Topical Past Paper Questions Workbook

Edexcel International GCSE Physics (4PH1) Paper 2P & 2PR

Exam Series: Jan 2017 – Jun 2022

Format Type A:
Answers to all questions are provided as an appendix

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Introduction

Each Topical Past Paper Questions Workbook contains a comprehensive collection of hundreds of questions and corresponding answer schemes, presented in worksheet format. The questions are carefully arranged according to their respective chapters and topics, which align with the latest IGCSE or AS/A Level subject content. Here are the key features of these workbooks:

1. The workbook covers a wide range of topics, which are organized according to the latest syllabus content for Cambridge IGCSE or AS/A Level exams.
2. Each topic includes numerous questions, allowing students to practice and reinforce their understanding of key concepts and skills.
3. The questions are accompanied by detailed answer schemes, which provide clear explanations and guidance for students to improve their performance.
4. The workbook's format is user-friendly, with worksheets that are easy to read and navigate.
5. This workbook is an ideal resource for students who want to familiarize themselves with the types of questions that may appear in their exams and to develop their problem-solving and analytical skills.

Overall, Topical Past Paper Questions Workbooks are a valuable tool for students preparing for IGCSE or A level exams, providing them with the opportunity to practice and refine their knowledge and skills in a structured and comprehensive manner. To provide a clearer description of this book's specifications, here are some key details:

- Title: Edexcel IGCSE Physics (4PH1) Paper 2P & 2PR Topical Past Papers
- Subtitle: Exam Practice Worksheets With Answer Scheme
- Examination board: Pearson Edexcel
- Subject code: 4PH1
- Years covered: Jan 2017 – June 2022
- Paper: 2P and 2PR
- Number of pages: 499
- Number of questions: 156

Contents

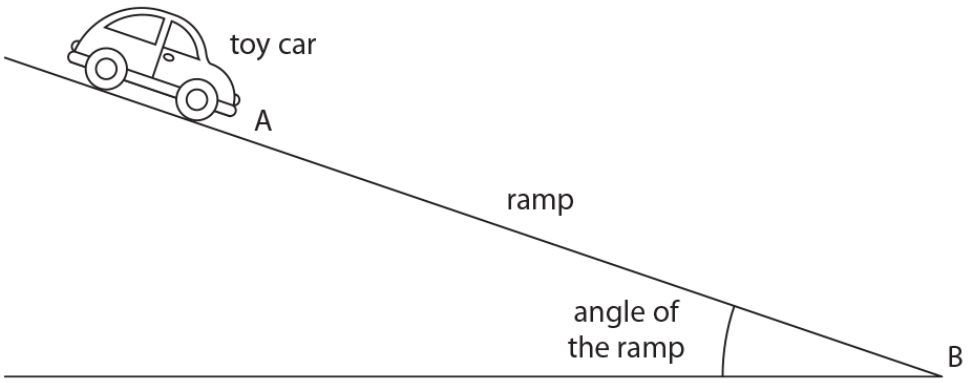
Chapter 1

Forces and motion

1.1 Movement and position

1. 4PH0_2P_que_20180616 Q: 3

A student uses this apparatus to investigate how the angle of a ramp affects the time taken for a toy car to travel down the ramp.



This is the student's method.

- set the angle of the ramp to 10° and measure the time for the car to travel from A to B
- repeat the experiment for five different angles, using the same car travelling from A to B

