

Calculate the change in gravitational potential energy of the cyclist between the top and the bottom of the slope.

The gravitational field strength, g, is 10 N/kg.

(3)

change in gravitational potential energy = ... J

(b) An aircraft waits at the start of a runway.
The aircraft accelerates from a speed of 0 m/s to a speed of 80 m/s.
The acceleration of the aircraft is 4 m/s^2.

Calculate the distance, *x*, travelled by the aircraft while it is accelerating.

Use the equation

$$x = \frac{v^2 - u^2}{2a}$$

(2)

x = ... m

(c) A student needs to measure the average speed of an accelerating trolley between two marks on a bench.

Figure 3 shows the arrangement of some apparatus that the student can use.

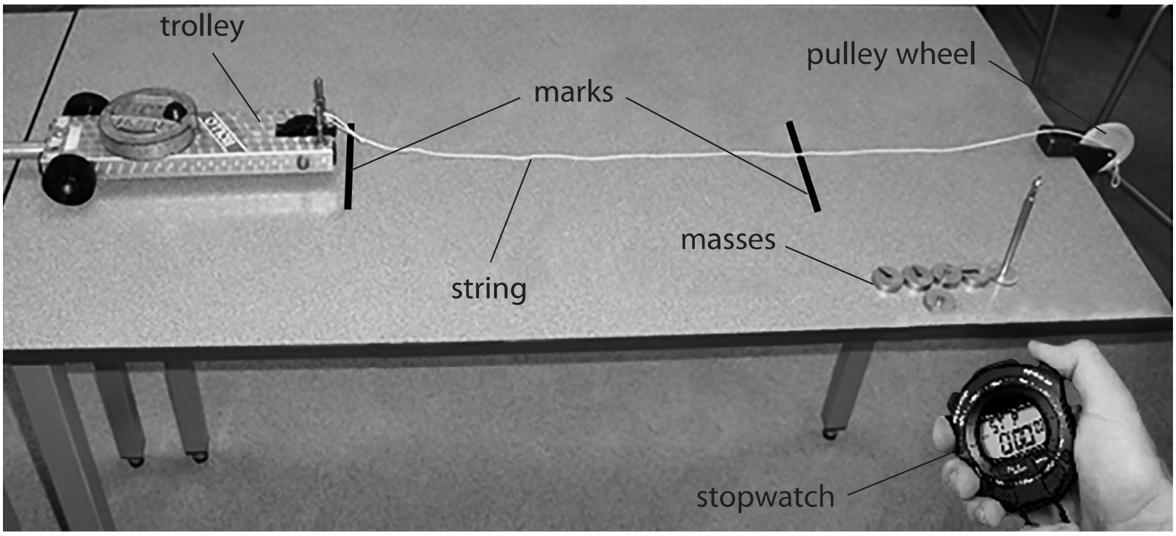

Figure 3

(i) One piece of apparatus is missing from the diagram.
This piece of apparatus is needed to determine the average speed.

State the extra piece of apparatus needed to determine the average speed.

(1)

....

(ii) Describe how the student can make the trolley accelerate along the bench.

(2)

....

....

....

....

(iii) The student wishes to develop the experiment to determine the acceleration of the trolley.

State **one other** measurement that the student must make to determine the acceleration of the trolley.

(1)

....

....

(Total for Question 4 = 10 marks)

5 (a) Which colour of visible light has the longest wavelength?

(1)

☒ **A** blue

☒ **B** green

☒ **C** red

☒ **D** yellow

(b) Some television remote controls use infrared radiation and other remote controls use radio waves.

Explain why an infrared remote control may not switch on the television from behind an armchair but a radio wave remote control always will.

(2)

....

....

....

....

(c) Figure 4 is a diagram of a water wave.

A cork is floating on the water.

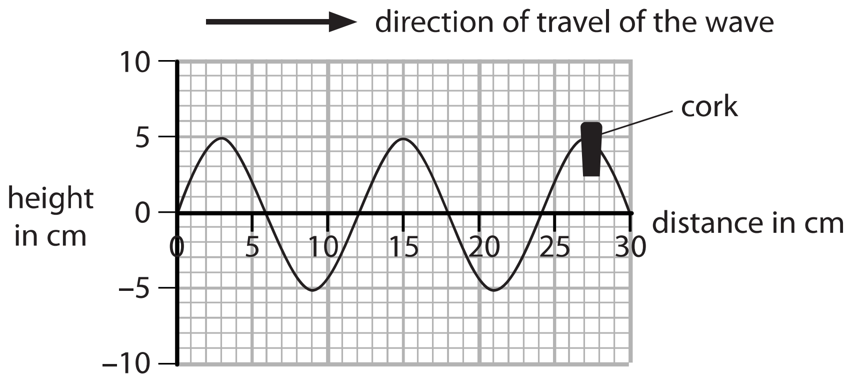

Figure 4

(i) Use the scale on the diagram to measure the wavelength of the wave.

