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 20 May 2020

Afternoon (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.

Turn over ▶

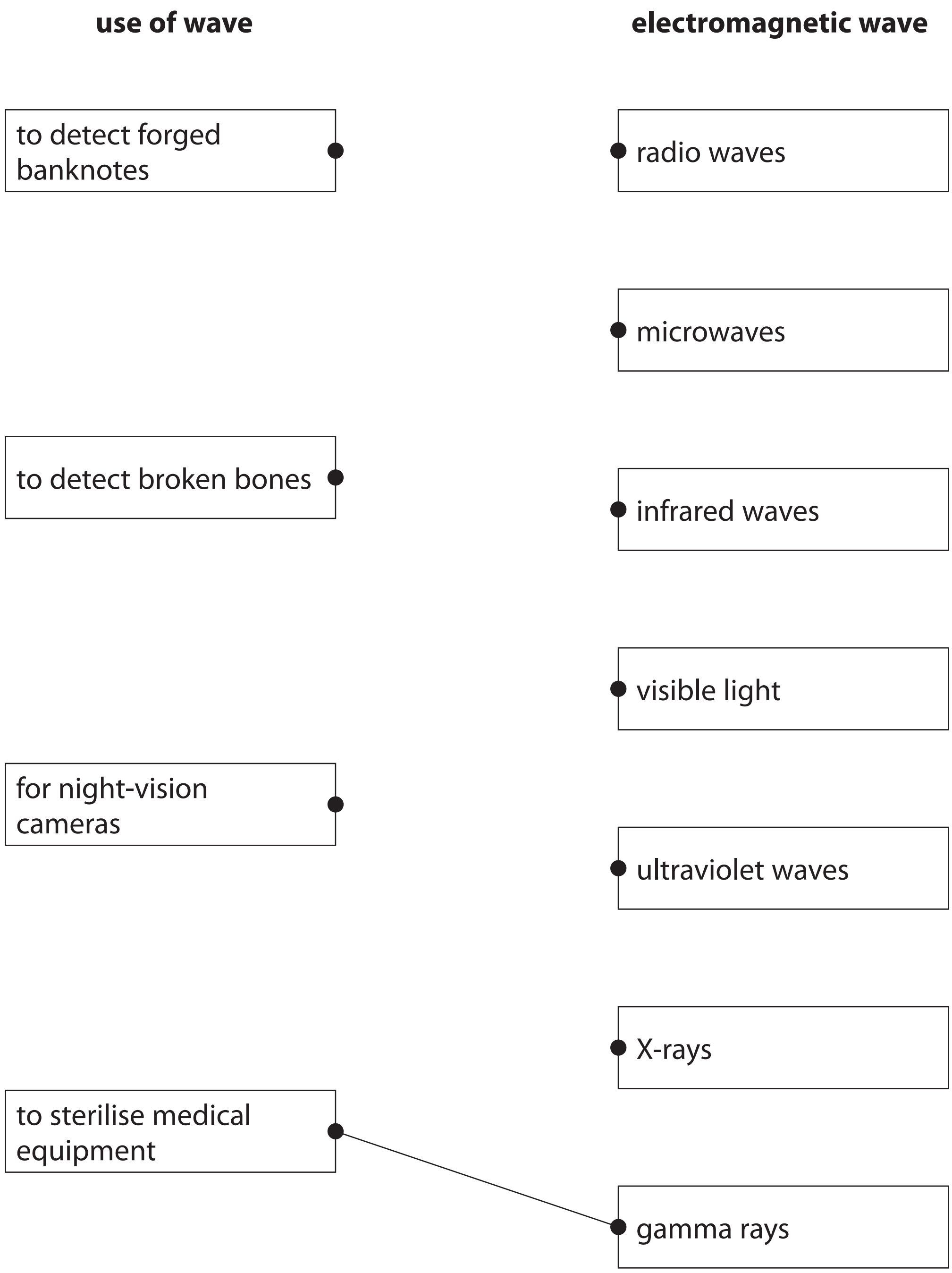
Answer ALL questions. Write your answers in the spaces provided.

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) Draw one line from each **use of wave** to the matching **electromagnetic wave**.

