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

Time 1 hour 10 minutes

Paper reference **1SC0/1PF**

Combined Science
PAPER 3
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.
- Good luck with your examination.

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 the parts of the electromagnetic spectrum.

gamma rays	x-rays	**J**	visible	**K**	micro-waves	**L**

Figure 1

(i) Which row of the table names the parts **J**, **K** and **L** of the electromagnetic spectrum?

(1)

		J	K	L
☒	**A**	infrared	radio	ultraviolet
☒	**B**	radio	infrared	ultraviolet
☒	**C**	ultraviolet	infrared	radio
☒	**D**	ultraviolet	radio	infrared

(ii) All electromagnetic waves can travel in a vacuum.

Which of these is the same for all electromagnetic waves travelling in a vacuum?

(1)

☒ **A** amplitude

☒ **B** frequency

☒ **C** speed

☒ **D** wavelength

(b) X-rays can be useful and harmful to humans.

(i) State **one** way that x-rays are useful to humans.

(1)

....

(ii) State **one** way that x-rays are harmful to humans.

(1)

....

(c) A person warms their hands in front of a hot fire as shown in Figure 2.

(Source: © Andreas Saldavs/Shutterstock)

Figure 2

Use words from the box to complete the following sentences.

chemical	infrared	radio	thermal	ultraviolet

(2)

The electromagnetic waves that the fire mostly emits are .... waves.

These waves transfer .... energy to the hands.

(Total for Question 1 = 6 marks)

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2 (a) A cyclist has a mass of 64 kg.

(i) The cyclist rides from a flat road to the top of a hill.

The top of the hill is 24 m above the flat road.

Calculate the gain in gravitational potential energy, ΔGPE, of the cyclist.

Use $g = 10$ N/kg

Use the equation

$$\Delta GPE = m \times g \times \Delta h$$

(2)

gain in gravitational potential energy = ... J

(ii) The cyclist returns to the flat road.

The mass of the cyclist is 64 kg.

Calculate the kinetic energy of the cyclist when the cyclist is travelling at 6.0 m/s.

Use the equation

$$KE = \frac{1}{2} \times m \times v^2$$

(3)

kinetic energy = ... J

(iii) The cyclist then uses the brakes on the bicycle to stop.

Explain what happens to the kinetic energy of the cyclist.

(2)

....

....

....

....

(b) A different cyclist uses a motorised bicycle.

The motorised bicycle is powered by an electric motor.

Figure 3 is an energy diagram for the motor.

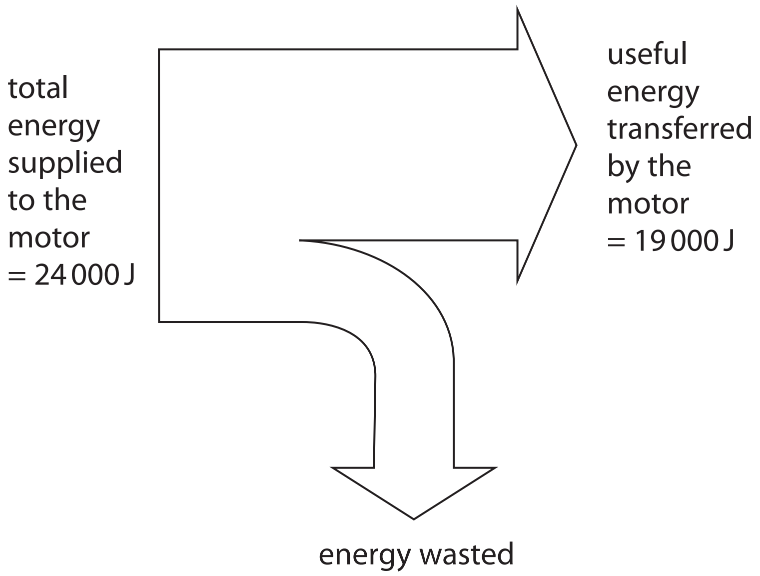

Figure 3

(i) Calculate how much energy is wasted.