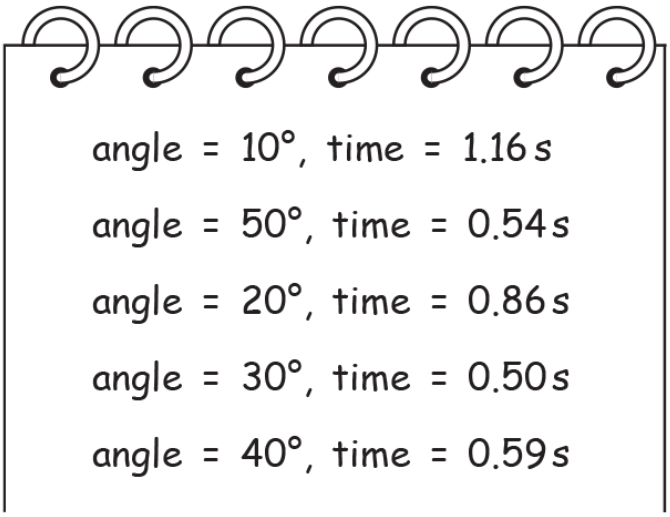
(a) The table lists some variables in this investigation.

Place one tick (✓) in each row to show the independent, dependent and control variables.

(4)

	Independent variable	Dependent variable	Control variable
Type of toy car			
Time to travel from A to B			
Angle of ramp			
Distance travelled down ramp			

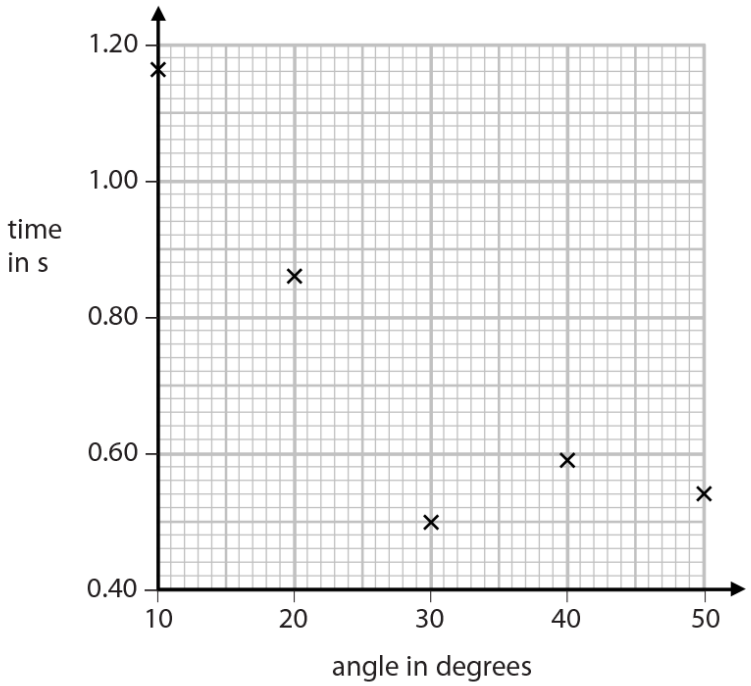
(b) These are the student's results.



Draw a table of the student's results.

(3)

(c) The graph shows the results of the student's investigation.



(i) Circle the anomalous point on the graph.

(1)

(ii) Suggest how the student should deal with the anomalous result.

(1)

.....

.....

(iii) Draw the curve of best fit on the graph.

(1)

(iv) Suggest why the student did not start either axis from zero.

(1)

.....

.....

(Total for Question 3 = 11 marks)

1.2 Forces, movement, shape and momentum

2. 4PH1_2P_que_20220119 Q: 1

(a) Which of these is a device used to measure force?

(1)

- ☒ **A** newton meter
- ☒ **B** ruler
- ☒ **C** thermometer
- ☒ **D** voltmeter

(b) Airbags are safety devices used in cars to protect the driver if there is a crash.

(i) State the formula linking momentum, mass and velocity.

(1)

(ii) A person inside a car has a mass of 72 kg and a velocity of 13 m/s.

Show that the momentum of the person is about 900 kg m/s.

(1)

(iii) The person experiences a crash and comes to rest in 0.29 s.

Calculate the force on the person.

(2)

force = ... N

(iv) Which statement explains how airbags protect the driver?

(1)

- ☒ **A** increase the force acting on the driver
- ☒ **B** increase the time taken for the driver to stop
- ☒ **C** increase the kinetic energy store of the driver
- ☒ **D** increase the momentum of the driver

(Total for Question 1 = 6 marks)

3. 4PH1_2P_que_20220624 Q: 2

This question is about momentum.

