

**M1.** (a) B

more aerodynamic **or** most streamlined shape **or**  
smaller (surface) area

*accept less air/wind resistance **or** less drag **or** less friction  
clothing traps less air **or** rolled up into ball **or** arms, legs  
drawn in*

*accept converse*

2

(b) (i) gravity

1

(ii) air resistance

1

(iii) go up

1

(iv) stays the same

1

(c) bigger the area, the bigger force Y

*accept the converse*

**or** bigger the area more drag

*accept when the parachute opens then force Y bigger*

**or** bigger the area more air resistance

*need the relation of area to force*

1

[7]

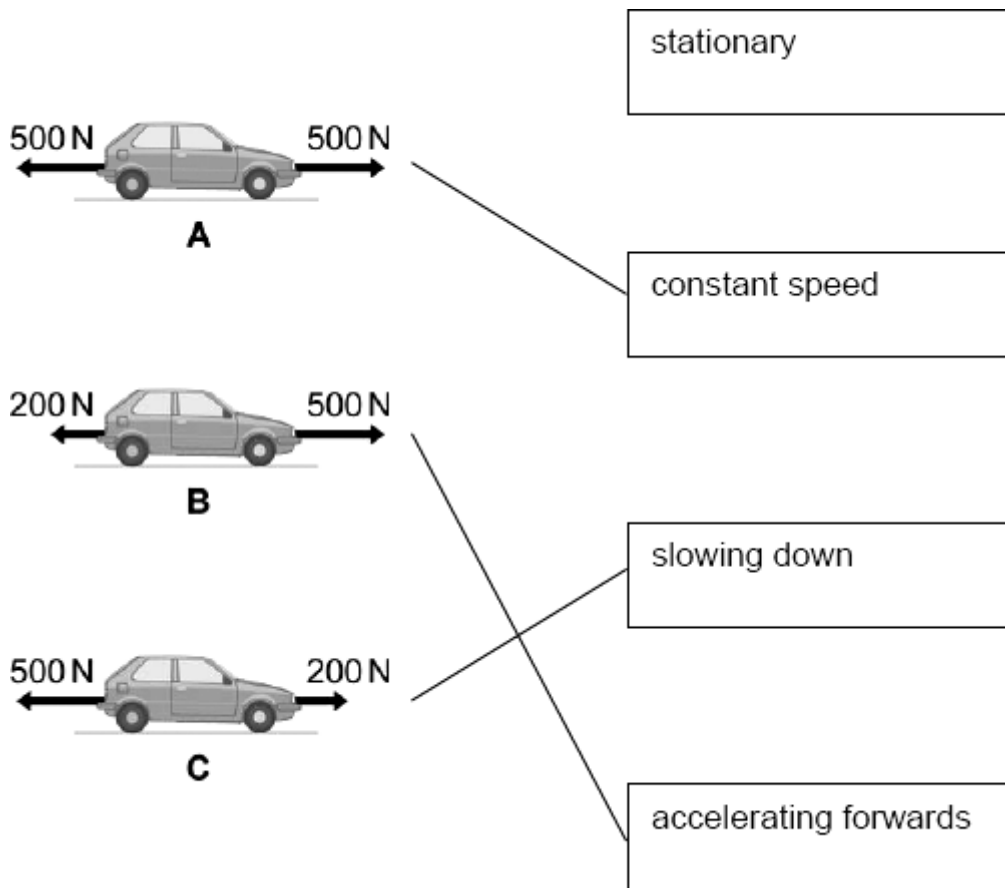
- M2.** (a) (i) friction  
*accept any way of indicating the correct answer* 1
- (ii) gravity  
*accept any way of indicating the correct answer* 1
- (b) (i) accelerates **or** speed / velocity increases  
*accept faster and faster (1 mark)*  
*do **not** accept faster pace / falls faster*  
*or suggestions of a greater but constant speed* 1
- downwards / falls  
*accept towards the Earth / ground*  
*this may score in part (b)(ii) if it does not score here and*  
*there is no contradiction between the two parts* 1
- (ii) constant speed / velocity **or** terminal velocity / speed or zero acceleration  
*stays in the same place negates credit* 1