(1)

energy wasted = ... J

(ii) Calculate the efficiency of the electric motor.

(2)

Use the equation:

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

efficiency of electric motor = ...

(Total for Question 2 = 10 marks)

3 (a) A car is travelling at 10 m/s.

The driver sees a danger and stops the car.

(i) The stopping distance for the car would be smaller if the car

(1)

- ☒ **A** had more passengers
- ☒ **B** had worn tyres
- ☒ **C** needed new brakes
- ☒ **D** was travelling more slowly

Figure 4 shows a speed-time graph for the driver stopping the car.

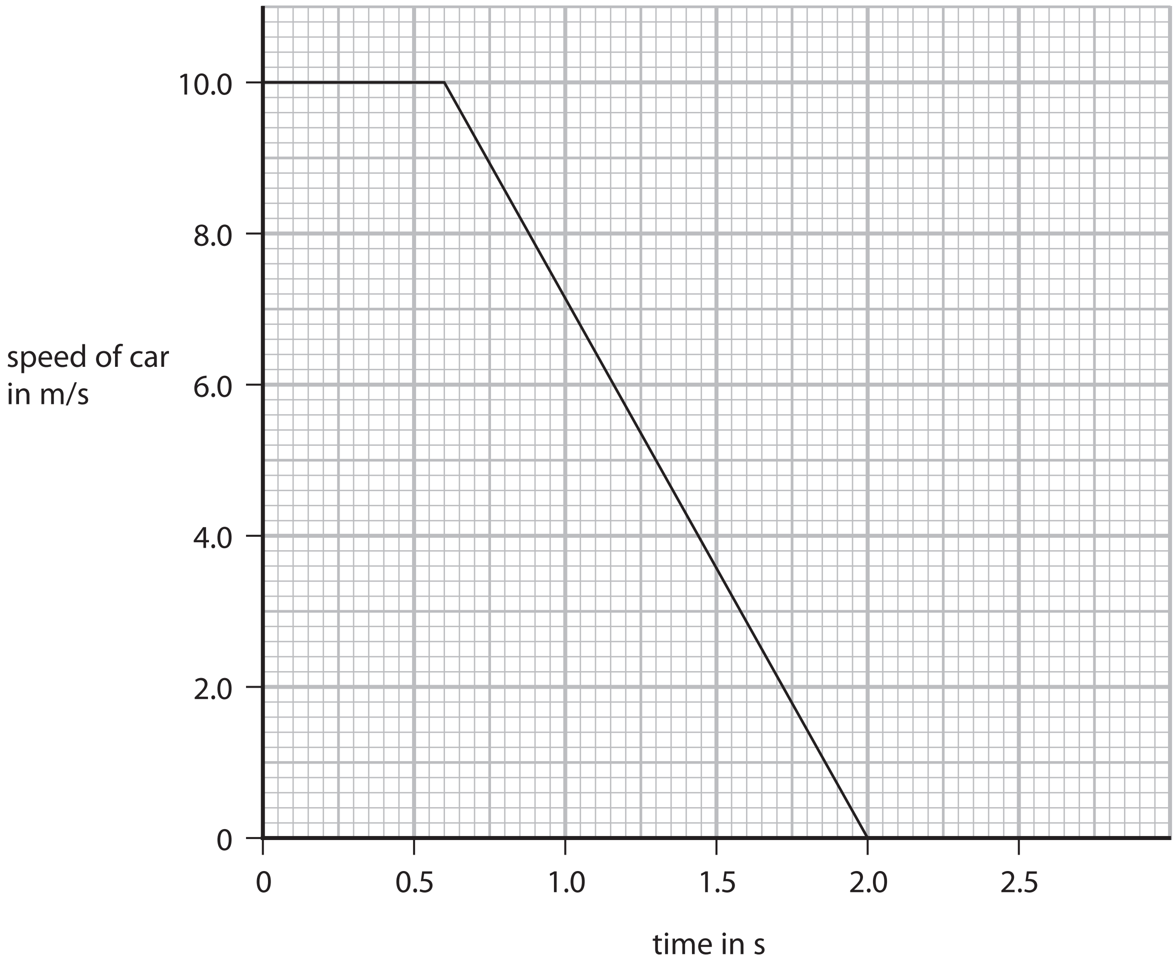

Figure 4

(ii) Use the graph to find the driver's reaction time.

