Topical Past Papers

Edexcel IGCSE Physics (4PH1)

[Paper 2P]

Exam Series: January 2017 - June 2024

Format Type B:
Each question is followed by its answer scheme

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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 Edexcel IGCSE or AS/A Level subject content. Here are the key features of these resources:

1. The workbook covers a wide range of topics, which are organized according to the latest syllabus content for Edexcel IGCSE or 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 International GCSE Physics (4PH1) Paper 2P Topical Past Papers
- Subtitle: Exam Practice Worksheets With Answer Scheme
- Examination board: Pearson Edexcel
- Subject code: 4PH1
- Years covered: January 2017 - June 2024
- Paper: 2P
- Number of pages: 683
- Number of questions: 213

Contents

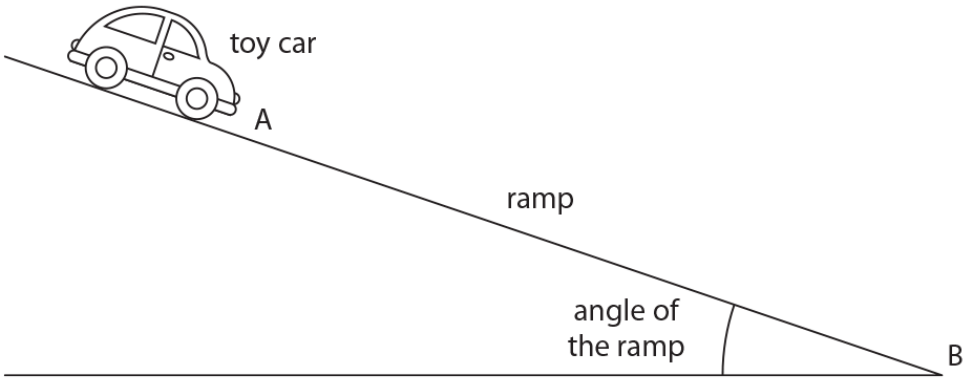
Chapter 1

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

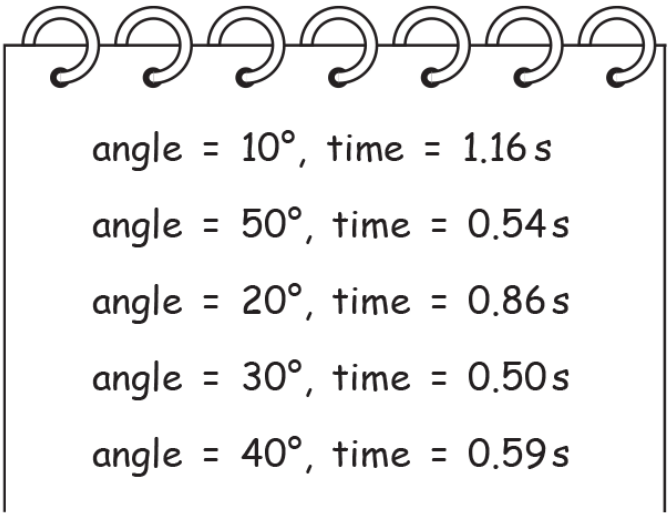
(a) The table lists some variables in this investigation.

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			

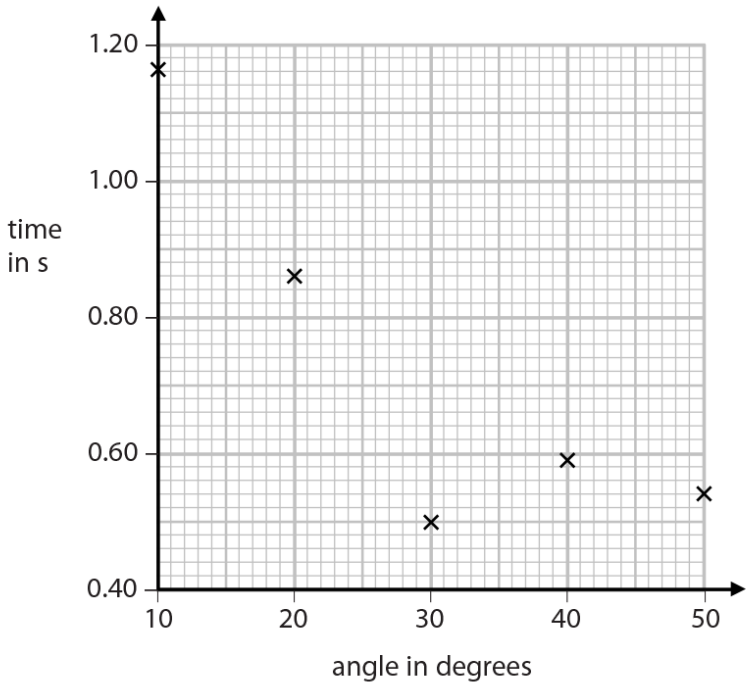
(b) These are the student's results.



