Paper Reference(s) 1SC0/1PF
Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Combined Science

PAPER 3

Foundation Tier

Total Marks

Time: 1 hour 10 minutes plus your additional time allowance

In the boxes below, write your name, centre number and candidate number.

Surname					
Other names					
Centre Number					
Candidate Number					

X66624A

Pearson

YOU MUST HAVE

Calculator, ruler

YOU WILL BE GIVEN

Diagram Booklet, Equation Booklet

INSTRUCTIONS

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.

An Equation Booklet is provided.

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.

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) Look at Figure 1 for Question 1(a) in the Diagram Booklet. It shows the parts of the electromagnetic spectrum.

(i) Which row of the table names the parts J, K and L of the electromagnetic spectrum? (1 mark)

		J	K	L
☐	A	infrared	radio	ultraviolet
☐	B	radio	infrared	ultraviolet
☐	C	ultraviolet	infrared	radio
☐	D	ultraviolet	radio	infrared

(continued on the next page)

1 continued.

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

Which of these is the same for all electromagnetic waves travelling in a vacuum? (1 mark)

☐ A amplitude

☐ B frequency

☐ C speed

☐ D wavelength

(continued on the next page)

1 continued.

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

(i) State ONE way that x-rays are useful to humans.
(1 mark)

_____

_____

(ii) State ONE way that x-rays are harmful to humans.
(1 mark)

_____

_____

(continued on the next page)

1 continued.

(c) A person warms their hands in front of a hot fire.

Use words from the list below to complete the following sentences.
(2 marks)

chemical

infrared

radio

thermal

ultraviolet

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

These waves transfer _____ energy to the hands.

(Total for Question 1 = 6 marks)

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.
(2 marks)

Use g = 10 N / kg

Use the equation

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

gain in gravitational potential energy = _____ J

(continued on the next page)

2 continued.

(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.
(3 marks)

Use the equation

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

kinetic energy = _____ J

(continued on the next page)

2 continued.

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

Explain what happens to the kinetic energy of the cyclist.
(2 marks)

(continued on the next page)

2 continued.

(b) A different cyclist uses a motorised bicycle.

The motorised bicycle is powered by an electric motor.

Look at Figure 3 for Question 2(b) in the Diagram Booklet. It is an energy diagram for the motor.

(i) Calculate how much energy is wasted. (1 mark)

energy wasted = _____ J

(continued on the next page)

2 continued.

(ii) Calculate the efficiency of the electric motor.
(2 marks)

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 mark)

☐ A had more passengers

☐ B had worn tyres

☐ C needed new brakes

☐ D was travelling more slowly

Look at Figure 4 for Question 3(a)(ii) in the Diagram Booklet. It shows a speed-time graph for the driver stopping the car.

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

reaction time = _____ s

(continued on the next page)

3 continued.

(b) Look at Figure 5 for Question 3(b) in the Diagram Booklet. It 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.

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

(continued on the next page)

3 continued.

(c) Look at Figure 6 for Question 3(c) in the Diagram Booklet. It shows a set of results used to find the average stopping distance of the toy car on a surface.

(i) State the anomalous value of stopping distance given in the table in Figure 6. (1 mark)

(continued on the next page)

3 continued.

(ii) Use the results in Figure 6 in the Diagram Booklet to calculate the average stopping distance.
(2 marks)

average stopping distance = _____ m

(continued on the next page)

3 continued.

(iii) State ONE way the student could increase the speed of the car as it reaches the flat surface. (1 mark)

_____

_____

_____

(continued on the next page)

3 continued.

(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.
(2 marks)

Use the equation

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

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 mark)

☐ **A mass**

☐ **B force**

☐ **C energy**

☐ **D distance**

(continued on the next page)

4 continued.

(b) Look at Figure 7 for Question 4(b) in the Diagram Booklet. It shows a ball bearing as it falls slowly through a clear, dense liquid.

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 marks)

You should include:

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

(continued on the next page)

4 continued.

(continued on the next page)

4 continued.

(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 marks)

(continued on the next page)

4 continued.

(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.
(2 marks)

Use the equation

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

velocity of ball bearing = _____ m/s

(Total for Question 4 = 9 marks)

5 (a) Look at Figure 8 for Question 5(a) in the Diagram Booklet. It shows part of a wave.

Use data from Figure 8 to calculate the wavelength of the wave.
(2 marks)

wavelength = _____ cm

(continued on the next page)

5 continued.

(b) (i) Look at Figure 9 for Question 5(b)(i) in the Diagram Booklet. A student is sitting on the shore of a lake watching ripples on the surface of the water moving past a toy boat.

Figure 9 shows the ripples on the surface of the water moving past the boat.

The student has a stopwatch.

Describe how the student could determine the frequency of the ripples on the lake.
(3 marks)

(continued on the next page)

5 continued.

_____

_____

(continued on the next page)

5 continued.

(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.
(2 marks)

Use the equation

$v = f \times \lambda$

wavelength = _____ m

(continued on the next page)

5 continued.

(iii) Water waves are transverse waves.

Describe the difference between transverse waves and longitudinal waves.
(2 marks)

(continued on the next page)

5 continued.

(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.
(2 marks)

Use the equation

$$x = v \times t$$

distance = _____ m

(Total for Question 5 = 11 marks)

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 mark)

- ☐ **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**

(continued on the next page)

6 continued.

(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 marks)

similarity

_____

_____

_____

difference

_____

_____

_____

(continued on the next page)

6 continued.

(c) Look at Figure 10 for Question 6(c) in the Diagram Booklet. It 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.

(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 marks)

(continued on the next page)

6 continued.

(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 mark)

_____

_____

_____

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

_____

_____

(continued on the next page)

6 continued.

*(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 marks)

(continued on the next page)

6 continued.

(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS

END OF PAPER