AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.5.1.2

Contact and non-contact forces

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**14**
Available paper years	**2018–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

6.5.1.2 Contact and non-contact forces

Answer 01 · Mark scheme June 2018 | 8464/P/2F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	increases		1	AO1 6.5.3
05.2	the band returns to its original shape because there is an elastic force	allow band gets shorter allow because the stretching force has been removed if no other mark has been scored, allow for **1** mark the elastic potential energy decreases	1 1	AO1 6.5.3
05.3	any **two** from: • initially the band does not stretch when a force is applied • (when extending) as force increases the extension increases • the relationship is non-linear	allow a certain force is needed before the band extends allow the increase is not proportional do **not** accept directly proportional	2	AO3 6.5.3
05.4	straight diagonal line from bottom left to top right straight line through the origin	allow the line to curve upwards beyond the elastic limit	1 1	AO1 6.5.3
05.5	force = spring constant × extension	allow F = *k e*	1	AO1 6.5.3

6.5.1.2 Contact and non-contact forces

Answer 01 · Mark scheme

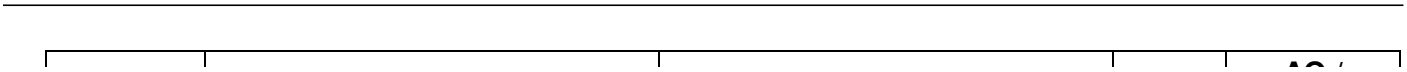
June 2018 | 8464/P/2F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6		an answer of 120 (N) scores **3** marks an answer of 12 000 (N) scores **2** marks		AO2 6.5.3
	7.5 cm = 0.075 m		1	
	$F = 1\,600 \times 0.075$	this mark may be awarded if e is incorrectly / not converted	1	
	$F = 120$ (N)	allow an answer that is consistent with their value of e	1	
Total			**11**	

6.5.1.2 Contact and non-contact forces

Answer 01 · Mark scheme

June 2018 | 8464/P/2F | Original Q5



6.5.1.2 Contact and non-contact forces

Answer 02 · Mark scheme June 2018 | 8464/P/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.1	its acceleration would decrease to zero the resultant force on it would decrease to zero		1 1	AO3 6.5.4.2.2
07.2	any **one** from: • move the second light gate closer to the first • shorten the string length	allow use a taller table	1	AO3 6.5.4.2.2
07.3		each mistake and its correction may be given in any order		AO3 6.5.4.2.2
	1.26667 (m/s^2) (is wrong)	allow (mean value calculated at) 0.20 (N)	1	
	give value to 2 significant figures	allow give value to 1 decimal place allow 1.3 (m/s^2)	1	
	6.7 (m/s^2) (is wrong)	allow (mean value calculated at) 0.98 (N) allow test 2 for 0.98 (N) or 7.2 is an anomaly	1	
	discard the anomalous result and recalculate the mean	allow repeat the anomalous test result and re-calculate the mean allow 6.4 (m/s^2)	1	
07.4	(resultant) force is directly proportional to acceleration	allow the larger the (resultant) force, the greater the acceleration allow positive correlation between (resultant) force and acceleration allow mass / weight (of the holder) for (resultant) force	1	AO3 6.5.4.2.2

6.5.1.2 Contact and non-contact forces

Answer 02 · Mark scheme

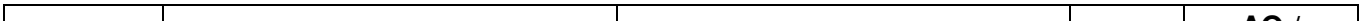
June 2018 | 8464/P/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.5	all points correctly plotted within ½ small square curved line of best fit	allow **1** mark for 3 or 4 points correctly plotted	2 1	AO2 6.5.4.2.2
07.6	inversely proportional	allow as mass increases, acceleration decreases	1	AO3 6.5.4.2.2
Total			**12**	

