Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

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

Thursday 22 May 2025

Morning (Time: 1 hour 10 minutes) | **Paper reference** | **1SC0/1PH**

Combined Science
PAPER 3

Higher Tier

You must have:
Calculator, ruler, Equation Booklet (enclosed)

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.*

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.

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 ▶

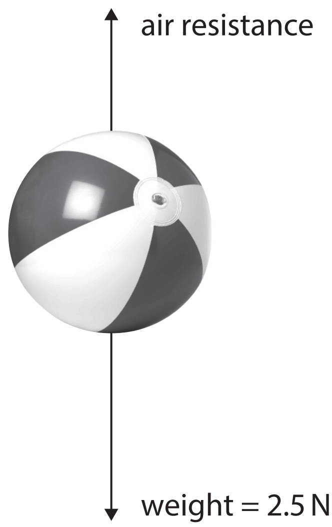
Pearson

BLANK PAGE

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

Some questions must be answered with a cross in one of the four boxes ☒. 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 two forces acting on a beach ball as it falls through the air.



(Source: © Stepan Bormotov/Shutterstock)

Figure 1

The resultant of these two forces is 0.92 N downwards.

(i) The mass of the beach ball is 0.25 kg.

Calculate the acceleration of the beach ball as it falls.

Use the equation

$$F = m \times a$$

(3)

acceleration = ... m/s^2

(ii) Calculate the size of the air resistance force on the beach ball.

(1)

air resistance = ... N

(b) Some students are investigating forces.

They use a newton meter to keep a trolley stationary on a sloping runway, as shown in Figure 2.

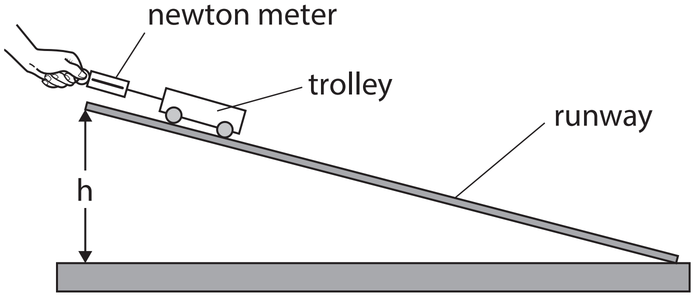


Figure 2

They measure the force needed to keep the trolley stationary on the sloping runway.

(i) They do this at four different places on the runway.

When the height, h, of the runway is 0.60 m, their four readings for force are

2.1 N   2.7 N   2.5 N   2.2 N

Calculate the mean value of these forces.

(1)

mean force = ... N

The students then measure values of the force, F, for several different values of h, the height of the runway.

Figure 3 is a graph of F against h.

