Write your name here

Surname	Other names

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

Centre Number | | | | | |

Candidate Number | | | | |

Combined Science

Paper 5: Physics 1

Higher Tier

Sample Assessment Materials for first teaching September 2016

Time: 1 hour 10 minutes

Paper Reference
1SC0/1PH

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.

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 ▶

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S 5 0 0 6 2 A 0 1 2 0

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 There are many different types of waves.

(a) Waves on the surface of water are transverse waves.

Sound waves are longitudinal waves.

Describe the difference between transverse waves and longitudinal waves.

(2)

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.....

(b) Figure 1 shows a ripple tank.

This is used to study the behaviour of water waves.

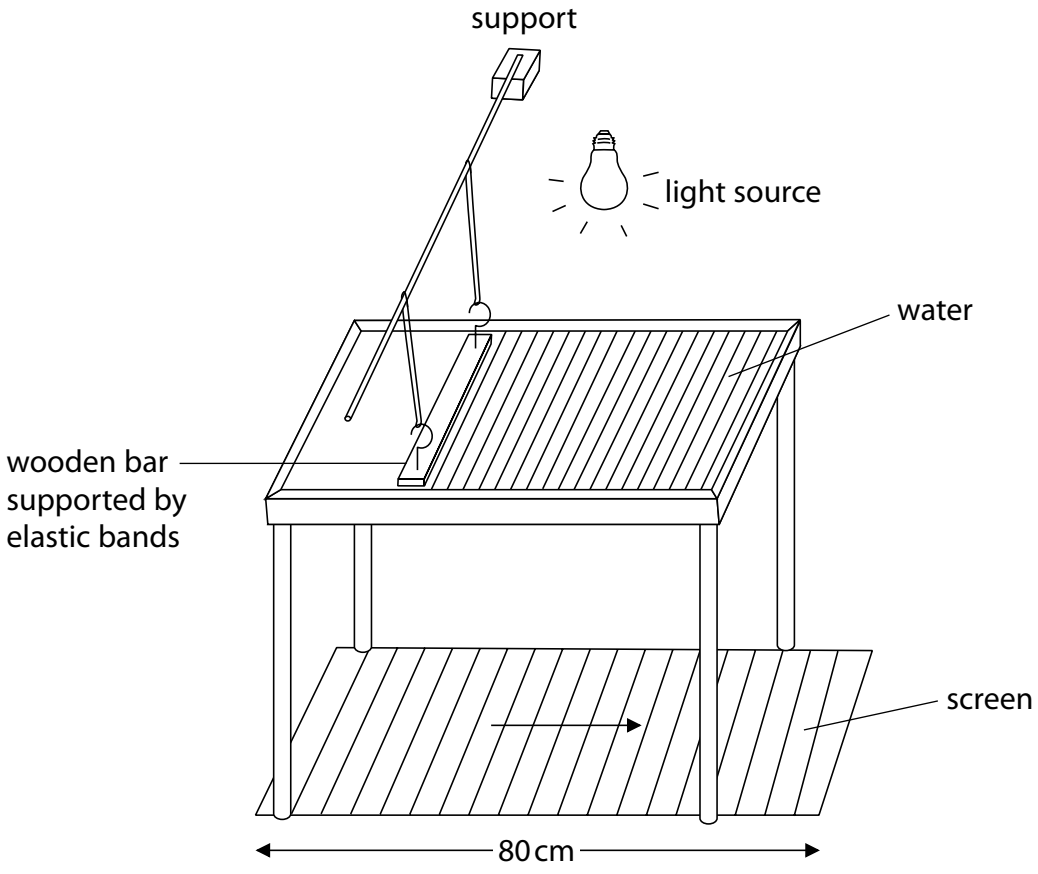

Figure 1

Water waves are produced in the tank.

The shadow of the waves is projected onto the screen below the tank.

The waves appear to move in the direction of the arrow.

(i) Describe how to determine the frequency of the waves.

(2)

(ii) The screen is 80 cm long.

What is the approximate wavelength of the waves as seen on the screen?

(1)

- ☒ **A** 4 cm
- ☒ **B** 8 cm
- ☒ **C** 40 cm
- ☒ **D** 80 cm

(iii) A student uses the image to estimate the speed of the water wave as 75 cm/s.

Which of these is a reason why the estimate is not correct?

(1)

- ☒ **A** the student used a ruler without mm markings
- ☒ **B** the light was not bright enough
- ☒ **C** the student's measurement was inaccurate
- ☒ **D** the wave seen on the screen is magnified

(Total for Question 1 = 6 marks)

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2 Figure 2 shows two students investigating reaction times.

Student B supports his left hand on a desk.

Student A holds a ruler so that the bottom end of the ruler is between the finger and thumb of student B.

When student A releases the ruler, student B catches the ruler as quickly as he can with his left hand.