6.5.1.2 Contact and non-contact forces

Answer 02 · Mark scheme

June 2018 | 8464/P/2F | Original Q7



6.5.1.2 Contact and non-contact forces

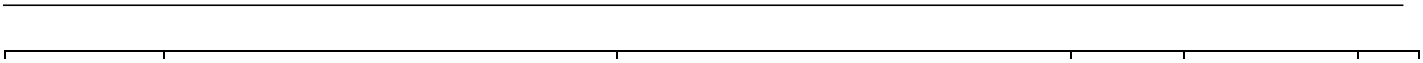
Answer 03 · Mark scheme June 2019 | 8464/P/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
01.1	electrostatic gravitational		1 1	AO1 6.5.1.2	A
01.2	D		1	AO2 6.7.1.1	A
01.3	bring two unlike poles close together bring two like poles close together	allow north and south poles allow opposite poles allow two north / south poles allow N for north and S for south	1 1	AO1 6.7.1.1	E
01.4	induced magnetism		1	AO1 6.7.1.1	A
01.5	all 4 poles correctly labelled north and south	allow N for north and S for south allow 1 mark for 2 or 3 correctly labelled poles	2	AO3 6.7.1.1	E
Total			**8**		

6.5.1.2 Contact and non-contact forces

Answer 03 · Mark scheme

June 2019 | 8464/P/2F | Original Q1



6.5.1.2 Contact and non-contact forces

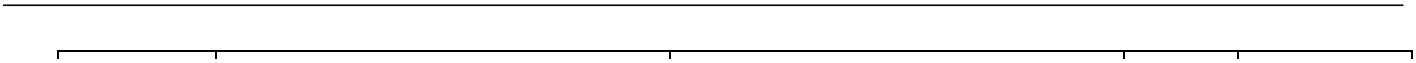
Answer 04 · Mark scheme November 2020 | 8464/P/2F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	gradient = $\frac{250 - 0}{50 - 0}$ speed = 5.0 m/s	allow any correct pair of values substituted allow 5 (m/) allow the use of s = v t	1 1	AO2 6.5.4.1.4
04.2	gravitational force		1	AO1 6.5.1.2
04.3	W = 30 × 250 W = 7500 J		1 1 1	AO2 AO2 AO1 6.5.2
04.4	frictional kinetic chemical		1 1 1	AO1 6.5.2
Total			**9**	

6.5.1.2 Contact and non-contact forces

Answer 04 · Mark scheme

November 2020 | 8464/P/2F | Original Q4



6.5.1.2 Contact and non-contact forces

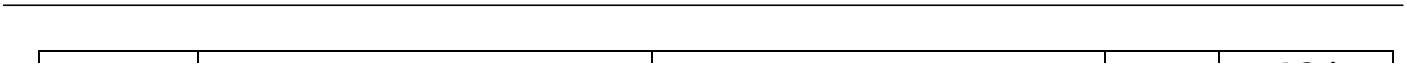
Answer 05 · Mark scheme November 2021 | 8464/P/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	electrostatic force		1	AO1 6.5.1.2
01.2	the downward force is the same size as the upward force		1	AO2 6.5.1.2
01.3	normal contact force		1	AO1 6.5.1.2
01.4	W = 55 × 9.8 539 (N)	 allow 540 (N)	1 1	AO2 6.5.1.3
01.5	the weight decreased		1	AO3 6.5.1.3
01.6	centre of mass		1	AO3 6.5.1.3
01.7	300 (N)		1	AO2 6.5.1.4
Total			**8**	

6.5.1.2 Contact and non-contact forces

Answer 05 · Mark scheme

November 2021 | 8464/P/2F | Original Q1



6.5.1.2 Contact and non-contact forces

Answer 06 · Mark scheme November 2021 | 8464/P/2F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	(air resistance) increases		1	AO1 6.5.4.1.5
05.2	less than		1	AO3 6.5.4.1.5
05.3	s = 35 × 14 s = 490 (m)		1 1	AO2 6.5.4.1.2
05.4	work done = force × distance **or** W = Fs		1	AO1 6.5.2
05.5	54 000 000 = F × 270 $F = \frac{54\,000\,000}{270}$ F = 200 000 (N)		1 1 1	AO2 6.5.2