(a) Which of these is the correct unit for momentum?

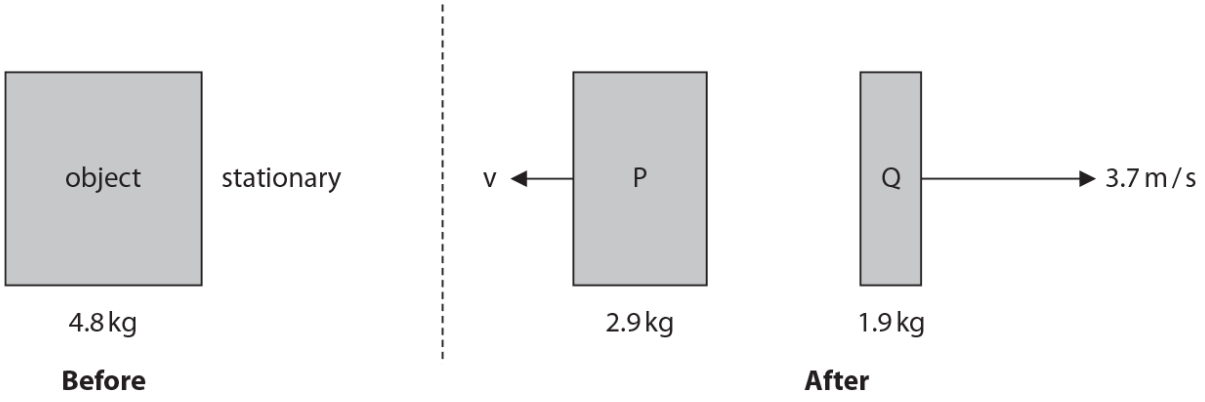
(1)

- ☒ **A** kg/m/s
- ☒ **B** $kg^2 m/s$
- ☒ **C** $kg\,m/s^2$
- ☒ **D** kg m/s

(b) The diagram shows an object before and after an explosion.

The object breaks into two parts, P and Q.

The parts move away from each other in opposite directions.



(i) State what is meant by the **principle of conservation of momentum**.

(1)

.....

.....

(ii) Calculate the magnitude of the velocity of part P after the explosion.

(3)

velocity = ... m/s

(c) A child drops an egg from a height of 10 cm and the egg lands on the floor.

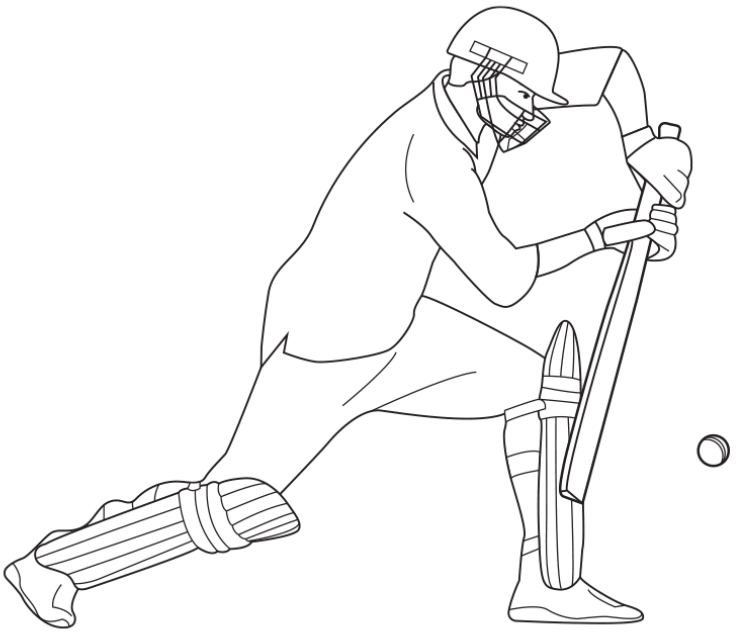
Explain why the egg is less likely to break if the floor is covered with a thick carpet than if the floor were covered in hard tiles.