The investigation is repeated with the right hand of student B.

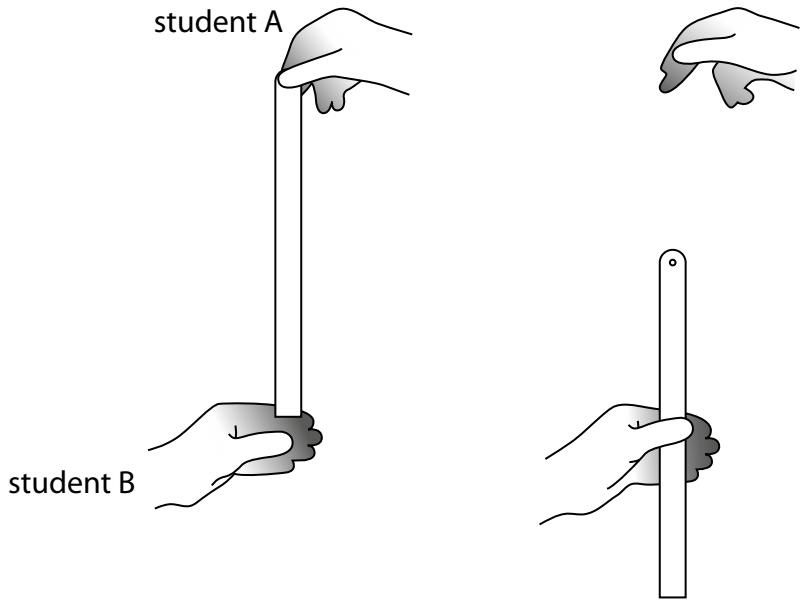

Figure 2

(a) The students took five results for the left hand and five results for the right hand.

Figure 3 shows their results.

which hand	distance dropped (cm)					
	trial 1	trial 2	trial 3	trial 4	trial 5	average
left	10.1	25.5	18.4	14.6	11.7	14
right	17.5	16.1	19.4	18.6	20.2	.....

Figure 3

(i) Calculate the average distance dropped for the right hand.

Give your answer correct to two significant figures.

(2)

distance = ... cm

(iii) Calculate the average time for the left hand.

Use the equation

$$\text{time}^2 = \frac{\text{distance}}{500}$$

(2)

average time = ... s

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(b) Explain whether any of the readings are anomalous.

(2)

(c) Give **two** ways that the students can improve the quality of their data other than ignoring anomalous results.

(2)

1

2

(d) Describe how the students could develop their investigation to investigate how reaction time changes with another variable.

(2)

(Total for Question 2 = 10 marks)

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3 (a) A car accelerates at a constant rate of 1.83 m/s^2 along a flat, straight road.

The force acting on the car is 1.870 kN.

Calculate the mass of the car.

Give your answer to three significant figures.

(3)

mass = ... kg

(b) The car accelerates from rest for 16 s.

Calculate the speed of the car after 16 s.

(3)

speed = ... m/s

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(c) The car starts on another journey.

Figure 4 shows the graph of the car's movement.