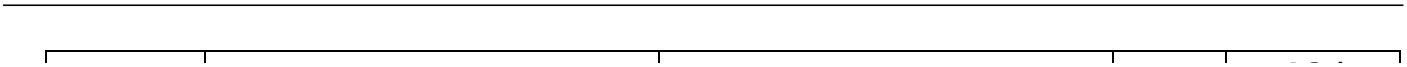
Answer 06 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
05.6	**Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar/different is made clear and (where appropriate) the magnitude of the similarity/difference is noted.	4–6	AO3 6.5.4.1.2
	Level 1: Relevant features are identified and differences noted.	1–3	
	No relevant content	0	
	Indicative content • distance travelled is the same for each aeroplane • time in the air is much greater for jet aeroplane • speed of rocket plane is much greater • speed of rocket plane is 32 times greater • radiation dose each hour greater for rocket aeroplane • radiation dose each hour is 2 times greater for rocket aeroplane • overall radiation dose is less for rocket plane • dose in jet aeroplane is 16 times greater overall • much higher risk in jet aeroplane • increased risk of skin cancer • increased risk of gene mutation and cancer To access level 2, there must be a relevant calculation.		
Total			**14**

6.5.1.2 Contact and non-contact forces

Answer 06 · Mark scheme

November 2021 | 8464/P/2F | Original Q5



6.5.1.2 Contact and non-contact forces

Answer 07 · Mark scheme

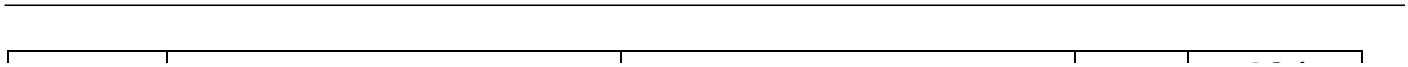
November 2021 | 8464/P/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	the spring will return to its original length when the force is removed		1	6.5.3 AO1
06.2	measure the original length of the spring **and** the extended length of the spring (with the metre rule) extension = extended length – original length		1 1	6.5.3 AO1
06.3	e = 0.080 m $E_e = 0.5 \times 40 \times (0.080)^2$ $E_e = 0.128$ (J)	 allow a correct substitution using an incorrectly / not converted value of e allow a correct calculation using an incorrectly / not converted value of e	1 1 1	6.5.3 AO2
06.4	force = spring constant × extension **or** F = k e		1	6.5.3 AO1
06.5	300 = k × 0.40 $k = \frac{300}{0.40}$ k = 750 (N/m)		1 1 1	6.5.3 AO2
Total			**10**	

6.5.1.2 Contact and non-contact forces

Answer 07 · Mark scheme

November 2021 | 8464/P/2F | Original Q6



6.5.1.2 Contact and non-contact forces

Answer 08 · Mark scheme

June 2022 | 8464/P/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	the same distance as the lift		1	AO2 6.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	it decreases		1	AO2 6.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	E = 1300 × 9.8 × 4.0 E = 50960 (J)	 allow 51000 (J)	1 1	AO2 6.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	kinetic internal	this order only	1 1	AO1 6.1.1.1 6.3.2.1

6.5.1.2 Contact and non-contact forces

Answer 08 · Mark scheme

June 2022 | 8464/P/1F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	the distance moved by the lift the weight of the people in the lift		1 1	AO2 6.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2.6	$E_e = 0.5 \times 880\,000 \times 0.015^2$ $E_e = 99$ (J)		1 1	AO2 6.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2.7	less energy is transferred		1	AO1 6.1.2.2

Total Question 2		11

6.5.1.2 Contact and non-contact forces

Answer 09 · Mark scheme

June 2022 | 8464/P/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	work done = force × distance (along the line of action of the force) **or** $W = F\ s$		1	AO1 6.5.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	3 360 000 = F × 42 000 $F = \frac{3\ 360\ 000}{42\ 000}$ F = 80 (N)		1 1 1	AO2 6.5.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	distance travelled = speed × time		1	AO1 6.5.4.1.5

6.5.1.2 Contact and non-contact forces

Answer 09 · Mark scheme

June 2022 | 8464/P/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	42 000 = v × 5600 $v = \frac{42\,000}{5600}$ v = 7.5 (m/s)		1 1 1	AO2 6.5.4.1.2