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)

Answer:

<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

1.2 Forces, movement, shape and momentum

2. 4ph1-2p-que-20230121 Q: 4

A squash ball is made of rubber and used to play a game called squash.

(Source: © mexrix/Shutterstock)

A student observes that the squash ball bounces higher after its temperature increases.

The student designs an investigation to see how the temperature of the ball affects the maximum height after it bounces.

(a) State the independent and dependent variables in the student's investigation.

(2)

independent variable

.....

dependent variable

.....

(b) The diagram shows the ball at its maximum height after it bounces.

Determine the distance the ball moves from the floor to its maximum height.

Assume the ball does not change shape when it bounces.
[1 cm on diagram = 4 cm in laboratory]

(2)

floor

distance = ... cm

(c) Design a method that the student could use to investigate how the temperature of the ball affects the maximum height after it bounces.

Your answer should include details of

- apparatus needed
- measurements required
- control variables

You may draw a diagram to support your answer.

(6)

(Total for Question 4 = 10 marks)

Answer:

Question number	Answer	Notes	Marks
(a)	IV = temperature (of ball); DV = height (of bounce);	condone 'T' allow vertical distance condone 'h'	2
(b)	measurement from floor to bottom of ball; correct use of scale; e.g. distance = 6.2 (cm) distance = (6.2 × 4 =) 24.8 (cm)	accept range 6.1-6.3 (cm) accept range 24.4-25.2 (cm) ECF candidate's value for measurement. 25.6-30.0 (cm) scores 1 mark	2
(c)	six marks as distributed: **apparatus (2 marks max.)** MP1. ruler / tape measure; MP2. idea of water bath (and thermometer); **measurements (2 marks max.)** MP3. range of temperatures; MP4. height of the ball's (first) bounce; MP5. height measured at eye level; MP6. repeats taken **at each temperature** and mean found; **control variables (2 marks max.)** MP7. height ball is dropped from; MP8. surface the ball bounces on; MP9. condition of drop; MP10. idea of using multiple copies of the same ball;	marks can be awarded if clear from diagram allow use of heated beaker and water with thermometer reject idea of heating ball directly with a Bunsen burner allow other methods of direct heating must be clear that different temperatures are tested allow reduce parallax error allow use of phone/video camera AND idea of freeze frame or ruler in shot i.e. non-human dropping mechanism or checking that ball is dropped from rest	6

3. 4ph1-2p-que-20230121 Q: 5

Diagram 1 shows a wooden plank balanced horizontally on two supports, A and B.

A block is suspended from the plank between the supports by a cable of negligible weight.