(2)

reaction time = ... s

(b) Figure 5 shows the apparatus a student uses to investigate how the stopping distance of a toy car depends on the type of surface that it is stopping on.

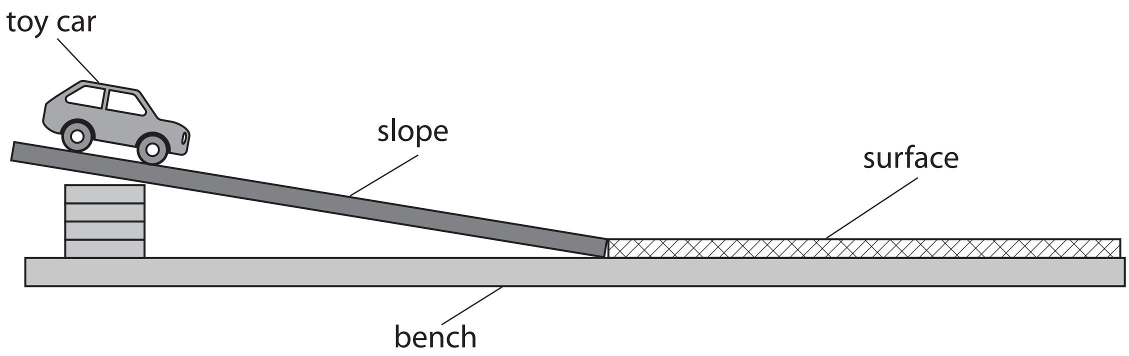

Figure 5

Describe an experiment to find out how the stopping distance depends on the surface that stops the toy car.

(2)

....

....

....

....

(c) Figure 6 shows a set of results used to find the average stopping distance of the toy car on a surface.

test number	stopping distance in m
1	0.35
2	0.32
3	0.52
4	0.38
5	0.33

Figure 6

(i) State the anomalous value of stopping distance given in the table in Figure 6.

(1)

....

(ii) Use the results in Figure 6 to calculate the average stopping distance.

(2)

average stopping distance = ... m

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(iii) State **one** way the student could increase the speed of the car as it reaches the flat surface.

(1)

....

....

(d) A car is travelling down a slope at 2.0 m/s.

The car accelerates for 4.0 s.

The speed of the car increases to 12 m/s.

Calculate the acceleration of the car.

Use the equation

$$a = \frac{(v - u)}{t}$$

(2)

acceleration of the car = ... m/s^2

(Total for Question 3 = 11 marks)

4 Quantities can be either scalar or vector.

(a) Which of these is a vector quantity?

(1)

- ☒ **A** mass
- ☒ **B** force
- ☒ **C** energy
- ☒ **D** distance

(b) Figure 7 shows a ball bearing as it falls slowly through a clear, dense liquid.

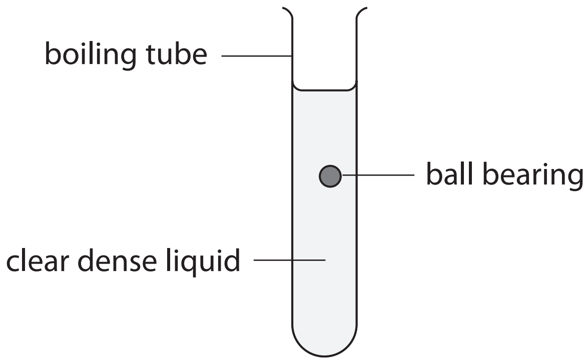

Figure 7

The apparatus in Figure 7 is used to find the average speed of the ball bearing as it falls.