6.5.1.2 Contact and non-contact forces

Answer 09 · Mark scheme

June 2022 | 8464/P/2F | Original Q7

Question	Answers	Mark	AO / Spec. Ref.
07.5	**Level 2:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	3–4	AO3 6.5.4.1.2
	Level 1: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	1–2	
	No relevant content	0	
	Indicative content the effect on speed must be consistent with the cause of the change • competitors accelerate at the start • so speed increases • the road is not flat • so speed increases going downhill and / or speed decreases going uphill • the competitor goes round a bend • so speed decreases • competitors may tire towards the end (so the force they exert decreases) • so they slow down • competitors may sprint during the race • causing speed to increase • may get a puncture • so speed would decrease or they would stop • resistive forces on competitors may increase/decrease • so speed would decrease/increase		

Total Question 7		**12**

Answer 10 · Mark scheme

June 2023 | 8464/P/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	decreases		1	AO1 6.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	increases		1	AO 1.1 6.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	$E_p = 2.5 \times 9.8 \times 3.4$ $E_p = 83.3$ (J)	 allow 83 (J)	1 1	AO2 6.1.1.1 6.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	$E_k = 0.5 \times 2.5 \times 4.8^2$ $E_k = 28.8$ (J)	 allow 29 (J)	1 1	AO2 6.1.1.1 6.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	some energy is transferred to the surroundings		1	AO1 6.1.1.1 6.1.2.1

6.5.1.2 Contact and non-contact forces

Answer 10 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	speed will increase (because work done against) friction decreases		1 1	AO1 6.1.2.1

Total Question 2	**9**

Answer 11 · Mark scheme

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	weight acts downwards		1	AO2 6.5.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	a gravitational		1	AO1 6.5.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	$W = 12\ 000 \times 0.070$ $W = 840$ (N)		1 1	AO2 6.5.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	$E_e = 0.5 \times 12\ 000 \times (0.070)^2$ $E_e = 29.4$ (J)	 allow 29 (J)	1 1	AO2 6.5.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	the spring will not go back to its original length when the force is removed		1	AO1 6.5.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	B		1	AO3 6.5.3 RPA18

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	B		1	AO1 6.5.3 RPA18

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.8	any **two** from: • use a greater range of forces • use forces that are similar to the weight of a person • test more (identical) springs • find the limit of proportionality • repeat (discard anomalous results) and calculate a mean	allow test more forces allow elastic limit	2	AO3 6.5.3 RPA18

Total Question 1	11

Answer 12 · Mark scheme

June 2023 | 8464/P/2F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	compression rarefaction	this order only	1 1	AO1 6.6.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	longitudinal waves transfer energy		1	AO1 6.6.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	amplitude		1	AO2 6.6.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	340 (m/s)	allow answers in the range 339 to 340 (m/s)	1	AO2 6.6.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	s = 340 × 0.20 s = 68 m	 allow ecf from question **04.4**	1 1	AO2 6.6.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	the higher the temperature the greater the speed (so) time taken is less	do not accept the greater the speed the higher the temperature	1 1	AO3 6.6.1.2

Total Question 4	**9**

6.5.1.2 Contact and non-contact forces

Answer 13 · Mark scheme

June 2025 | 8464/P/2F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	1.3 s		1	AO3 6.5.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	A		1	AO2 6.5.4.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	friction		1	AO1 6.5.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	(air resistance) increased		1	AO1 6.5.1.2 6.5.4.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	$\Delta v = 60 \times 0.35$ $\Delta v = 21$ (m/s)	 allow − 21 (m/s)	1 1	AO2 6.5.4.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	$F = 75 \times 60$ $F = 4500$ (N)	 allow − 4500 (N)	1 1	AO2 6.5.4.2.2

Total Question 1	**8**

Answer 14 · Mark scheme

June 2025 | 8464/P/2F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	distance travelled = speed × time		1	AO1 6.5.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	1 500 000 = v × 670 000 $v = \frac{1\ 500\ 000}{670\ 000}$ V = 2.2… (m/s)		1 1 1	AO2 6.5.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	F = (6 × 370) - 520 F = 1700 (N)	if no other mark awarded allow **1** mark for 370 - 520 = (-)150 (N)	1 1	AO2 6.5.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	speed	allow velocity	1	AO1 6.5.4.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	friction + air resistance = pull of the rope on the sled		1	AO1 6.5.1.4 6.5.4.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	the force of the sled on the rope		1	AO1 6.5.4.2.3

Total Question 6	**9**

6.5.1.2 Contact and non-contact forces

Answer 05 · Examiner comments — November 2021 | 8464/P/2F | Original Q1

Question 1 (Low demand)

01.1 Approximately 60 % of students correctly identified that friction is a non-contact force.

01.2 Approximately one third of students knew that the two forces were the same size. Of those that did not, the majority though that the downwards force was greater.

