Question	Answers	Extra information	Mark	AO / Specification reference
01.1	Newton's first law — motion doesn't change unless a force acts on it Newton's second law — acceleration depends on force and mass Newton's third law — forces come in pairs	all correct for two marks one correct for one mark	2	AO1 6.5.4.2.1 6.5.4.2.2 6.5.4.2.3
01.2	resultant force		1	AO1 6.5.4.2.2
01.3	not moving/stationary **or** moving with a constant velocity/steady speed in one direction Newton's first law	do not allow 'steady speed' on its own	1 1	AO1 6.5.4.2.1
02.1	no there is no resultant force acting on the puck		1 1	AO1 6.5.4.2.1
02.2	no (the puck does not carry the force) you need to apply a resultant force in the opposite direction		1 1	AO1 6.5.4.2.1
02.3	no the force of the puck on the stick is the same magnitude as the force on the stick of the puck		1 1	AO1 6.5.4.2.3
02.4	yes the speed does not change but the direction does		1 1 1	AO3 6.5.4.2.2
03.1	thinking distance — is the distance the car travels while the driver reacts braking distance — is the distance the car travels while the driver applies the brakes stopping distance — is the thinking distance and braking distance added together	two marks for all lines correct one mark for one line correct	2	AO1 6.5.4.3.1

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Specification reference</th></tr>
<tr><td>03.2</td><td>0.5 s</td><td></td><td>1</td><td>AO1
6.5.4.3.2</td></tr>
<tr><td>03.3</td><td>speed</td><td></td><td>1</td><td>AO1
6.5.4.3.2
6.5.4.3.4</td></tr>
<tr><td>04.1</td><td><table>
<tr><th>Factor</th><th>Affects thinking distance</th><th>Affects braking distance</th><th>Both</th></tr>
<tr><td>road conditions</td><td></td><td>✓</td><td></td></tr>
<tr><td>distractions in the car</td><td>✓</td><td></td><td></td></tr>
<tr><td>speed</td><td></td><td></td><td>✓</td></tr>
</table></td><td>one mark for each correct column</td><td>2</td><td>AO1
4.5.6.3.1
4.5.6.3.2
4.5.6.3.3</td></tr>
<tr><td>04.2</td><td>appropriate example e.g.,
tiredness
increases reaction time/if you are tired, your reaction time is greater
the thinking distance will increase</td><td>one mark for suitable condition affecting thinking distance
one mark for indication that the factor affects thinking distance
one mark for correct effect</td><td>1
1
1</td><td>AO1
4.5.6.3.2</td></tr>
<tr><td>04.3</td><td>appropriate example, e.g.,
icy road conditions
increase the braking distance
the stopping distance will increase</td><td>one mark for suitable condition affecting braking distance
one mark for indication that stopping distance includes braking distance
one mark for correct effect</td><td>1
1
1</td><td>AO1
4.5.6.3.1
4.5.6.3.3</td></tr>
</table>

Question	Answers	Extra information	Mark	AO / Specification reference
05.1	B		1	AO2 6.5.4.2.1
05.2	C		1	AO2 6.5.4.2.1
05.3	force = 3500 × 4 = 14 000 N		1 1	AO2 6.5.4.2.2
05.4	the track is not straight		1	AO3 6.5.4.2.1
06.1	moving at a steady speed the same size as		1 1	AO2 6.5.4.2.1
06.2	different from unbalanced balanced		1 1 1	AO2 6.5.4.2.2
06.3	the car will slow down		1	AO3 6.5.4.2.2
07.1	**one** from: • the speed • mass of car/load in car • condition of tyres • condition of brakes		1	AO1 6.5.4.3.1 6.5.4.3.3

Question	Answers	Extra information	Mark	AO / Specification reference
07.2	one mark for two or three bars correct two marks for all bars correct		2	AO2 6.5.4.3.3
07.3	as the road conditions become more slippery, the braking distance increases		1	AO3 6.5.4.3.3
07.4	because there is less friction		1	AO3 6.5.4.3.3
07.5	to make the results more repeatable/to make sure the results don't include outliers/don't include random errors		1	AO3 6.5.4.3.3
07.6	the road conditions do not affect the thinking distance		1	AO3 6.5.4.3.2 6.5.4.3.3
08.1	force = mass x acceleration		1	
08.2	force = 50 x 2 = 100 N/newtons		1 1 1	AO1 AO2 6.5.4.2.2
08.3	it doubles/is bigger acceleration is proportional to force		1 1	AO3 6.5.4.2.2
09.1	when two objects interact, the forces they exert on each other are equal and opposite	or words to that effect	1	AO1 6.5.4.2.3
09.2	the exhaust gases pushing downwards produces a force of equal magnitude acting in the opposite direction	or words to that effect	1 1	AO1 6.5.4.2.3

Question	Answers	Extra information	Mark	AO / Specification reference
09.3	no Newton's third law applies to two different objects interacting and the student is talking about one object	or words to that effect	1	AO1 6.5.4.2.3
10	Example answer: in both situations the forces are balanced in both situations the Earth is exerting a force on the student/there is a gravitational force on the student acting down the forces acting upwards result from interactions with different objects (water and sunbed) but are the same size/magnitude in both cases when floating, the upwards force is upthrust when on the sunbed, the upwards force is the normal/reaction force		6	AO2 6.5.1.2 6.5.1.4