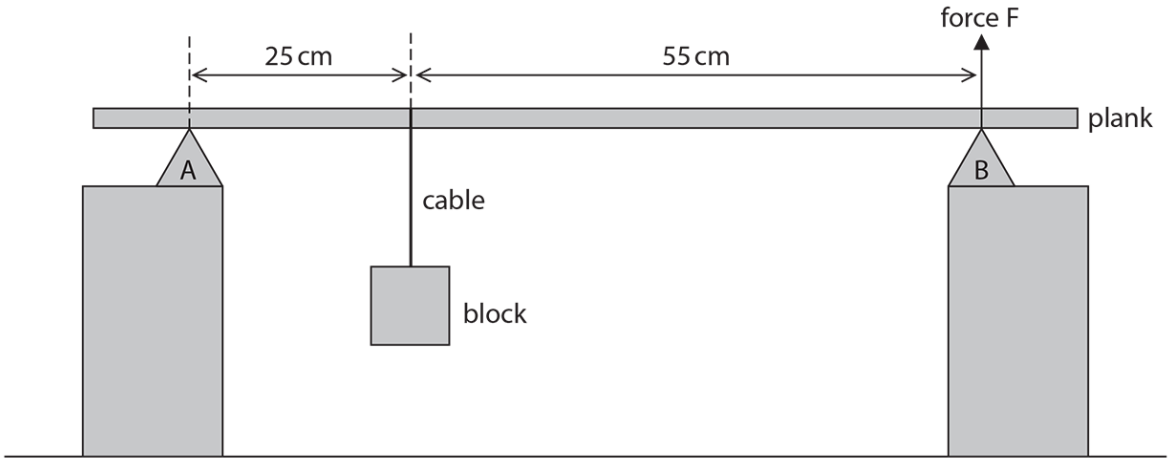


Diagram 1

(a) The weight of the block is 260 N.

(i) State the formula linking moment, force and perpendicular distance from the pivot.

(1)

(ii) By taking moments about support A, calculate force F.

Assume the weight of the plank is negligible.

(3)

force F = ... N

(iii) Explain what will happen to the magnitude of force F if the block is moved towards support B.

(3)

(b) Diagram 2 shows the block and the cable connecting the block to the plank.

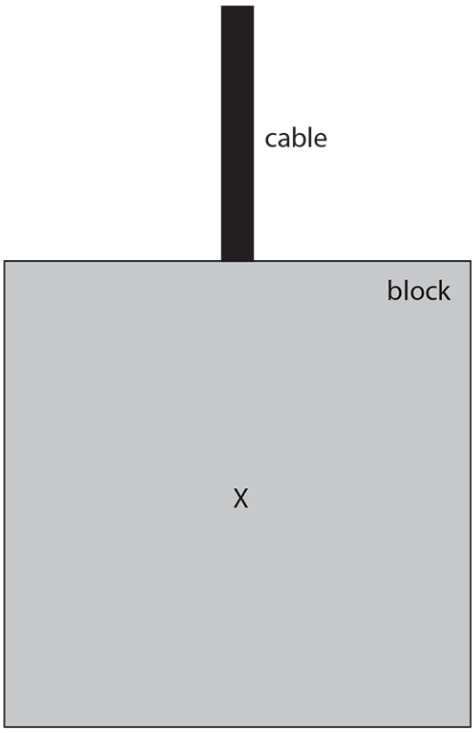


Diagram 2

(i) The centre of gravity of the block is located at point X.

Draw an arrow on diagram 2 to show the weight of the block.

(2)

(ii) The block also experiences a force due to the tension in the cable.

Explain why the block remains stationary when it is supported by this tension force.

(2)

(iii) Explain why the forces acting on the block are **not** an example of Newton's third law of motion.

(2)

(Total for Question 5 = 13 marks)

Answer:

Question number	Answer	Notes	Marks
(a) (i)	moment = force × (perpendicular) distance;	allow standard symbols and rearrangements allow d or s for distance condone m, M for moment	1
(ii)	correct calculation of or substitution for moment of block's weight; use of principle of moments; evaluation of force F; e.g. (moment of weight = 260 × 0.25 =) 65 (Nm) 65 = force F × 0.80 force F = 81 (N)	 stated or implied POT -1 allow 6500 (Ncm) allow 81.25 (N) 118(.2) (N) scores 2	3
(iii)	force F increases; with any two from: • distance from support A increases / distance from support B decreases; • clockwise moment / moment of weight increases; • anti-clockwise moment / moment of force F increases (to keep balance);	 ignore 'moves closer to B'	3
(b) (i)	**one** vertical downwards arrow drawn; arrow starts at centre of gravity;	ignore label DOP	2
(ii)	any two from: MP1. tension force is upwards; MP2. tension force is same magnitude as weight / eq; MP3. idea of no resultant force / acceleration;	 allow forces balance allow forces cancel out	2
(iii)	any two from: MP1. forces are acting on the same body; MP2. idea that forces are not the same type / origin; MP3. correct example of Newton's third law pair;	 e.g. weight of block is balanced by gravitational force of block on Earth	2
1			