(3)

(Total for Question 2 = 8 marks)

4. 4PH1_2PR_que_20220119 Q: 2

Cricket is a sport played with bats and balls.



(a) (i) A cricket player hits a ball with a bat. Before the ball is hit, it is moving to the **left** with a momentum of 4.2 kg m/s.

The bat is in contact with the ball for 0.012 s.

After the ball is hit, it moves to the **right** with a momentum of 6.7 kg m/s.

Calculate the mean force the bat exerts on the ball and state the direction of the force.

(3)

mean force = ... N

direction .....

(ii) State the magnitude and direction of the mean force the **ball** exerts on the **bat**.

(1)

magnitude of mean force = ... N

direction of force .....

(b) The cricket player wears padded protective equipment.

This protective equipment reduces the risk of injury to the player if they are struck by the cricket ball.

Explain how this protective equipment reduces the risk of injury to the player.

Use ideas about momentum in your answer.

(3)

(Total for Question 2 = 7 marks)

5. 4PH1_2Pr_que_20220624 Q: 7

Diagram 1 shows a gate fitted with a spring mechanism.

The spring mechanism shuts the gate automatically.

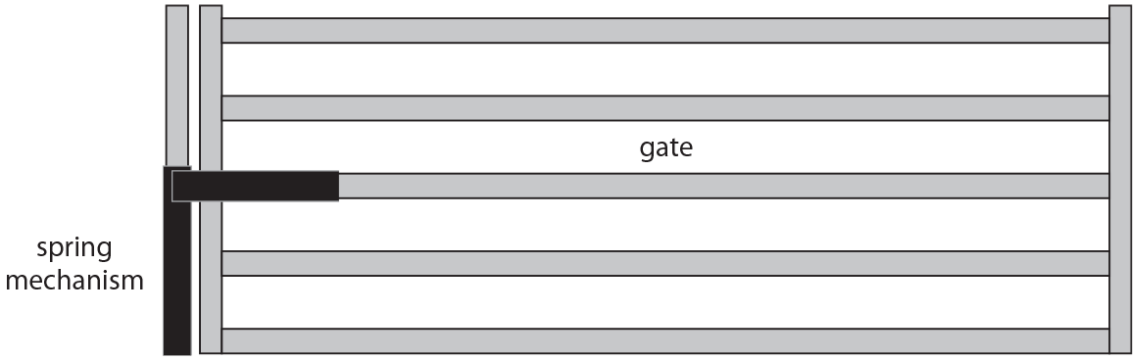
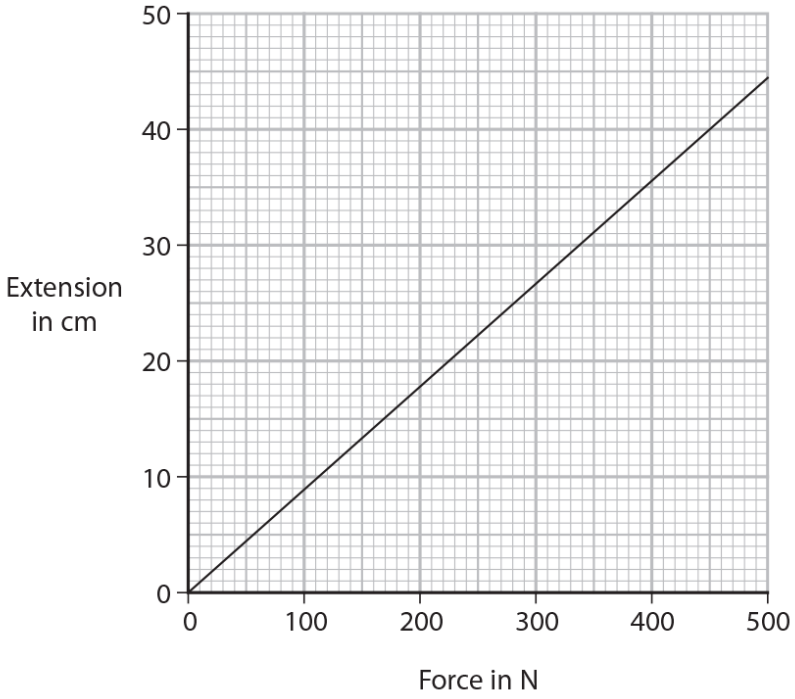


