Question	Answer	Marks	Guidance
(a)	KE change $= \pm\left(0.5\times900\times16^2 - 0.5\times900\times11^2\right)$ $\left[= \pm(115200 - 54450) = \pm60750\right]$	**B1**	
	PE $= 900g\times150\times0.12$ $\left[=162000\right]$	**B1**	Allow $900g\times150\times\sin6.89°$ or $900g\times150\times\sin6.9°$ Not from use of constant acceleration/Newton's second law.
	[Work done by car's engine =] 24000×12 $\left[=288000\right]$	**B1**	OE e.g. $24000 = \frac{\text{WD}}{12}$
	Work done against resistive forces $= 24000\times12 - 900g\times150\times0.12 - 0.5\times900\times16^2 + 0.5\times900\times11^2$ $= 288000 - 162000 - 115200 + 54450$	**M1**	Use of work-energy 5 terms; dimensionally correct. Work done by car's engine not from using one of the given speeds. Allow sign errors.
	Work done = 65 250 J	**A1**	or 65.25 kJ Allow AWRT 65300 J or 65.3 kJ from correct work
		5	

Question	Answer	Marks	Guidance
(b)	Driving Force $= \dfrac{32000}{v}$	**B1**	OE e.g. $32000 = DF \times v$
	$\dfrac{32000}{v} = 1520 + 4v$	**M1**	Apply N2L to the car with $a = 0$ (3 terms) and attempt to solve a 3-term quadratic in v. For reference $4v^2 + 1520v - 32000 = 0$ Allow if no working seen and have correct real solution(s) to *their* 3-term quadratic. If working shown and if using the formula, it must be using the correct formula. If factorising must have 3 of the 4 terms correct of $(v - 20)(v + 400)$
	Speed $= 20\,\text{ms}^{-1}$	**A1**	Only.
		3	