01.3 Approximately one third of students knew that the force acting upwards on the person was a normal contact force.

01.4 This calculation was very well answered. Over 90% of students scored 2 marks, and a few students scored 1 mark for correctly substituting, but then not correctly evaluating the final answer.

01.5 Just over 50% of students got this question correct by selecting 'The weight decreased'.

01.6 50% of students knew that the point 'X' represented the centre of mass.

01.7 Again, 50% of students were able to determine the resultant force. From those that could not, there was a mix of answers. Some students wrote one of the forces down, and some added the forces together.

Answer 06 · Examiner comments — November 2021 | 8464/P/2F | Original Q5

Question 5 (Low demand and standard demand)

05.1 Over 50% of students correctly stated that the air resistance would increase. Of those that didn't, many of them failed to answer the question, and wrote answers such as 'the acceleration will overcome the air resistance'.

05.2 Only 15% of students correctly identified that the lift force on the wings will be the same as the weight of the rocket aeroplane.

05.3 This low demand calculation was very well answered, with the vast majority of students scoring 2 marks.

05.4 Over 50% of students correctly recalled the equation.

05.5 This standard demand calculation was reasonably well answered. Nearly 75% were able to substitute into the correctly rearranged equation, and the vast majority of those went on to correctly evaluate the answer and score full marks.

05.6 This question was an extended response question that was marked with a level of response mark scheme. Over 10% of students did not attempt the question. Of those that did 35% did not write any relevant content. Nearly all these students failed to include any

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6.5.1.2 Contact and non-contact forces

Answer 06 · Examiner comments November 2021 | 8464/P/2F | Original Q5

information from the question. Where students are given an additional instruction such as 'Use values from Table 2', they must do so. Of the 35% of students that did score mark the majority made simple statements that the radiation dose for the rocket aeroplane was greater. Very few appreciated that because the rocket aeroplane was much faster, it spent much less time in the air. Only a handful of students wrote level 2 answers.

Answer 07 · Examiner comments November 2021 | 8464/P/2F | Original Q6

Question 6 (standard demand)

06.1 30% of students correctly selected the meaning of elastically deformed.

06.2 10% of students scored marks on this question. Most of the answers that did not score marks did not refer to any practical procedure or equipment. Some answers did mention measuring the spring, but did not identify which property should be measured, nor which piece of equipment should be used to take the measurement.

06.3 80% of students were able to select the correct equation from the physics equations sheet, and substitute the values into the equation. Nearly all these students correctly evaluated the answer and were awarded 2 marks. Only 2 students converted 80 mm to metres and scored full marks.

06.4 Approximately 25% of students correctly recalled the equation.

06.5 Approximately 25% of students were able to substitute the numbers into the correctly rearranged equation and evaluate the answer to score full marks.

6.5.1.2 Contact and non-contact forces

Answer 08 · Examiner comments

June 2022 | 8464/P/1F | Original Q2

Question 02 (Low demand)

02.1 Approximately half of all students used the diagram to work out that the counterweight and the lift would move through the same distance.

02.2 Only about 40% of students realised that the gravitational potential energy of the counterweight would decrease as it moved down.

02.3 Just under 90% of students gained both marks in this calculation.

02.4 About half of all students gained at least 1 mark, with about 15% gaining both marks.

It was more common for students to identify that the kinetic energy of the lift would decrease, than to identify that the internal energy of the brakes would increase.

02.5 Nearly 90% gained at least 1 mark, with just under 40% ticking both of the correct boxes.

02.6 Just under 70% of students scored both marks.

The fact that extension should have been squared was missed or misunderstood by a fair proportion of students, who either calculated 0.5 × spring constant × extension, or calculated (0.5 × spring constant × extension)^2.