Diagram 1

(a) The graph shows some data from an investigation into how the extension of the spring changes with an increasing force.



Describe the relationship shown by the graph.

(2)

.....

.....

.....

.....

(b) Diagram 2 shows the gate viewed from above.

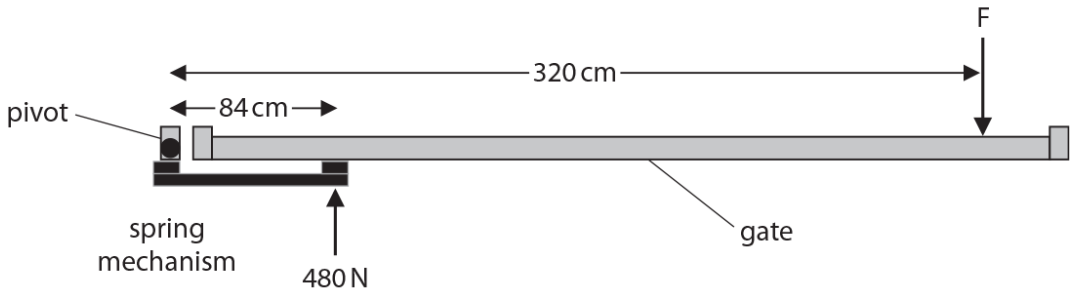


Diagram 2

The force the spring exerts on the gate is 480 N.

Show that the moment of the force the spring exerts on the gate is about 400 Nm.

(2)

(c) The force, F, is the minimum force needed to start opening the gate.

Calculate the magnitude of force F.

(4)

force F = ... N

(d) The spring is removed for testing.

Explain what will happen to the spring if the force applied to extend the spring is too large.

(2)

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.....

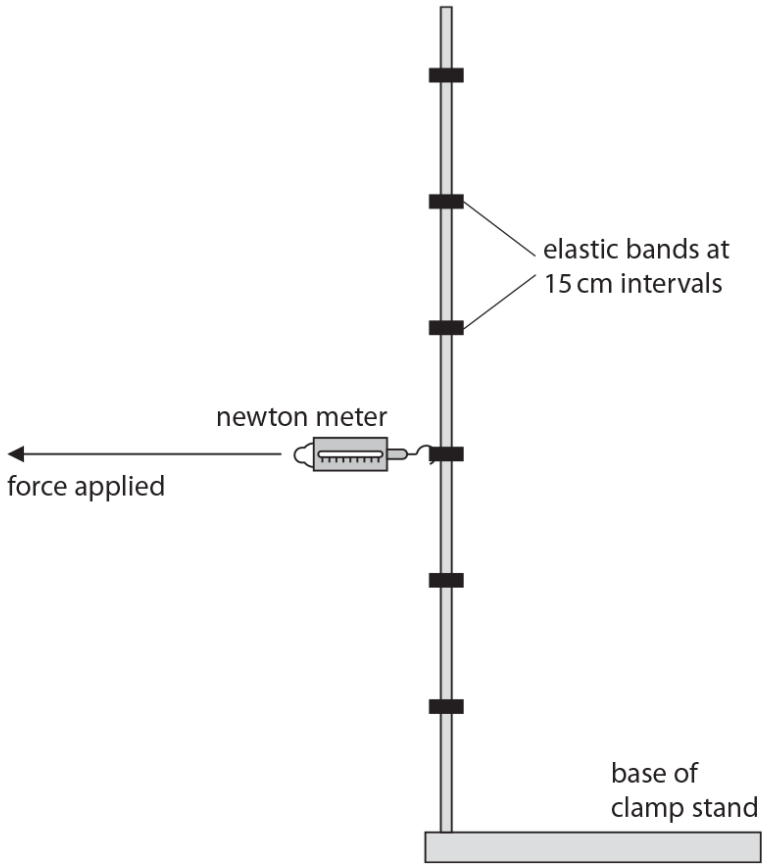
.....