4. 4ph1-2p-que-20230617 Q: 1

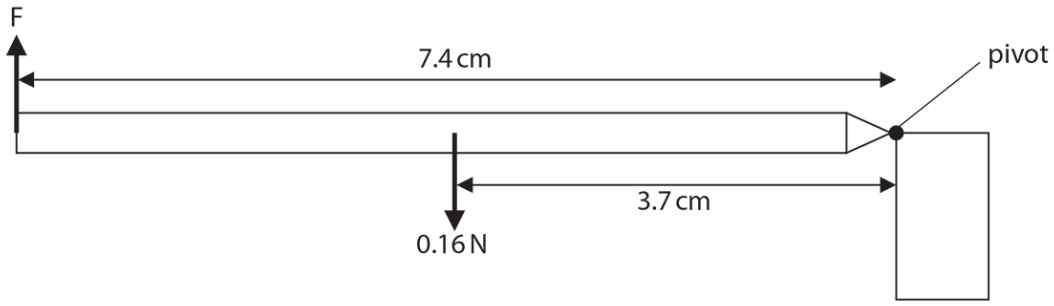
A pencil has a weight of 0.16 N.

(a) What is the mass of the pencil?

(1)

- ☒ **A** 1.6 g
- ☒ **B** 16 g
- ☒ **C** 160 g
- ☒ **D** 1600 g

(b) The diagram shows the pencil with one end resting on a small block.



A finger provides an upwards force, F, to keep the pencil horizontal.

(i) The weight of the pencil is 0.16 N.

Calculate the moment of the weight of the pencil about the pivot.

Use the formula

moment = force × perpendicular distance from the pivot

(2)

moment = ... N cm

(ii) State the moment of the force F.

(1)

moment = ... N cm

(iii) Show that force F is 0.080 N.

(2)

(Total for Question 1 = 6 marks)

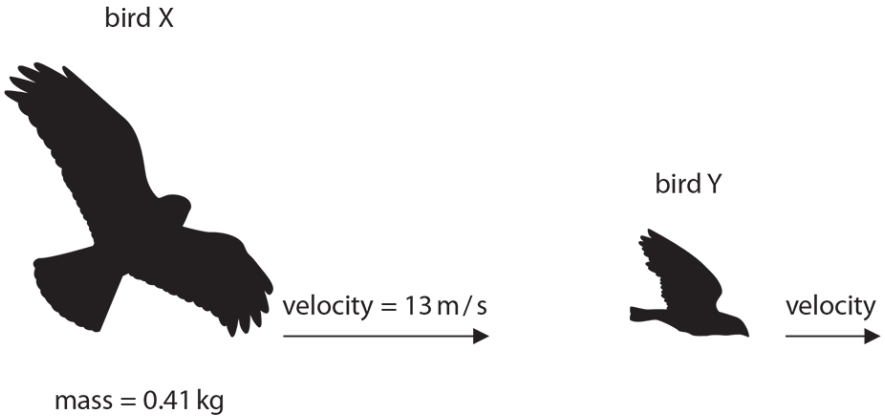
Answer:

Question number	Answer	Notes	Marks
(a)	B - 16 g; A cannot be correct as g on Earth is not 100 C cannot be correct as g on Earth is not 1 D cannot be correct as g on Earth is not 0.1		1
(b) (i)	substitution into given formula; correct evaluation; correct answer: 0.59(2) (N cm) e.g. moment = 0.16 × 3.7 moment = 0.592 (N cm)	ignore units here accept 0.00592 Nm (i.e. unit on answer line changed) condone 1sf answer accept 0.00592 Nm (i.e. unit on answer line changed) -1 POT error otherwise	2
(ii)	0.59(2) (N cm);	ECF candidate's answer from (i)	1
(iii)	substitution; re-arrangement and evaluation; e.g. 0.592 = F × 7.4 F = 0.592 ÷ 7.4 = 0.08(0)	ECF candidate's answer from (ii) for substitution only ignore reverse argument accept 0.16 x 3.7 for 0.59(2) 0.592/7.4 = 0.080 or 0.59 /7.4 = 0.0797... or 0.6 /7.4 = 0.08108... all score 2 marks	2

5. 4ph1-2p-que-20230617 Q: 4

The diagram shows two birds, just before bird X catches the smaller bird Y.

