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

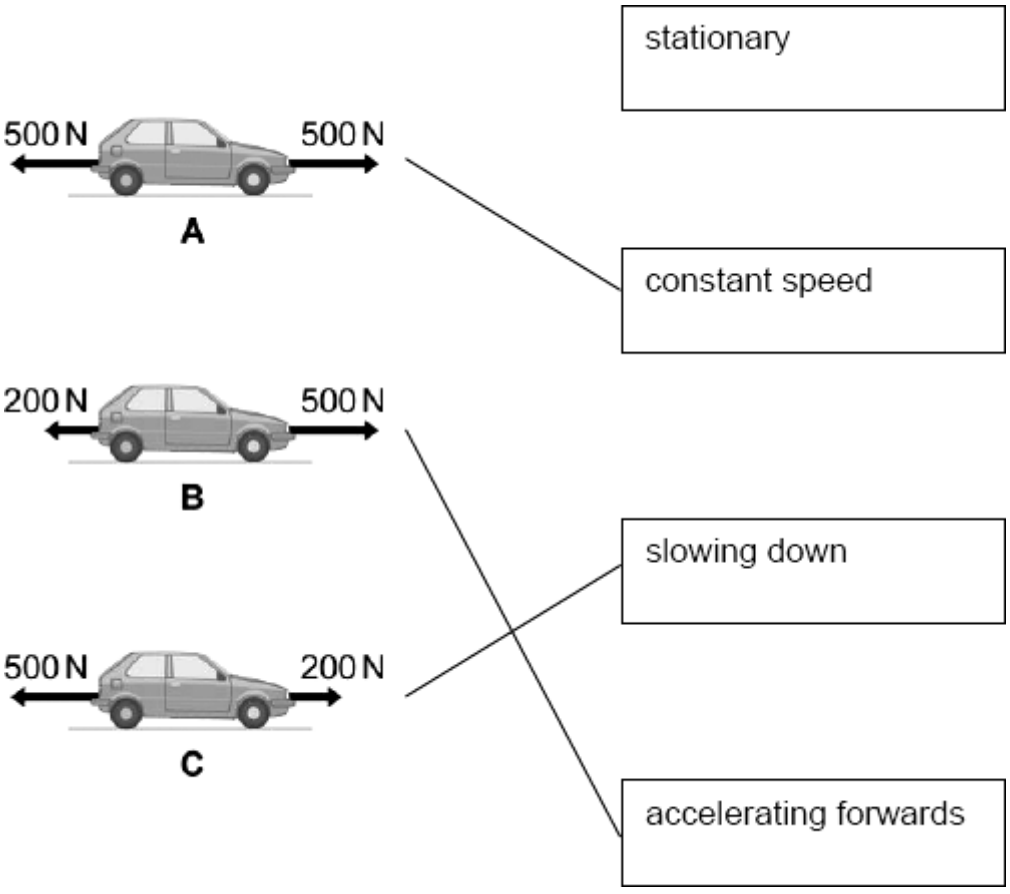
greatest mass **or** because it's heavier

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 × 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 × 2.5 provided no subsequent step*
an answer of 87 500 indicates acceleration (2.5) has been squared and so scores zero

2

[4]