[5]

- M3.** (a) (i) same size 1
- (ii) **K** 1
- (b) velocity 1
- (c) **C** 1
- greatest mass **or** because it's heavier  
*accept biggest load*  
*accept heaviest **or** more weight*  
*do **not** accept fuller*  
*do **not** accept more items*  
*do **not** accept it's loaded*  
*do **not** accept loaded most*  
*ignore references to time as neutral* 1

[5]

- M4.(a)** 3 lines drawn  
 all correct  
 allow 1 mark for each correct line  
 if two or more lines are drawn from any diagram then all these lines are incorrect



3

- (b) (i) horizontal arrow to the right  
*judge by eye*  
*accept an arrow drawn outside the box if it is labelled correctly*

1

- (ii) horizontal arrow to the left  
*judge by eye*  
*accept an arrow drawn outside the box if it is labelled correctly*

1

- (iii) equal to

1

(iv) to measure the forces exerted on the dummy during the impact

1

[7]

- M5.** (a) (i) 0.6  
*allow 1 mark for correct substitution* 2
- newtons  
*accept N*  
*do **not** accept n*  
*accept Newtons* 1
- (ii) the same as 1
- (b) (i) changed velocity  
*accept increased/ decreased for change*  
*accept speed for velocity*  
*accept change direction*  
*accept getting faster/ slower*  
*accept start/ stop moving*  
*accept correct equation in terms of change in speed or*  
*change in velocity* 1
- (ii) down(wards)  
*accept towards the ground*  
*accept ↓*  
*do **not** accept south* 1

[6]

**M6.** (i) the thicker the tile, the greater the (fall) height  
*accept the higher (the fall) the thicker the tile*  
*accept there is a positive correlation*  
*do **not** accept they are proportional*

1

(ii) 60 (mm)  
*accept any number or range between 60 and 85 inclusive*  
*if units are given must match range*

1

(minimum thickness) needed to reduce risk of injury  
*reason must match thickness choice*  
*do **not** accept to keep child safe*  
*accept an answer in terms of – the thicker the tile, the less*  
*chance there is of a serious injury if the answer given is*  
*greater than 60*  
*accept answers in terms of use of graph e.g. the graph*  
*shows that for a 2m fall a thickness of 60 mm is needed*  
*minimum level answer' the graph shows that's what's*  
*needed' accept only if 60 is the answer*

1

[3]

**M7.(a) Level 2 (3–4 marks):**

A detailed and coherent description of a plan covering all the major steps is provided.

The steps are set out in a logical manner that could be followed by another person to obtain valid results.

**Level 1 (1–2 marks):**

Simple statements relating to relevant apparatus or steps are made but they may not be in a logical order. The plan would not allow another person to obtain valid results.

**0 marks:**

No relevant content.

**Indicative content**

- measure the distance the ruler falls before being stopped
- the greater this distance the greater the reaction time
- repeat measurements and calculate a mean
- repeat several times with the student listening to music (through earphones). Calculate a mean.
- a (significant) difference between the two means would show that music affects reaction time.

4

(b) reaction time decreases with practice

*allow Y has a shorter reaction time*

1

*allow Y has faster reaction times (than X)*

(c) the stop clock was started before the computer test started

1

the student was distracted

1

[7]



**M8.** (a) any **two** from:

- (make shape / body) more streamlined  
*accept a correct description*  
*accept lower the seating position of the driver*
- increase power of engine  
*faster engine is insufficient*
- reduce mass / weight (of go-kart)  
*change wheel size is insufficient*

2

(b) (i) A–B

*reason only scores if A–B is chosen*

1

steepest / steeper gradient / slope

1

(iii) 1820

*allow 1 mark for correct substitution, ie  $140 \times 13$  provided no subsequent step shown*

2

[6]

**M9.** (a) (i) not moving

1

(ii) straight line from origin to (200,500)

*ignore a horizontal line after (200,500)*

1

(b) 35 000

*allow 1 mark for correct substitution, ie  $14\ 000 \times 2.5$  provided no subsequent step*

*an answer of 87 500 indicates acceleration (2.5) has been squared and so scores zero*

2

[4]