Both birds are travelling horizontally at constant velocity.



(a) Show that the momentum of bird X is about 5 kg m / s.

(2)

(b) The momentum of bird Y just before it is caught is 0.15 kg m / s.

Calculate the total momentum of the birds just before bird X catches bird Y.

(1)

momentum = ... kg m / s

(c) State the total momentum of the birds just after bird X has caught bird Y.

(1)

momentum = ... kg m / s

(d) Bird Y has a mass of 0.17 kg.

Calculate the velocity of the birds just after bird X has caught bird Y.

(3)

velocity = ... m/s

(Total for Question 4 = 7 marks)

Answer:

Question number	Answer	Notes	Marks
(a)	0.41 × 13; 5.3(3);		2
(b)	5.15 / 5.45 / 5.48 / 5.5;	allow ecf from (a)	1
(c)	same as candidate's answer to (b) i.e. 5.48 (kg m/s);		1
(d)	total mass = 0.58 (kg); substitution of candidate's answer to part (c); rearrangement and correct evaluation; correct answer: 9.4 (m/s) e.g. total momentum = 5.48 kg m/s total mass = 0.58 kg velocity = 5.48 ÷ 0.58 velocity = 9.448... (m/s)	accept re-calculation of total momentum 'from first principles' acceptable values for the velocity here are 8.88...,9.40... , 9.448..., 9.48... or ecf from (c) allow full credit for correct answer with no working	3

6. 4ph1-2p-que-20231123 Q: 2

This question is about moments.

Diagram 1 shows the raised lower leg of a person.

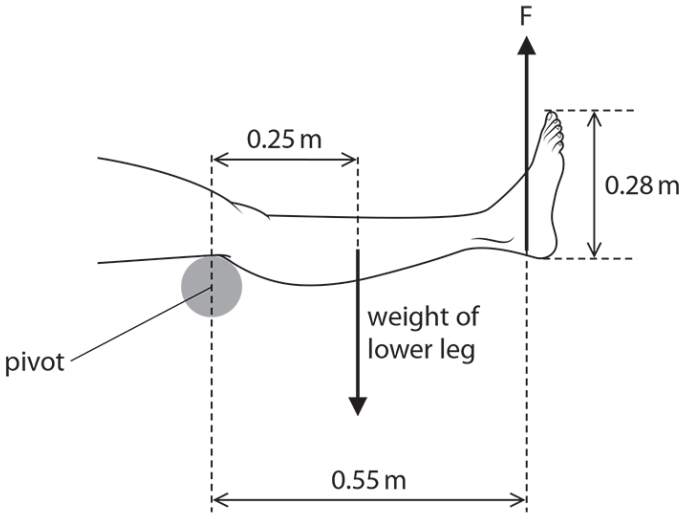


Diagram 1

(a) (i) The moment of the weight of the lower leg about the pivot is 19 N m.

A vertical force, F, is applied to the person's foot to keep the lower leg raised.

The lower leg does not move.

Calculate the magnitude of force F, using the formula

moment = force × perpendicular distance from pivot

(2)

force F = ... N

(ii) Which distance is used to calculate the moment of the weight of the lower leg about the pivot?

(1)

☒ **A** 0.25 m

☒ **B** 0.28 m

☒ **C** 0.30 m

☒ **D** 0.55 m

(b) Diagram 2 shows the person resting their lower leg on two supports.

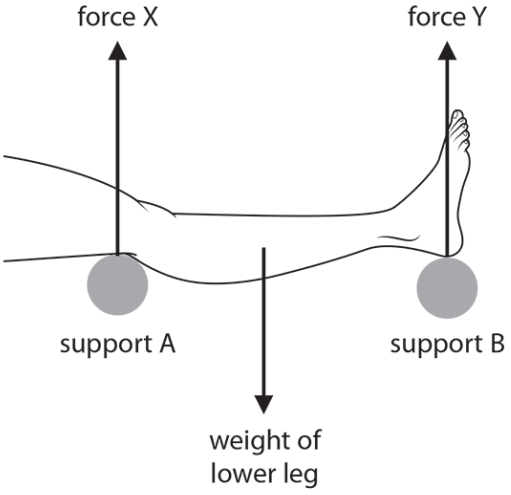


Diagram 2

(i) The centre of gravity of the lower leg is 0.25 m away from support A and 0.35 m away from support B.