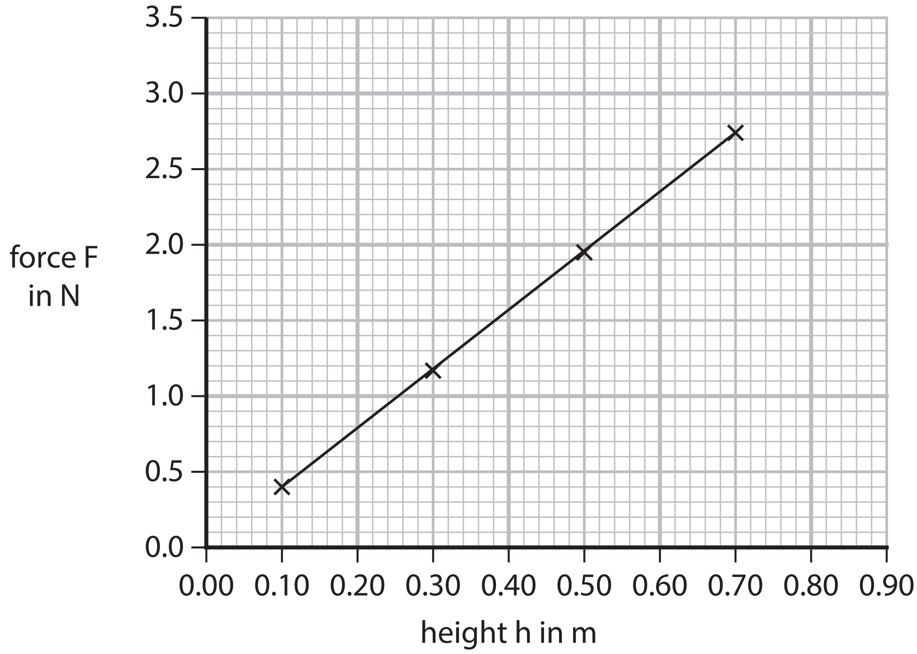


Figure 3

(ii) Use the graph in Figure 3 to determine the value of F when h = 0.80 m.

(2)

F = ... N

(iii) Determine the gradient of the graph in Figure 3.

(2)

gradient = ... N / m

(Total for Question 1 = 9 marks)

2 (a) Figure 4 is a diagram of part of a water wave.

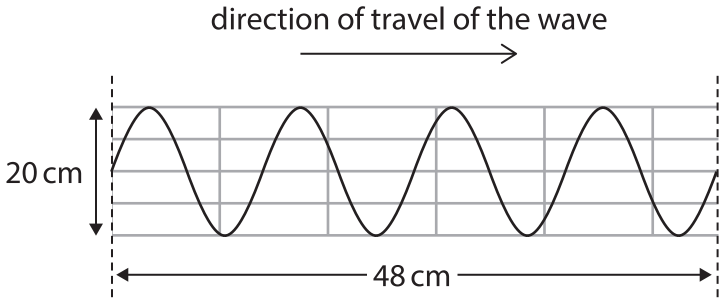


Figure 4

(i) Use data from Figure 4 to determine the amplitude of the wave.

(1)

amplitude = ... cm

(ii) Use data from Figure 4 to determine the wavelength of the wave.

(1)

wavelength = ... cm

(iii) The water wave shown in Figure 4 is generated in a large tank.

A student observes the wave.

Describe how the student could determine the wave speed of the wave.

(2)

....

....

....

....

(b) When an earthquake happens, waves are transmitted through the Earth. Figure 5 is a diagram of a part of the Earth's crust.

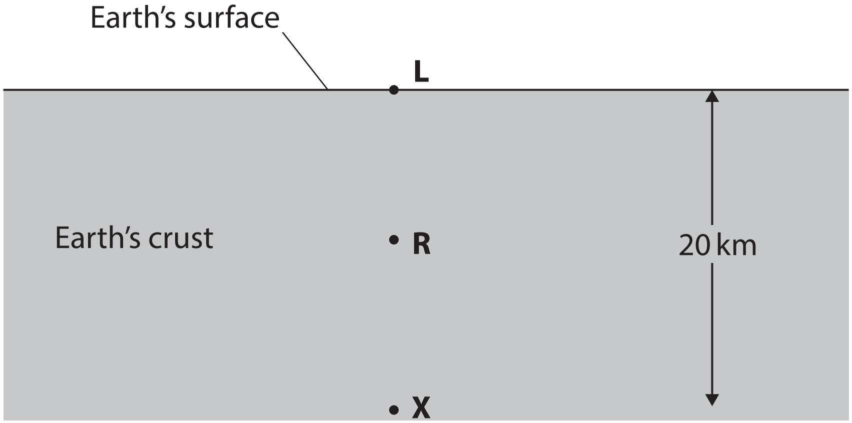


Figure 5

An earthquake happens at point **X**, 20 km below the Earth's surface.

An earthquake wave from **X** is detected at point **L**.

This earthquake wave is a transverse wave.

(i) State **one** other example of a transverse wave.

(1)

....

(ii) A point in the crust is labelled **R** in Figure 5.
There is a rock at point **R**.

Describe the effect that this earthquake wave has on the rock at **R** as the wave passes through the rock.

You may add to Figure 5 to help your answer.

(2)

....

....

....

....

(iii) The wave from **X** reaches **L** 3.8 seconds after it passes through **R**.