(2)

wavelength = ... cm

(ii) Describe the motion of the cork.

You should include how the cork moves relative to the direction of travel of the wave.

(2)

....

....

....

....

(d) A different water wave has a wavelength of 0.25 m and a frequency of 1.5 Hz.

Calculate the wave speed.

(2)

wave speed = ... m/s

(Total for Question 5 = 9 marks)

6 (a) Carbon-13 and carbon-14 are isotopes of carbon.

Nuclei of carbon-13 and carbon-14 can be represented by these symbols

$$^{13}_{6}C \quad \text{and} \quad ^{14}_{6}C$$

Complete the table for an atom of carbon-13 and an atom of carbon-14.

(2)

	number of neutrons in the nucleus	**number of electrons in orbit around the nucleus**
carbon-13		
carbon-14		

(b) (i) State the name of an instrument that can be used to measure radioactivity.

(1)

....

(ii) State **two** sources of background radiation.

(2)

1 ....

2 ....

(c) Carbon-14 is radioactive and has a half-life of 5 700 years.

The number of radioactive carbon-14 atoms in a very old piece of wood is found to have decreased from 1 000 000 to 125 000.

Determine the age of the piece of wood.

(2)

age of wood = ... years *(d) In 1908 a scientist called Rutherford was investigating ideas about atoms.

His students fired a beam of alpha particles at a thin piece of gold foil.

Figure 5 shows the arrangement of the experiment.

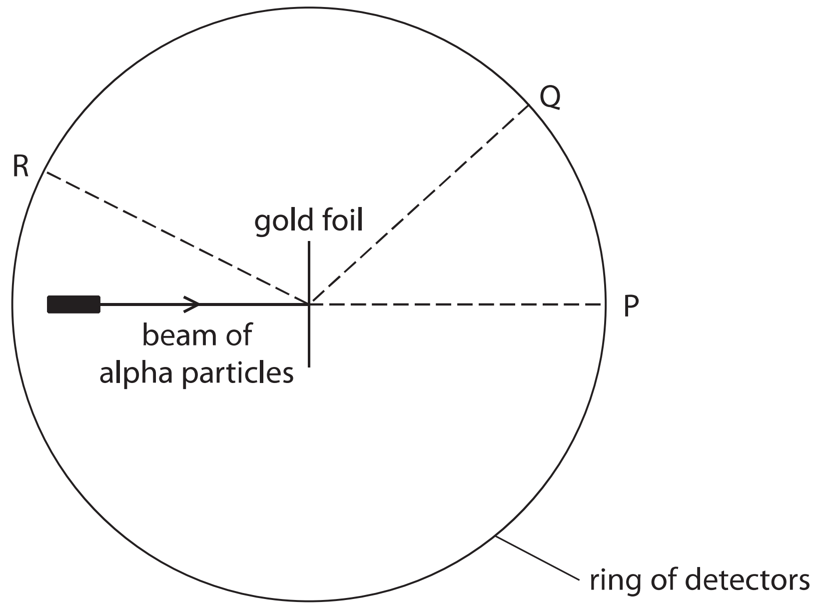

Figure 5

Some alpha particles were found at all parts of the ring of detectors.

The table in Figure 6 shows how many alpha particles were detected at P, at Q and at R, in one experiment.

position	number of alpha particles detected
P	72340
Q	25
R	2

Figure 6

Explain what the information in Figure 5 and Figure 6 shows about the structure of an atom.

(6)

....

....

....

....

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(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS

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Equations

(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance $v^2 - u^2 = 2 \times a \times x$
energy transferred = current × potential difference × time $E = I \times V \times t$
potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil $V_p \times I_p = V_s \times I_s$
change in thermal energy = mass × specific heat capacity × change in temperature $\Delta Q = m \times c \times \Delta\theta$
thermal energy for a change of state = mass × specific latent heat $Q = m \times L$
$P_1 V_1 = P_2 V_2$ to calculate pressure or volume for gases of fixed mass at constant temperature
energy transferred in stretching = 0.5 × spring constant × (extension)^2 $E = ½ \times k \times x^2$