.....

(Total for Question 7 = 10 marks)

6. 4PH1_2P_que_20210304 Q: 3

A student uses this apparatus to investigate moments.



This is the student's method.

- attach elastic bands at 15 cm intervals on a one metre tall clamp stand
- attach a newton meter to the highest elastic band and measure the horizontal force required to tilt the stand
- repeat the method at each 15 cm interval

(a) Name an instrument that the student should use to accurately measure the distances on the clamp stand.

(1)

.....

(b) The table shows the student's results.

Distance in cm	Force applied in N
15.0	10.0
30.0	5.6
45.0	
60.0	2.6
75.0	2.2
90.0	1.8

(i) The photograph shows the reading on the newton meter when the distance is 45.0 cm.

Use the photograph to determine the force required to tilt the stand when the distance is 45.0 cm.

(1)

force = ... N

(ii) Give a reason why this newton meter is unsuitable for measuring the force for distances less than 15.0 cm.

(1)

.....

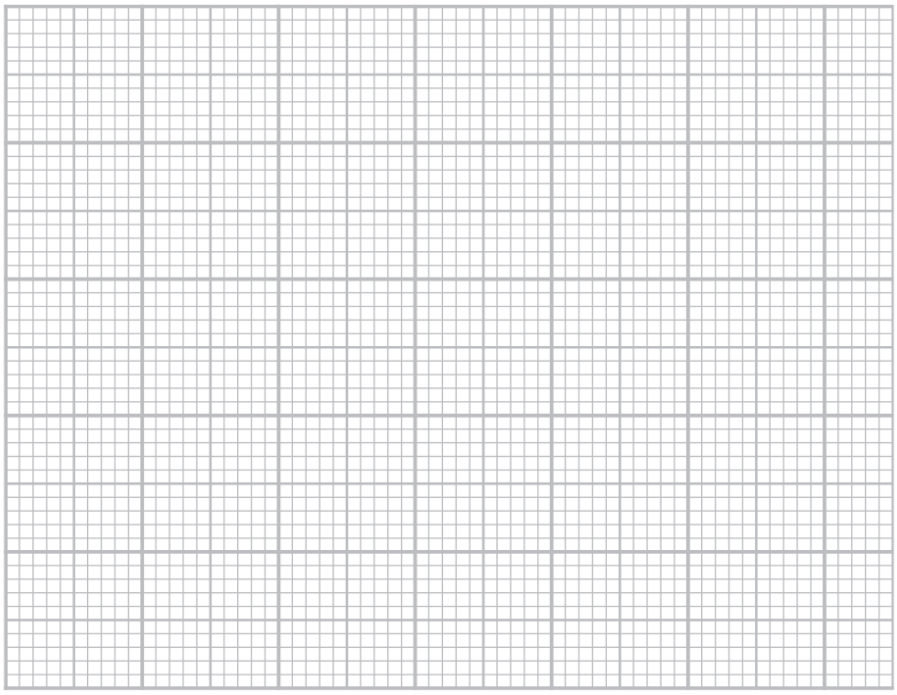
.....

(c) (i) Plot a graph of the student's results on the grid.

(3)

(ii) Draw the curve of best fit.

(1)



(d) The student concludes that the moment required to tilt the clamp stand does not change when the distance is varied.

Use data from the table or the graph to evaluate the student's conclusion.