The speed of the wave is 4500 m / s.

Calculate the distance between **X** and **R**.

(2)

distance = ... m

(Total for Question 2 = 9 marks)

3 (a) When light travels from air into glass, it is refracted.

To investigate this, a student has a rectangular glass block and a ray box.

The ray box produces a ray of light.

Describe how the student should use the glass block and ray box to produce a refracted ray and mark its position.

You may draw a diagram to help your answer.

(4)

(b) Figure 6 is a table of data for three coloured beams of light travelling from air into glass.

	wavelength in air	frequency in air	wavelength in glass	frequency in glass
red light	650 nm	4.6×10^{14} Hz	490 nm	4.6×10^{14} Hz
yellow light	580 nm	5.2×10^{14} Hz	440 nm	5.2×10^{14} Hz
blue light	470 nm	6.4×10^{14} Hz	350 nm	6.4×10^{14} Hz

Figure 6

Using data from Figure 6,

(i) state what happens to the wavelength of light when the light travels from glass into air

(1)

....

....

(ii) state what happens to the frequency of light when the light travels from glass into air.

(1)

....

....

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(iii) The speed of blue light in air is 3.0×10^8 m/s.

Calculate the change in the speed of blue light when it travels from air into glass.

Use the equation

$$v = f \times \lambda$$

(3)

change in speed = ... m/s

(Total for Question 3 = 9 marks)

4 (a) Figure 7 shows a skier sliding down a slope.

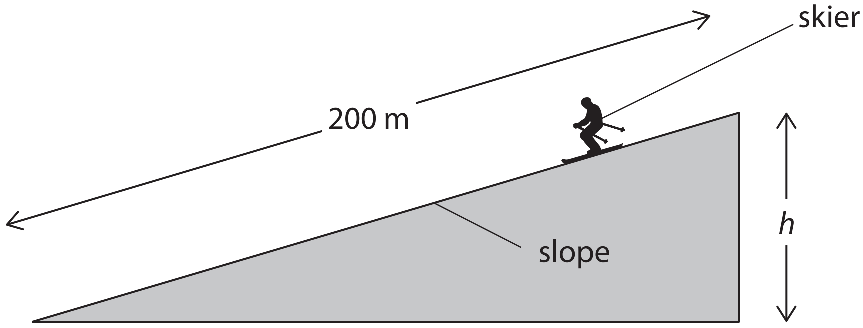


Figure 7

(i) The gravitational potential energy of the skier decreases by 39 000 J between the top and the bottom of the slope.

The mass of the skier is 70 kg.

Calculate the height, h, of the slope.

The value of g is 10 N / kg.

Use the equation

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

(2)

h = ... m

(ii) The skier starts from rest at the top of the slope.

The velocity of the skier at the bottom of the slope is 27 m / s.

Using information from Figure 7, calculate the acceleration of the skier along the slope.

(3)

acceleration = ... m / s^2

(iii) When the skier slides from the top to the bottom of the slope, some energy is dissipated.

Explain how to determine the amount of energy dissipated.

(2)

....

....

....

....

(b) Figure 8 shows athletes running at a constant speed on a curved section of a track.

(Source: © Photo and Co/Getty Images)

Figure 8

(i) Even though they are running at a constant speed, the velocity of each athlete is changing.

State why the velocity of each athlete is changing.

(1)

....

....

(ii) The athletes start the race on a straight section of track.

Figure 9 shows a distance / time graph for one of the athletes.

