AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.5.4.2.1

Newton's First Law

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**3**
Available paper years	**2018–2022**

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.

6.5.4.2.1 Newton's First Law

Answer 01 · Mark scheme June 2018 | 8464/P/2H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.1	its acceleration would decrease to zero the resultant force on it would decrease to zero		1 1	AO3 6.5.4.2.2
01.2	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
01.3		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	
01.4	(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

6.5.4.2.1 Newton's First Law

Answer 01 · Mark scheme

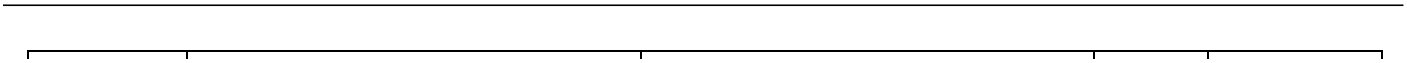
June 2018 | 8464/P/2H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.5	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
01.6	inversely proportional	allow as mass increases, acceleration decreases	1	AO3 6.5.4.2.2
Total			**12**	

6.5.4.2.1 Newton's First Law

Answer 01 · Mark scheme

June 2018 | 8464/P/2H | Original Q1



6.5.4.2.1 Newton's First Law

Answer 02 · Mark scheme

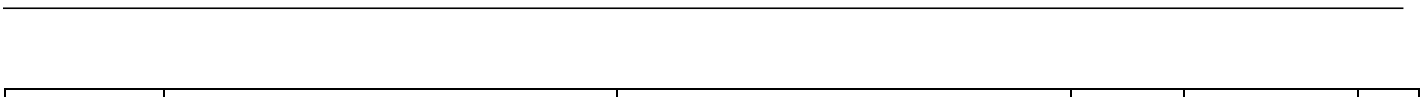
June 2019 | 8464/P/2H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
06.1	thrust decreases	allow air resistance or drag increases ignore air resistance decreases as speed decreases	1	1xAO1 1xAO2 2xAO3 6.5.4.2.1	E
	so there is a resultant force in opposite direction	allow so air resistance or drag is greater than thrust	1		
	lift must decrease (because weight stays the same)		1		
	so there is a resultant downwards force	allow so weight is greater than lift the last two marking points cannot be awarded if there is a reference to the weight increasing	1		
06.2		an answer of 300 000 (kg) scores **5** marks		AO2 6.5.4.1.5 6.5.4.2.2	E
	$a = \frac{(10-80)}{28}$	allow $a = \frac{(80-10)}{28}$	1		
	$a = (–)2.5\ (m/s^2)$	a valid equation must have been used to calculate a to score subsequent marks	1		
	$(–)\ 750\ 000 = m \times (–)2.5$	allow a correct substitution using their calculated value of a	1		
	$m = \frac{(-)750\ 000}{(-)2.5}$	allow a correct rearrangement using their calculated value of a	1		
	m = 300 000 (kg)	allow a correct calculation using their calculated value of a	1		
Total			**9**		

6.5.4.2.1 Newton's First Law

Answer 02 · Mark scheme

June 2019 | 8464/P/2H | Original Q6



6.5.4.2.1 Newton's First Law

Answer 03 · Mark scheme

June 2022 | 8464/P/2H | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	$21 = 30 \times t$ $t = \frac{21}{30}$ $t = 0.7$ (s)	allow use of any correct pair of values from the graph allow 0.70 (s)	1 1 1	AO2 6.5.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	one square represents 5 (m) number of squares = 9 braking distance = 9 × 5 = 45 (m)	 allow number of squares in the range 8.5 to 10 allow an answer in the range 42.5 (m) to 50 (m)	1 1 1	AO2 6.5.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	gradient is equal to acceleration gradient / acceleration is not constant so resultant force is not constant because resultant force is directly proportional to acceleration (for constant mass)	 allow resultant force is not constant because F = ma	1 1 1	AO1 AO3 AO3 6.5.4.2.2

Total Question 6		9

6.5.4.2.1 Newton's First Law

Answer 01 · Examiner comments

June 2018 | 8464/P/2H | Original Q1

Question 1 (standard demand)

01.1 This was generally well answered with nearly 40% scoring both marks. The most common incorrect responses were that acceleration and the resultant force would increase.

01.2 Many students did not realise that it was distance that was important and a significant number spoke of needing to have less weight so that the glider moved more slowly. About 40% scored this mark. Correct responses of raising the table and shortening the string were given fairly equally.

01.3 Many students were not clear about how means were calculated and spoke of the mode being used instead at 0.59 N. There was widespread misunderstanding about accuracy with many stating that the more decimal places, the more accurate a result.

There were many references to recurring decimals. Those who scored in this question often did so by the 'decimal point' route rather than the 'significant figure' route.

Nearly 40% scored 2 marks, with a fairly even spread between those who identified one error and corrected it, or for identifying the 2 errors but not adequately describing how they would correct them.

01.4 This was well done with over 80% scoring the mark, but common errors were to refer to 'faster' or 'quicker' acceleration. A few made reference to the investigation not being a fair test.

01.5 46% scored all 3 marks. The quality of the plotting was generally good, but lines of best fit were often mistakenly given as straight lines, 50% gaining 2 marks. Where a curve was drawn these were generally of a credit worthy standard.

01.6 This was well done, with 73% gaining the mark, but a common error was to refer to “slower” acceleration. There were a number of answers which were insufficient, for example “negative correlation”.

6.5.4.2.1 Newton's First Law

Answer 03 · Examiner comments

June 2022 | 8464/P/2H | Original Q6

Question 6 (Standard/high and high demand)

06.1 As students were provided with the equations, this question proved to be more straight-forward than originally expected. Students had to interpret the graph to determine the reaction time. As they were given the equation over 70% were able to read two values off the graph, and correctly determine the reaction time. Nearly all students that did read two correct values scored full marks. Those that did not usually rearranged the equation incorrectly.

06.2 Only a small percentage of students appreciated that they had to determine the area under the graph. Of those that did, only about 1% failed to go on and score all the marks. About 6% of students scored on this question. Most incorrect answers gave two values from the graph and multiplied them together.

06.3 This was a high demand question, and approximately 30% of students gained some marks. Nearly all answers that did not gain any marks did not mention the gradient at all. Only about 3% of students went on to say that the gradient represents the acceleration, and very few stated that acceleration was proportional to force or that force is equal to mass times acceleration.