02.7 About half of all students gained this mark.

Answer 09 · Examiner comments

June 2022 | 8464/P/2F | Original Q7

Question 7 (Standard demand)

07.1 Nearly 90% of students were able to write down the correct equation.

07.2 This was a relatively straightforward calculation. However, it was not attempted by nearly 20% of students, and only approximately 50% of students gained full marks.

07.3 Nearly 90% of students were able to select the correct equation.

07.4 This calculation was well answered with 75% of students gaining full marks.

07.5 This extended response question was well answered. 70% of students were able to write responses worth some credit, with most stating that the competitors may get tired. Of the students that did not get into level 2, most gave reasons why the speed may change, but did not link this to an increase or decrease in speed.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

6.5.1.2 Contact and non-contact forces

Answer 10 · Examiner comments

June 2023 | 8464/P/1F | Original Q2

Question 02 (Low demand)

02.1 Just below 50% of students knew that the gravitational potential energy decreases.

02.2 About 70% of students knew that the kinetic energy decreases.

02.3 Nearly 90% of students answered this question correctly. The most common mistake was from students who calculated 2.5 × 9.8, but did not then multiply by the height of the block above the ground.

02.4 Just over four fifths of students gained both marks in this kinetic energy calculation. The most common error was to forget to square the value for speed.

02.5 Slightly less than half the students recognised that friction transfers energy to the surroundings.

02.6 Nearly 90% of students gained at least 1 mark for this explanation, most commonly for identifying that the speed would increase. Many students were not using physics terms to describe the effects of oiling the wheel, with many just saying it would be more slippery. This was insufficient to gain marking point 2. A fair proportion of students stated that the oil would make the wheel wet, or that it would prevent rust, neither of which gained credit.
It did not matter where students thought the friction was being reduced: some stated that friction between the wheel and the zip wire would be reduced, while others had the friction between the wheel and the axle. As long as they had the idea of reduced friction, they scored marking point 2.

6.5.1.2 Contact and non-contact forces

Answer 11 · Examiner comments

June 2023 | 8464/P/2F | Original Q1

Question 1 (Low demand)

01.1 Over 95% of students knew that weight acts downwards.

01.2 Approximately 90% of students knew that weight is a gravitational force.

01.3 A little over 90% of students correctly calculated the weight. Nearly all students that substituted correctly also gave the correct final answer.

01.4 Over 80% of students scored 2 marks for this calculation. Again, nearly all students that substituted correctly also gave the correct final answer.

01.5 Approximately 85% of student knew that inelastically deformed meant that the spring will not go back to its original length when the force is removed.

01.6 This question was not as well answered, but over 60% of students were able to identify which length was the extension.

01.7 Nearly 80% of students were able identify which graph shows that the extension of the spring is directly proportional to the force applied to the spring.

01.8 Only 5% of students were able to suggest two improvements to the investigation. Most of the 45% of students that gained one mark suggested using a greater number of forces, or a bigger force. There were lots of vague responses that suggested repeating but not taking a mean.

6.5.1.2 Contact and non-contact forces

Answer 12 · Examiner comments June 2023 | 8464/P/2F | Original Q4

Question 4 (Low demand and standard demand)

04.1 Nearly 30% of students scored two marks on this question. Of the 50% that scored one mark, the majority correctly labelled the compression.

04.2 75% of students knew that longitudinal waves transfer energy.

04.3 Approximately 40% of students knew that the amplitude changes. The most popular incorrect response was wavelength.

04.4 90% of students read the correct speed off the graph. As the line does not cross at exactly 340, a tolerance was allowed and many students picked up the mark for an answer between 339 and 340.

04.5 Over 80% of students used their value from question 04.4 in the equation and scored two marks. A small number of students did not use their value from question 04.4 despite the instruction to do so.

04.6 Approximately 25% of students identified that when the temperature of the air increases, the speed increases. Of those that did, only a very small minority of students went on to state that therefore the time would decrease. Many students contradicted themselves by stating that the speed would increase with temperature, but then said that the time would increase.