One line has been drawn for you.

(3)



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

Which of these colours of visible light has the highest frequency?

(1)

☒ **A** blue

☒ **B** green

☒ **C** orange

☒ **D** yellow

(c) Figure 1 shows how the brightness of a source of light changes with wavelength.

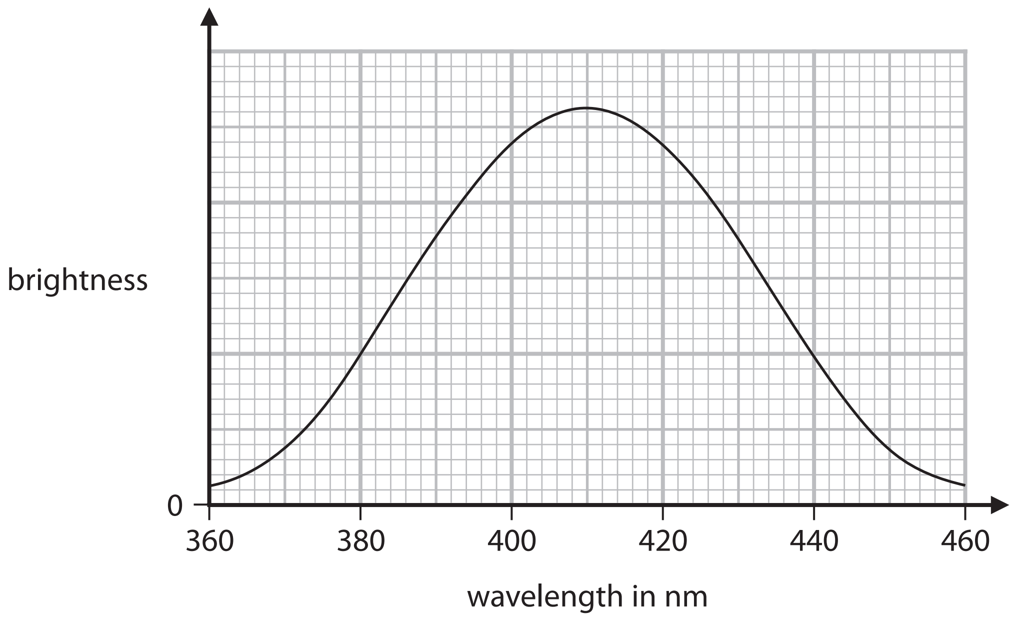


Figure 1

Describe how the brightness changes with wavelength.

(2)

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(Total for Question 1 = 6 marks)

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

(1)

- ☒ **A** $F = m + a$
- ☒ **B** $F = m - a$
- ☒ **C** $F = m \times a$
- ☒ **D** $F = m \div a$

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

Calculate the force needed to accelerate the cyclist at 2.0 m/s^2.

State the unit.

(2)

force = ... unit = ...

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

Calculate the average speed of the cyclist.

Use the equation

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

(2)

average speed = ... m/s

(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.

Figure 2 shows the set-up used to measure the average speed.

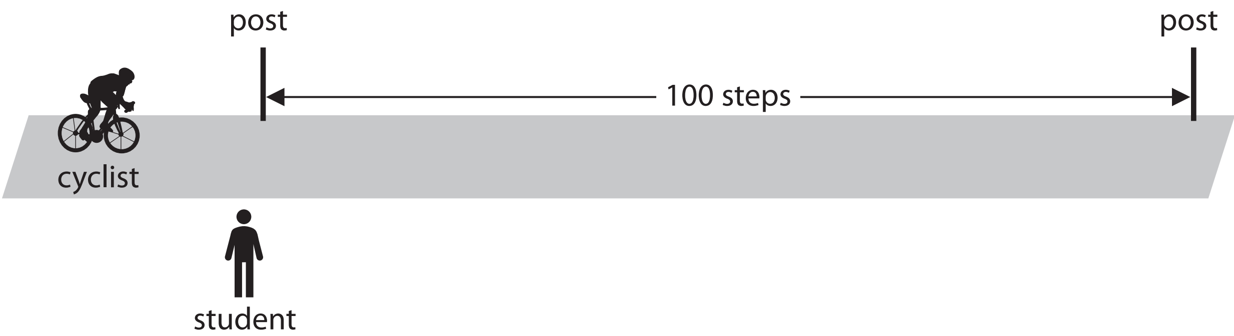

Figure 2

State **two** improvements the student could make to this method.