Explain whether force X or force Y is larger.

Ignore the weight of the upper leg.

(3)

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(ii) A bag of ice is placed on the lower leg, vertically above the centre of gravity.

This causes force X and force Y to increase.

The bag is then moved towards the person's foot.

Describe how force X and force Y change as the bag is moved towards the person's foot.

(3)

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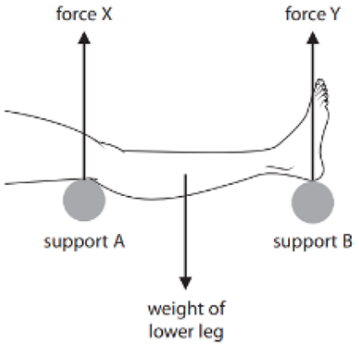
(Total for Question 2 = 9 marks)

Answer:

Question number	Answer	Notes	Marks
(a) (i)	substitution OR rearrangement; evaluation; e.g. 19 = force × 0.55 OR force = moment/distance (force =) 35 (N)	 allow 34.5, 34.54, etc. -1 POT error	2
(ii)	A (0.25 m); B is incorrect because this is not a perpendicular distance C is incorrect because this is the distance between weight and force F D is incorrect because this is the distance to force F		1
(b) (i)	**force** X has the shorter distance to the CoG; moments of two forces must be equal/eq; so force X must be larger;  	Note: no credit for repeating question I.e. CoG is closer to support A condone reference to **force** A accept 'weight' for CoG allow RA i.e. (total) clockwise moment = (total) anti-clockwise moment DOP on either	3
(ii)	any three from: force X decreases; force Y increases; change by the same amount; total force remains the same;	 allow idea of change with distance is linear	3

7. 4ph1-2p-que-20231123 Q: 6

This question is about momentum and forces.

(a) State the principle of conservation of momentum.

(1)

.....

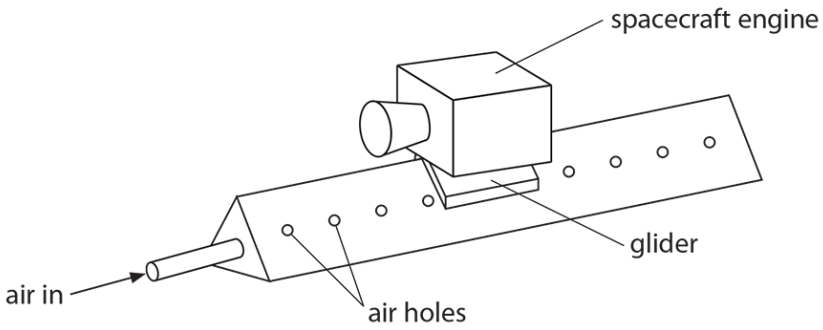
.....

.....

(b) The diagram shows an air track that can be used to investigate motion without friction.

Air comes out through a series of small holes in the air track. The air lifts the glider slightly above the track.

A small spacecraft engine floats at rest on a cushion of air.



(i) State the momentum of the spacecraft engine when it is at rest.

(1)

momentum = ... kg m / s

(ii) The spacecraft engine ejects large numbers of xenon ions to the left.

A mass of 2.6×10^{-8} kg of xenon ions leaves the engine with a mean speed of 26 km / s.

Calculate the momentum of all the ejected xenon ions.

(3)

momentum = ... kg m / s

(iii) State the magnitude and direction of the spacecraft engine's momentum after these xenon ions leave the engine.

(2)

magnitude of momentum = ... kg m / s

direction of momentum = ...

(iv) The ions exert a force of 2.6 mN on the spacecraft engine.

The spacecraft engine has a mass of 1.2 kg.

Calculate the acceleration of the engine.

Give your answer to 2 significant figures.

(4)

acceleration = ... m/s^2

(c) The engine is designed to accelerate a spacecraft while the spacecraft is travelling through space.

The spacecraft carries a mass of 0.75 kg of xenon ions for the engine.

When the engine is used, 9.9×10^{-8} kg of xenon ions leave the engine each second.