Answer 13 · Examiner comments

June 2025 | 8464/P/2F | Original Q1

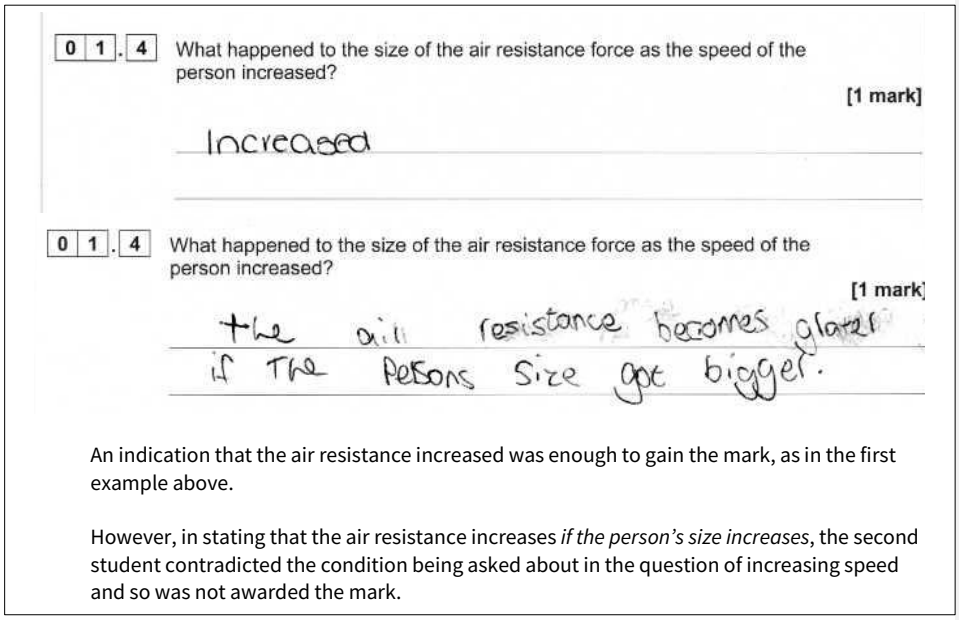
Question 1 (Low demand)

01.1 About four in five students were able to identify the anomalous result.

01.2 Slightly more than half of students identified that air resistance acts upwards on a body falling vertically downwards.

01.3 Nearly three quarters knew that friction is a contact force.

01.4 Just under two thirds of students correctly identified that air resistance increases with speed.



An indication that the air resistance increased was enough to gain the mark, as in the first example above.

However, in stating that the air resistance increases *if the person's size increases*, the second student contradicted the condition being asked about in the question of increasing speed and so was not awarded the mark.

01.5 This calculation was well answered, with nearly 90% of students gaining both marks.
For those who did not answer correctly, the unit for acceleration was often the cause of difficulty. When some of these students read '60 m/s^2', they were clearly not sure what to do with the 'seconds squared', and decided to square the value of the acceleration, calculating $60^2 \times 0.35$ instead of 60×0.35

Some of these students did manage to gain the first mark for substituting into the equation and including the relevant units for all quantities, only making the error when they evaluated their calculation (i.e. '60 m/s^2 × 0.35 s = 12.6 m/s'). However, those who wrote '$60^2 \times 0.35 = 12.6$' did not gain any credit as their final answer did not match the calculation they had shown.

01.6 Another well answered calculation, with around 9 in 10 students gaining both marks. This question also caused issues for a minority of students who thought that 60 m/s^2 means that the acceleration value should be squared.

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6.5.1.2 Contact and non-contact forces

Answer 14 · Examiner comments June 2025 | 8464/P/2F | Original Q6

Question 6 (Standard demand)

06.1 Approximately 90% of students were either able to recall the equation linking distance, speed and time, or used the Physics Equations Sheet to look it up.

06.2 Nearly two thirds were able to correctly rearrange the equation selected and arrive at the correct answer. This was perhaps aided by some students recalling the equation as 'speed = distance / time' and arriving at the correct answer using this memorised form of the equation rather than by re-arranging the equation they selected in the previous question.

0 6 . 2 The longest dog-sled race in the world covers a distance of 1 500 000 m.