(2)

1 ....

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2 ....

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(Total for Question 2 = 7 marks)

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3 (a) Figure 3 shows the symbol for the nucleus of an atom of strontium-90.

$$^{90}_{38}\mathrm{Sr}$$

Figure 3

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

(1)

☒ **A** 38

☒ **B** 52

☒ **C** 90

☒ **D** 128

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

(1)

☒ **A** 38

☒ **B** 52

☒ **C** 90

☒ **D** 128

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

The table in Figure 4 gives some information about how the mass of a sample of strontium-90 changes with time.

mass of strontium-90 in g	time in years
1600	0
....	29
400	....

Figure 4

Complete the table in Figure 4.

(2)

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

Figure 5 shows some of the equipment she uses.

(Source: *www.einstein.yu.edu*)

Figure 5

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

(1)

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P 6 2 0 9 9 A 0 8 2 0

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)

1 ....

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2 ....

....

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

(4)

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(Total for Question 3 = 11 marks)

4 (a) Figure 6 shows a large tank of water.

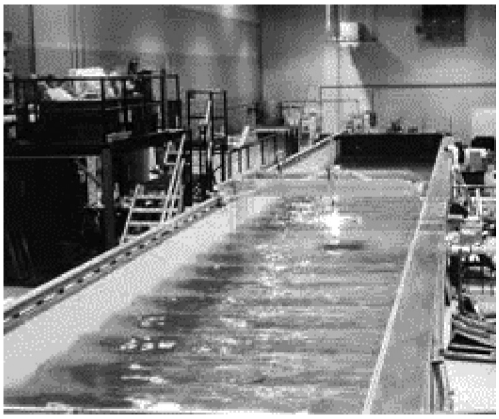

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Figure 6

The tank of water is used to study water waves.

(i) Water waves are transverse waves.

Give another example of a transverse wave.

(1)

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(ii) Figure 7 shows a side view of part of the tank.

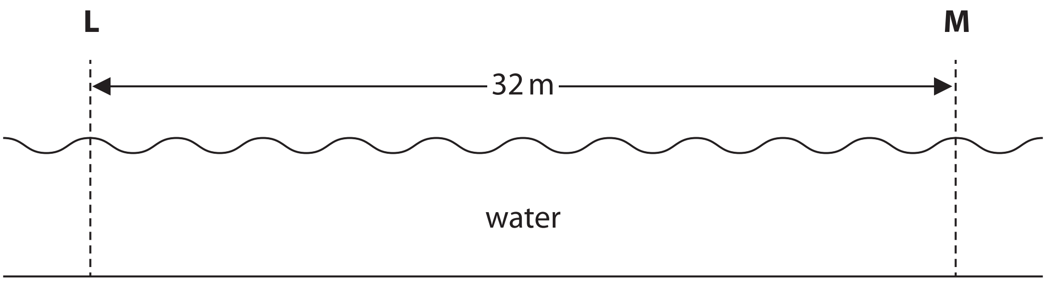

Figure 7

A water wave is moving from **L** to **M**.

Calculate the wavelength of the wave.

(2)

wavelength = ... m

(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)

frequency = ... Hz

(b) Figure 8 shows part of the inside of the Earth below the surface.

