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

Total Marks

# Combined Science
## Paper 3
## Foundation Tier

**Wednesday 20 May 2020 – Afternoon**

**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 | | | | | |

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Pearson

**YOU MUST HAVE**

**Calculator, ruler**

**YOU WILL BE GIVEN**

**Diagram Booklet, Equations 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.**

**A list of equations is provided as a separate booklet.**

## 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.**

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**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 the diagram for Question 1(a) in the Diagram Booklet. Draw one line from each USE OF WAVE to the matching ELECTROMAGNETIC WAVE.**

**One line has been drawn for you.**
**(3 marks)**

**(continued on the next page)**

1 continued.

(b) Ultraviolet light has a higher frequency than infrared light.

Which of these colours of visible light has the highest frequency? (1 mark)

☐ A blue

☐ B green

☐ C orange

☐ D yellow

(continued on the next page)

1 continued.

(c) Look at Figure 1 for Question 1(c) in the Diagram Booklet. It shows how the brightness of a source of light changes with wavelength.

Describe how the brightness changes with wavelength.
(2 marks)

(Total for Question 1 = 6 marks)

2 (a) (i) **Which of these is the correct equation that relates force, mass and acceleration?**
**(1 mark)**

☐ **A** $F = m + a$

☐ **B** $F = m - a$

☐ **C** $F = m \times a$

☐ **D** $F = m \div a$

**(continued on the next page)**

2 continued.

(ii) A cyclist has a mass of 70 kg.

Calculate the force needed to accelerate the cyclist at $2{\cdot}0\,m/s^2$.

State the unit.
(2 marks)

force = _____ unit = _____

(continued on the next page)

2 continued.

(b) Another cyclist travels 1200 m in a time of 80 s.

Calculate the average speed of the cyclist.
(2 marks)

Use the equation

$$\text{average speed} = \frac{\text{distance}}{\text{time}}$$

average speed = _____ m/s

(continued on the next page)

2 continued.

(c) A student wants to measure the average speed of a cyclist.

The student estimates that one of his own steps is 1 m.

He counts 100 steps between two posts on a track.

He uses a stopwatch to measure the time the cyclist takes to travel between the two posts.

Look at Figure 2 for Question 2(c) in the Diagram Booklet. It shows the set-up used to measure the average speed.

State TWO improvements the student could make to this method. (2 marks)

(continued on the next page)

**2 continued.**

**1** _____

_____

_____

**2** _____

_____

_____

**(Total for Question 2 = 7 marks)**

3 (a) Look at Figure 3 for Question 3(a) in the Diagram Booklet. It shows the symbol for the nucleus of an atom of strontium-90.

(i) How many protons are in the nucleus of an atom of strontium-90? (1 mark)

☐ A 38

☐ B 52

☐ C 90

☐ D 128

(continued on the next page)

3 continued.

(ii) How many neutrons are in the nucleus of an atom of strontium-90? (1 mark)

☐ A 38

☐ B 52

☐ C 90

☐ D 128

(continued on the next page)

3 continued.

(b) The half-life of strontium-90 is 29 years.

Look at Figure 4 for Question 3(b) in the Diagram Booklet. It gives some information about how the mass of a sample of strontium-90 changes with time.

Complete the table in Figure 4.
(2 marks)

(continued on the next page)

3 continued.

(c) A teacher sets up an experiment to show some students how far beta particles travel in air.

Look at Figure 5 for Question 3(c) in the Diagram Booklet. It shows some of the equipment she uses.

(i) State the scientific name for the radioactivity detector shown in Figure 5.
(1 mark)

(continued on the next page)

3 continued.

The teacher also has:

- a radioactive source that emits only beta particles
- a metre rule.

(ii) State TWO precautions the teacher must take to protect herself from the effects of radioactivity.
(2 marks)

1 _____

_____

_____

2 _____

_____

_____

(continued on the next page)

3 continued.

(iii) Describe how the teacher could show how far beta particles travel in air.
(4 marks)

(continued on the next page)

3 continued.

(Total for Question 3 = 11 marks)

4 (a) Look at Figure 6 for Question 4(a) in the Diagram Booklet. It shows a large tank of water.

