1	**C is the correct answer** A is not the correct answer as units would be kg m s^{-2} B is not the correct answer as units would be kg m s^{-1} D is not the correct answer as units would be kg m^2 s^{-2}	**(1)**

6	**The only correct answer is B (parabola-shaped graph)** A is not correct because the acceleration is zero C is not correct because the acceleration is zero D is not correct because the acceleration is zero where the line is straight, acceleration changes where the line curves, and acceleration is zero again when the line becomes straight again.	**1**

5	**The only correct answer is D (the change in velocity of the aeroplane during time *t*)** A is not correct because displacement is the area under a velocity-time graph B is not correct because displacement is the area under a velocity-time graph C is not correct because the shaded area is the change in velocity during time *t*	**1**

9	**A increase but then remain constant**	**1**
	Incorrect Answers: the reading on the scales (assuming it is in newtons) = *ma* + *mg*. There is only a change in the reading as the lift starts its motion i.e. the reading goes from *mg* to *mg* + *ma* B – reading increases from *mg* to *mg* + *ma* at the instant it starts to accelerate only C – reading will increase and not decrease (and then remain constant) D – reading will increase and not decrease	

Question Number	Answer	Mark
15(a)	20 m s^{-1} is the average velocity **Or** the velocity is not constant **Or** the car is accelerating (1) Tangent drawn onto graph at $t = 15$ s **Or** use of correct equations of motion with $u = 0$ (1) Velocity = 40 (m s^{-1}) (1) (Do not award MP2 for approximation of the curve to a straight line at 15 s) Example of calculation Gradient of tangent = $\frac{520\text{ m} - 100\text{ m}}{20.0\text{ s} - 10.5\text{ s}} = 44.2$ m s^{-1}	**3**
15(b)	The acceleration is decreasing **Or** the rate of change of velocity is decreasing (1) Drag forces are increasing (with increased velocity) **Or** the car is heading towards terminal velocity **Or** the resultant force is decreasing due (to the increasing drag force) **Or** air resistance is proportional to velocity (squared) (1)	**2**
	Total for question 15	**5**

Question Number	Answer		Mark
13(a)	Use of $s = ut + \frac{1}{2}at^2$ Allow any valid suvat method.	**(1)**	
	Uses difference in distances travelled by A and B of 9m	**(1)**	
	$t = 1.13$ (s)	**(1)**	**3**
	Example calculation $(93\ \text{ms}^{-1} \times t) + 9\ \text{m} = (93\ \text{ms}^{-1} \times t) + \left(\frac{1}{2} \times 14\ \text{ms}^{-2} \times t^2\right)$ $9\ \text{m} = \left(\frac{1}{2} \times 14\ \text{ms}^{-2} \times t^2\right)$ $t = \sqrt{\frac{9\ \text{m}}{\frac{1}{2} \times 14\ \text{ms}^{-1}}} = \sqrt{1.29\ \text{s}} = 1.13\ \text{s}$		
13(b)	Use of $s = ut + \frac{1}{2}at^2$ Allow any valid suvat method.	**(1)**	
	Time for A to finish = 1.075 s **Or** Time for B to finish = 1.084 s (allow correctly calculated value for another quantity given in the question)	**(1)**	
	Comparison of time for A to finish with time for B to finish and valid conclusion **Or** comparison of time for A to finish with 1.13 s and valid conclusion (ecf from **13(b)**) (allow valid conclusion based on comparison of calculated values for other quantities given in the question)	**(1)**	**3**
	Example calculation $t_A = \frac{100\ \text{m}}{93} = 1.075\ \text{s}$ $109 = 93t_B + \frac{1}{2} \times 14 \times {t_B}^2$ $t_B = \frac{-93 + \sqrt{93^2 - 4 \times \left(\frac{14}{2}\right) \times (-109)}}{2 \times \frac{14}{2}} = 1.084\ \text{s}$ 1.075 s < 1.084 s so car A will finish first.		
	Total for question 13		**6**