Question	Answer	Marks
7(a)	$T - 2mg = 0$	B1
	$3mg \sin\theta - T = 0$ (**M1** for resolving forces parallel to the plane and solving for θ)	M1
	$\theta = 41.8$ (41.810...)	A1
		3
7(b)	$R = 3mg\cos 30$	B1
	Use of $F = \mu R$	M1
	$2mg - T = 0.1 \times 2m$ OR $T - 3mg \sin 30 - \mu \times 3mg \cos 30 = 0.1 \times 3m$	M1
	$2mg - 0.2m - 3mg \sin 30 - \mu \times 3mg \cos 30 = 0.1 \times 3m$	M1
	$\mu = \frac{\sqrt{3}}{10}$	A1
		5
7(c)	$v^2 = 0 + 2 \times 0.1 \times 0.8 \quad (v = 0.4)$	M1
	$-3mg \sin 30 - \mu \times 3mg \cos 30 = 3ma \ (a = -6.5)$	M1
	$0 = -0.4 - 6.5t$	M1
	$t = 0.4/6.5 = 0.0615$ s	A1
		4

Question	Answer	Marks	Guidance
6(a)	Attempt to use Newton's Second law	M1	
	For *P*: $0.3g\sin 60 - T = 0.3a$ For *Q*: $T + 0.2g\sin 30 = 0.2a$ System: $0.3g\sin 60 + 0.2g\sin 30 = 0.5a$ $\frac{0.3g\sin 60 - T}{0.3} = \frac{0.2g\sin 30 + T}{0.2}$	A1 A1	For any one equation For any second equation
	$0.3g\sin 60 + 0.2g\sin 30 = 0.5a \quad a = \ldots$	M1	For solving for *a* or *T*
	Magnitude of acceleration = 7.20 ms^{-2} Tension = 0.439 N	A1	
		5	
6(b)	$R = 0.2g\cos 30$	B1	
	$[0.3g\sin 60 - T = 0]$ $T = \frac{3\sqrt{3}}{2}$ or $T = 2.598\ldots$	B1	Equilibrium for *P*
	$T + 0.2g\sin 30 - F - 3 = 0$	M1	Equilibrium for *Q* on the point of moving down
	$\frac{3\sqrt{3}}{2} + 0.2g\sin 30 - \mu(0.2g\cos 30) - 3 = 0$	M1	Use of $F = \mu R$
	$\mu = 0.345$	A1	
		5	

Question	Answer	Marks	Guidance
6(a)	$R = 5g,\ F = 6g - 4g$	M1	For resolving forces to find F and R.
	$\mu = \frac{2g}{5g} = 0.4$	A1	AG
		2	
6(b)	$T_1 - 4g = 4a$ or $8g - T_2 = 8a$	M1	For applying Newton's 2nd law to the 4 kg particle or the 8 kg particle.
	$T_1 - 4g = 4a$ and $8g - T_2 = 8a$	A1	Both equations correct.
	$T_2 - T_1 - F = 5a$ and $F = 0.4 \times 5g$	B1	
	Adding gives $8g - 4g - 2g = 17a$ leading to $a = \ldots$.	M1	Attempt to solve for a, T_1 or T_2.
	$a = 1.18\ \text{ms}^{-2}$, $T_1 = 44.7\ \text{N}$, $T_2 = 70.6\ \text{N}$	A1	
		5	
6(c)	$T - 4g = 4a$, $-T - F = 5a$, $F = 2g$ or $-4g - 2g = 9a$	M1	Applying Newton's 2nd law to both active particles.
	$a = -\frac{60}{9}$	A1	
	$v^2 = 2 \times \frac{20}{17} \times 0.5 = \frac{20}{17}$ leading to $v = \ldots$ [$v = 1.0846\ldots$]	M1	Use of $v^2 = u^2 + 2as$ or equivalent to find v or v^2 when the 8 kg particle reaches the ground.
	$0 = \sqrt{\frac{20}{17}} - \frac{60}{9}t$	M1	Use of $v = u + at$ or equivalent to find t.
	$t = 0.163\ \text{s}$	A1	From $t = 0.1626978\ldots$
		5	