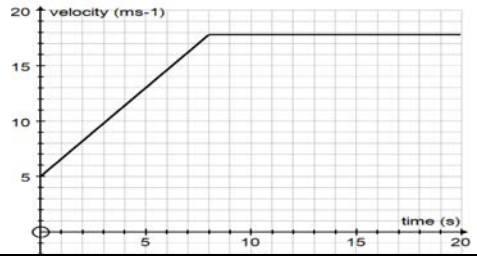
Question			Answer	Marks	AOs		Guidance
14	(i)		$u = 5,\ v = 11.4,\ t = 4$ $a = \frac{v-u}{t} = \frac{11.4-5}{4} = 1.6$ $v = 5 + 1.6t$	**M1** **A1** **A1** **[3]**	**3.1b** **1.1b** **3.3**	Using *suvat* equation(s) leading to value for *a* Any form FT their *a*	
	(ii)		The car would not be able to accelerate indefinitely – the velocity would become too large	**E1** **[1]**	**3.5b**		
	(iii)		When $v = 17.8$ $t = \frac{17.8-5}{1.6} = 8$  	**B1** **G1** **G1** **[3]**	**1.1a** **1.1a** **3.5c**	Calculation or point on graph labelled at $t = 8$ Two line segments with one horizontal Axes labelled. (0, 5) and constant speed 17.8 clear on vertical scale	Mark intent for 17.8 – allow for a linear scale beyond 17.8
	(iv)		Dividing area into sections Area under trapezium = $\frac{1}{2}(5+17.8)\times 8 = 91.2$ Area rectangle $12 \times 17.8 = 213.6$ Total displacement = 304.8 m	**M1** **A1** **A1** **[3]**	**3.1b** **1.1a** **1.1b**	 May be found as sum of areas. May be implied by correct total FT their distance found for first 8s	FT their graph if linear for M1 A0 for a triangle or trapezium area 213.6 must be added to another distance
	(v)		When $t = 4\ \ v = 5 + 0.3\times 4^2 - 0.05\times 4^3 = 11.4\ \text{m s}^{-1}$ Which matches the given value	**B1** **[1]**	**3.4**	Allow without comment	
	(vi)		$\frac{\mathrm{d}v}{\mathrm{d}t} = 0.6\times 2t - 0.05\times 3t^2\ \left[= 1.2t - 0.15t^2\right]$ When $t = 8\ \ v = 1.2\times 8 - 0.15\times 64 = 0$ Acceleration is zero at $t = 8$ which means that the car reaches its maximum speed without the sudden change in acceleration in model A.	**M1** **A1** **E1** **[3]**	**1.1a** **3.2a** **3.2a**	Need not be simplified Must mention acceleration Must compare with model A	Final mark can be awarded independently for a statement about change in acceleration as long as supported by some numerical evidence

Question	Answer	Marks	AOs		Guidance
(vii)	EITHER $\int_0^8 \left(5+0.6t^2-0.05t^3\right)\,\mathrm{d}t = \left[5t+0.2t^3-0.0125t^4\right]_0^8$ =91.2 m	**M1** **A1**	**2.1** **1.1b**	**BC**	Allow for correct definite integral stated and calculator used. Also allow M1A1 for $5\times 8-0.2\times 8^3-0.0125\times 8^4$ seen
	which is same as model A for the first 8 s Distance is the same for the remainder of the time So this is the same as model A at t = 20	**E1** **[3]**	**2.1**	Must consider to t = 20	
	OR $\int_0^8 \left(5+0.6t^2-0.05t^3\right)\,\mathrm{d}t = \left[5t+0.2t^3-0.0125t^4\right]_0^8$ =91.2 m Distance at 17.8 ms^{-1} 213.6 Total distance 304.8m [which is the same as model A]	**M1** **A1** **A1**		**BC** Must consider to t = 20	Allow for correct definite integral stated and calculator used.