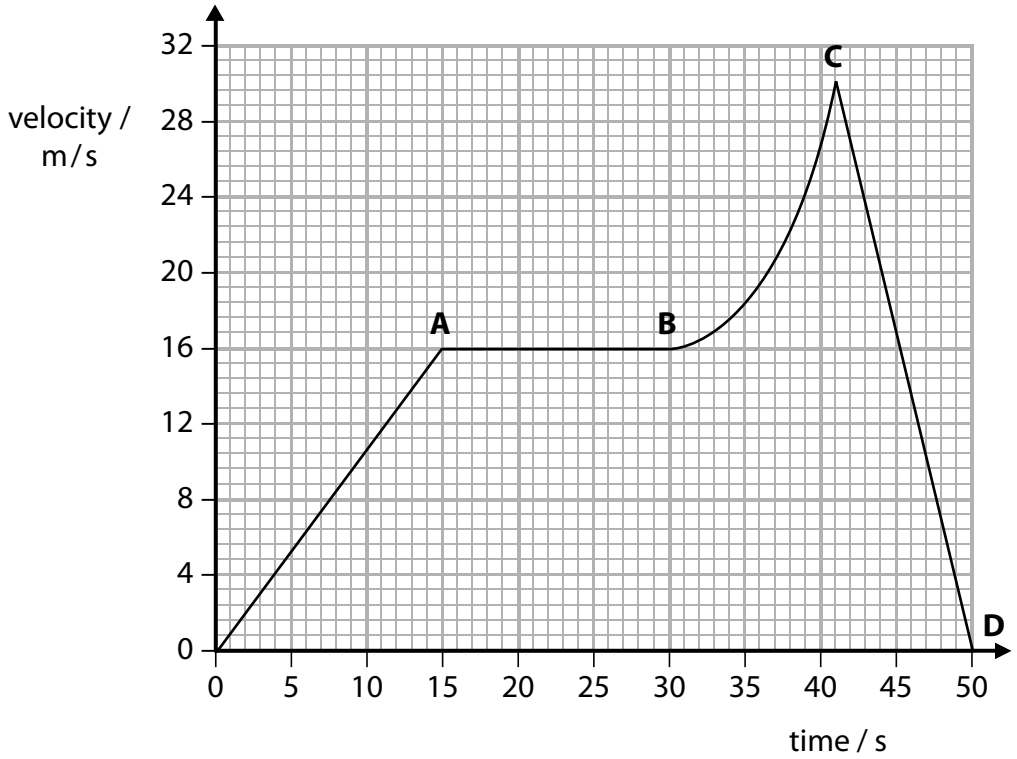

Figure 4

Show that the distance travelled when the car is moving at a constant speed is greater than the distance travelled when the car is slowing down.

(4)

(Total for Question 3 = 10 marks)

4 Figure 5 shows the nuclei of four atoms.

$^{234}_{92}U$	$^{235}_{92}U$	$^{238}_{94}Pu$	$^{238}_{95}Am$
uranium-234	uranium-235	plutonium-238	americium-238

Figure 5

(a) Which two nuclei have the same number of neutrons?

(1)

☒ **A** plutonium-238 and uranium-235

☒ **B** uranium-235 and americium-238

☒ **C** uranium-234 and americium-238

☒ **D** americium-238 and plutonium-238

(b) (i) State what is meant by the term 'half-life'.

(1)

.....

.....

(ii) Plutonium-238 is used in spacecraft to provide heat to power generators.

One of these generators contains 925 g of plutonium-238 when it is manufactured.

One gram of plutonium-238 has a power density of 0.54 W/g.

Plutonium-238 has a half-life of 87.7 years.

Calculate the average energy released per second by the generator after 263 years.

(4)

average energy released per second = ... (J)

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(c) The nucleus of americium-238 can absorb an electron.

When this happens, one of the protons in the nucleus becomes a neutron, as shown in Figure 6.

$$ {}^{1}_{1}\mathrm{p} + {}^{0}_{-1}\mathrm{e} \longrightarrow {}^{1}_{0}\mathrm{n} $$

Figure 6

(i) Describe how absorbing an electron affects the proton number and the nucleon number of a nucleus.

(2)

.....

.....

.....

.....

(ii) Deduce which nucleus is formed when americium-238 absorbs an electron.

(1)

☐ **A** uranium-234

☐ **B** uranium-235

☐ **C** plutonium-238

☐ **D** americium-238

(Total for Question 4 = 9 marks)

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5 A student investigates how the average speed of the trolley varies with starting height.

Figure 7 shows the trolley and runway.

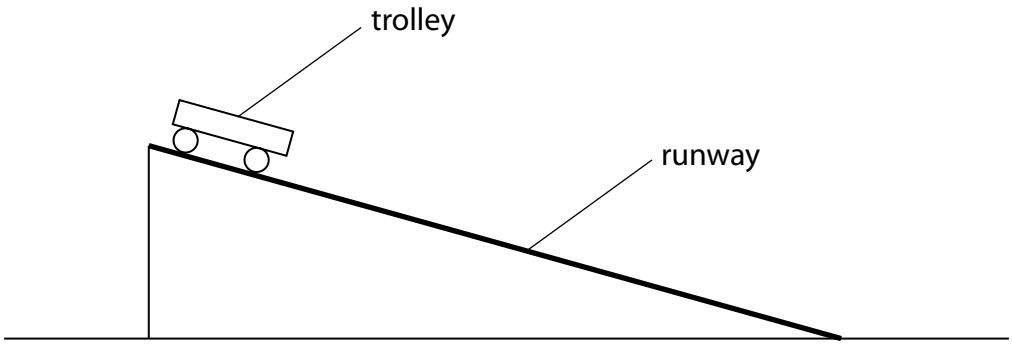

Figure 7

(a) Describe how the student can determine the average speed of the trolley.

(4)

(b) Figure 8 shows his results.

starting height / m	v / ms^{-1}
0.01	0.22
0.02	0.31
0.04	0.44
0.09	0.66
0.12	0.77
0.14	0.83
0.18	0.94

Figure 8

Figure 9 shows the student's graph.

