

# Forces and Braking

## Mark Scheme 1

<b>Level</b>	GCSE (9-1)
<b>Subject</b>	Combined Science: Trilogy - Physics
<b>Exam Board</b>	AQA
<b>Topic</b>	6.5 Forces
<b>Sub-Topic</b>	Forces and Braking
<b>Difficulty Level</b>	Bronze Level
<b>Booklet</b>	Mark Scheme 1

**Time Allowed:** 56 minutes

**Score:** /56

**Percentage:** /100

**Grade Boundaries:**

<b>M1.(a)</b>	C		1
(b)	2040 / 120		1
	17 (m / s)		1
	<i>allow 17 (m / s) with no working shown for 2 marks</i>		
(c)	the thinking distance and the braking distance combined <i>accept 36 m</i>		1
(d)	thinking distance increases		1
	braking distance stays the same		1
			<b>[6]</b>
<b>M2.(a)</b>	time		
	<i>correct order only</i>		1
	force		1
(b)	The car tyres being badly worn		1

- (c) (i) braking distance increases with speed  
*accept positive correlation*  
*do **not** accept stopping distance for braking distance*

1

relevant further details, eg

- but not in direct proportion
- and increases more rapidly after 15 m/s  
*accept any speed between 10 and 20*  
*accept numerical example*
- double the speed, braking distance increases  $\times 4$

1

- (ii) line drawn above existing line starting at the origin  
*as speed increases braking distance must increase*  
*each speed must have a single braking distance*

1

- (d) (i) reaction time / reaction (of driver) does not depend on speed (of car)

1

- (ii) (on the reduced speed limit roads) over the same period of time  
*accept a specific time, eg 1 year*

1

monitor number of accidents before and after (speed limit reduced)  
*allow 1 mark only for record number of vehicles / cars using the (20 mph) roads **or** collect data on accidents on the (20 mph) roads*  
*to score both marks the answer must refer to the roads with the reduced speed limit*

1

[9]

M3.(a) 96 (m)

1

- (b) (i) similar shape curve drawn above existing line going through (0,0)  
*allow 1 mark for any upward smooth curve or straight upward line above existing line going through (0,0)*

2

- (ii) Rain on the road

1

- (c) (i) all three lines correctly labelled  
*allow 1 mark for one correctly labelled*

top line – **C**  
*accept 1.2*

middle line – **B**  
*accept 0.9*

bottom line – **A**  
*accept 0.7*

2

- (ii) any **two** from:

- (table has) both variables are together  
*accept tired and music as named variables*
- both (variables) could / would affect the reaction time  
*accept cannot tell which variable is affecting the drive (the most)*
- cannot tell original contribution
- need to measure one (variable) on its own  
*accept need to test each separately*
- need to control one of the variables  
*fair test is insufficient*

2

[8]

- M4.** (a) The driver has been drinking alcohol.  
*reason only scores if this box is ticked*

1

driver's reaction time increases  
*accept slower reactions*  
*accept slower reaction time*  
or thinking distance / stopping distance increases  
*do not accept braking distance increases*  
or driver less alert  
*accept driver may fall asleep / be tired*

1

- (b) they are all variables that could affect outcome / results  
*accept specific effect of changing one of the variables*  
*accept to make the test valid*  
*ignore reliable*

1

so data / barriers can be compared  
*accept to see which is / works best / safest*  
*do **not** accept fair test on its own*

1

- (c) ticks in both the top and middle boxes

1

[5]

- M5.** (a) distance travelled under the braking force

- accept braking (distance)* 1
- (b) (directly) proportional  
*accept a correct description using figures*  
**or**  
increase in the same ratio  
*eg if speed doubles then*  
*thinking distance doubles*  
*accept for 1 mark positive correlation*  
*accept for 1 mark as speed*  
*increases so does thinking distance*  
*accept as one increases the other increases*  
*accept as thinking distance increases speed increases* 2
- (c) (i) control variable 1
- (ii) experiment done, student listens to music / ipod (etc) 1
- experiment (repeated), student not listening to music  
*for both marks to be awarded there must be a comparison* 1
- (d) increase it  
*accept an answer which implies reactions are slower*  
*do **not** accept answers in terms of thinking distance only* 1
- (e) Y 1

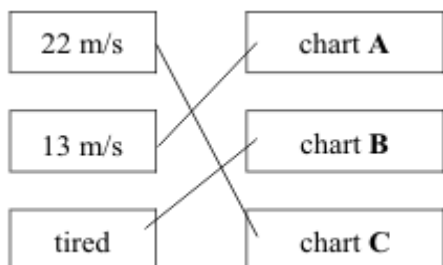
**M6.** (a) (i) constant

1

(ii) heat

1

(b) (i) 3 links correct



*allow 1 mark for 1 correct link*

*if more than one line is drawn from a condition mark all lines from that condition incorrect*

2

(ii) increased

1

[5]

**M7.** (a) 53 (m)

1

(b) (i) Similar shape curve drawn above existing line going through (0, 0)

*allow 1 mark for any upward smooth curve or straight upward line above existing line going through (0, 0)*

2

(ii) rain on road 1

car brakes in bad condition 1

(c) (i) all three lines correctly labelled  
*allow 1 mark for one correctly labelled*

top line – C  
*accept 1.2*

middle line – B  
*accept 0.9*

bottom line – A  
*accept 0.7*

2

(ii) any **two** from:

- (table has) both variables are together  
*accept tired and music as named variables*
- both (variables) could/ would affect the reaction time
- cannot tell original contribution  
*accept cannot tell which variable is affecting the drive (the most)*
- need to measure one (variable) on its own  
*accept need to test each separately*
- need to control one of the variables

2

[9]

**M8.** (a) MN

*accept 5.8, 8 seconds must include unit*

1



(b) LM

*accept 0.8, 5.8 seconds must include unit*

1

(c) (i) 0.8

1

(ii) drinking alcohol

1

(d) straight (by eye) line starting at 0.8 seconds

1

line drawn steeper than LM starting before L

*ignore lines going beyond 2 seconds but line must exceed  
2.5 metres per second before terminating*

1

[6]