The tank of water is used to study water waves.

(i) Water waves are transverse waves.

Give another example of a transverse wave.
(1 mark)

(continued on the next page)

4 continued.

(ii) Look at Figure 7 for Question 4(a)(ii) in the Diagram Booklet. It shows a side view of part of the tank.

A water wave is moving from L to M.

Calculate the wavelength of the wave.
(2 marks)

wavelength = _____ m

(continued on the next page)

4 continued.

(iii) A technician stands at the side of the tank.

He counts the peaks of the waves as they pass him.

12 peaks pass the technician in a time of 15 s.

Calculate the frequency of the wave. (2 marks)

frequency = _____ Hz

(continued on the next page)

4 continued.

(b) Look at Figure 8 for Question 4(b) in the Diagram Booklet. It shows part of the inside of the Earth below the surface.

An earthquake starts at **Q**.

A seismic wave travels from **Q** to **S**.

The seismic wave is a longitudinal wave.

(i) Draw arrows on Figure 8 to show how the rock at **R** moves when the seismic wave passes through **R**.
(2 marks)

(continued on the next page)

4 continued.

(ii) The frequency of the seismic wave is 12 Hz.

The wave speed of the seismic wave is 7 km/s.

Calculate the wavelength of the seismic wave, in metres.
(3 marks)

Use the equation

$$\text{wavelength} = \frac{\text{wave speed}}{\text{frequency}}$$

wavelength = _____ m

(continued on the next page)

4 continued.

(c) A technician measured the frequency of the water wave in part (a) by counting how many waves passed him in 15 s.

Explain why this would NOT be a suitable method for measuring the frequency of the seismic wave in part (b)(ii).
(2 marks)

(Total for Question 4 = 12 marks)

**5** Look at Figure 9 for Question 5 in the Diagram Booklet. A student lifts a toy car from a bench and places the toy car at the top of a slope as shown.

**(a)** Describe an energy transfer that occurs when the student lifts the toy car from the bench and places the toy car at the top of the slope.
(2 marks)

(continued on the next page)

5 continued.

(b) The student lets the toy car roll down the slope.

Describe how the student could find, by experiment, the speed of the toy car at the bottom of the slope.
(4 marks)

(continued on the next page)

5 continued.

(continued on the next page)

5 continued.

(c) The student needs to develop the experiment to determine the loss in potential energy and the gain in kinetic energy as the toy car is rolling down the slope.

State the other measurements the student must make.
(2 marks)

(continued on the next page)

5 continued.

(d) When the toy car rolls down the slope, some energy is transferred to the surroundings as thermal energy.

State how the student could calculate the amount of energy transferred to the surroundings.
(1 mark)

(continued on the next page)

**5 continued.**

**(e) Explain ONE way the student could reduce the amount of thermal energy transferred to the surroundings as the toy car rolls down the slope.**
**(2 marks)**

**(Total for Question 5 = 11 marks)**

6 (a) Which of these is a vector?
(1 mark)

☐ A energy

☐ B force

☐ C mass

☐ D work

(b) (i) State the equation that relates acceleration to change in velocity and time taken.
(1 mark)

(continued on the next page)

6 continued.

(ii) A van accelerates from a velocity of 2 m/s to a velocity of 20 m/s in 12 s.

Calculate the acceleration of the van. (2 marks)

acceleration = _____ $m/s^2$

(continued on the next page)

6 continued.

(c) Look at Figure 10 for Question 6(c) in the Diagram Booklet. It is a velocity/time graph for 15 s of a cyclist's journey.

Calculate the distance the cyclist travels in the 15 s.
(3 marks)

distance = _____ m

6 continued.

*(d) Many factors can affect the stopping distance of a car.

Some of these factors involve the driver and some of these factors involve the car or the road.

Explain how the stopping distance of a car is affected by

- factors involving the driver
- factors involving the car or the road.

You should include examples in your explanations.
(6 marks)

(continued on the next page)

6 continued.

(continued on the next page)

**6 continued.**

**(Total for Question 6 = 13 marks)**

**TOTAL FOR PAPER = 60 MARKS**
**END OF PAPER**