(4)

(Total for Question 3 = 11 marks)

Appendix A

Answers

1. 4PH0_2P_rms_20180616 Q: 3

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>a</td><td>one mark for each correct row;;;;

<table><tr><th></th><th>Independent variable</th><th>Dependent variable</th><th>Control variable</th></tr><tr><td>Type of toy car</td><td></td><td></td><td>✓</td></tr><tr><td>Time to travel from A to B</td><td></td><td>✓</td><td></td></tr><tr><td>Angle of ramp</td><td>✓</td><td></td><td></td></tr><tr><td>Distance travelled down ramp</td><td></td><td></td><td>✓</td></tr></table></td><td>do not award each mark if two or more ticks in same row</td><td>4</td></tr>
<tr><td>b</td><td>only two columns/rows with headings of ‘angle’ and ‘time’;

correct units included in both headings;

data for angles given in ascending/descending order and all data given to same precision as in the paper;</td><td>ignore third column/row for numbering tests
columns/rows can be in either order
reject if any units given with data values
ignore abbreviations for units e.g. ‘deg’, ‘secs’
units can be given in words or symbols and written in brackets, separated using / or written as e.g. ‘time in s’</td><td>3</td></tr>
</table>

Question number	Answer	Notes	Marks
c (i)	point circled at (30,0.50);		1
(ii)	any one from: MP1. ignore it (in calculations / drawing curve); MP2. repeat it;	allow exclude it, discard it ignore 'repeat the (whole) experiment'	1
(iii)	smooth curve passing within 1 square of all points except for (30,0.50);		1
(iv)	any one from: MP1. makes better use of the grid; MP2. time would never be zero; MP3. ramp would be flat / car would not move; MP4. no results taken below 10°/ 0.50 s;	allow 'no results at zero'	1

2. 4PH1_2P_rms_20220119 Q: 1

Question number	Answer	Notes	Marks
(a)	A; B cannot be correct as it measures distance C cannot be correct as it measures temperature D cannot be correct as it measures voltage		1
(b) (i)	momentum = mass × velocity;	accept standard symbols e.g. p for momentum reject m or M for momentum	1
(ii)	72 × 13 = 936;		1
(iii)	substitution into given equation; correct evaluation; correct answer: 3200 (N) e.g. force = change in momentum ÷ time taken = 936 ÷ 0.29 = 3200 (N)	accept use of Δp of 900, 936 or 940 expect values of 3103, 3228 and 3241	2
(iv)	A cannot be correct as increasing the force does not protect the driver C cannot be correct as they would both increase the force on the person D cannot be correct as the airbag decreases the momentum		1

3. 4PH1_2P_rms_20220624 Q: 2

Question number	Answer	Notes	Marks
(a)	D (kg m/s); A is incorrect because this would be from mass / velocity B is incorrect because this would be from mass^2 × velocity C is incorrect because this would be from mass × velocity^2		1
(b) (i)	idea that (total) momentum before (collision) = (total) momentum after (collision) (in the absence of external forces);	allow references to explosion/event, rather than collision 'momentum is conserved' is insufficient	1
(ii)	setting up equation using conservation of momentum; rearrangement; evaluation; e.g. 0 = [1.9 × 3.7] + [2.9 × v] v = -7.03 / 2.9 (v =) -2.4 (m/s)	using either substitution of correct values or algebraically allow [1.9 × 3.7] = [2.9 × v] allow 2.42… (m/s) ignore sign of final answer correct evaluation of object Q's momentum i.e. (-)7.03 (kg m/s) scores 1 mark if no other mark scored	3
(c)	idea of carpet increases impact time; carpet reduces rate of change of momentum (for the same speed or momentum of egg); (carpet) reduces force;	ignore references to hard/soft floors ignore references to absorbing force or reduction in 'impact' ignore references to energy allow RA allow RA allow reference to given equation or word equation allow reduces deceleration or acceleration allow RA	3