(i) Devise an experiment to determine the average speed of the ball bearing as it falls through the liquid.

(4)

You should include:

- any extra apparatus you would use to take measurements
- the measurements you would take
- how you would calculate the speed.

....

....

....

....

....

....

....

....

(ii) A student thinks that the ball bearing falls through the liquid at a constant speed.

Explain how you could develop this experiment to determine if the ball bearing falls through the liquid at constant speed.

You may draw a diagram to help your answer.

(2)

....

....

....

....

(c) The ball bearing is now dropped through air.

The initial velocity of the ball bearing is zero.

The acceleration of the ball bearing is 10 m/s^2.

The ball bearing falls 1.5 m.

Calculate the velocity of the ball bearing when it has fallen 1.5 m.

Use the equation

$$v^2 - u^2 = 2 \times a \times x$$

(2)

velocity of ball bearing = ... m/s

(Total for Question 4 = 9 marks)

Turn over ▶

5 (a) Figure 8 shows part of a wave.

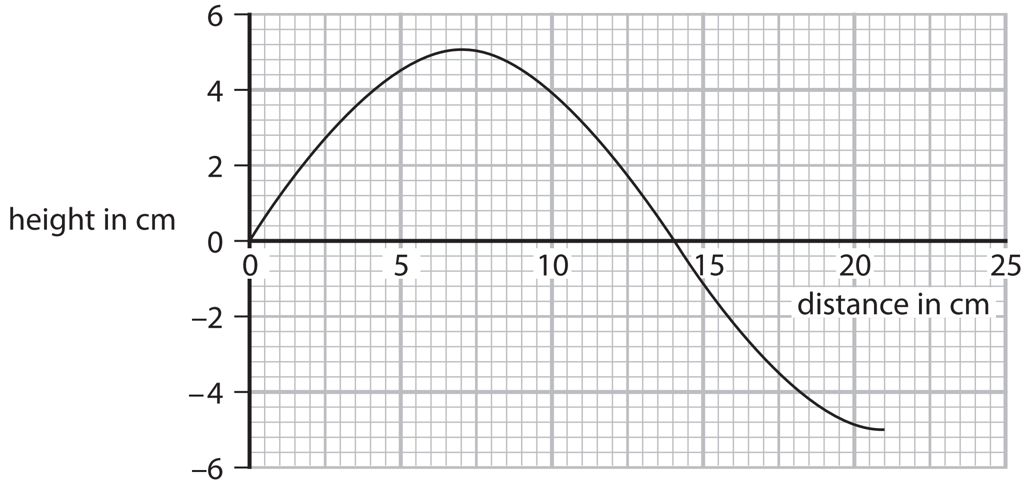

Figure 8

Use data from Figure 8 to calculate the wavelength of the wave.

(2)

wavelength = ... cm

(b) (i) Figure 9 shows a student sitting on the shore of a lake watching ripples on the surface of the water moving past a toy boat.

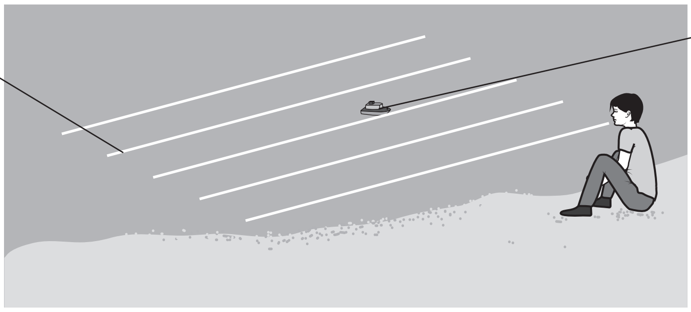

Figure 9

The student has a stopwatch.

Describe how the student could determine the frequency of the ripples on the lake.

(3)

....