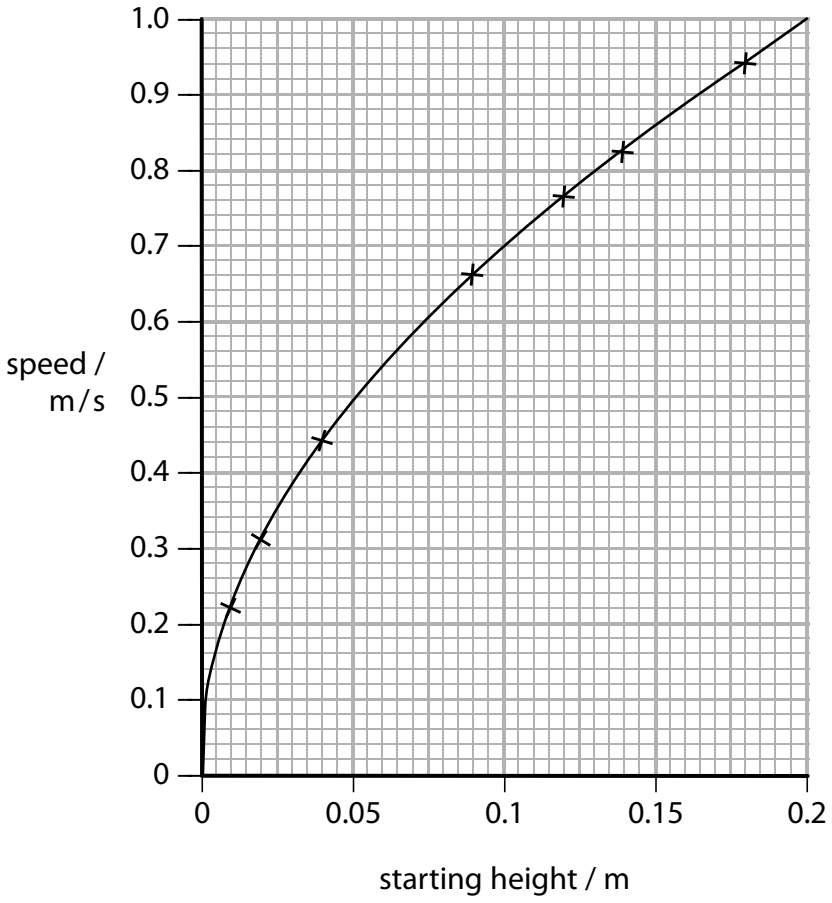

Figure 9

(i) The trolley has a mass of 650 g.

Calculate the average kinetic energy of the trolley which had a starting height of 0.075 m.

(2)

average kinetic energy = ... J

(ii) Determine the gradient of the graph when the height is 0.1 m.

(2)

gradient = ...

(iii) Describe how the speed of the trolley varies with the changes in height made by the student between 0.04 m and 0.12 m.

(2)

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(c) The student wants to change his experiment to investigate how different surfaces of the runway affect the speed of the trolley down the slope.

Devise an experiment that would allow him to investigate the effect of different surfaces on the average speed of the trolley.

(3)

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(Total for Question 5 = 13 marks)

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6 (a) Explain what happens to the wavelength of light when it passes from air into glass.

(2)

*(b) Figure 10 shows a beam of red light approaching one side of a rectangular glass block.

The beam of light will pass through the block and leave through the opposite side.

AB is a wavefront.

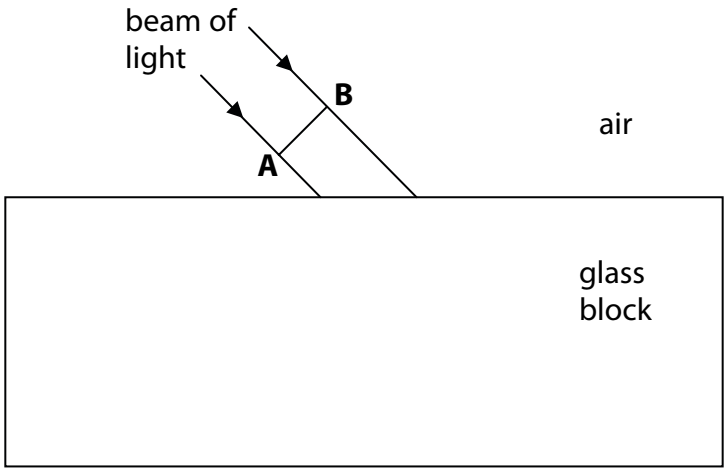

Figure 10

Discuss the path of the wavefront **AB** as it enters and leaves the glass block.

(6)

(c) The distance between the Earth and the Sun is 1.50×10^{11} m.

Light takes 500 s to travel from the Sun to the Earth.

The wavelength of red light is 670 nm.

Calculate the frequency of red light, using only the data provided.

(4)

frequency = ... Hz

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

Equations

(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance $v^2 - u^2 = 2 \times a \times x$
force = change in momentum ÷ time $F = \frac{(mv - mu)}{t}$
energy transferred = current × potential difference × time $E = I \times V \times t$
force on a conductor at right angles to a magnetic field carrying a current = magnetic flux density × current × length $F = B \times I \times l$
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 $E = ½ \times k \times x^2$