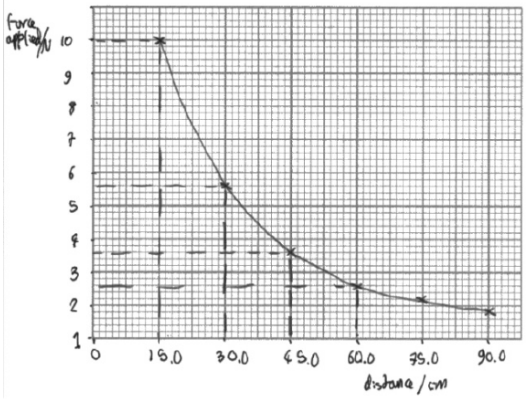
4. 4PH1_2PR_rms_20220119 Q: 2

Question number	Answer	Notes	Marks
(a) (i)	substitution into F = (mv - mu)/t; evaluation; correct direction; e.g. (F =) (6.7 - −4.2) / 0.012 (F =) 910 (N) (direction =) right	 -1 if POT error independent mark 208.3… scores 2 marks max. if given with correct direction allow 908.3…(N) allow forwards ignore compass directions 0.9083… scores 1 mark	3
(ii)	same forces as in (a)(i) AND opposite direction; e.g. (F =) 910 (N) AND (direction =) left	allow ECF from (a)(i) for both points allow ECF for compass direction only if opposite to direction given in (i)	1
(b)	any three from: MP1. idea that there is a change of momentum (when ball hits player); MP2. (equipment) increases (impact) time; MP3. decreases rate of change of momentum (of ball); MP4. decreases force (on player); MP5. decreases pressure (on player);	 allow spreads force over larger area	3

5. 4PH1_2Pr_rms_20220624 Q: 7

Question number	Answer	Notes	Marks
(a)	idea that extension increases as force increases; idea of a linear relationship;	ignore positive correlation allow "force is proportional to extension" for 2 marks if no other marks scored then mention of Hooke's law scores 1 mark	2
(b)	substitution into moment = force × distance; evaluation of moment to at least 3s.f.; e.g. moment = 480 × (0.)84 moment = 403 (Nm)	ignore units 1 mark max. for reverse calculation e.g. calculating the force or the distance allow 403.2 (Nm)	2
(c)	idea of principle of moments; moment of push force = F × 3.2; rearrangement; evaluation; e.g. 403.2 = F × 3.2 F = 403.2 / 3.2 (F =) 130 (N)	implied by substitution or written in words seen anywhere in calculation -1 for POT error allow use of 400 Nm, giving 125 N allow use of 403 Nm, giving 125.9…, 126 (N) clockwise moment = anti-clockwise moment allow 126 (N)	4
(d)	idea of spring exceeding/reaching elastic limit; idea of permanent deformation / not returning to original shape / permanent stretching;	ignore idea of spring losing elasticity / stop stretching allow limit of proportionality for elastic limit ignore spring breaking	2

6. 4PH1_2P_rms_20210304 Q: 3

Question number	Answer	Notes	Marks
(a)	(metre) rule(r)/(metal) tape measure;	allow (Vernier) caliper(s)	1
(b) (i)	3.6;	allow 3.7	1
(ii)	idea that the reading would be larger than the range of the instrument;		1
(c) (i)	suitable linear scale chosen (>50% of grid used); axes labelled with quantities and units; plotting correct to nearest half square;  	ignore plotting of 45cm point	3
(ii)	line (curve) of best fit acceptable;	allow ECF from plotting i.e. smooth curve with points evenly distributed about it	1
(d)	any four from: MP1. as distance increases, **force** decreases; MP2. (because) moment = force x distance; MP3. any one calculated moment value from results table or graph; MP4. a second calculated moment value from results table or graph; MP5. evidence shows moments are not all the same; MP6. (but) no pattern in the data (so could be attributed to experimental errors);	no mark for simply 'student is right/wrong' allow evidence shows moments are similar allow consistent conclusion i.e. variation isn't large enough	4