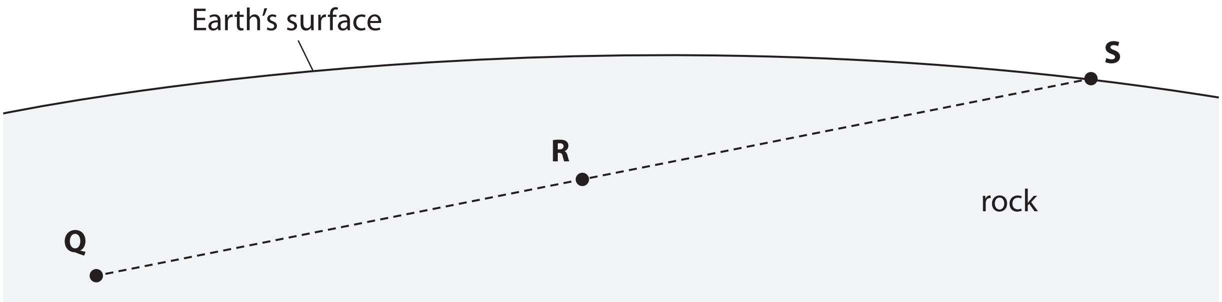

Figure 8

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)

(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.

Use the equation

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

(3)

wavelength = ... m

(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)

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(Total for Question 4 = 12 marks)

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5 A student lifts a toy car from a bench and places the toy car at the top of a slope as shown in Figure 9.

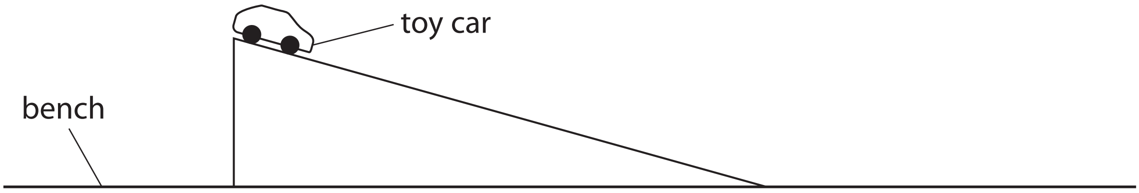

Figure 9

(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)

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(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)

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(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)

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(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)

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(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)

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(Total for Question 5 = 11 marks)

6 (a) Which of these is a vector?

(1)

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

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

(1)

(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)

acceleration = ... m / s^2

(c) Figure 10 is a velocity / time graph for 15 s of a cyclist's journey.

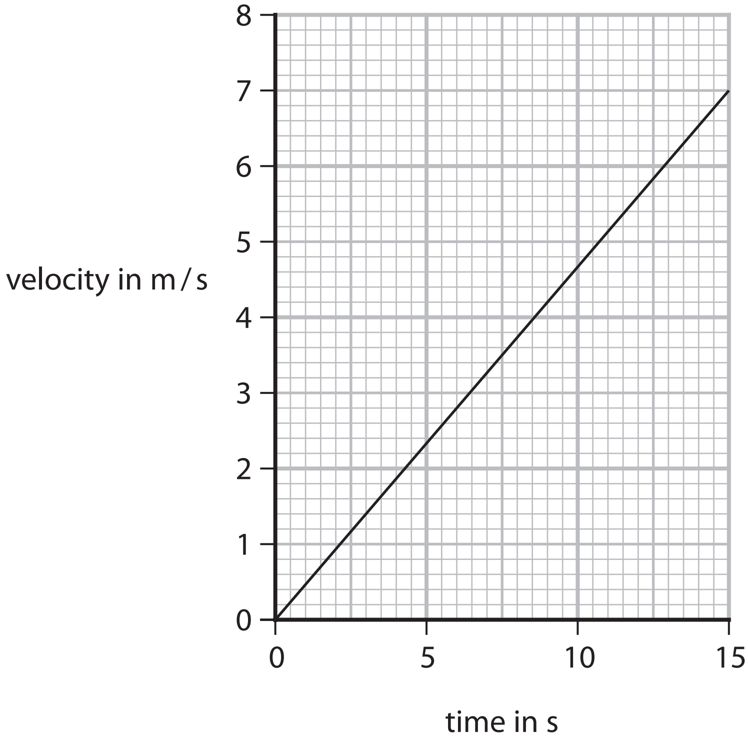

Figure 10

Calculate the distance the cyclist travels in the 15 s.

(3)

distance = ... m *(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)

(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 $Q = m \times L$
$P_1 V_1 = P_2 V_2$ to calculate pressure or volume for gases of fixed mass at constant temperature
energy transferred in stretching = 0.5 × spring constant × (extension)^2 $E = ½ \times k \times x^2$

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