....

....

....

....

....

(ii) The speed of a water wave is 1.5 m/s.

The frequency of the wave is 0.70 Hz.

Calculate the wavelength of this wave.

Use the equation

$$v = f \times \lambda$$

(2)

wavelength = ... m

(iii) Water waves are transverse waves.

Describe the difference between transverse waves and longitudinal waves.

(2)

....

....

....

....

(c) Sound waves travel at 330 m/s in air.

A student sees a flash of lightning.

The student hears the sound of thunder 4.0 s later.

Calculate the distance from the student to the flash of lightning.

Use the equation

$$x = v \times t$$

(2)

distance = ... m

(Total for Question 5 = 11 marks)

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6 This question is about radioactivity.

(a) Alpha (α), beta (β) and gamma (γ) are three types of radioactive emissions.

Which statement describes **all** of these radioactive emissions?

(1)

- ☒ **A** ionising and emitted by stable nuclei
- ☒ **B** ionising and emitted by unstable nuclei
- ☒ **C** neutral and emitted by stable nuclei
- ☒ **D** neutral and emitted by unstable nuclei

(b) Fluorine-19 is a stable isotope of the element fluorine.

The element fluorine also has several radioactive isotopes.

Describe **one** similarity and **one** difference between the numbers of particles in one nucleus of fluorine-19 and one nucleus of a radioactive isotope of fluorine.

(2)

similarity ....

....

difference ....

....

(c) Figure 10 shows a Geiger–Muller (G–M) tube attached to a counter.
The G–M tube is used to measure the activity of a source of beta (β) radiation.
There is an aluminium sheet between the beta source and the G–M tube.
The counter is switched on and after 1 minute shows a count of 268.

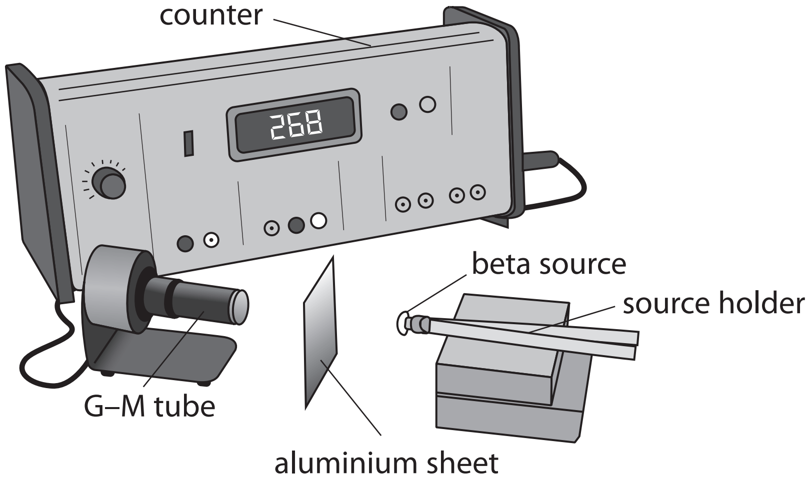

Figure 10

(i) The aluminium sheet is taken away.
The counter is reset to zero and then switched on again.
A new count is taken for 1 minute.

Explain why the new count is greater than 268.

(2)

....

....

....

....

(ii) The beta source is then also taken away.
The counter is reset to zero and switched on again.
A new count is taken for 1 minute.

Give a reason why there would now be a reading on the counter.

(1)

....

....

(iii) State the SI unit for the activity of a radioactive source.

(1)

....

*(d) Exposing people to radioactive sources can be dangerous.

Describe the dangers of exposure to radioactive sources and what can be done to protect hospital staff when they are working with radioactive sources.

(6)

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(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS

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 $Q = m \times L$
to calculate pressure or volume for gases of fixed mass at constant temperature $P_1 V_1 = P_2 V_2$
energy transferred in stretching = 0.5 × spring constant × (extension)^2 $E = \frac{1}{2} \times k \times x^2$