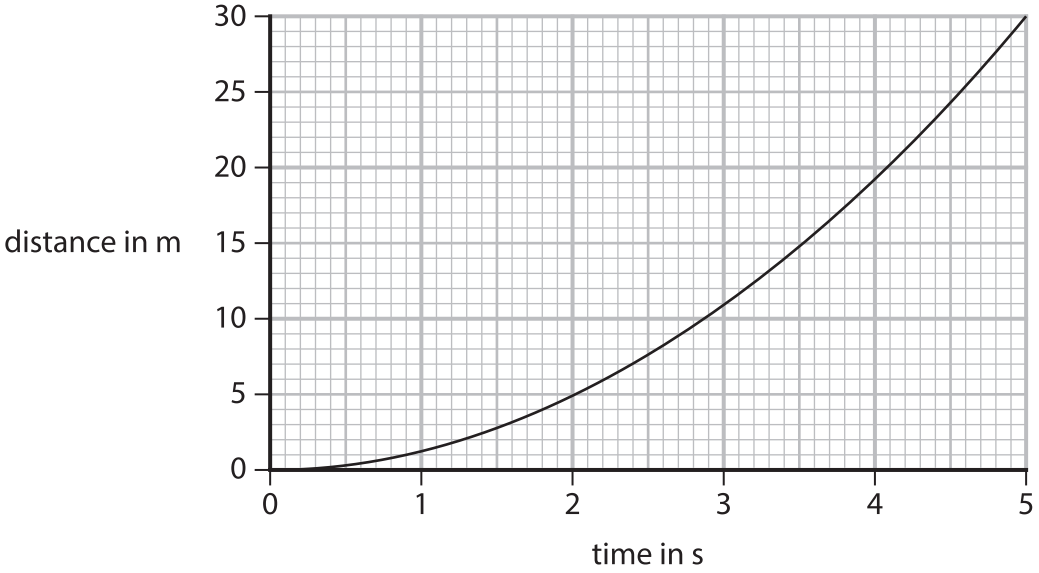


Figure 9

Determine the gradient of this graph at a time of 2.5 s.

(2)

gradient = ... m / s

(Total for Question 4 = 10 marks)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

BLANK PAGE

5 (a) Figure 10 shows a footballer and a ball.

(Source: © GelgelNasution/Shutterstock)

Figure 10

The ball is stationary before it is kicked.

The mass of the ball is 0.43 kg.

The kick exerts a force of 2700 N on the ball.

The velocity of the ball just after it has been kicked is 36 m / s.

(i) Calculate the momentum of the ball just after it has been kicked.

State the unit for momentum.

(3)

momentum = ...

unit ....

(ii) Calculate the amount of time that the footballer's kicking foot is in contact with the ball.

(2)

time = ... s

(iii) Explain how Newton's third law applies to the interaction between the kicking foot and the football.

(3)

....

....

....

....

....

....

....

....

(b) Figure 11 shows a system consisting of two toy trolleys, **S** and **T**, on a straight, horizontal track.

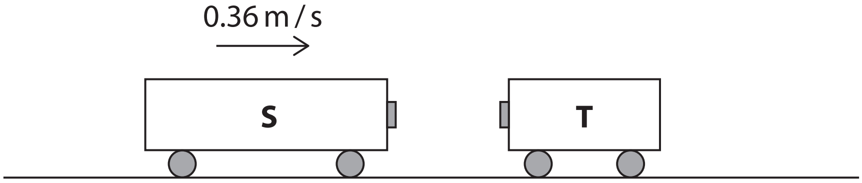


Figure 11

T is not moving.

S is moving with a velocity of 0.36 m / s towards **T**.

S collides with **T**.

The trolleys stick together and move off together.

With reference to the momentum of the system, explain why the velocity of the trolleys after the collision is less than the velocity of **S** before the collision.

(3)

....

....

....

....

....

....

....

....

(Total for Question 5 = 11 marks)

6 (a) Carbon-14 is a radioactive substance that emits beta minus (β^-) particles.

(i) Which of these is the unit for the activity of a sample of carbon-14?

(1)

☒ **A** Pa

☒ **B** Nm

☒ **C** Gs

☒ **D** Bq

(ii) Which row of the table gives a correct comparison of the penetrating abilities of alpha, beta and gamma radiation?

(1)

		least penetrating ⟶ most penetrating
☒	**A**	alpha, beta, gamma
☒	**B**	alpha, gamma, beta
☒	**C**	gamma, beta, alpha
☒	**D**	gamma, alpha, beta

(iii) The mass of a beta minus particle is 9.1×10^{-31} kg.

Calculate the kinetic energy of a beta minus particle moving with a speed of 3.8×10^{6} m/s.

