Question number	Answer	Notes	Marks
2 (a)	clear recognition that stationary is the horizontal sections; 3.5 (minutes);	seen on graph or in working e.g. use of 1.5 or 2 allow 3½	2
(b)	A; idea of line having smallest gradient;	 allow 'line is shallowest' / 'least steep' etc. allow calculated speeds	2
(c) (i)	(average) speed = distance (moved) / time (taken);	allow in standard symbols or in words e.g. s = d/t OR v = s/t	1
(ii)	substitution; evaluation; matching unit; e.g. (speed =) 200 / 60 (speed =) 3.3 m/s	 must match units used in calculation allow 3, 3.33, 3.333 etc. condone 3.34 200 metres per minute receives 3 marks 12 km / h (condone kph) receives 3 marks 200 m/s receives 2 marks allow any suitable unit of speed for 1 mark if no other mark scored	3
(d)	any 2 of: speed of car; mass / weight of car; road / weather conditions; road slope / angle; condition / type / age of tyres; condition / age of brakes; wind speed / direction;	ignore references to reaction time, thinking distance, stopping distance etc. road surface, rain, ice, snow etc. ignore fog, mist etc.	2

Total for question 2 = 10 marks

(d)	any two of: MP1. move scale closer to card / use a ruler and place it nearer the light gate; MP2. measure height at eye level / parallax; MP3. drop using a clamp / eq; MP4. make sure scale is vertical / perpendicular to ground / use a set square; MP5. idea of accounting for zero error;	ignore references to precision, human error, repeats allow 'ruler' for scale allow idea of consistent release mechanism allow put light gate at zero	2

Total for question 3 = 14 marks

Question number	Answer	Notes	Marks
12 (a) (i)	smoke (particles) in air (in smoke cell) OR pollen (grains) on water OR dust (particles) in air;		1
(ii)	MP1. large (observed) particles move randomly; MP2. (because) tiny / small particles are hitting them; MP3. tiny / small particles are not visible (by eye);	allow named large particle e.g. smoke, pollen, dust allow named tiny particle e.g. air, water allow invisible	3
(b)	MP1. (particles) collide with walls (of container); MP2. idea that force is produced (by bombarding molecules); MP3. pressure is force on an area;	bombard, hit, impact upon allow Newton's Laws / momentum argument allow p = F / A	3
(c) (i)	pressure = force / area;	allow in standard symbols or in words e.g. p = F / A	1
(ii)	substitution; rearrangement; evaluation; e.g. 193,000 = F / 0.013 (F =) 193,000 x 0.013 (F =) 2500 (N)	 -1 for POT error allow 2510, 2509 2.509 (N) gets 2 marks 2.509 kN gets 3 marks	3
(iii)	area decreases; with any 2 of: • particles move faster / have more KE; • particles hit (tyre) wall more frequently / with more force / harder; • pressure increases (and force of vehicle weight stays the same);	allow molecules for particles throughout reject if incorrect reference to volume increasing	3

Total for question 12 = 14 marks