A student suggests that this small spacecraft engine would not be useful because the acceleration it produces is very small.

Evaluate the student's suggestion.

(2)

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(Total for Question 6 = 13 marks)

Answer:

Question number	Answer	Notes	Marks
(a)	idea that (total) momentum before = (total) momentum after (event);	ignore 'momentum is conserved'	1
(b) (i)	zero/0/nought/nothing;		1
(ii)	recall of momentum = mass × velocity; substitution; evaluation; e.g. p = mv p = 2.6 × 10^{-8} × 26 000 p = 6.8 × 10^{-4} (kg m/s)	allow standard symbols e.g. p = m × v -1 POT error allow 6.76 × 10^{-4}	3
(iii)	6.8 × 10^{-4} (kg m/s); right;	allow ecf from (ii)	2
(iv)	substitution into 'F=ma'; rearrangement; evaluation; answer given to 2s.f.; e.g. 2.6 (×10^{-3})= 1.2 × acceleration acceleration 2.6 (×10^{-3}) / 1.2 (acceleration =) 2.16... × 10^{-3} (m/s^2) (acceleration =) 2.2 × 10^{-3} (m/s^2)	ignore units −1 for POT error independent mark	4
(c)	any two from: MP1. idea of tiny amount of fuel 'consumed' per second; MP2. any attempt of calculation of time to run out of xenon **seen**; MP3. correct calculation of 7.575... × 10^6 s; MP4. idea that 'burn' is for a long time; MP5. idea that low acceleration for long time gives high speed change; MP6. mass of spacecraft will be larger so acceleration is even smaller;	ignore idea of simple yes/no accept 88 or 87.68.. days, 2104 hours, 1.26.. × 10^5 minutes , 12.5.. weeks, 0.24... years	2

8. 4ph1-2pr-que-20230121 Q: 7

A crumple zone is a safety feature in a car.

It is a part of the car that is designed to collapse during a collision.

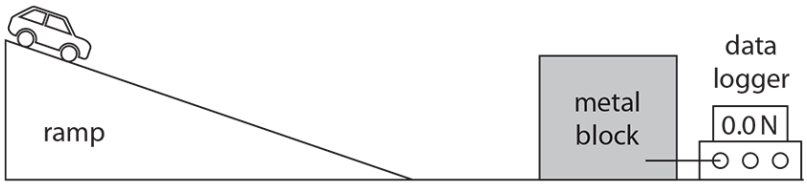
A student investigates the effectiveness of crumple zones.

The student rolls two model cars down a ramp.

Each car comes to rest when it hits a large metal block.

A data logger measures the mean force applied to the car during the collision with the block.

The diagram shows the equipment used in the investigation.



Car 1 has a paper crumple zone at the front.

Car 2 has no paper crumple zone.

The table shows the student's results.

Car	Mean force on car from block in N	Velocity just before car hits block in m/s
1	2.5	3.0
2	4.9	3.0

(a) The mass of each car is 0.074 kg.

Calculate the time taken for the velocity of car 1 to decrease from 3.0 m/s to 0.0 m/s.

(3)

time taken = ... s

(b) State the magnitude and direction of the force on the metal block, when car 2 collides with the block.

(2)

magnitude = ... N

direction = ...

(c) Explain why the mean force from the block on car 1 is smaller than the mean force on car 2.

(2)

.....

.....

.....

.....

(Total for Question 7 = 7 marks)

Answer:

Question number	Answer	Notes	Marks
(a)	substitution into F = (mv − mu) / t; rearrangement; evaluation; e.g. 2.5 = [0.074 × 3.0 (−0.074 × 0.0)] / time time = (0.074 × 3.0) / 2.5 (time =) 0.089 (s)	 0.08 scores 2 marks if supported by valid working allow alternative method using F=ma and a=(v-u)/t allow 0.09, 0.0888 (s) condone 0.088 (s)	3
(b)	magnitude = 4.9 (N); direction = right/opposite to car;	 ignore East	2
(c)	any two from: MP1. (crumple zone) increases the time (taken to stop); MP2. same momentum change (as car 2); MP3. smaller acceleration; MP4. reference to formula force = change in momentum/time;	 allow same velocity change (as car 2) allow deceleration	2