(2)

kinetic energy = ... J

P 7 8 7 0 2 R A 0 1 9 2 4

Turn over ▶

(b) Describe what happens in the nucleus of an atom when a beta plus particle is emitted.

(2)

....

....

....

....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

*(c) Radioactive decay can produce gamma radiation and alpha radiation.

Compare the processes of gamma decay and alpha decay.

Your answer should include

- a description of both gamma radiation and alpha radiation
- the effect of each type of decay on the original nucleus.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

BLANK PAGE

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

BLANK PAGE

P 7 8 7 0 2 R A 0 2 3 2 4

BLANK PAGE

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

Thursday 22 May 2025

Paper reference **1SC0/1PH**

Combined Science

PAPER 3

Higher Tier

Equation Booklet

Do not return this Booklet with the question paper.

Turn over ▶

P78702RA

Y:1/1/1/1/1/1/

P 7 8 7 0 2 R A

Pearson

If you're taking **GCSE (9–1) Combined Science** or **GCSE (9–1) Physics**, you will need these equations:

HT = higher tier

	distance travelled = average speed × time	
	acceleration = change in velocity ÷ time taken	$a = \frac{(v-u)}{t}$
	force = mass × acceleration	$F = m \times a$
	weight = mass × gravitational field strength	$W = m \times g$
HT	**momentum = mass × velocity**	$\boldsymbol{p = m \times v}$
	change in gravitational potential energy = mass × gravitational field strength × change in vertical height	$\Delta GPE = m \times g \times \Delta h$
	kinetic energy = 1/2 × mass × (speed)^2	$KE = \frac{1}{2} \times m \times v^2$
	efficiency = $\frac{(\text{useful energy transferred by the device})}{(\text{total energy supplied to the device})}$	
	wave speed = frequency × wavelength	$v = f \times \lambda$
	wave speed = distance ÷ time	$v = \frac{x}{t}$
	work done = force × distance moved in the direction of the force	$E = F \times d$
	power = work done ÷ time taken	$P = \frac{E}{t}$
	energy transferred = charge moved × potential difference	$E = Q \times V$
	charge = current × time	$Q = I \times t$
	potential difference = current × resistance	$V = I \times R$
	power = energy transferred ÷ time taken	$P = \frac{E}{t}$
	electrical power = current × potential difference	$P = I \times V$
	electrical power = (current)^2 × resistance	$P = I^2 \times R$
	density = mass ÷ volume	$\rho = \frac{m}{V}$

	force exerted on a spring = spring constant × extension	$F = k \times x$
	(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance	$v^2 - u^2 = 2 \times a \times x$
HT	**force = change in momentum ÷ time**	$\boldsymbol{F = \frac{(mv - mu)}{t}}$
	energy transferred = current × potential difference × time	$E = I \times V \times t$
HT	**force on a conductor at right angles to a magnetic field carrying a current = magnetic flux density × current × length**	$\boldsymbol{F = B \times I \times l}$
	For transformers with 100% efficiency, 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	$Q = m \times L$
	energy transferred in stretching = 0.5 × spring constant × (extension)^2	$E = \frac{1}{2} \times k \times x^2$

If you're taking **GCSE (9–1) Physics**, you also need these extra equations:

	moment of a force = force × distance normal to the direction of the force	
	pressure = force normal to surface ÷ area of surface	$P = \frac{F}{A}$
HT	$\boldsymbol{\frac{\textit{potential difference across primary coil}}{\textit{potential difference across secondary coil}} = \frac{\textit{number of turns in primary coil}}{\textit{number of turns in secondary coil}}}$	$\boldsymbol{\frac{V_p}{V_S} = \frac{N_p}{N_S}}$
	to calculate pressure or volume for gases of fixed mass at constant temperature	$P_1 \times V_1 = P_2 \times V_2$
HT	**pressure due to a column of liquid = height of column × density of liquid × gravitational field strength**	$\boldsymbol{P = h \times \rho \times g}$

END OF EQUATION LIST

BLANK PAGE